Government of Pakistan

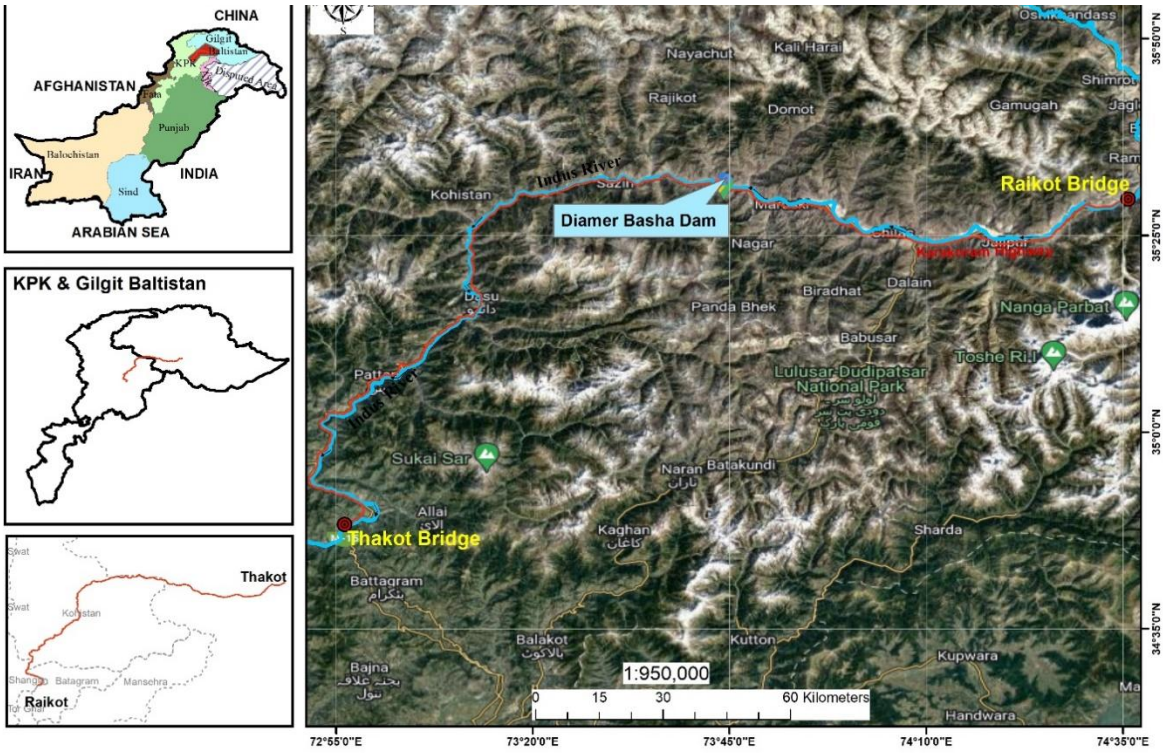
Ministry of Communication

NATIONAL HIGHWAY AUTHORITY

Consultancy Services for Feasibility Study & Detailed Design for

REALIGNMENT OF KKH FROM THAKOT TO RAIKOT

due to construction of Dams on River Indus



ENVIRONMENTAL IMPACT ASSESSMENT REPORT

(Sazeen to Raikot Section - Gilgit Baltistan)

March, 2023

A Joint Venture of

National Engineering Service Pakistan (NESPAK) *(Lead Firm)*

HARZA Consultant Pvt. Ltd.

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LIST OF ACRONYMS

CPEC	China-Pakistan Economic Corridor
RFP	Request for Proposal
EIA	Environmental Impact Assessment
NHA	National Highway Authority
PEPA	Pakistan Environmental Protection Act
NEQS	National Environmental Quality Standards
COI	Corridor of Impact
CBO	community based organizations
NCS	National Conservation Strategy
IEE	Initial Environmental Examination
EPA's	Environmental Protection Agencies
LAA	Land Acquisition Act
EALS	Environment, Afforestation, Land and Social
PEPC	Pakistan Environmental Protection Council
EMP	Environmental Management Plan
RoW	Right of Way
LAC	Land Acquisition Collector
CITES	Convention on "International Trade in Endangered Species
UNFCCC	UN Framework Convention on Climate Change
POPs	Persistent Organic Pollutants
PPE	personal protective equipment
STDs	sexually-transmitted disease
CC	Construction Contractor
SC	Supervision Consultant
EO	Environmental Officer
WHO	World Health Organization
EE	Environmental Engineer
EMC	Environmental Monitoring Committee
BEPA	Balochistan Environmental Protection Agency
APs	affected parties
GA	Government Agency
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
TSS	Total Suspended Solids
IFC	International Finance Corporation
PAK-EPA	Pakistan Environmental Protection Agency
LAC	Land Acquisition Collector
MEAs	Multilateral Environmental Agreements
LS	Law of Seas
DDT	dichlorodiphenyltrichloroethane

Conversions

British Units	Metric Units	Metric Units	British Units
1 ft	0.305 m	1 m	3.28 ft
1 mile	1.609 km	1 km	0.621 miles
1 cusec (ft^3/s)	0.283 cumec (m^3/s)	1 cumec (m^3/s)	35.315 cusec (ft^3/s)
1 ac	0.405 Ha	1 ha	2.47 ac

EXECUTIVE SUMMARY

National Highway Authority (NHA) intends to remodel Thakot to Raikot section of Karakoram Highway (KKH) to provide a safe, congestion free and high-speed facility to commuters of the project area as well as to tourists. This road will improve the communication network between the Province Punjab, Northern Areas of Khyber Pakhtunkhwa Province and Gilgit Baltistan and will also boost the trade with China. Overall, the Project will have a positive impact on the economic development of the country due to trade activities and tourism.

The proposed Thakot and Raikot section of KKH involves upgrading of the existing and construction of new 2 lanes Road. The road, approximately 292 km long, traverses through four (04) districts, one of Gilgit Baltistan and three of KPK namely Diamer, Upper Kohistan, Lower Kohistan and Besham respectively. Road furniture comprising lane markings, traffic signs, guardrails and reflectors will be provided. Provision of service lanes wherever required for the smooth movement of traffic will also be considered. The required RoW of the proposed Project is about 7.3m. The proposed road will be consisted of two lanes each side having width of 3.65 meters each. The geometric design will be carried out as per AASHTO Criteria of Highway Design. Design speed for the proposed project on main carriageway is 30-80 Kilometers per hour (KPH). As per Consultant's previous experience, the workforce for proposed project has been estimated as 800 workers. The proposed Project is expected to be completed within two (02) years. This EIA report is for Sazeen to Raikot Section of KHH that falls in - Gilgit Baltistan.

Following alternatives are considered for the proposed project:

Alternative I: No Project Option;

Alternative II: Other Transport Modes'

Alternative-III: 'Realignment of Thakot-Raikot Section of KKH.

The No Project Option (NPO) is keeping the existing road condition as such without remodeling and construction. NPO conditions will result in further worsening of the present environmental conditions and increased disturbance to residents of the area and the road users. This link will also bring about further revolution in road transport and time saving journey for passengers. It will also contribute to ensure smooth and efficient movement of trade, goods and traffic in relatively shorter time. Therefore, Alternative III is the only feasible option in terms of environmental social and economic aspects as it mostly runs along existing alignment and require comparatively less permanent land acquisition.

The proposed project falls under administrative jurisdiction of District Diamer, District Upper Kohistan. District Lower Kohistan and District Besham. The proposed Project as per Building Code of Pakistan (BCP), 2007 (Seismic Provisions) falls entirely in the zone-3 (Modest Hazard) category with Peak Ground Acceleration (PGA) 2.4 to 3.2 of the seismic zonation.

The project area is characterized by a large variation in climatic conditions, strongly varying with altitude. Commonly, the climate in the zones lower than 1,500 m is classified as "dry subtropical", whereas the higher elevated zones have a "temperate" climate. Annual rainfall generally is low with figures between 200 mm and 300 mm. There is a strong increase in rainfall with altitude. It is not unusual that rainfall (often in the form of snow) amounts to values of 1,000 mm at altitudes of 3,000-5,000 m. The summers are usually hot in the valleys (average maximum temperature of 35°C in August) and winters are cold (average minimum temperature of 5° C in January).

In order to determine the ambient air, background noise levels, surface water and ground wastewater quality of the study area different locations were selected in the RoW. Five (05) surface water, ten (10) drinking water/groundwater have been collected. Similarly, ten (10) points have been selected for ambient air and background noise monitoring at site. All the parameters of ambient air quality are well within the USEPA Standards except PEQS applicable limiting values. The monitoring results of all three sites are within the prescribed limits of PEQS except particulate matter (PM2.5), this may be due to from the vehicular traffic on existing roads and dispersion of dust (deposited on these roads) due to movement of the vehicles. While noise level at all monitoring points were within limits.

Flora: There are so many varieties of roses, lilies, and pansies in the Project area. Most of the fruit trees are found in the residential areas owned by people. Apples, apricots, peaches, plums, walnuts, Oranges and grapes are fully ripe from June to October and almonds from October to March. Apart from the fruit trees, many other tree species are also commonly found in the regions including pine, poplar, Palosa, and wild olive. These floral species are an important habitat for the wildlife of the area and also play a crucial role in landscaping and scenic beauty to the place. As the natural forests are scarce, the local residents have planted Poplar and Kikar trees which are utilized as timber and firewood. In addition to the crops, high alpine plants and weeds (wildflower and plants) are found near agricultural fields, along the roadside, stream/river banks and mountain tops.

Fauna: Mammals found in the Project Area are mainly jackal (Canis aureus), rabbit (Lepus nigricollis), Rhesus macaque and Hill fox are common in the plains. Domestic animals include cows, buffaloes, sheeps, goats, cats and camels.

Another domestic animal of the area is donkey, which is used for cart pulling. Reptiles include snakes and small sized lizards which are a common sight in the area. Squirrel (Funambulus layardi) and Mouse (Mus musculus) are the basic rodents found in the Project Area. Toad (Bufo bufo) and Frog (Rana tigrina) are commonly found in the Project Area. Important resident bird species/avifauna found in Project Area are house sparrow, common crow, kite, dove, desert lark, cattle egret, etc.

The KKH realignment is starting from Thakot which is in District Shangla and ends at Raikot in District Diamer. Cumulatively KKH realignment spreads on an area of approximately 270 km with 11.3 m RoW. Sensitive receptors such as Human settlements, mosques, and buildings are found close to the proposed KKH realignment. Along the existing Road, a baseline socio- economic survey was carried out. During the baseline survey, 100 respondents were interviewed, comprising of males and females. It was witnessed that out of 100 respondents, 12.15% were shopkeepers, 23.75% were reported themselves as drivers of vans & taxi, Labours, etc., 39.75% of the respondents reported their profession as farming, belonging to private service were 5.45% while 11.45% were associated with the government service. Majority of respondents i.e. 90% had awareness about the proposed project while remaining 10% of the respondents had no knowingness about the proposed project. Out of 100 respondents, 75% respondent were in favour of the construction of proposed project by considering it beneficial for the public. Contrary to this, only 25% responses were against the construction of the proposed project due to loss of their commercial structures, residential structures, and agriculture lands.

A series of public consultations were held to get the feedback/concerns of the different category of stakeholders including, district level departments which mainly includes Environmental Protection Agency of GB Districts, National Highway Authority, Forest and Wildlife Department, Mining Department and Tourism Department, potential PAPs, local community and other general public residing in the Study Area. Consultation process includes focus group discussion, village/Town meetings and semi-structured interviews in

Raikot, Gohar Abad, Sunai Wal Khund. Governor Farm, Jalipur, Chilas, Hadur, Maruski, and Basha.

Significant efforts were made to identify the main physical, ecological, social, cultural and environmental issues related to the construction and operation of the proposed project. The positive impacts due to the proposed project are: The rehabilitation with improved facilities shall provide an efficient / intelligent transport corridor; It will provide a safe, congestion free and high-speed facility to the commuters of project area; provide fast access to heavy traffic travelling from Thakot to Raikot; and the corridor will largely contribute to the economic and social development of the region as well as monitory benefits to Provincial Government through tolling.

The adverse impacts and their mitigations during the construction and operation phases are briefly discussed below:

Larger part of RoW for the proposed Project is already available and owned by NHA, however realignment of KKH will involve land acquisition. Permanent acquisition of various categories of land, i.e. agricultural, residential and barren land for the Proposed road will be required. In addition, land will also be required temporarily for contractor's camps/ office/ labor colonies, batching plant, material storage etc. So, high impact is anticipated regarding permanent land and temporary acquisition.

The Project Road falls under zone 3 of the seismic zone map of Pakistan. As per seismic categorization, Zone-3 is a highly severe damage zone where distant earthquake for short duration may cause severe damage to structures. The proposed road and the associated structures will be designed and constructed as per Seismic Building Code of Pakistan 2007 (SBC-07) to comply with minimum requirements for seismic safety of structures.

Due to the proposed Project public utilities i.e. electric poles, water pipes may be affected creating disruption of public services and inconvenience to the local residents. All public utilities (e.g. electric lines, water pipes etc.) likely to be affected by the proposed project will be relocated well ahead of time before the actual commencement of the construction work. In order to proceed the advance warnings will be given to the locals well before the start of relocation works.

The project has an extensive network of drainage channels/ nullahs falling in to the River Indus. There are both intermittent and perennial streams draining towards the KKH alignment, as typical of mountainous region. Based on the project location, the risks include flooding due to increased precipitation and unusual snow melt. The proposed Project engineering design team may ensure that the current design on any bridges can handle the expected increase in extreme precipitation intensities and high temperatures. It may be ensured that during the design process of the project both hydrological and hydraulic design variables have been assessed using a very precautionary approach, which included much higher extreme inputs, higher return periods, high freeboards, and design provisions generally considering wide margins. The proposed project design team may recalculate the flow characteristics of the 25-years return level of discharge events for drainage culverts under the assumption of an increase in daily maximum precipitation.The project involves permanent acquisition of various categories of land, i.e. agricultural land, residential and barren. This impact would be of high significance. This impact can be mitigated by ensuring compliance of Land Acquisition Act, 1894, addressing community grievances on priority basis and timely compensation to affectees.

Open burning of solid waste from the Contractor's camps and at construction site will be strictly banned; Regular water sprinkling of the site will be carried out to suppress excessive dust emission(s); Siting of asphalt plants, batching plants and other point sources facilities

that cause high dust and/or gaseous emissions will be at least 500 m from settlements and necessary environmental clearance/approval shall be obtained from respective department prior to establishment and operation;

Wastewater will be generated at the construction camps and from construction activities. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources. The wastewater generation is estimated to be 25,600 liters/day for 800 construction workers. Domestic effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks;

Considering the laborers (about 800 in numbers) residing in the construction camp and the locally available labor, an average solid waste generation rate of 0.5 kg/capita/day is adopted for the estimation of solid waste generation. Based on this assumption, a total of about 400 kg of solid waste will be generated from construction camps on daily basis. All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. The Contractor will coordinate with local representatives and administration of the concerned solid waste management department for the disposal of solid waste. whereas construction solid waste might be reused or recycled through vendors;

Due to the proposed Project public utilities i.e. electric poles, water pipes may be affected creating disruption of public services and inconvenience to the local residents. This impact will be medium significant. Mitigation measures will include: Incorporate technical design features to minimize effect on public utilities and All public utilities (e.g. electric lines, water pipes etc.) likely to be affected by the proposed project will be relocated well ahead of time before the actual commencement of the construction work. In order to proceed the advance warnings will be given to the locals well before the start of relocation works.

Due to construction activities, waste will be generated at construction and contractors camp site. The construction waste will include wastewater, oil spillage from machinery, domestic waste and solid waste etc. Burning of waste will be prohibited at project site; Solid Waste will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; Planning for disposal sites with reasonable distance from the human settlements; Disallow siting for work camps, including waste dump sites, in a distance closer than one kilometer to any nearby community. Incorporate technical design features for refuse collection containers at sites that would minimize burning impacts; Devise plan(s) for safe handling, storage and disposal of harmful materials.

Surface water might get contaminated due to the disposal of construction waste generated due to the Project activity at these water bodies; this contamination will endanger the aquatic life. Construction camps will be established in areas with adequate natural drainage channels in order to facilitate the flow of the treated effluents after ensuring that PEQS are met; the surface and groundwater reserves will be adequately protected by installing screens and barriers to protect the source of contamination such as construction and oily waste that will degrade its potable quality;

The water resources of the project area mainly comprised of surface water i.e. River Indus, Streams/Nullas and Springs. Surface water especially of Springs is being used by all communities for drinking purpose. These will be affected as their water shall be used at the labor camp for everyday use, along the project corridor for sprinkling to suppress dust emissions and for construction activities. Availability of water for camp site facilities and construction purposes will be ensured by the contractor prior to start of construction activities. As per Local Government Act, the contractor will seek approval from the Local Government for exploitation of the water resources. The Contractor will be required to act as a go-

between closely with local communities to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly.

Air quality will be affected by fugitive dust emissions from construction machinery; dust from the unpaved surface and construction vehicles. Emissions from batching / asphalt plants can be controlled efficiently by the installation of cyclone / scrubbers. Diesel operated equipment will be equipped with well-maintained fuel filter and may be replaced timely (if required). In addition to that, regular maintenance activities comprising changing of lubricating oil, changing the air and fuel filter, cleaning the fuel system, draining the water separators and proper tuning may also help in reducing the emissions from diesel generators. Construction materials (sand, gravel, and rocks) and spoil materials will be transported trucks covered with tarpaulins and all vehicles (e.g., trucks, equipment, and other vehicles that support construction works) will comply with the PEQS (as amended) for carbon emissions and noise; Regular water sprinkling of the site will be carried out to suppress excessive dust emission(s);

The project will involve cutting of vegetation cover on construction areas particularly along proposed road construction. Thousands of Trees are estimated to be cut or removed within the ROW of the proposed project road. Large number of eucalyptus trees in Thakot-Dasu Section, Wild Olive in Sazin-Raikot section, and other trees including Bakain, Shisham, Shahtoot. shrubs and bushes etc. will be removed. A tree plantation program shall be formulated with the recommendations and technical support of concerned Forest Department;

During construction phase the existing population of mammals and reptiles of the construction areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery and vehicular traffic, movement of labor, camping, etc. Care shall be taken during construction activities for avoiding purposely or chance killing of animals. If found any wild species and habitat during construction that must dealt carefully and local wildlife department officials will be called. Hunting, poaching and harassing of wild animals shall be strictly prohibited, and Contractor shall be required to instruct and supervise its labor force accordingly and clear orders will be given in this regard;

During construction there will be a number of activities which, if not mitigated, are likely to cause disturbance to communities in the project area; these are: Increased traffic on public routes; Health and safety risk will also be posed to the community due to the existence of a construction site(s) and the storage and use of hazardous chemicals; and Movement of plant and vehicles throughout the project area, especially along haulage routes passing alongside private land during disrupting local movement and posing traffic safety issues.New saplings of different plants and trees would be planted to enhance the aesthetics and compensate the loss of affected trees. This will have a positive impact of permanent nature. The presence of adequate flora at available spaces along the proposed alignment will help in absorbing flue gases, emitting from a large number of vehicles and public transport passing through the Project Area, which shall help improve the air quality. The saplings planted in the Project Area against the trees affected will be properly maintained throughout their growth.

Enhanced vehicular movement and speed in the long run may result in road safety issues like traffic accidents. This impact is permanent but moderately adverse in nature, since the frequency of accidents may be lowered, but their intensity may be quite severe due to enhanced speeds at which vehicles will move. Strict enforcement of speed limits, installation of speed guns and channelization of traffic with respect to categories (heavy vehicle traffic and light vehicle traffic), will be ensured for the smooth flow of traffic moving from major road crossings. Enforcement of penalties for the violators will reduce the significance of this impact.

Poor maintenance of the road drainage system, particularly during the monsoon season can cause nuisance to the travelers and public due to flooding in the existing drainage line. In case of chocking of road drainage, the increased surface runoff due to heavy rains will accumulate along the road banks. The impact can be controlled / reduced by timely and continuous maintenance/ cleaning of the drainage system.

The EMP of the proposed project mainly comprises Institutional Requirements; Environmental Mitigation and Management Matrix; Environmental Monitoring Plan; Planning for EMP Implementation; Training and Capacity Building; Communication & Documentation; Management Plans; and EMP Cost. Contractor would be responsible for preparation of SSEMP describing the mechanism to comply with the EMP and get it approved from Supervisor Consultant (SC) and EALS-NHA prior to mobilization. EALS-NHA will be responsible for overall project implementation and implementation of EMP of the proposed Project during construction and operational phase. Reporting and feedback mechanism involve that the contractor's environmental specialist will manage the daily activities to be conducted in compliance with the EMP and will be responsible for monthly reporting to SC.

The total cost required to effectively implement the mitigation measures is approximately Rs. 71.84/- million which includes cost of training, environmental monitoring, and Health and Safety etc. during construction and operational phase. The EMP will be part of the contract document with the Contractor.

A Grievances Redress Mechanism (GRM) provides a way to reduce risk for the proposed project, offers communities an effective system for expressing concerns and achieving remedies, and promotes a mutually constructive relationship.

The formal GRM will be set up with a three-tiered structure including: first at site/village level set-up through community involvement; second at Project Implementation Unit (PIU) level and third at Project Management Unit (PMU) level enabling immediate local recourse to address grievances and higher-level review for addressing more difficult cases not resolved at the PIU or local level.

Project is socio-economically viable and environmentally feasible if EMP is implemented according to this EIA. Results of the EIA Study have shown that there will be some significant impacts on the biological and social environment. These impacts could be reduced by proper and judicious compensation to the affectees and well-planned meticulous design of the facility and by implementing an appropriate tree plantation plan. An EMP for both the phases (construction and operation) has been developed as part of the report which provides a detailed mitigation matrix that covers impacts, mitigation measures roles and responsibilities and timings to avoid, minimize or mitigate the adverse impacts of the Project.

The EMP, its mitigation and monitoring programs, contained herewith will be included within the Bidding documents for project works of all Project components. The Bidding documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own Site-specific EMP which will adopt all of the conditions of the EMP. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs. The EMP and all its requirements will then be added to the Contractor's Contract, thereby making implementation of the EMP a legal requirement according to the Contract.

This version of the EIA is still a work in progress. The EIA will be further updated and disclosed prior to board approval.

1 INTRODUCTION

National Highway Authority (NHA) intends to remodel Thakot to Raikot section of Karakoram Highway (KKH) to provide a safe, congestion free and high-speed facility to commuters of the project area as well as to tourists. This road will improve the communication network between the Province Punjab, Northern Areas of Khyber Pakhtunkhwa Province and Gilgit Baltistan Area and will also boost the trade with China. Overall, the Project will have a positive impact on the economic development of the country due to trade activities and tourism.

1.1 Project Background

The Karakoram Highway known by its initials KKH, also known as N-35 or National Highway 35 or the China-Pakistan Friendship Highway is a 1,300 km (810 mi) National highway which extends from Hassan Abdal in the Punjab province of Pakistan to the Khunjerab Pass in GB, where it touches the China and becomes China National Highway 314. This highway connects the Pakistani provinces of Punjab and KPK as well as GB with China's Xinjiang. It is a popular tourist attraction and is one of the highest paved roads in the world, passing through the Karakoram Mountain range, at maximum elevation of 4,714 m (15,466 ft.) near Khunjerab. Due to its high elevation and the difficult conditions in which it was constructed, it is often referred as eighth wonder of the world.

At 806 km, the Pakistani section of the highway starts at Abbottabad, although N-35 which is part of KKH, officially starts from Hasan Abdal. The highway meets the Indus River at Thakot and continues along the river until Jaglot, where Gilgit river joins the Indus River. The western end of the Himalayas, marked by the ninth highest peak in the world, Nanga Parbat, can be seen from the highway. The highway passes through the capital of Gilgit Baltistan, Gilgit, and continues through the valleys of Nagar and Hunza, along the Hunza river. Some of the highest mountains and famous glaciers in Karakoram can be seen in this section. The highway meets the Pakistani-Chinese border at Khunjerab Pass.

The approx. 292 kilometers (181 mi) long, 2 lane highway between Thakot and Raikot section of KKH, falls in an area in which the Government of Pakistan is either currently planning or actively constructing several hydropower project (Diamer-Bhasha Dam, Dasu Dam, Dam at Pattan and Thakot). Work on Dasu dam and Diamir Bhasha Dam has already started. Due to construction of dams, the existing KKH will be submerged in Dams Lake and hence needs relocations. The approximate length of KKH submerged due to the construction of four dams is approx. 20km at Thakot, 10km at Pattan, 70km at Dasu and 150km at Bhasha. However, length of each section will vary from the original length depending upon its relocation.

Design of relocation of KKH due to construction of Dasu and Diamir Basha Dam was done earlier by a consultant nominated by WAPDA, however that design was not consistent with the requirements of CPEC design standards. Moreover, design for relocation of KKH due to construction of Thakot and Pattan dams was never conducted by any agency. Therefore, NHA intends to carryout detailed review of design conducted by WAPDA consultant for the location of Dasu and Diamir Basha dams as per NHA and CPEC’s design standards and in the same time conduct detailed design for remaining portion. The scope of this project is to construct a realigned KKH between Thakot and Raikot under CPEC in order to provide a safe, efficient and rapid all-weather communication link. The existing road after its realignment, widening and rehabilitation will not only provide as a quick link between Gilgit Baltistan and rest of the country but will also help in improving trade between Pakistan and China.

M/s NESPAK (Pvt) Ltd. in JV with M/s Euroconsult Pakistan (Pvt.) Ltd. and M/s Harza Consultants (SMC-Pvt.) Ltd. has been awarded the contract through open competition of consultancy services for feasibility study and detailed design for Realignment of KKH from Thakot to Raikot due to construction of Dams on River Indus.

The location of Karakorum highway from Thakot to Raikot is shown in Figure 1- 1 The project area lies within Khyber Pakhtunkhwa Province and Gilgit Baltistan Province boundary.

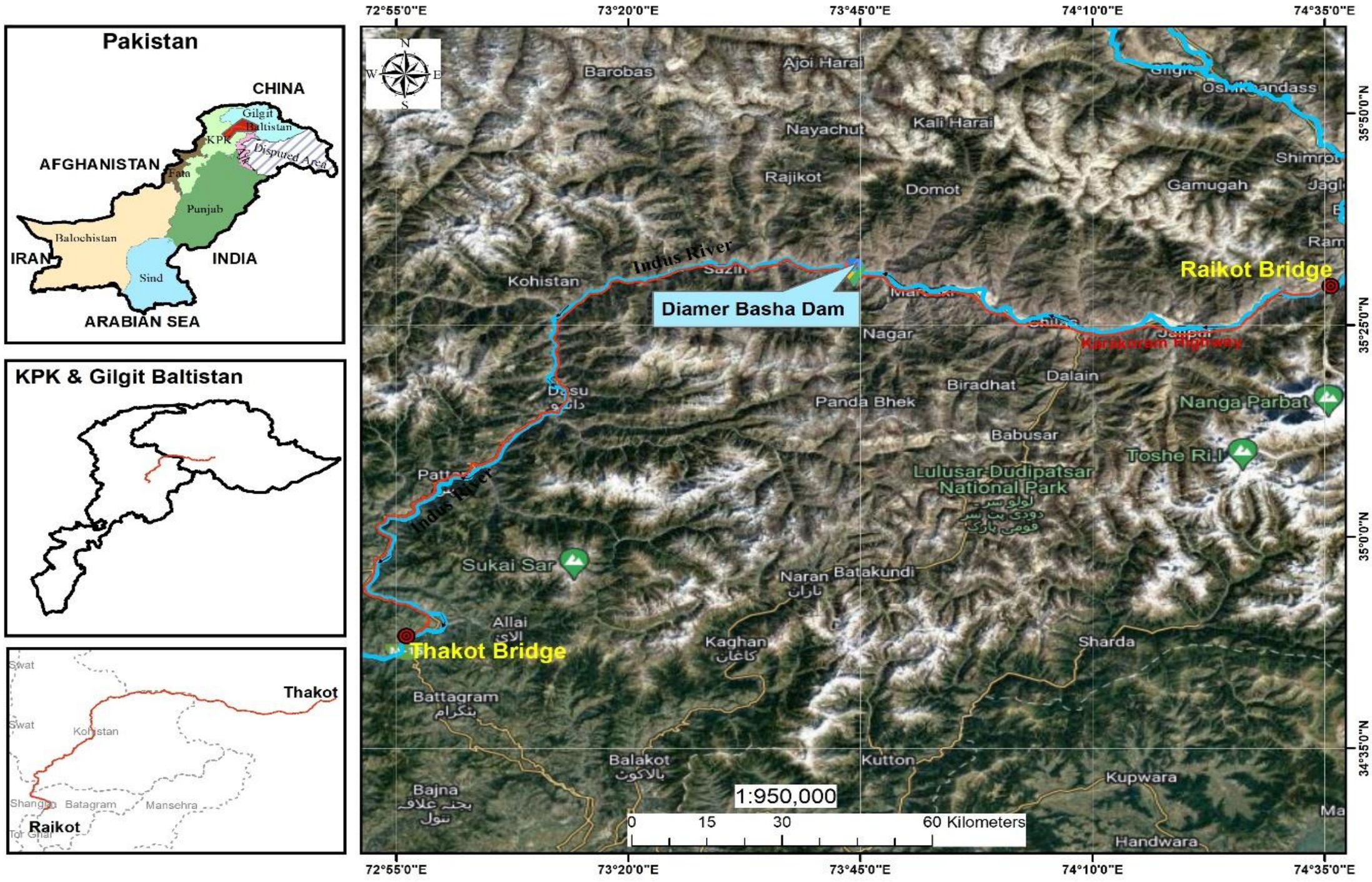


Figure 1-1: Project Location Map

1.2 Requirement of EIA for the Proposed Project

The apex Pakistani law governing the subject of environment is the Pakistan Environmental Protection Act – 1997 (PEPA-97). Under Section 12 of the Act, it is mandatory for the proponents of the projects to execute the IEE and / or EIA (where warranted), and get the approval from federal agency (i.e. Pak-EPA). This function has been delegated under Section 26 to provincial EPAs.

After the 18th amendment to the constitution of Pakistan, environment became a provincial subject. As the project (Section-II) lies in Gilgit Baltistan Province, so the environmental laws governing the Remodeling of KKH Project are now the Gilgit Baltistan Environmental Protection Act of 2014.

Gilgit Baltistan Environmental Protection Act of 2014 has adopted guidelines of Pak-EPA Review of IEE and EIA Regulations 2000, according to which

"No proponent of a Project shall commence construction or operation unless he has filed with the Federal Agency an initial environmental examination or, where the Project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained approval from the Federal Agency in respect thereof."

The project envisaging remodeling of Thakot-Raikot Section of KKH, falls under category D (Other projects) specified in Schedule II of Pak-EPA Review of IEE and EIA Regulations 2000. It therefore requires EIA before implementation.

1.3 Study Objectives

Main objectives of the EIA study are to fulfill the statuary requirements of Gilgit-Baltistan Environmental Protection Act of 2014 to facilitate decision making by GBEPA regarding grant of No Objection certificate/Environmental approval for the proposed project.

The overall objective of this EIA is to carry out a detailed environmental assessment of the project area; to assess impacts caused by the different activities of the proposed project and to address measures to mitigate adverse environmental impacts arising from the execution of the proposed project. The specific objectives of the EIA Study are as follows:

- To determine pre-project state of affairs to assess post-project conditions if they have changed for better or worse;
- Documentation of all the resources likely to be affected due to the implementation of the proposed project;
- To provide maximum information to the proponent and other stakeholders about the existing environmental conditions and the implications of the proposed project;
- Allow the Planners to minimize potential impacts of the proposed project on different environmental conditions such as physical environment, biological environment and socio-economic environment; and
- To facilitate decision makers to take informed decisions.

1.4 The Proponent and Consultant

The proponent of the Project is NHA while the Consultant is NESPAK JV, the addresses are given as under:

a) Proponent Contact Address

General Manager (EALS)

National Highway Authority (NHA)

27 Mauve Area, G-9/1,

Islamabad

Ph: 051-8351506

b) Consultant Contact Address

National Engineering Services Pakistan (NESPAK) Private Limited

EPHE Division, NESPAK House

1-C, Block – N, Model Town Extension

Lahore

Tel: 042-99090000

1.5 Study Team

A multidisciplinary team was formulated to conduct the study. The team comprises the following persons:

Dr Akhtar Iqbal	:	Environmental and Social Expert
Altaf Hussain	:	Environmental and Social Expert
Umar Raza	:	GIS Expert
Muhammad Zeshan	:	Hydrologist
Husnain Azam	:	Junior Environmentalist
Zawar Hussain	:	Junior Environmentalist
Hasnat	:	Junior Environmentalist

1.6 Study Approch and Methodology

This section presents the approach and methodology adopted for conducting EIA study for proposed Project.

1.6.1 Desktop Studies

Prior to mobilization, the consultants conducted a desktop study through collection and review of guidelines, data and reports related to the project, that included (a) review of National Environmental Legislations; (b) Google Earth Satellite Imagery of year 2021; (c) Relevant District Census Reports (DCR) and any other relevant documents/drawings; and (d) Data available in studies such as traffic study etc., Census Survey by Pakistan Bureau of Statistics, 1998 and 2017 for socio-economic data; and other design data provided by the Client.

1.6.2 Environmental Legislative Requirements and Institutional Requirements.

All the applicable environmental policies, laws, guidelines, acts and legislations of the Government of Pakistan (GoP) & Gilgit-Baltistan were reviewed.

1.6.3 Delineation of the Corridor of Impact (COI) and Right of Way (RoW)

Keeping in view the national and provincial regulatory requirements, impacts and risks have been identified and analyzed within the project CoI. The CoI of the project encompasses primary project site(s) and related facilities that the borrower/client (including its contractors) develops or controls, such as main road route, its components, interchange area, service roads, borrow pits, disposal areas and construction camps. The CoI does not include potential impacts that might occur without the project or independently of the project. Environmental impacts and risks were identified and analyzed for all relevant stages of the project cycle, including pre-construction, construction and operation phases of the project.

The CoI includes the actual RoW of project as well as the surrounding areas where positive and adverse impacts may be foreseen due to the implementation of the proposed Project.

RoW of the proposed Project from the center line is 3.56 m on either side. CoI is taken 50 meters from outer edge of the road on either side.

1.6.4 Analysis of Alternatives.

It is a mandatory requirement for EIA study to analyses each potential alternative available that could have been developed to meet the objectives and recommend the most environmentally and economically feasible option.

The analysis of different alternatives was carried out for the selection of the most feasible route of the study in order to select the most viable route keeping in view the environmental, economic and social constraints. Moreover, the No Project Option (NPO) was also considered with reference to the substantial increase in traffic volume and subsequent pressure on infrastructure of the settlements of the project area. This exercise confirmed the justification for the need of the proposed Project.

1.6.5 Environmental and Social Baseline Information

After the selection of the most feasible route for the proposed project based on the satellite images and the delineation of CoI, detailed environmental surveys were conducted within the CoI. Detailed investigations/surveys were carried out for the environmental parameters on which any adverse or positive impacts were envisaged by the implementation of the proposed Project. The data presented in the forthcoming sections has been collected from the primary and secondary sources. For Primary data acquisition, Environment team conducted field visits during the months of December 2022 and March 2023. Prior to the start of field visit, comprehensive checklists, performas and maps were developed.

The Consultants developed the existing baseline information of CoI of proposed Project. Baseline data has been gathered through field surveys, field measurements, data collection through stakeholder consultation, collection of published data, reports, etc. Keeping in view the scope of work and findings of scoping study, checklists for data collection related to physical, ecological and social aspects were also developed. Interviews were conducted using semi-structured formats/questionnaires for communities and departments to extract relevant information. The areas covered under baseline study has been identified in Chapter-4 of this report which include physical, biological & socio-economic environment. The details of these are described as under:

Physical Environment

The information acquired for the establishment of physical environment baseline included the following main parameters:

- Land resources (including land use pattern, soil composition, contamination of soil and soil erosion, etc.);
- Water resources (including available surface and groundwater resources and natural streams, hydrology, water supply, water contamination etc.);
- Climate data (including temperature, rainfall, humidity, wind speed and direction etc.);
- Ambient air quality and noise level monitoring data;
- Existing solid waste management and effluents disposal practices and storm water drainage;
- Buildings and infrastructure details, including residential, commercial and animal shed for complete/partial relocation;
- Religious, cultural and heritage information (mosques, shrines, graveyards); • Archaeological monuments; and
- Other private/public infrastructures such as roads, telephone poles, hand pumps, tube wells etc.

Ecological Environment.

Field visit was conducted for delineating the ecological baseline condition. Using IUCN database for conservation status, a preliminary inventory of common flora and fauna were developed for designing the field survey. Vegetation and wildlife information were collected through physical observation. The tree/flora count was done through GIS technology and the species identification (types of trees) carried out during the field visit and observation. Forest and Wildlife departments of GB Province were consulted.

Socio-economic Environment.

The Consultant utilized a combination of desk research, field investigations, census data, structured interviews, maps, reports to generate the data required for description of the existing social environment and assessment of the potential impacts of the construction of proposed project on communities. Data was collected on the following aspects of the social environment: Population; Archaeology; • Settlements distribution; • Demographic features; • Community study and employment opportunities; • Stakeholder engagements; • Land use; • Transportation and access; • Utilities; • Traffic load; • Labor influx to project area; • Waste management services; and • Other public infrastructures (schools, universities, markets, hospitals, shops, libraries, mosques etc.).

Stakeholder Consultations.

The Consultants identified project stakeholders and held meetings with them during the surveys to receive feedback on the expected environmental issues related to the project impacts and suggested mitigation measures. Meetings were carried out with the project affectees, relevant departments including Forest, Wildlife, Agriculture, Mining, Tourism, Education, Social Welfare, Irrigation, local and national NGOs and Environment Protection Department to discuss the issues/constraints and get their views and feedback to mitigate the potential environmental impacts associated with the implementation and operation of the project.

Consultations/group discussions were carried with the local residents along the COI.

The proceedings of the consultations/meetings along with the photographs and list of Participants are documented in Chapter 8.

1.6.6 Impacts Assessment and Mitigation Measures

The impacts identified for the pre-construction, construction and operational phases of the proposed Project during scoping stage have been assessed in terms of their magnitude during EIA stage. Checklists, overlays and matrices were utilized for impact assessment on physical, ecological and social components. GIS overlays were also prepared to identify significant impacts within the CoI of the proposed Project.

Identification of potential environmental and social impacts in terms of their nature, magnitude, extent, location, timing and duration were carried out. The impacts were correlated to the Project location, design stage, construction as well as operation stage. Based on the impacts prediction methods and as a result of public/stakeholder consultations, consultants screened the adverse environmental impacts for inclusion in the mitigation measures and EMP. The same process was followed for the identification of social impacts. Public consultations (which provided feedback of the impacts from the stakeholder's viewpoint) were used to screen out the insignificant impacts. Matrices and overlays were used for the evaluation of temporal and spatial impacts respectively.

The Consultants proposed practicable, economically feasible and socially acceptable mitigation measures for the significant adverse environmental and social impacts. These measures were based on exploring the ways to achieve the project objectives causing least disturbance to the existing environment by alternative ways, proposing changes in the Project design (RoW and sitting of facilities), through improved monitoring and management practices (storage of construction materials, labor camps, waste disposal, disposal of construction debris etc. or through monitory compensation)

1.6.7 Environmental Management Plan

An EMP has been prepared to ensure the adequacy and effectiveness of the proposed protocol by clearly identifying the roles and responsibilities of the agencies responsible for implementation, monitoring and auditing of EMP activities, existing and suggested framework, necessary approvals, training needs and the required further studies. The EMP also includes organizational setup, a monitoring mechanism, monitoring plan, environmental and social parameters to be monitored with their frequency. Similarly, costs for environmental monitoring, ecological and social component/social mitigation measures were also included as part of the EMP. Environmental monitoring, evaluation, auditing and reporting mechanism were also proposed in the EMP.

1.6.8 Conclusions and Recommendations.

Based on the baseline conditions, identified impacts and suggested mitigation measures and proposed environmental cost, conclusions have been developed along with recommendations regarding the future plan of action and outcome of the EIA report.

1.6.9 Organization of the report

This report contains nine chapters. The contents of chapters are described as under**:**

Chapter 1: Introduction

This section represents an introduction of the EIA Report. It contains the scope of study and overview of the project. The section also includes the project categorization as per GB-EPA.

Chapter 2: Policy, Legal and Administrative Framework

This section comprises policy, guidelines, statutory obligations and roles of institutions concerning EIA study of the proposed project.

Chapter 3: Description of the Project

In this section, salient features of the project are presented. It provides information about the Project location and its benefits to the public. The focus information is as under:

a) Overview of the Proposed Project;
b) Location of the Project;
c) Project Components including Geometric Design Standards;
d) Project Right of Way (Row);
e) Construction Material;
f) Schedule of Construction;
g) Construction Camps; and
h) Workforce and Machinery Requirements.

Chapter 4: Description of the Environment

It provides an overview of the present environmental baseline of the project area. It discusses the following:

a) Physical Environment;
b) Ecological Environment;
c) Cultural Environment; and
d) Socio-Economic Environment**.**

Chapter 5: Alternatives

This section discusses the possible alternatives of the proposed Project.

Chapter 6: Anticipated Environmental Impacts and Mitigation Measures

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

a) Project Corridor;
b) Pre-Construction/Design Phase Impacts and Mitigation Measures;
c) Construction Phase Impacts and Mitigation Measures; and
d) Operation Phase Impacts and Mitigation Measures.

Chapter 7: Environmental Management Plan

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

a) Objectives of EMP;
b) Key Environmental and Social Components;
c) Role of Functionaries;
d) Specific Implementation Responsibilities;
e) Environmental Monitoring Plan;
f) Environmental Management Plan (In Matrix);
g) Environmental Mitigation Cost;
h) Environmental Technical Assistance and Training Plan; and
i) Environmental Monitoring, Mitigation and Training Costs.

Chapter 8: Public Involvement and Disclosure

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

a) Identification of The Main Stakeholders;
b) Details of Scoping Sessions;
c) Stakeholders' Concerns;
d) Proposed Measures for incorporating the Stakeholders' Concerns;
e) Village Meetings; and
f) Future Information Disclosure Plan.

Chapter 9: Conclusions

This section presents the outcomes of the whole study. It explains the following in details:

a) Identification of the Main Issues and Concerns;
b) Proposed Mitigation Measures;
c) Benefits of the Project; And
d) Surveillance and Monitoring of the KKH after Construction.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 General

This section deals with the current environmental policy as well as legal and administrative framework related to carrying out the Environmental Impact Assessment (EIA) of Thakot-Raikot Section of N-35. All the relevant provisions of these Environmental policy and Guidelines Pak-EPA, and Gilgit Baltistan EPA legal frameworks have been duly discussed.

2.2 Government Environmental Policy and Legal Farmework

The Ministry of Environment is the responsible authority for policy making on environmental protection in Pakistan.

2.2.1 National Environment Policy, 2005

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

2.2.2 Pakistan Environmental Protection Act, 1997

The Act was enacted on December 06, 1997 by repealing the Pakistan Environmental Protection Ordinance 1983. The PEPA 1997 provides the basic legal framework for implementation of National Conservation Strategy 1992, protection and conservation of species, wildlife habitats and biodiversity, conservation of renewable resources, establishment of standards for the quality of the ambient air, water soil, marine & noise pollution. The PEPA, 1997 has prescribed penalties for violating its provisions. Under the Act, Pak EPA and Provincial EPAs have been vested with more powers to impose penalties for possible breaches through the establishment of Environmental Tribunals and appointment of Environmental Magistrate. According to the 18th Amendment in 1973 Constitution, the PEPA 1997 has been confined to Federal Area and provinces have been allowed to formulate their own legislations on subject of environment.

Assessment of Environment is mandatory under Section 12 of PEPA, 1997. No project ensuing construction or any change in physical environment can be implemented unless an Initial Environmental Examinations (IEE) or an Environmental Impact Assessment (EIA) is conducted by the proponent of the Project and approved by the EPA. The section 12(6) of the Act states that this provision is applicable only to those categories of projects as provided in Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000.

2.2.3 Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000

Pakistan Environmental Protection Agency (Pak-EPA) under the powers conferred upon it by the Act, formulated The Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000 (hereinafter termed as the Regulations). The Regulations provide detailed guidelines to prepare reports regarding IEE/EIA of a project and submit the same to the concerned EPA for their review. Under the Regulations, the projects requiring IEE and EIA have been categorized depending upon their potential to cause environmental degradation on implementation. Project listed in Schedule-I are designated as potentially less damaging to the environment and those listed in Schedule-II as having more potential to make adverse effects on the environment. Schedule-I projects require an IEE to be conducted, provided

they are not located in environmentally sensitive areas. For the schedule-II projects, conducting an EIA is necessary. Salient features of the regulation, relevant to the proposed Project are listed below:

1. Categories of projects requiring IEE and EIA are issued through two schedules attached with the Regulations.

2. A fee, depending on the cost of the project, has been imposed for review of EIA and IEE.

3. The submittal is to be accompanied by an application in prescribed format included as schedule IV of the Regulations.

4. The EPA is bound to conduct a preliminary scrutiny and reply within 10 days of submittal of report a) confirming completeness, b) asking for additional information, or c) requiring additional studies.

5. The EPA is required to make every effort to complete the review process for IEE within 45 days and of the EIA within 90 days, of issue of confirmation of completeness.

6. EPAs accord their approval subject to following conditions:

- Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
- Before commencing operation of the project, the proponent is required to obtain from EPA a written confirmation of compliance with approved conditions and requirements of the EIA.

7. An EMP is required to be submitted with the request for obtaining confirmation of compliance.

8. The EPAs are required to issue confirmation of compliance within 15 days of receipt of request and complete documentation.

9. The EIA approval will be valid for three years from the date of accord.

10. A monitoring report is required to be submitted to the EPA after completion of construction, followed by annual monitoring reports during operations.

2.2.4 National Environmental Quality Standards (NEQS), 2000

The Pakistan Environmental Protection Council first approved the National Environmental Quality Standards (NEQS) in 1993. The NEQS revised later in 1995, 2000 and 2010 respectively provide information on the permissible limits for discharges of municipal and industrial effluent parameters and industrial gaseous emissions in order to control environmental pollution. The same NEQS were followed by the GB-EPA.

Drinking Water Quality Standards

In pursuance of the statutory requirement under clause (c) of sub-section (1) of section (6) of the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997), the Pakistan Environmental Protection Agency with prior approval of the Pakistan Environmental Protection Council, has published the National Standards for Drinking Water Quality in 2010. WHO Drinking water quality guidelines and USEPA standards are being used for bench marking purpose along with the National Standards for Drinking water quality since January, 2013.

Air Quality Standards

In pursuance of the statutory requirement under clause (e) of sub-section (1) of section (6) of the Pakistan Environmental Protection Act, 1997(XXXIV of 1997), the Pakistan Environmental Protection Agency with prior approval of the Pakistan Environmental Protection Council, has revised the NEQS for Ambient Air in 2010, which became effective in January, 2013.

Noise Quality Standards

In pursuance of the statutory requirement under clause (c) of sub-section (1) of section (6) of the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997), the Pakistan Environmental Protection Agency with prior approval of the Pakistan Environmental Protection Council, has revised the NEQS for Noise in 2010. These standards have been established for four different categories which include residential area, commercial area, industrial area and silent zone. These standards vary according to the day and night timing, day time hours are 6:00 am to 10:00 pm and night time hours are 10:00 pm to 6:00 am. USEPA standards and World Bank guidelines along with National Environmental Quality Standards for Noise are being used as bench mark purpose since January, 2012.

2.2.5 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. No land acquisition is expected for the proposed project. However, 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 PDA 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.

This Act will be applicable as proposed Project will involve permanent acquisition land in the Project area.

2.2.6 Pakistan Climate Change Act, 2017

This Act aims to meet obligations under international conventions relating to climate change and to provide for adoption of comprehensive adaptation and mitigation policies, plans, programs, projects and other measures required to address the effects of climate change and for matters connected herewith and ancillary thereto.

This Act will be triggered due to the emissions from the construction machinery.

2.2.7 The Forest Act (1927)

The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests.

The major part of proposed project area is narrow valley surrounded by hills, no protected forest is situated in its RoW.

2.2.8 Cutting of Trees (Prohibition) Act, 1975

This act prohibits cutting or chopping of trees without permission of the Forest Departments (in case of proposed project relevant Forest departments is of Gilgit-Baltistan Provinces).

2.2.9 Pakistan Penal Code (1860)

The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions and disposal of effluents.

The provisions of the Penal Code, 1860 are applicable to the project in terms of penalties for effecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.

2.2.10 Explosives Act, 1884

It provides regulations for handling, transportation and use of explosives. The contractors have to abide by the regulation during quarrying and blasting for construction and for other purposes.

2.2.11 Highways Safety Ordinance, 2000

This ordinance includes provisions for the licensing and registration of vehicles and construction equipment; maintenance of road vehicles; traffic control, offences, penalties and procedures; and the establishment of a police force for motorways and national highways charged with regulating and controlling traffic on the national highways, and keeping the highways clear of encroachments.

2.2.12 Motor Vehicle Rules, 1969

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

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

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

2.2.14 Seismic Building Code of Pakistan (BCP) 2007

This code stipulates the minimum requirements for seismic safety of building and structures and the provisions of the BCP (Seismic Provisions-2007) shall apply for engineering design of buildings, like structures and related components.

Construction of building shall be considered as violation of professional engineering work specified under clause (XXV) of section 2 of the Act.

This Code is applicable to the proposed Project as it includes the formation of structures.

2.2.15 The Canal and Drainage Act, (CDA) 1873.

CDA 1873 focuses on construction and maintenance of drainage channels and defines powers to prohibit obstruction or order their removal. It also covers issues related to canal navigation. It briefly addresses issues relating to environmental pollution. Section 70(5) of the CDA clearly states that no one is allowed to "corrupt or foul the water of any canal so as to render it less fit for the purpose for which it is ordinarily used. In addition, Section 73 of the CDA gives power to arrest without warrant to be taken before the magistrate a person who has willfully damaged or obstructed the canal or ‘rendered it less useful.

This act will be applicable as the proposed alignment traverses through nullahs.

2.2.16 National Disaster Management Act, 2010

National Disaster Management Act, 201O was passed by Parliament of Pakistan in 2010. The Act applies to whole Pakistan. The Act was passed in backdrop of 2010 Floods in Pakistan and strengthens Disaster Management system.

This act is applicable to the proposed Project. The proposed Project will require special consideration to disasters and risk management strategies as per the Act.

2.2.17 Explosive Act, 1884

This act prohibits the manufacturing, possessions, use, sale, transport and export of explosive without the permission licence. The project contractor is bound for getting the licence and using the explosive during blasting and other purposes.

2.2.18 Factories Act, 1934

The clauses relevant to the proposed project are those, which concern the health, safety and welfare of workers, disposal of solid waste and effluent, and damage to private and public properties. The Act also provides regulations for handling and disposing of toxic and hazardous materials.

2.2.19 Hazardous Substance Rule, 2003

The rule describes the procedure of handling, transportation and disposal of hazardous substances and hazardous waste. Inter alia, general safety precautions for handling hazardous substances as well as safety precautions for workers, and notification requirements in the event of an accident are described in these rules. Requirements for project waste management plans are also defined. These include a requirement for updating the plan every three years, the need to provide for management of hazardous waste in a manner that will prevent adverse environmental impacts and to ensure that hazardous and non-hazardous waste are not mixed.

This rule is applicable to the proposed Project due to involvement of hazardous waste handling, use and disposal during the construction stage.

2.2.20 Gilgit-Baltistan Environmental Protection Act of 2014

The Act was enacted in 2015, by repealing the Pakistan Environmental Protection Act (1997). It provides the framework for establishment of the Gilgit Baltistan Environmental Protection Council, establishment of Gilgit- Baltistan Environmental Protection Agency, Establishment of the Gilgit- Baltistan Sustainable Development Fund, Protection and Conservation of Species, Conservation of Renewable Resources, Establishment of Environmental Courts and Green Courts, Initial Environmental Examination (IEE), and Environmental Impact Assessment (EIA) studies. Section 16 of the Act stresses the need to carry out environmental impact assessment study prior to construction or operation of any project enlisted under Schedule I and II of Gilgit Baltistan Environmental Protection Act of 2014. This EIA study has been carried out in the light of policy guidelines of the Preparation of IEE/EIA Reports under the procedures and practices formulated by the Pak EPA/GB-EPA. The major provisions/clauses of this Act are similar to that of Pakistan Environmental Protection Act, 1997. Minor amendments/changes have been made viz:

- The Name of Act has been changed into “Gilgit Baltistan Environmental Protection Act of 2014”.
- For the words “Federal Government”, wherever occur, the word “Government” shall be substituted indicating the Government of Gilgit-Baltistan;
- For the word “Council”, wherever occurs, the Gilgit-Baltistan Environmental Protection Council shall be referred to.

All the other clauses, sub-clauses, sections and sub-sections are almost same. In accordance with Clause 4 of The Regulations (of Review of IEE/ EIA 2000), an EIA for the proposed project needs to be submitted to Gilgit- Baltistan Environmental Protection Agency for review and approval of EIA Report.

2.3 International Treaties & Conventions

Pakistan is a member of several international organizations such as United Nations Organization (UNO), Organization of the Islamic Conference (OIC), South Asian Association for Regional Cooperation (SAARC), and the Economic Cooperation Organization (ECO). The conventions, and obligations related to the proposed Project are:

- Convention on Biological Diversity, 1994

This convention is applicable to the projects for the conservation of biological diversity and habitat restoration during project life.

- The Rio Declaration, 1992

The declaration emphasis on the environmental protection during project life.

- Kyoto Protocol, 1992

It is applicable to the projects to reduce the emissions from project construction activities.

- The Basel Convention, 1989

This convention emphasis on the minimization of waste generation and proper management during construction as well as operation and maintenance phases.

- Convention on the International Trade of Endangered Species **(**CITES), 1975

This convention is applicable to the projects during construction and operation phases to safeguard the endangered species (i.e. flora and fauna).

- UNESCO Convention on the Protection of Worlds Cultural and Natural Heritage, 1975

This convention is applicable during construction phase of the project to protect and conserve the cultural and heritage sites.

2.4 Administrative Framework

2.4.1 National Highway Authority (NHA)

The implementing agency of the proposed project is NHA, therefore, NHA is responsible for liaising with line departments to ensure that the Project complies with the laws and regulations controlling the environmental concerns of highway construction and operation, and that all pre-construction requisites, such as permits and clearances are met. The office of Environment, Afforestation, Land and Social (EALS) of NHA will be responsible for ensuring that all the measures proposed in the Environmental Management Plan are effectively implemented by the contractor during construction phase and by Directorate of Operation & Maintenance of NHA during operation phase of the proposed Project.

2.4.2 Environmental Protection Agencies/Agency

Pak EPA has been established at the Federal level and all other EPAs at Provincial level. However, Gilgit-Baltistan has its own Environmental Protection Agency that is headed by the Director General and it functions to safeguard the environmental quality and acts against any non-conformities that may be a threat to the environment. The organizational set-up is given below:

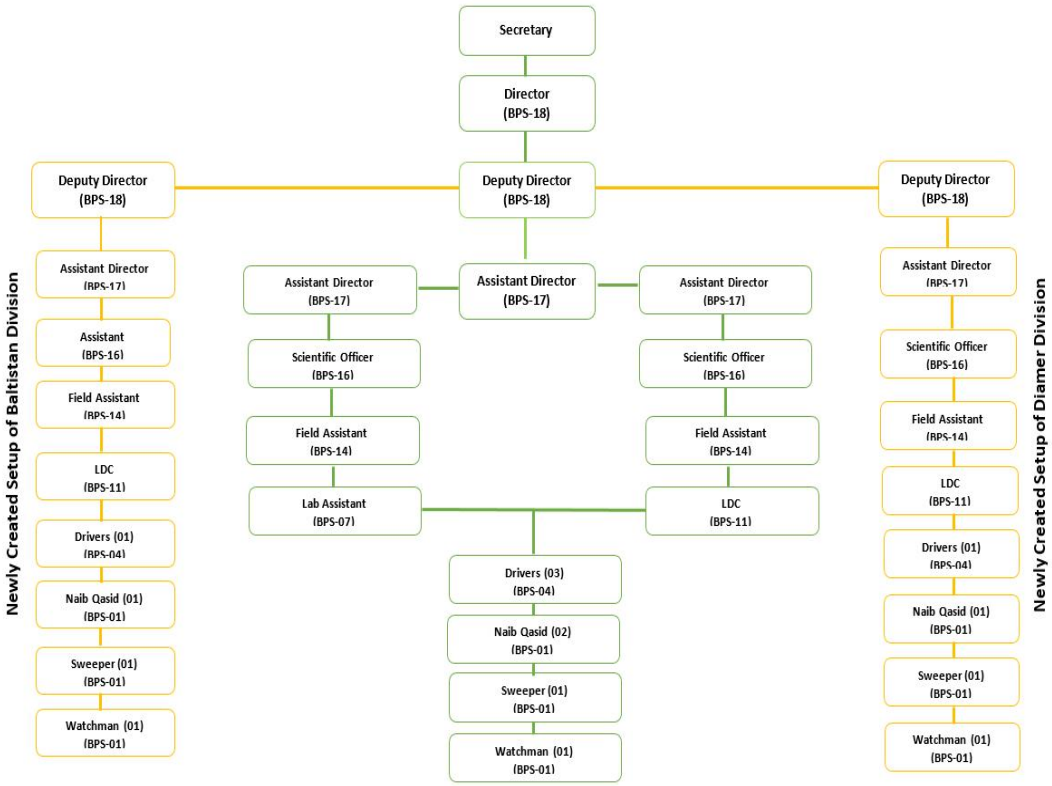


Figure 2-1: Organizational Framework of GB-EPA

2.4.3 Environmental Protection Council

The Gilgit-Baltistan Environmental Protection Council is the apex decision making body of Gilgit-Baltistan. As per Gilgit-Baltistan Environmental Protection Act of 2014 , the council has been set up under the chairmanship of Chief Minister of Gilgit-Baltistan with Members from other relevant Departments. Functions of the Council are listed below:

1. Co-ordination and supervision of the provisions of the Act and other Laws related to the environment in the province.

2. Approval of comprehensive provincial environmental and sustainable development policies, guaranteeing their implementation within the framework of a conservation strategy and sustainable development plan approved by the Government as and when required.

3. Approval of the Gilgit-Baltistan Environmental Quality Standards.

4. Provision of guidelines for the protection and conservation of species, habitats, and biodiversity in general, and for the conservation of renewable and non-renewable resources and new emerging environmental challenges like Climate Change and its mitigation.

5. Coordinating integration of the principles and concerns of sustainable development into socio-economic and development policies, plans and programs at the provincial, District and local levels.

6. Consideration of the annual Gilgit-Baltistan Environment Report, giving appropriate directions thereon and causing it to be laid before the Provincial Assembly.

7. Dealing with inter-provincial and federal-provincial issues, liaising and coordinating with other Provinces through appropriate inter-provincial forums regarding formulation and implementation of standards and policies relating to environmental matters with an inter-provincial impact, and

8. Provision of guidelines for bio safety and for the use of genetically modified organisms.

2.4.4 Gilgit-Baltistan Sustainable Development Fund

Gilgit-Baltistan Sustainable Development Fund has been established following the guidelines of the GB-EPA, 2015. The fund is to be used to financially aid and support projects aimed at environmental protection, conservation, rehabilitation and improvement. It is administratively headed by the Chief Secretary as the Chairperson along with members from other relevant departments.

2.4.5 Environmental Courts

Government of GB exercises the power to formulate as many Environmental Courts as it deems fit under the GB EPA, 2015. In case of more than one Environmental Courts, it is mandatory to specify the territorial limits within which their jurisdiction falls. An Environmental Court shall consist of a Chairperson who is, or has been, or is qualified for appointment as a Judge of the Session Court to be appointed after consultation with the Chief Justice of the Chief Court and two members to be appointed by the Government, of which at least one shall be a technical member with suitable professional qualifications and experience in the environmental field as may be prescribed.

2.4.6 Forest, Wildlife and Environment Department, Gilgit-Baltistan

The Project implementation will involve clearing of vegetation and trees within the Right of Way (ROW). This might have a direct or indirect impact on the wildlife of the project area as well. Therefore, the project contractors will be responsible for acquiring a 'No-Objection Certificate' (NOC) from the Forest, Wildlife and Environment Department, Gilgit-Baltistan on the basis of the approved EIA. The application for the NOC will need to be endorsed by the NHA. Tree avenue plantation will be carried out by NHA itself or through work awarded to Forest, Wildlife and Environment Department of Gilgit-Baltistan. NHA will also be responsible for liaising with the aforesaid department regarding the types of trees to be planted and other matters concerning plan for plantation as a measure to compensate for the loss of trees and to mitigate the damages caused to the environment during the course of the project.

2.4.7 Department of Inland Revenue, Gilgit-Baltistan

As per Land Acquisition Act (LAA) of 1894, the Department of Inland Revenue (GB) is authorized to carry out the acquisition of private land or built-up property for public purposes. For this purpose, the proponent of the Project (i.e. NHA) needs to make a request in writing to the respective District Administration to depute a Land Acquisition Collector (LAC) and other revenue staff incorporating members from other relevant departments, who will eventually be responsible for handling matters related to land acquisition and the disbursement of compensation for the respective provincial jurisdictions.

3. DESCRIPTION OF THE PROJECT

3.1 General

The approx. 292 kilometers (181mi) long, 2 lane highway between Thakot and Raikot section of KKH, falls in an area in which the Government of Pakistan is either currently planning or actively constructing several hydropower project (Diamer-Bhasha Dam, Dasu Dam, Dam at Pattan and Thakot). Work on Dasu dam & Diamer Bhasha dam has already started. Due to construction of dams, the existing KKH will be submerged in Dam Lake and hence needs relocations. The approximate length of KKH submerged due to the construction of four dams is approx. 20km at Thakot, 10km at Pattan, 70km at Dasu and 150km at Bhasha. However, length of each section will vary from the original length depending upon its relocation. The scope of this project is to construct a realigned KKH between Thakot and Raikot under CPEC in order to provide a safe, efficient and rapid all-weather communication link. The existing road after its realignment, widening and rehabilitation will not only provide as a quick link between Gilgit Baltistan and rest of the country but will also help in improving trade between Pakistan and China.

3.2 Objectives of the proposed project

The proposed Project will greatly benefit the road users by reduction in the vehicle operating cost due to less traffic congestion, better pavement surface and improved geometry. Time delays and accidents will also be reduced. Besides vehicle operating cost, there are numerous unquantifiable benefits such as improved environment, better communication, enhanced economic activities and less driving stress etc. The implementation of the Project is envisaged to have the following objectives:

- To provide a better road facility for inhabitants of area.
- To provide a safe, congestion free and high-speed facility to the commuters of the project area and tourists;
- To provide a trade link between Pakistan and China;
- To provide a safe and more efficient passage to Karakorum Highway, Northern Areas and China;
- To reduce the traffic loads on KKH;
- It will also contribute towards the promotion of industry and other infrastructure;
- To provide job opportunities to locals; and
- To improve linkages of Khyber Pakhtunkhwa and Gilgit-Baltistan to the Provincial and National Highways.

3.3 Location of the Project

The subject project aims to provide the best alignment option to connect Thakot in KPK to Raikot, a town near Chilas in Gilgit Baltistan area. The present single carriageway connecting Thakot to Raikot is approximately 290Km long out of which approximately 230Km stretch of the road passes through KPK area while the remaining 70Km passes through GB. Originating from Thakot and proceeding towards Raikot bridge, it passes well known locations of Shung, Besham, Jijial, Pattan, Mandraza, Dasu, Doga, Sazin, Shatial, Bhasha, Maruski, Chilas, Jalipur, Gunar and Drang. At present, it is a single lane carriageway (1+1) with total length of 290km. It is maintained and operated by NHA. This route is not only used by thousands of local commuters and tourists, but also serves as a trade route on national and international level.

The traffic consisting of light, medium and heavy substantially slows when number of road users increases during peak hours and seasonal holidays. The increased traffic on the road thus results in substantial delays to the road users. The starting point and major part of the project alignment lies in Khyber Pakhtunkhwa Province but its end in Gilgit Baltistan Province. However, the proposed Thakot to Dasu part of alignment falls under the administrative jurisdiction of Battagram, Shangla, Lower & Upper Kohistan of KP Province,

while Sezeen to Raikot section falls under Jurisdiction of District Upper Kohistan of KP and District Diamer of Gilgit-Baltistan Province. Figure 3-1 shows project alignment marked on google imagery. Project Administrative Jurisdiction.

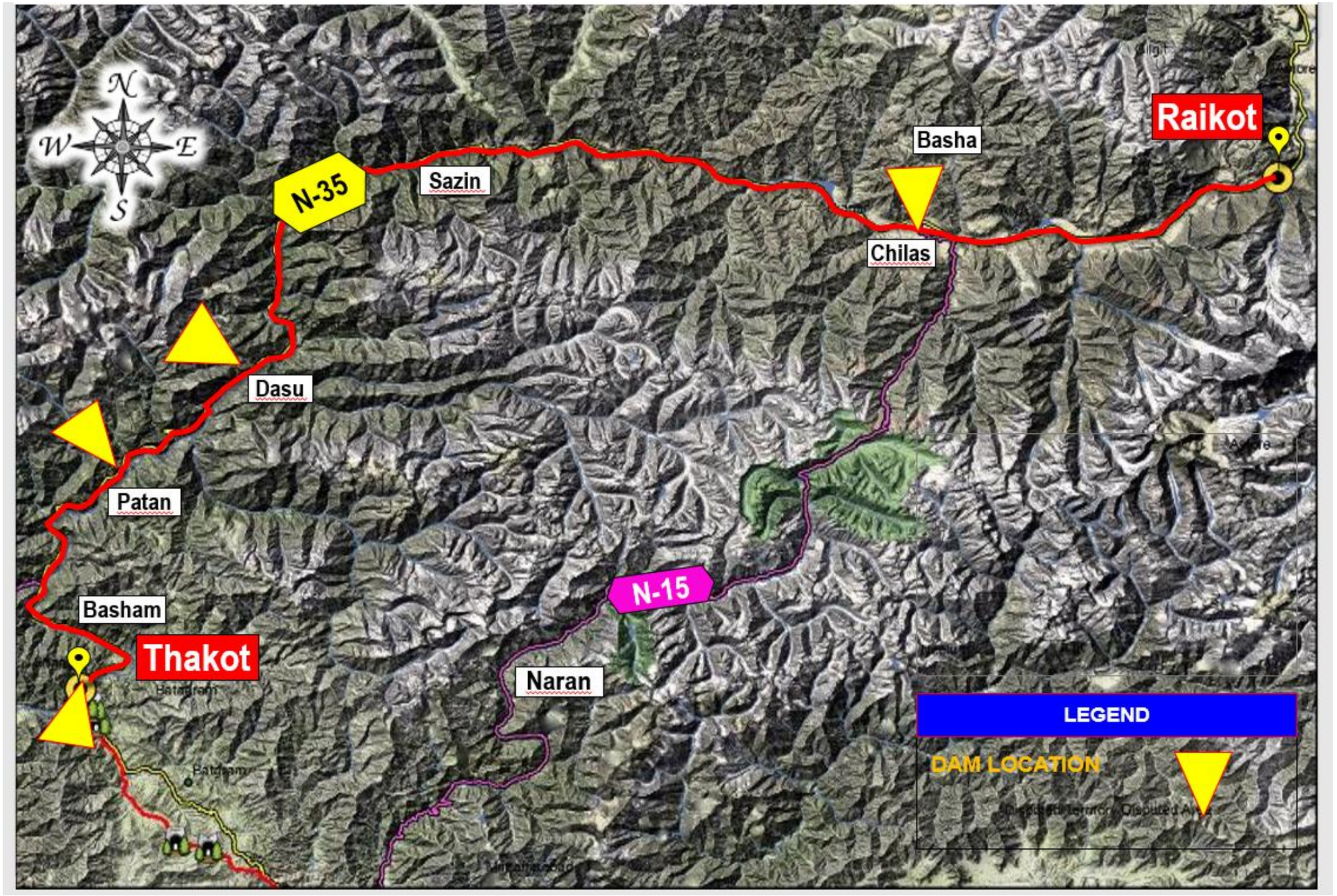


Figure 3-1: Map Showing Alignment of Proposed Project

3.4 Project Implementation Schedule

The implementation of the Project is expected to be started at the 1st half of the year 2024 and completed in 36 months. At present, the proposed Project is at the Feasibility and Engineering design stage.

3.5 Component of the Project

The proposed Project (Thakot to Raikot Section) of N-35 is envisaged to re-align it through reconstruction and upgrading works. The Civil work will involve 2 lanes Road Standard with 3.65m width of each Lane. Design Speed for the project on main carriageway is 30-80 Kilometers per Hour (KPH). The main specific roads to be improved and realigned under this project are based on the following Component:

Table 3-1: Main Components of the Project.

Sr. No	Start Point (Km)	End Point (Km)	Length (Km)	Standard Lane	Width
Road Section					
1	Thakot 173+800	Dasu 276+800	102	2 Lanes	3.65
2	Sazeen 326+500	Raikot 467+800	109	2 Lanes	3.65

The number of structures proposed in GB sections are described as under;(to be finalized by Lead firm)

Sazeen to Raikot Section - Gilgit Baltistan

No. of Tunnels : 11

No. of Culverts : 169

No. of Bridges : 102

In the project area, widening the Right of Way (RoW) of the proposed road requires cutting into the sides to achieve the required width of 3.65 meters. Consequently, retaining walls are proposed in these cut areas. As a result, retaining walls will be present throughout the alignment of the proposed road.

Drainage Sysytem

A drainage system has been designed, comprising culverts and bridges. Drainwater will be directed into nearby proposed culverts, following the slope of the area. Typically, culverts collect water from both sides. Layout plan (Typical) of the proposed drainage system is provided in Figure 3-2 below.

Maintenance Work and Service Area

Two Service and Maintenance work areas each equipped with prayer rooms and other necessary facilities, are included in the project (see attached Road Layout).

There are 5 maintenance and service areas proposed in the GB section of the project.

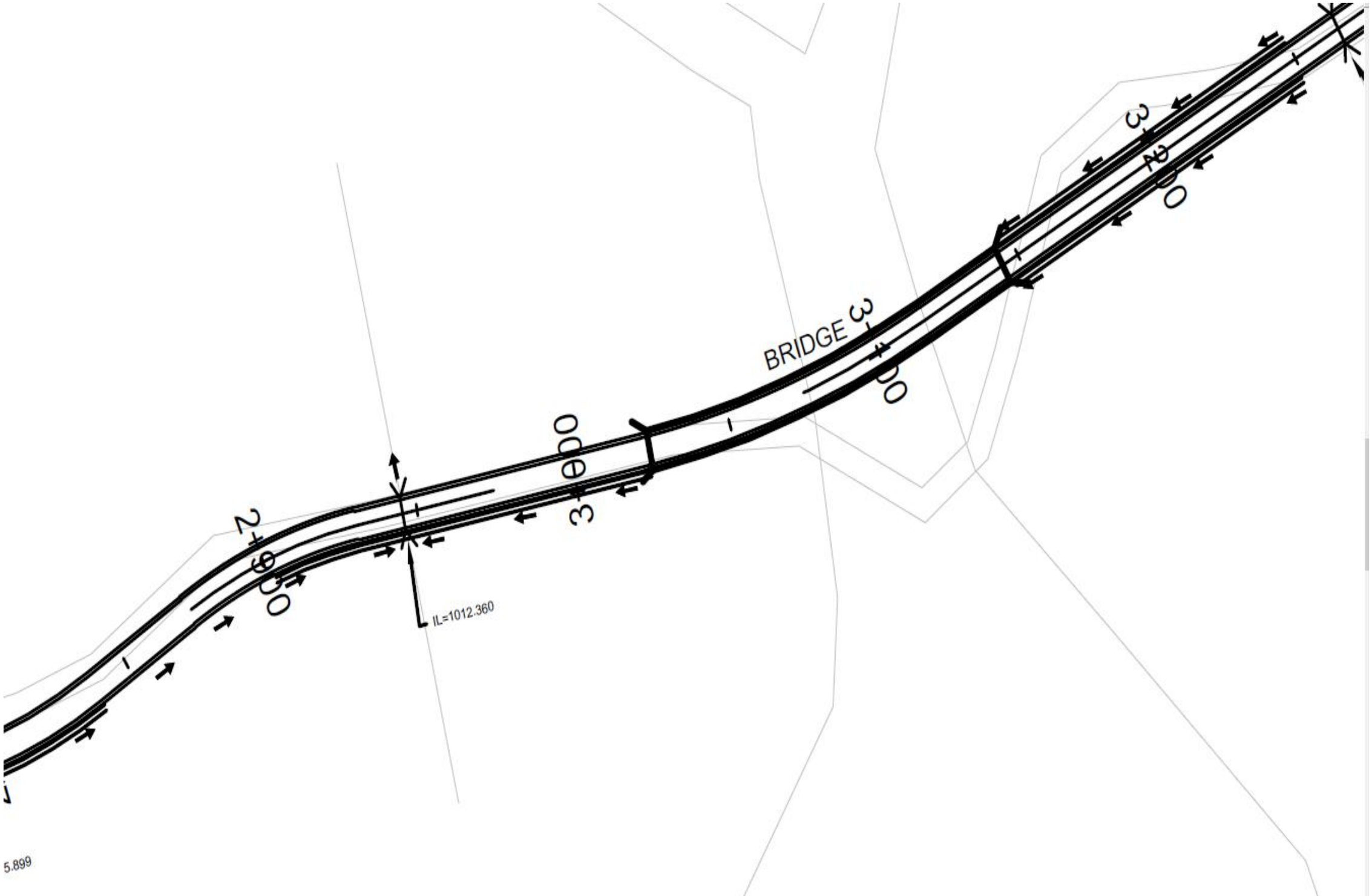


Figure 3-2: Layplan of Drainage, GB Section

3.6 Geometric Design of the Proposed Road Project

The geometric design of the proposed road Project is governed by AASHTO Criteria. N-35 National Highway (GB Section) shall be a limited access facility and shall conform to the following specifications:

Table 3- 2: Geometric Design of the Proposed Road Project

Sr. No.	Description	
1	Length of Project Approx. Right of way (Proposed) Design Vehicle	292km 40'(min) hilly Tractor Trailer 6- axle
2	**Design speed**	40-80 Kph Class-II
3	**Road cross section** Lane width No of Lanes Travel Lane width **Shoulder** Inner (Paved) Outer (Hilly) Outer (Rolling/Plain)	 3.65m Two (2) Single carriageway 7.3m Nil 1.0m (Cut) 2.5m + 0.5m rounding (Fill)
4	**Carriage way cross slope** Pavement Outer shoulder TST Inner shoulder	 2% 4% Nil
5	**Horizontal Alignment** Minimum Radius Minimum radius with no super elevation Absolute Minimum Curve radius at turnings/Channelizing Islands (m) Maximum super elevation Minimum stopping sight distance	 40m to 60m (Class-II Highway) 738m to 1440m 22m 6% 50-85 (min)
6	**Vertical Alignment** Maximum allowable Gradient Minimum Gradient K value for crest vertical curve K value for sag vertical curve	 7-8% Nil 04 to 26 09 to 30
7	**Design life of pavement** **Pavement Lane marking** White Line Yellow line Studs (white, yellow, green)	10 Years Between two lanes C/L Roadway edge/ Shoulder Lines, Chevron As required
8	Divider (Highway)	Nil (Chevron signs at curves) At shoulder where required
9	Bridges, tunnels, River protections works, slope protections, retaining/ breast walls, toe walls etc. culvert widening, bridge extension, new culverts, fill sections, rock cut	As per data available/ site requirements

3.7 Codes and Standards

The codes and standards applicable for the design of the Project facilities are listed below as a ready reference:

Table 3-3: Codes and Standards

Geometrics:		
AASHTO 2018 Green Book publication 'A Policy on the Geometric Design of Highway and Streets'		
Pavements:		
AASHTO Guide for Design of Pavement Structures, 1993		
Road Signs:		
Manual of Uniform Traffic Control Devices for Streets and Highways by FHWA – 2003		
Structures:		
BCP (2007)	-	Building Code of Pakistan
WPCPHB (1967)	-	West Pakistan Code of Practice for Highway Bridges
AASHTO (2017)	-	AASHTO LRFD Bridge Design Specification. American Association of State Highway and Transportation Officials. (For the design of all structural members ASD combination for the calculating length of pile.)
ACI 318-08	-	Building Code Requirements for Reinforced Concrete - American Concrete Institute
ACI 301-02	-	Specifications for Structural Concrete - American Concrete Institute
ASTM A-615	-	Specifications for Deformed and Plain Billet Steel Bars for Concrete Reinforcement American Society of Testing Materials
ASTM C-150	-	Specifications for Portland Cement
ACI-350 R	-	Environmental Engineering Concrete Structures
ASTM C-33	-	Specifications for Concrete Aggregate
Electrical:		CIBSE & CIE Standards
Loading		West Pakistan Code of Practice for Highway Bridges 1967.
Seismic Design		AASHTO analysis and design with latest seismic zoning map for Pakistan as per revised current Government of Pakistan seismic parameter

3.8 Traffic Survey Analysis

Traffic studies are intended to provide necessary input data for determination of the magnitude and the pattern of the traffic load for the project road through the design period that involves collection, verification and analysis of the traffic data. From these results, the projected traffic for the design life is calculated and converted into equivalent standard axles loads (ESAL) for the structural design of pavement. The same counts and traffic study data is used to carry out capacity analysis of the intersection and check for adequacy of the existing facilities and/or propose adequate traffic solutions.

3.8.1 Classified Traffic Counts

Detailed traffic survey has been carried out at following locations in order to cover peak and lowest traffic during August – 2022.

Table 3-4: Location of Traffic Count

Sr.#	Location	Period
1	Before Besham on N – 35 (L – 1)	8 Days (24 Hrs.) Traffic Count i/c 08 days OD Survey
2	Before Dasu on N – 35 (L – 2)	8 Days (24 Hrs.) Traffic Count i/c 08 days OD Survey
3	Near Raikot on N – 35 (L – 3)	7 Days (24 Hrs.) Traffic Count i/c 07 days OD Survey
4	At Dalain on N – 15 (L – 4)	7 Days (24 Hrs.) Traffic Count i/c 07 days OD Survey

The traffic survey was stratified by the vehicle type. Table: 3-5 lists the vehicle types counted during traffic study:

Table 3-5: Traffic Survey Vehicle Types

Fast Moving Vehicles			
Sr.#	**Vehicle Type**	**Sr.#**	**Vehicle Type**
1	Motor Cycle/Rickshaw	7	Truck 2. Axle
2	Car/ Taxi / jeep	8	Truck 3. Axle
3	Mini Bus	9	Truck 4. Axle
4	Large Bus	10	Truck 5
5	Pickup / Van	11	Truck 6 Axle
6	Mini Truck	12	Tractor Trolley

Location map of traffic count stations is provided in Figure 3-2 below. The Average Daily Traffic (ADT) for August – 2022 @ L – 1, L – 2, L – 3 & L – 4 have been provided in Table 3-6. Traffic counts were conducted direction wise in the field, while they were combined for the calculation of ADT.

Table 3-6: Summary of Average Daily Traffic (ADT)

Location	Before Besham on N - 35 (L - 1)	Before Dasu on N - 35 (L - 2)	Raikot on N - 35 (L - 3)	Dalain on N - 15 (L - 4)
Motor Cycle	1126	979	216	288
Rickshaw	52	3	1	1
Car	1901	1187	989	840
Pickup	831	562	177	139
Van	322	137	125	115
Mini Bus	82	54	73	98
Bus	29	16	37	36
Mini Truck	115	100	69	22
2-Axle Truck	252	92	169	125
3-Axle Truck	66	43	118	38
4-Axle Truck	5	6	4	3
Trailer 5-Axle above	7	10	6	0
Tractor Trolley	2	0	2	2
Total ADT	4790	3189	1986	1707

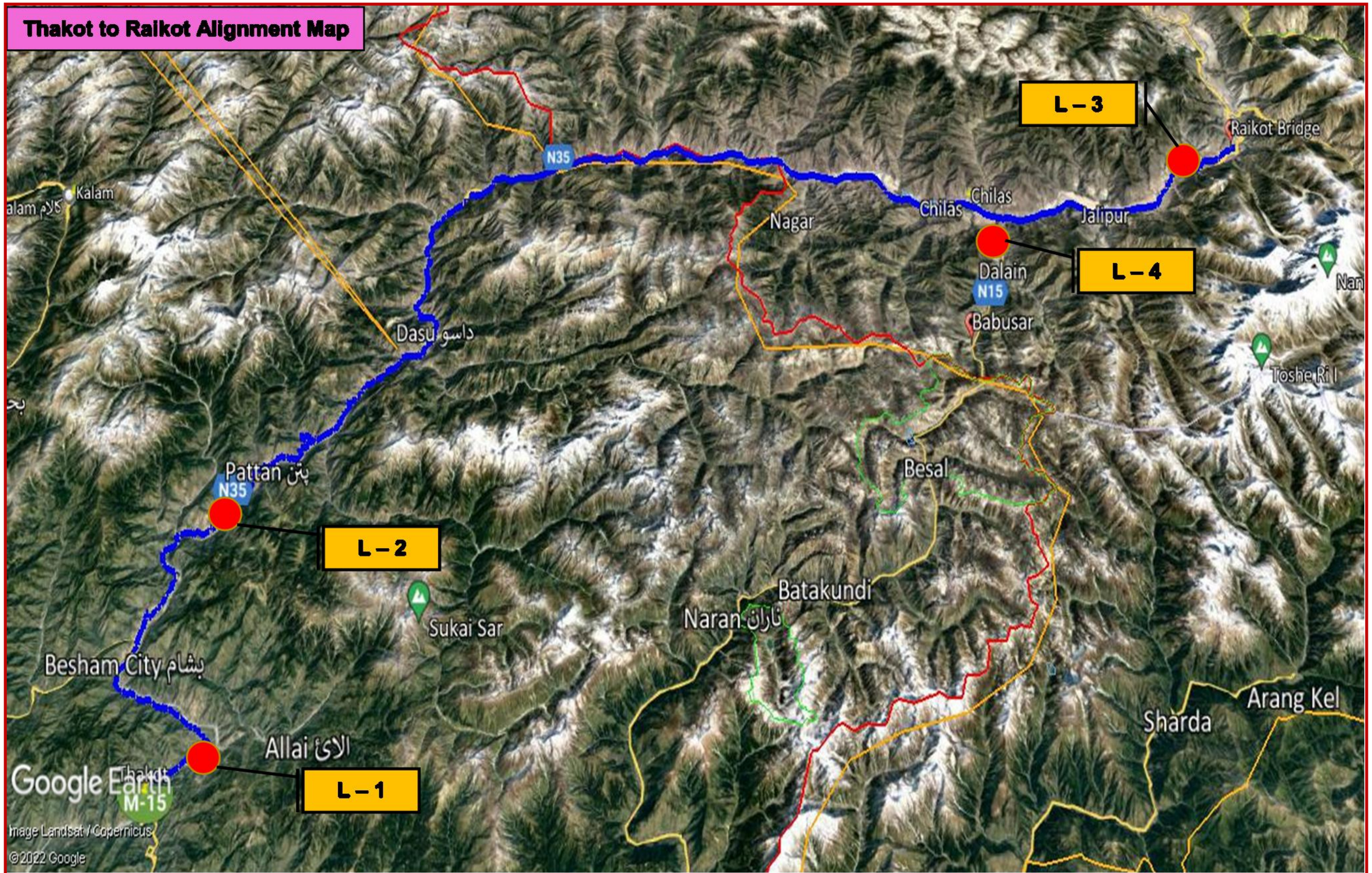


Figure 3-3: Location Map of Traffic Count Stations

3.8.2 Origin Destination Survey

Origin Destination Survey was carried out at KKH (N – 35) and N – 15 along with the traffic counts. Origin-Destination (O-D) survey plays important role in determination / estimation of anticipated traffic on a new transportation facility. This survey is carried out on sample based. Stations are setup at major key arterial locations close to the stations setup for 24 hours arterial count.

Traffic counts alone cannot give a good indication of the volumes of traffic that could potentially transfer the traffic load to the new facility. A reliable traffic model generally requires a matrix of trips (showing various origin and destination, and number of trips between each unique pair of origin and destination). This matrix is derived from surveys.

The vehicles were stopped and their drivers were interviewed by the surveyor. The questions asked include the origin and destination of their trip, vehicle type, commodity carried, route followed etc. Following table shows the different coding zones used for the OD surveys for analysis.

Table 3-7: Zones for the Study for KKH (N – 35)

Sr. No.	Nodes / Zones	Areas Included
1	Rawalpindi / Islamabad	All areas including suburbs
2	Gilgit	All areas including suburbs
3	Skardu	All areas including suburbs
4	Mansehra/ Abbottabad	All areas including suburbs
5	Hasanabdal	All areas including suburbs
6	Chilas	All areas including suburbs
7	Besham	All areas including suburbs
8	Hunza	All areas including suburbs
9	Kaghan / Naran	All areas including suburbs
10	Lahore	All areas including suburbs
11	Faisalabad / Multan	All areas including suburbs
12	Peshawar	All areas including suburbs
13	Sust China Border / China	All areas including suburbs
14	Karachi	All areas including suburbs
15	Other areas of Punjab	All areas including suburbs
16	Other areas of Sindh	All areas including suburbs
17	Other Areas of KP	All areas including suburbs
18	Afghanistan	All areas including suburbs
19	Iran	All areas including suburbs
20	Others	All areas including suburbs

For analysis purpose, vehicles were also coded and the vehicle codes are provided in the following table:

Table 3-8:Vehicles Codes used for OD Surveys

Vehicle Type	Vehicle Code	Vehicle Type	Vehicle Code
Motor cycle/3	1	Mini Truck	6

Vehicle Type	Vehicle Code	Vehicle Type	Vehicle Code
wheeler			
Car, Jeep, Taxi	2	Truck 2 Axle	7
Pickup	3	Truck Multi Axle	8
Wagon, Mini Bus	4	Tractor Trolleys	9
Bus	5	Other Vehicles	10

Each survey site was carefully located at such point that surveys could be safely undertaken. At each location, there was sufficient space for vehicles to pull off the road on both sides. The sections of roads in the vicinity of the survey location were all straight and flat, providing good visibility from a distance.

O&D data was brought to office for further processing. Data coding was carried out according to a set 20 different zones as described above and these zones were numbered from 1 to 20. Zoning of the project area was done so as to facilitate collected data processing and interpretation. The coded data was then transferred to the data sorting model prepared in EXCEL worksheet software.

The model used for the analysis is capable of grouping trips of same origin and destination together, identifying any obvious errors (for example variable range and logical error checks) and presenting the results in the form of a trip matrix.

Based upon the OD Survey it is clear that most of the traffic ply between Besham and Raikot Bridge (over 82%).

3.8.3 Journey Time Survey

Traffic volumes on the project road were forecasted by travel time survey. Average speed as noted on the road was used to calculate average travel time between various pairs of cities in the area. The total travel time includes time spent on the highway as well as time spent to pass through a city or a town. Following table provides the summary of the travel time data on N – 35.

Table 3-9: Travel Time Survey Results on N - 35

S. No.	Vehicle Type	Location	Distance, Km	Travel Time, Hrs.	Stoppage / Rest Time, Hrs.	Actual Travel Time. Hrs.	Avg Speed
1	Bus	N - 35	260	8.30	1.83	7.13	36.64
2	Car	N - 35	260	6.94	0.74	6.21	42.08
3	Minibus / Van	N - 35	260	7.59	1.00	6.59	39.55
4	Mini Truck	N - 35	260	8.29	1.40	6.88	37.87
5	Oil Tanker	N - 35	260	8.13	1.00	7.13	36.52
6	2 - Axle Trucks	N - 35	260	9.38	1.69	7.69	33.90
7	3 - Axle Trucks	N - 35	260	9.73	1.59	8.14	32.07
8	4 - Axle Trucks	N - 35	260	9.86	1.72	8.14	32.03

3.8.4 Estimated Traffic on New Alignment of KKH

Traffic volume on new alignment of the KKH has been estimated as follows:

- Traffic calculated through Origin Destination Survey (excluding traffic of National Highway N – 90 – Khawazakhela – Besham).
- Traffic diverted from National Highway N-15 to new alignment of N-35.
- 20 % generated traffic
- Traffic generated for construction of Dams up to Dam Site.

Traffic Up to Dam Sites

Table 3-10: Traffic Up to Dam Site

Location	OD Traffic/ Diverted Traffic	Diverted Traffic (40 % Traffic from N-15)	Traffic generated for Construction of Dams	Total Traffic
Motor Cycle/ Rikshaw	858	103		**961**
Car	1,497	299		**1,796**
Pickup	495	50		**545**
Van/ Mini Bus	329	76		**405**
Bus	19	13		**32**
Mini Truck	91	8		**99**
2-Axle Truck	156	45	2,000	**2,201**
3-Axle Truck	39	14	1,000	**1,053**
Multi Axle	6	1		**7**
Tractor Trolley	2	1		**3**
Total Traffic	3,492	608	3,000	**7,100**

Traffic after Dam Sites

Table 3-11:Traffic after Dam Site

Location	OD Traffic/ Diverted Traffic	Diverted Traffic (40 % Traffic from N-15)	Total Traffic
Motor Cycle/ Rikshaw	858	103	**2,009**
Car	1,497	299	**3,487**
Pickup	495	50	**1,280**
Van/ Mini Bus	329	76	**772**
Bus	19	13	**58**
Mini Truck	91	8	**199**
2-Axle Truck	156	45	**419**
3-Axle Truck	39	14	**108**
Multi Axle	6	1	**17**
Tractor Trolley	2	1	**5**
Total Traffic	3,492	608	**4,100**

3.8.5 Traffic Forecast

Traffic forecasts have been prepared for Normal traffic and with generated traffic as well for 20 years for up to and after dam sites. PCU are also calculated. Summary and detail of Forecast and PCU are described below:

Table 3-12: Traffic Forecast

Location	AADT	Forecast				PCU			
		2029	2034	2039	2044	2029	2034	2039	2044
Up to Dam Sites	7,100	11,140	13,553	16,490	20,062	15,614	18,997	23,113	28,121
After Dam Sites	4,100	6,433	7,827	9,522	11,585	6,985	8,498	10,339	12,580

3.8.6 Peak Hour Factor

In order to calculate the PHF for the subject project traffic volume during15 min period in one hour has been noted. The PHF calculated for the subject road is **0.85.**

3.8.7 ESAL Computations

The damage caused by vehicles to a road depends on the axle loads and wheel configuration of the vehicles. It is therefore important to determine the axle loads of heavy commercial vehicles in the projected traffic mix that is likely to use proposed alignment over the design life. For pavement design purposes the damaging power of axles is related to a standard axle of 8.16 tons (18000 lbs) using equivalence factors as described below.

Equivalency Factor = {Actual weight on the axle (lb) / 18000} ^ x

The value of “x” used in Road Note 31 is 4.5 whereas for AASHTO Design Guide and Road Note 29 it is based on AASHTO Road Test and varies from 3.8 to 4.1 depending on the axle load, desired terminal serviceability index and pavement structure.

In order to determine the cumulative axle load damage that a pavement will sustain during its design life, it is necessary to express the total number of heavy vehicles that will use the road during the design period in terms of the cumulative number of equivalent standard axles load (ESAL).

Since the trucking industry in Pakistan is highly competitive and does not follow traditional trucking patterns (wherein trucks transport goods at the required destination and usually come back empty) on local roads. The cargo transportation for all long-distance transportation in which Heavy Loaded Vehicles ratio would be higher than mid-short distance cargo transport. The 80:20 generally used is only for the mid-short distance transport.

Summary and detail calculations of ESAL’s using Damaging Factors from **NTRC Study on N – 35 in the year 2020** is provided in the tables given below:

Table 3-13: Summary of ESALs

Location	ESALS			
	5 Years	10 Years	15 Years	20 Years
Up to Dam Site	71,986,166	159,568,647	266,126,342	395,770,197
After Dam Site	6,124,328	13,575,814	22,641,900	33,672,307

3.9 Construction Camps

Camp sites will be selected keeping in view the availability of adequate area for establishing camp sites, including parking areas for machinery, stores and workshops, access to local markets, and an appropriate distance from sensitive areas in the vicinity. There are 3 construction camp site locations that are in Dhasu, Chilas and Jalipur. Their coordinates are given below in Table 3-14. The layout plan of the proposed construction camps is given below in Figure 3-4, Figure 3-5 and Figure 3-6.

Table 3-14: Coordinates of Costruction Camps

Sr. No.	Construction Camp	Coordinates
1.	Dhasu	E= 367585.1969 N= 3932919.4630
2.	Chilas	E= 416959.8601 N= 3919732.6658
3.	Jalipur	E= 440813.0659 N= 3918423.8521

Keeping in view the following criteria guidelines, the contractor has to identify the final construction camp sites before start of the construction activities.

- There should be no resettlement issue for the location of the camps;
- Campsite should be away from the residential areas and sensitive receptors;
- Selection of sites for construction camps shall be near the project area having proper access to the nearby main/link road;
- The camps must be located in a place where the drainage from and through the camps will not threaten any domestic or public water supply;
- Camp site must be adequate in size to prevent overcrowding of necessary structures;
- The camp site should consider avoiding any damage of property, vegetation, irrigation, and drinking water supply systems;
- The camp site must not be subject to periodic flooding; and
- There should not be any ecological sensitive areas. wildlife, sanctuaries, game reserves, national parks, forest areas, etc. near to the construction camp site.

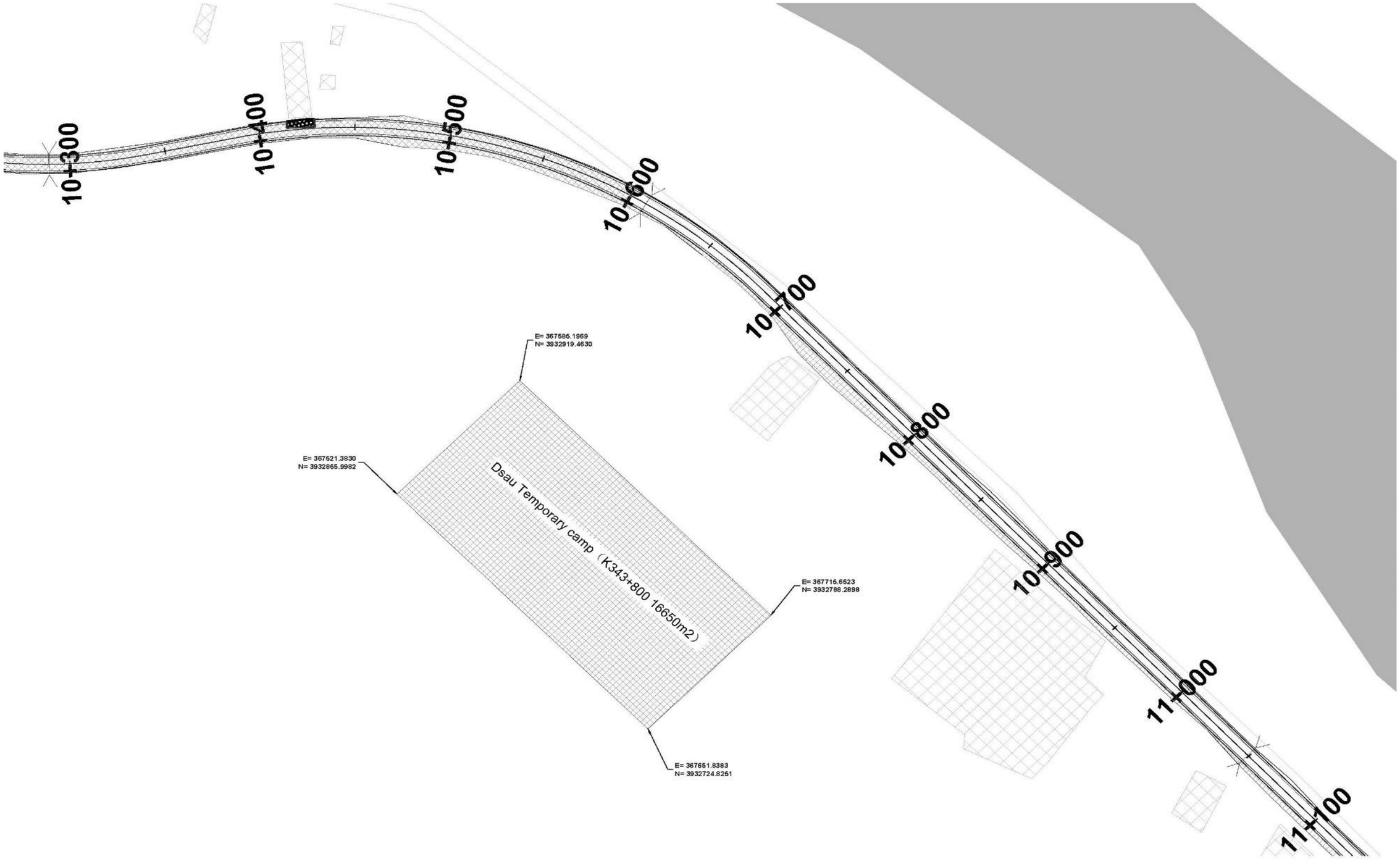


Figure 3-4: Construction Camp Site at Dhasu

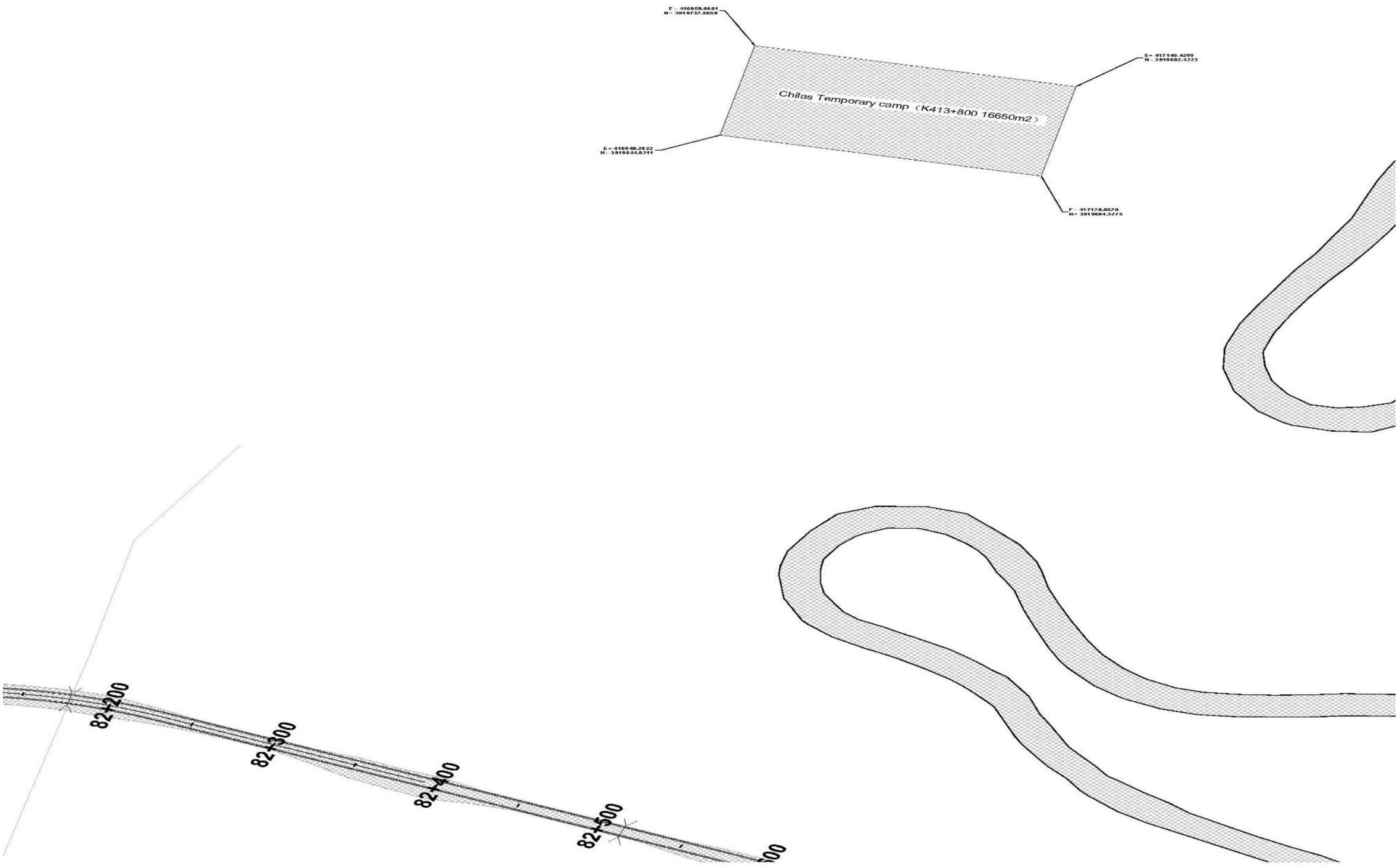


Figure 3- 5: Construction Camp Site at Chilas

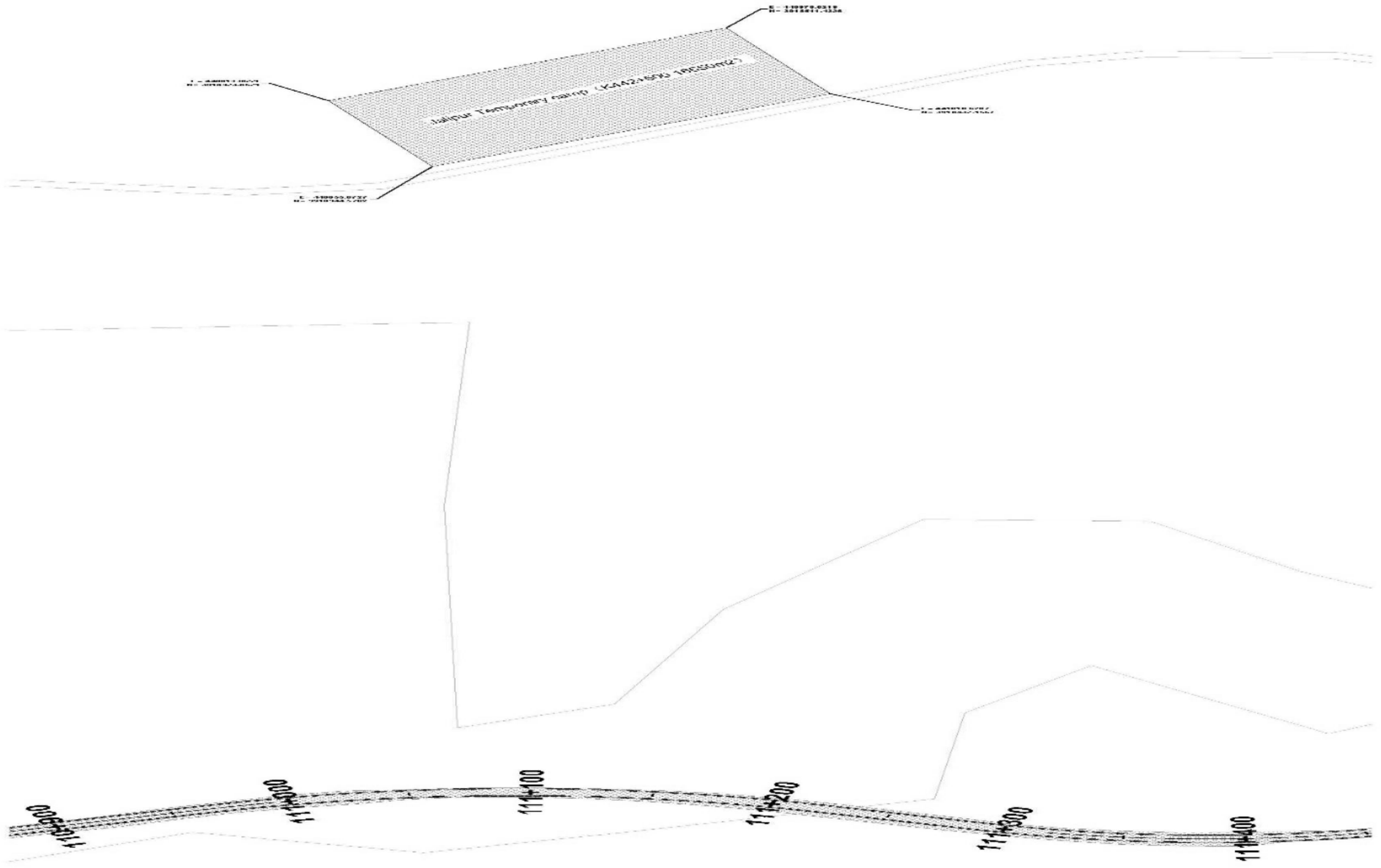


Figure 3-6: Construction Camp Site at Jalipur

3.10 Construction Machinery

The list of machinery and equipment required for the proposed project is provided in Table 3-15.

Table 3-15: Machinery and Equipment Requirement

Sr. No	Type of Machinery and Equipment	Sr. No	Type of Machinery and Equipment
1.	Dump Truck	11.	Asphalt Distributor
2.	Front End Loader	12.	Batching Plant
3.	Dozer	13.	Concrete Transit Truck
4.	Grader	14.	Concrete Pump
5.	Vibratory Roller	15.	Excavator
6.	Water Tanker	16.	Water Pump
7.	Aggregate Spreader	17.	Cranes
8.	Three Wheel Rollers	18.	Vibrator
9.	Asphalt Plant	19.	Generator
10.	Paver	20.	Concrete Mixer

3.11 Water Requirements

The source of water during the construction phase will be from water bowser tanks and ground water/ bottled water (for workers/skilled and unskilled labor) from local sources will be used.

The depth of the ground water table is along the Kabul and Indus River is generally less than 10 m while it is more than 30 m in higher elevations. The water consumption is estimated to be 32 ,000 liters/day for 800 construction workers for the proposed Project.

3.11.1 Power Requirements/ Power Source

The main source of electricity/electric power during construction phase will be diesel generators for construction camps and construction machinery and during the operational phase it would be taken from main electric power grid supplying power to the main city.

3.12 Project Implementation Schedule

The implementation Schedule for the proposed project is two (02) years

4. DESCRIPTION OF ENVIRONMENT

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

4.1 General

The areas covered under physical resources are; climate, water resources, topography, seismology, geology and soil conditions. The objective of the study was to establish.

- Baseline conditions of surface and groundwater resources
- Assess the surface and groundwater quality.
- Soil and geology baseline of the area
- Impact assessment of the project activities on the physical environment

The detailed description of physical resources is discussed as under:

4.1.1 Geology

Geologically, the northern Pakistan region is divided into three blocks, from north to south: Karakoram Block, Kohistan Island Arc and Indian plate. The project area is located in the southern part of the Kohistan Island Arc bounded by the Main Karakoram Thrust in the north and west (Northern Suture) and by the Main Mantle Thrust (MMT) to the south and east (Southern Suture) as shown in Figure 4-1.

The Kohistan Arc Complex is an area of igneous and sedimentary rocks that was formed during the mid-Cretaceous period. The area lies near to the area where the Asian and Indian continental plates meet, resulting in considerable thrusting, uplifting, tilting and plutonic activity. In the project area mainly, granulite’s and amphibolite’s can be found on both sides of the Indus. These rock formations both date from Cretaceous period.

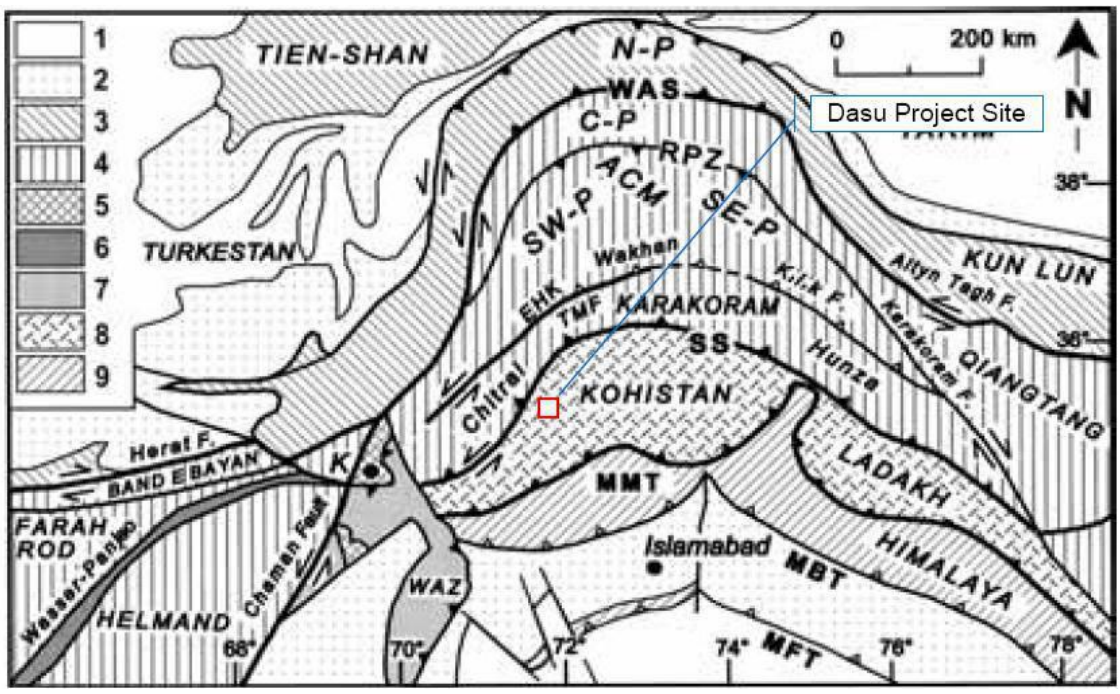


Figure 4- 1: Geological and Tectonic Sketch of Northern Pakistan and Surrounding Regions (after Zanchi et al., 2000)

4.1.2 Seismology

The Project area is located in an active seismic and earth quake zone. No earthquake monitoring was done in the country prior to last century. However, based on some historical documentation, it was evident that the region was subjected to severe earthquakes. The epicenters of three well-studied earthquakes of magnitude 5.9 or above have been recorded near the project site in respectively Pattan (1974), Hamran (1972) and Darel (1981). Another smaller concentration of epicenters of recent earthquakes (2002-2003) is located in the Raikot area on the western flank of the Nanga Parbat-Haramosh structure. The strongest of these earthquakes had a magnitude of 5.9 on the Richter scale. The epicenter of the heavy Kashmir earthquake of October 2005 (magnitude 7.6) was located at a distance of 90-100 km from the project area. The event struck the northern part of Pakistan, causing widespread damage and casualties in Azad Kashmir and adjoining areas of KP.

4.1.3 Rock Stability and Landslides

The project area is characterized by steep and moderately steep slopes. The granulite and amphibolite rock slopes are susceptible to rock fall and block toppling along steeply inclined foliation, discontinuities and occasional wedge sliding along various combinations of inclined joints and shears. The stability of rock slopes depends largely on rock mass properties, structural discontinuities, groundwater and earthquakes. Frequent landslides are not very common in the area. However, huge moraine deposits occur on nearly vertical slopes on either side of the Indus River. In the Project area these deposits occur near Kandia, Seo and Tial Medan. These deposits are loose and during heavy rainfall landslides and road blockage may happen. A few incidents with landslides were reported from the Kandia valley.

4.1.4 Sedimentation

The Indus River carries a heavy sediment load due to the ruggedness of the catchment area and the strong erosional forces in the upper catchment area caused by deforestation and lack of

protective vegetation cover. Another factor is the great variation between day and night temperatures. This may cause cracking and disintegration of rocks, erosion, and landslides on unstable slopes. Erosion materials in side valleys will be transported by melted snow towards the tributaries and will finally discharge as mud flows into the Indus. The river also derives sediments from vast alluvial fields and moraine deposits formed along its banks more upstream. Moraine deposits (silty sand with gravel and boulders from glacial origin are embedded) can be found on both embankments of the Indus River, sometimes characterized by nearly vertical slopes. The sediments in the river water comprise of suspended solid and moving bed load.

4.1.5 Soils

Geomorphologically the project area consists of mountain terraces and piedmont plains. The mountains are rugged with high relief and steep slopes. Geological erosion in these mountain areas is substantial. Rock debris is generally found at the toe of the highlands. Accessible slopes with a soil cover are terraced by the population for arable farming. The gravelly fans and terraces are of limited extent and mostly located at the bottom of mountain slopes. These are characterized by gravelly moderately coarse to medium textured soils. Most soils consist of sandy loam and silt loam. In general, the infiltration rate in these soils is moderately rapid. Water holding and nutrient holding capacity is low.

Cultivated areas are usually developed on alluvial fans and to the lesser extent by reclamation of old river terraces. The soils are generally low in clay and high in silt and sand with low organic matter content. These soils are used for the cultivation of wheat, maize, fodder and some vegetables. The soils are generally poor in plant nutrients. Soil samples (virgin soil, not used for agriculture) were collected along the valley and were analyzed for mercury. The concentration of mercury at all locations was found to be within the standard limits.

4.1.6 Hydrology

A dedicated hydrological study has been conducted for the Corridor of Influence (COI) and Right of Way (ROW) of the proposed alignment of KKH. The hydrological study report supported by extensive Field Work, Data collection, GIS data analysis, hydrological and hydraulic analysis incorporates 100-year return period flood estimates and routing then through streams in Corridor of Influence (COI) and Right of Way (ROW) of the proposed alignment of KKH. According to the report proposed road elevation is such that it is not impacted by 100-year flood. Moreover, appropriate hydraulic structures and surface drains have also been proposed to manage and dispose rain water.The magnitude of floods corresponding to 30, 50 and 100 years return periods as simulated using HEC HMS for all 145 water streams and hill torrents along the proposed alignment have been Annexed as Annexure X.

4.1.7 Flooding

In the upper Indus catchment area floods occur due to natural dam formation and their subsequent breakdown. Natural dam formations are either caused by landslides, or by bursting or overtopping of an ice dam, resulting in a sudden discharge of the lake behind the glacier. Dams created by massive landslides are rare but glacier dams are numerous; nearly 60 of such events have been reported since 1830. Dam break floods are characterized by a very rapid flood rise. Other causes of floods are heavy and prolonged storm runoff and intensive and extreme glacier and snow melting.

A number of historic floods are known from the upper Indus catchment area. The most recent one happened in 2010 in the Hunza Valley, when the Hunza River was blocked by an ice dam. After overtopping a considerable length of KKH near Ata-Abad was eroded away. The event created a lake which is still existing and affecting the trade with China. In February 2012 the blockage was blasted to release some 1,416 m3/s) to lower down the lake water level and ease

the situation to some extent. This resulted in a sudden raise in water level of the Indus at Thakot of about 2.5 m.

A dedicated hydrological study has been conducted for the Corridor of Influence (COI) and Right of Way (ROW) of the proposed alignment of KKH including Sazeen to Raikot Section - Gilgit Baltistan. The hydrological study report supported by extensive Field Work, Data collection, GIS data analysis, hydrological and hydraulic analysis incorporates 100-year return period flood estimates and routing then through streams in Corridor of Influence (COI) and Right of Way (ROW) of the proposed alignment of KKH. According to the report proposed road elevation is such that it is not impacted by 100-year flood. Moreover, appropriate hydraulic structures and surface drains have also been proposed to manage and dispose rain water.

4.1.8 Climate[1][2]

The project area is characterized by a large variation in climatic conditions, strongly varying with altitude. Commonly, the climate in the zones lower than 3,000 m is classified as “dry subtropical”, whereas the higher elevated zones have a “temperate” climate. Annual rainfall generally is low with figures between 200 mm and 300 mm. There is a strong increase in rainfall with altitude. It is not unusual that rainfall (often in the form of snow) amounts to values of 1,000 mm at altitudes of 3,000-5,000 m. The summers are usually hot in the valleys (average maximum temperature of 35°C in August) and winters are cold (average minimum temperature of 5° C in January). The area is not influenced by the monsoon and is lying in the rainfall shadow of the higher mountains, including the Nanga Parbat (over 8,000 m high). During winter, the precipitation falls as snow. Generally, the areas between 1,500 m and 5,000 m in the Upper Indus Basin are snow-covered during most of the winter months. The areas above 5,000 m are permanently snow covered. Although annual precipitation is low at the valley floor there can be occasional but intense rainfall events, often with significant hydrological and geomorphological significance (erosion). Winds can be very variable in the project area; the dominant wind directions depend largely on the local topography.

4.2 Environmental Testing & Monitoring

HARZA Consultants (SMC-Pvt). engaged the services of GELS (Green Environmental Laboratory Solution), an approved laboratory by the Environmental Protection Department (EPD) of Khyber Pakhtunkhwa, to undertake Environmental Monitoring of air & noise quality in the project area.

The main purpose of carrying out the environmental assessment is to check the adverse impacts of the project-related activities on the air and noise via monitoring the ambient air quality of the project area in compliance with the National Environmental Quality Standards. Environmental Testing & monitoring of environmental parameters such as Air Quality, Noise Level, Drinking Water Quality & Surface water Quality was tested for the project area.

4.2.1 Air Quality

The ambient air quality monitoring of Carbon Monoxide (CO), Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2) and Particulate Matter (PM10) was carried out in March 2023, the sampling locations were as under:

I. Basha Camp Downstream (Point 7)
II. Chilas City (Point 8)
III. Jalipur (Point 9)
IV. Raikot (Point 10)

[1] Pakistan Meteorological Department National Flood Forecasting Bureau, Lahore.
[2] Dasu HPP Environmental Management Action Plan

These locations have also been indicated in Figure 4-2. The sampling locations were selected near existing road. The sampling was conducted for 24 hours period. Samples were taken at downwind site

Figure 4- 2: Environmental Monitoring Location in Section-I of at Project

Table 4-1: Ambient Air Quality Analysis

Sr. No.	Parameters	Unit	Average Results at Sampling Locations				Duration Average	Pak NEQS
			Basha Camp Point-1	Chilas City Point-2	Jalipur Point-3	Raikot Point-4		
1	Carbon Monoxide (CO)	ppm	0.56	0.85	0.65	0.56	24 Hour	10 mg/m^3 (One Hour Average)
2	Sulfur Dioxide (SO2)	ppm	7.61	15.34	13.15	12.61		80 up/m^3 (Annual Arithmetic Mean)
3	Nitrogen Dioxide (NO2)	ppm	12	14.80	18.33	22.12		80 up/m^3 (24 Hour Average)
4	Particulate Matter (PM10)	µg/m^3	133.52	137.87	107.5	109.54		150 up/m^3 (24 Hour Average)
5	Particulate Matter (PM2.5)	µg/m^3	31.85	33.96	17.20	17.08		35 up/m^3 (24 Hour Average)

The results of ambient air quality parameters are compared with PAK NEQS standards

Table 4-1 indicates that all the tabulated parameters monitored in March 2023 are within prescribed permissible limits of NEQS standards. However, the proximity to the permissible level of particulate matter (PM2.5) is due to emissions from vehicular traffic on existing roads and the dispersion of dust deposited on these roads as a result of vehicle movement.

Due to increase in the traffic with the passage of time, it is estimated that average values of CO, SO2, NO2 and PM10 will also increase.

Figure 4-3:Ambient Air Monitoring at Site

4.2.2 Noise

Noise along the proposed highway is not a serious issue as it is a new alignment. Noise levels monitoring was carried out at the same locations where ambient air quality was monitored along the proposed alignment of the KKH. These locations have already been shown in Figure 4-4.

Table 4-2 indicates that noise level monitored in March 2023 are low from the given standards. However, it is expected that noise level will increase beyond permissible limits (NEQS) in construction and operation phase of the proposed project.

Table 4-2: Average Noise Levels at Various Locations

Sr. No.	Location	Equivalent Noise Level (L_{eq}) dB(A)		NEQS 2010 Recommended Noise Level (L_{eq}) dB(A)
		Peak	Average	
1.	Basha Camp Point-1	55.4	45.43	65 for the residential area, 70 for the commercial area
2.	Chilas City Point-2	57.8	45.97	
3.	Jalipur Point-3	56.30	46.42	
4.	Raikot Point-4	61.30	46.57	

Figure 4-4: Noise Monitoring at Site

4.2.3 Water Resources

The communities residing in the project area Districts rely on nullah, springs, rainfall and ground water aquifers to meet their water needs. There are perennial surface flows in and around the project area, so water shortage is not an issue. Water for domestic use is acquired from majority from Nullah/Springs. However, in Chilas town public water supply system also exit. Almost all the population surveyed for this project has access to drinking water.

a. Drinking Water Quality (Ground Water)

The complete lab reports for drinking water quality of the sample collected in the following locations:

I. Basha Camp Downstream
II. Chilas City
III. Jalipur
IV. Raikot

Results and Analysis

The results of the drinking water quality sampling are summarized as below Table 4-3:

Figure 4-5: Ground water sampling collection

b. Surface Water Quality

The lab reports for Surface Water Quality of the sample collected at selected locations are shown below:

I. Basha Camp Downstream
II. Basha Camp Upstream

Result and Analysis

The results of the Surface Water quality tested are summarized below Table 4-4.

Figure 4-6: Surface Water sampling

Table 4-3: Ground Water Quality Results

Sr. No.	Parameters	Unit	Average Results at Sampling Locations				NEQS Limit
			BashaCamp	ChilasCity	Jalipur	Raikot	
A. Chemical Parameters							
1.	pH**	-	8.02	7.56	7.76	6.73	6.5-8.5
2.	Odor	-	Odorless	Odorless	Odorless	Odorless	Non-Objectionable
3.	Taste	-	Sweet	Sweet	Sweet	Sweet	Non-Objectionable
4.	Color	Pt/Co	<1.0	<1.0	<1.0	<1.0	≤15 TCU
5.	Turbidity**	NTU	<0.1	<0.1	<0.1	<0.1	<5 NTU
6.	Total Hardness**	mg/l	162.0	180.0	144.0	84.0	< 500 mg/l
7.	Total Dissolved Solid (TDS)**	mg/l	193.0	251.0	193.0	95.0	< 1000
8.	Ammonia	mg/l	<0.002	<0.002	<0.002	<0.002	-
9.	Chloride**	mg/l	5.87	19.56	5.87	7.82	< 250
10.	Cyanide (CN)	mg/l	<0.01	<0.01	<0.01	<0.01	≤ 0.05
11.	Fluoride (F)**	mg/l	<0.01	<0.01	<0.01	<0.01	≤ 1.5
12.	Nitrite	mg/l	<0.01	<0.01	<0.01	<0.01	≤ 3 (P)
13.	Nitrate**	mg/l	0.3	0.2	<0.1	0.1	≤ 50
14.	Phenolic Compound	mg/l	<0.01	<0.01	<0.01	<0.01	-
15.	Residual Chlorine	mg/l	<0.1	<0.1	<0.1	<0.1	0.2-0.5
16.	Aluminum (Al)	mg/l	<0.028	<0.028	<0.028	<0.028	≤ 0.2
17.	Cadmium**	mg/l	<0.0028	<0.0028	<0.0028	<0.0028	0.01
18.	Copper**	mg/l	<0.0045	<0.0045	<0.0045	<0.0045	2
19.	Chromium**	mg/l	<0.0054	<0.0054	<0.0054	<0.0054	≤ 0.05 (P)
20.	Mercury	mg/l	<0.0008	<0.0008	<0.0008	<0.0008	≤ 0.001
21.	Antimony (Sb)**	mg/l	ND	ND	ND	ND	≤ 0.005 (P)
22.	Nickel**	mg/l	<0.008	<0.008	<0.008	<0.008	≤ 0.02
23.	Zinc**	mg/l	<0.0033	<0.0033	<0.0033	<0.0033	5.0
24.	Arsenic	mg/l	<0.01	<0.01	<0.01	<0.01	≤ 0.05 (P)
25.	Barium	mg/l	<0.031	<0.031	<0.031	<0.031	0.7
26.	Manganese**	mg/l	<0.0016	<0.0016	<0.0016	<0.0016	≤ 0.5

Sr. No.	Parameters	Unit	Average Results at Sampling Locations				NEQS Limit
			BashaCamp	ChilasCity	Jalipur	Raikot	
27.	Iron**	mg/l	<0.1	<0.1	<0.1	<0.1	-
28.	Boron	mg/l	<0.1	<0.1	<0.1	<0.1	0.3
29.	Lead**	mg/l	<0.013	<0.013	<0.013	<0.013	≤ 0.05
30.	Selenium	mg/l	ND	ND	ND	ND	0.01 (P)
B. Microbiological Parameters							
31.	Total Coliforms	CFU/100ml	76	10	Absent	03	0/100ml
32.	Faecal Coliforms (E. Coli)	CFU/100ml	68	Absent	Absent	Absent	0/100ml

Table 4-4: Surface Water Quality Results

Sr. No.	Parameters	Unit	Average Results at Sampling Locations		WHO Guidelines
			Basha Dam Start Point	Basha Dam End Point	
1.	Temperature	0C	24.7	24.7	-
2.	pH**	pH unit	7.79	7.90	0.01
3.	Total Dissolved Solid (TDS)**	mg/l	216.0	213.0	1.0
4.	Oil and Grease**	mg/l	<0.2	<0.2	0.2
5.	Biological Oxygen Demand	mg/l	<1.0	<1.0	1.0
6.	Chemical Oxygen Demand**	mg/l	4.0	4.0	1.0
7.	Total Suspended Solid**	mg/l	12.0	4.0	1.0
8.	Phenolic Compound	mg/l	<0.01	<0.01	0.01
9.	Chloride (Cl)**	mg/l	13.69	13.69	0.24
10.	Fluoride (F)**	mg/l	<0.01	<0.01	0.01
11.	Cyanide (CN)	mg/l	<0.01	<0.01	0.01
12.	Detergent	mg/l	ND	ND	-
13.	Sulphate**	mg/l	21.40	22.22	0.41
14.	Sulphide	mg/l	<0.2	<0.2	0.2
15.	Ammonia	mg/l	<0.002	<0.002	0.002
16.	Silver	mg/l	<0.0032	<0.0032	0.0032
17.	Cadmium**	mg/l	<0.0028	<0.0028	0.0028
18.	Chromium**	mg/l	<0.0054	<0.0054	0.0054
19.	Copper**	mg/l	<0.0045	<0.0045	0.0045
20.	Lead**	mg/l	<0.013	<0.013	0.013
21.	Mercury	mg/l	<0.0008	<0.0008	0.0008
22.	Nickel**	mg/l	<0.008	<0.008	0.008
23.	Zinc**	mg/l	0.020	0.018	0.0033
24.	Arsenic	mg/l	<0.01	<0.01	0.01
25.	Barium	mg/l	<0.031	<0.031	0.031
26.	Manganese**	mg/l	<0.0016	<0.0016	0.0016
27.	Iron**	mg/l	0.412	0.386	0.1
28.	Boron	mg/l	<0.1	<0.1	0.1
29.	Total Chlorine	mg/l	<0.1	<0.1	0.1
30.	Selenium	mg/l	ND	ND	-
31.	Pesticides	mg/l	ND	ND	-
32.	Total Toxic Metals	mg/l	ND	ND	-

4.3 Biological Environment

This section describes the biodiversity and natural resources as they exist in the project area, its baseline conditions, and ecosystem, and discusses existing ecological conditions. The proposed Project (section-II) is situated in District Diamer of Gilgit Baltistan. The project area with its vicinity, comprising of the Rocky Mountains and valleys along the river Indus, a medium to high barren valley on both sides, adjoined by mountain ranges up to approximately 2,000 masl elevation. which is adapted to the extreme variations in climate (-2°C to 35°C) and geographical conditions. Biological environment prevailing in the vicinity of the project road consists of Flora and Fauna.

Most of the project area falls mainly in the “montane dry sub-tropical scrub zone” characterized by barren hills with steep slopes. This zone is typical for foothills and areas between 800 and 3,500 m amsl. At lower altitudes, up to 950 m amsl, the shrub cover is dominated by Artemisia maritima and grasses. On intermediate slopes plots of mixed forest are encountered. Wildlife does not reside here but is reported to visit the area during winter in search of food when higher areas are snow laden.

The Flora includes vegetation and flowers that are found in human settlements/agricultural fields along the riverbanks/shops and mountain cliffs. The Fauna comprises of the wildlife habitat, endangered/rare species, livestock etc. The details are described as under:

4.3.1 Flora

Vegetation appeared in different areas mentioned above is bundles together as agro forestory i.e wood trees, fruit trees, shrubs/scrubs, herbs, grasses etc. The alpine scrubs are found in small ravines and in the upper tops of the higher mountains. Mostly trees grown near the project area include timber, firewood, and fruit trees. As the natural forests are scarce, the local residents have planted Poplar and Kikar trees which are utilized as timber and firewood. In addition to the crops, high alpine plants and weeds (wildflower and plants) are found near agricultural fields, along the roadside, stream/river banks and mountain tops.

Pastures: The natural pastures are found at elevation about 3811 m asl, which is above the tree limit. Grazing land and pastures are scattered in patches where the area is relatively flat. Mostly, herbaceous plants are grown in the pastures and the density of ground cover depends upon the available moisture and soil depth.

The far grazing area and their higher elevations contributes in the damage of forest. It was observed during the survey that mostly animals in the project area usually graze in agriculture fields, but in winter season they do not have any location to graze as it gets covered with snow or damaged by the frost. It is also observed that people wrap the trees stem with cloths or thorn to protect the plants from animal, which eats bark when they do not find any grazing area especially in winter season. Oak trees are lopped to feed the animals in winter season. The intensity of lopping is heavy and quit frequently and the oak branches looped for leaf fodder are utilized as a fuel wood

Orchards: Gilgit - Baltistan is well suited particularly for the production of deciduous fruits. Fruit crops have been grown here for last several years and now possess the genetic basis for tolerance to extreme cold, heat, frost, disease and pests. They represent a unique resource for future horticulture development (IUCN/GoP). Fruit trees are located in valleys and on the lower slopes.

The apricot trees are abundantly found in Gilgit - Baltistan with more than 300 different varieties of the fruit carrying different taste. The people have their own orchard full of fruit trees. Apricot is

the best source of income for the poor people. They also meet their fuel requirements from the trees during the cold and long winters.

During spring season, the apricot flowers not only add to the beauty of the region, but also fill the air with a sweet fragrance.

The locals of project area have reported that they have grown walnut, apricot, pears, mulberry and almonds on their land for their domestic and commercial purposes. Following tables 4-5 to 4-7 presents the diverse flora present in the project area.

Table 4- 5: List of Prominent Fruit Trees Identified in the project area

Sr. No	English Name	Scientific name
1.	Apple	Malus domestica/ Malus sylvestris/ Malus communis/ Pyrus malus
2.	Pear	Pyrus communis
3.	Almond	Prunus dulcis
4.	Plum	Prunus domestica
5.	Apricot	Prunus armeniaca
6.	Grapes	Vitis vinifera
7.	Peaches	Prunus persica
8.	Pomegranate	Punica granatum
9.	Cherry	Prunus avium
10.	Mulberry	Morus alba
11.	Walnut	Juglans

Table 4- 6: List of Wood Trees Identified

Sr. No	English Name	Scientific name
1.	Pine	Pinus gerardiana/ Pinus pinea
2.	Poplar	Populus alba
3.	Himalayan White Pine	Pinus wallichiana
4.	Red Cedar	Cedrella toona
5.	Himalayan Birch	Betula utilis
6.	Wild olive	Olea europaea
7.	Palosa	Acacia modesta
8.	Shesham	Dalbergia sissoo Roxb.
9.	Eucalyptus	Eucalyptus globulus

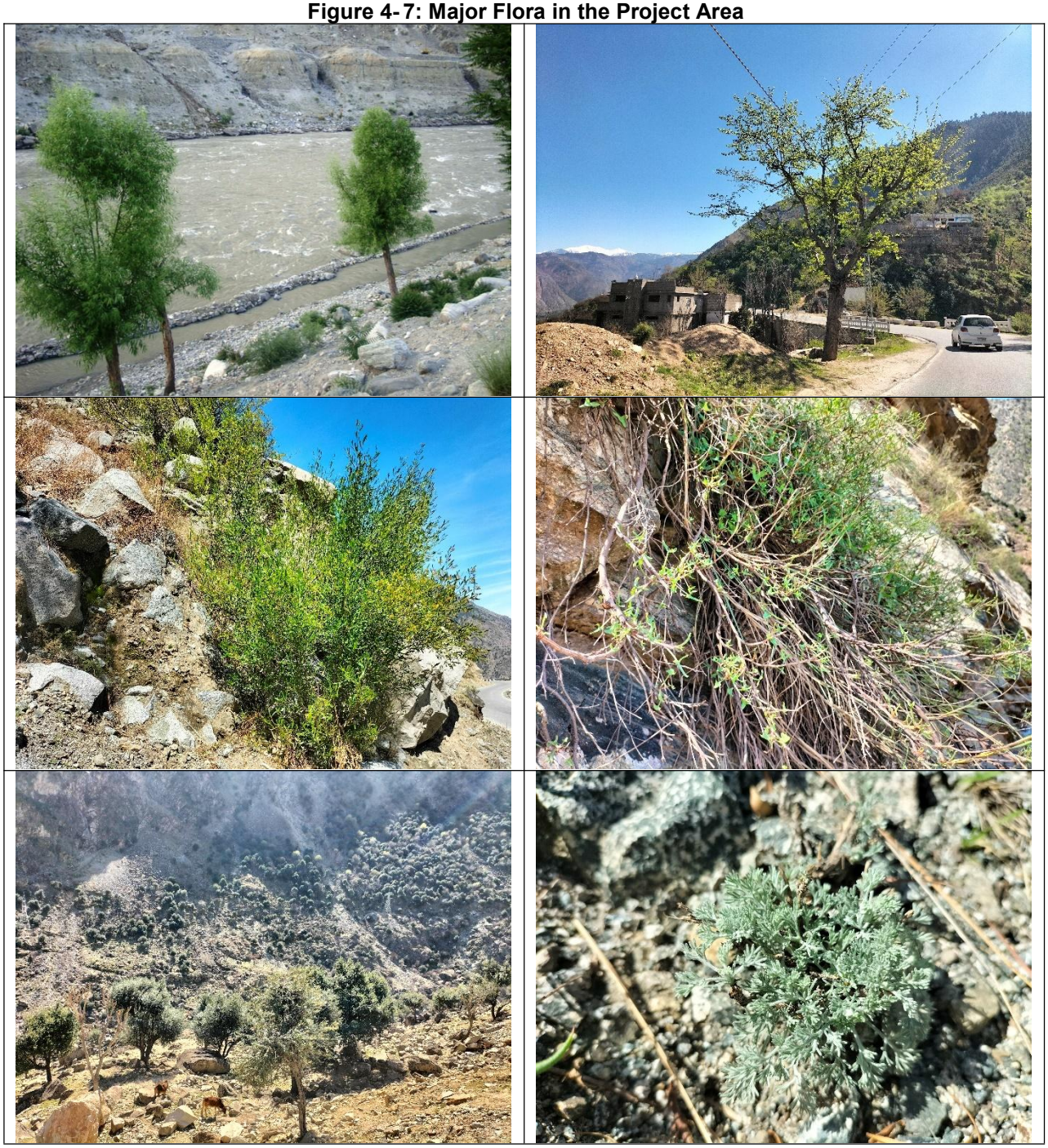
Table 4- 7: List of Shrubs, Herbs and Medicinal Plants

Sr. No	English Name	Scientific name
1.	Berberry	*Berberislycium*
2.	Wild rose	*Rosa webbiana*
3.	Trifolium	*Trifoliumrepens*
4.	Dandelion	*Taraxacumofficinale*
5.	Wild strawberry	*Fragariavesca*
6.	Ephedra	*Epherdra intermedia*
7.	Coriander	*Coriandrumsativum*
8.	Worm seed	*Artemisia aritime*
9.	Stinging nettle	*Urticadioica*
10.	Wild rue	*Peganumharmala*

Sr. No	English Name	Scientific name
11.	Curled sock	*Rumexhastatus*
12.	Horse mint	*Menthasylvestris*
13.	Kabbal	*Cynodon dactylon*

A variety of fruit trees, wood trees, shrubs, herbs etc. prevalent in the project area are shown in the figures below.

Figure 4-7: Major Flora in the Project Area



4.3.2 Fauna

Terrestrial fauna of the area comprised of domestic animals including dogs, sheep, goats, cows, donkeys and yaks. The wildlife in Ghizar and its surrounding is famous for its faunal diversity (mammals, residents and migratory). List of wild animals found in the area is given in the following table 4-8.

Table 4- 8: List of Important Mammals in the Project Area

Sr. No	English Name	Scientific name
1.	Asiatic jackal	*Canis aureus*
2.	Indian wolf	*Canis lupus*
3.	Hill or Kashmir fox	*Vulpes velpes griffithi*
4.	Common Leopard	*Panthera pardus*
5.	Leopard cat	*Prionilurus bengalensis*
6.	Caracal	*Felis caracal*
7.	Asiatic Black bear	*Ursus thibetanus*
8.	Himalayan musk deer	*Moschus chrysogaster*
9.	Markhor	*Capra falconeri cashmiriensis*
10.	Rhesus macaque	*Macaca mulatta*

Avifauna: Gilgit - Baltistan have one of the most diverse avifauna of the mountain region of the world. The Karakoram and Himalayan ranges separate the uplands of Central Asia from South Asia, forming a barrier between two large areas of Asia which are different climatologically. The geographic location of Gilgit - Baltistan makes it ideal for many bird species. The area is a staging, transitory, breeding, migratory and native ground for many species. In total, about 230 species of birds have been estimated for this region. These include passage migrants, vagrants, residents, breeding and irregular visitors. Many of these species breed in Northern Areas and are found over a large range. There are some rare species which not only occur in the area but also breed here. These include lammergeyer and the golden eagle.

Diamer has the highest avian-diversity in Gilgit-Baltistan with 321 bird species are found in the district, with the highest number (175 species) being Passeriformes (perching birds). This group includes a variety of flycatchers, finches, warblers, corvids, buntings, redstarts and pipits, with some lowland and Himalayan species. Waterfowl, during passage are 16 ducks & geese species, 31 waders, 9 gulls & terns, with 24 species of crakes, grebes, egrets and herons. Predatory birds are 19 hawks & eagles, 5 vultures, 7 owls and 5 falcon species. Other birds in the region include 8 pheasant and 9 pigeon & dove species, with some bee-eaters, woodpeckers, swifts and others.[3]

[3] https://www.birdsofgilgit.com/districts/diamer.html

Figure 4-8: Avian Diversity in the project area

4.3.3 Protected and Sensitive Areas

Protected areas include National Parks, Game Reserves and Wildlife Sanctuaries. Pakistan has a network of 225 Protected Areas comprising 14 National Parks, 99 Wildlife Sanctuaries, 96 Game Reserves, and 16 unclassified (private, proposed or recommended). No such location exists in the project area.

4.3.4 Aquatic Ecosystem

The Indus originates in Mansorawar Lake in Tibet, is approximately 3,058 km long and drains an area of 963,480 km² before discharging into the Arabian Sea. Physical geological, meteorological and hydro-biological conditions vary substantially along the river as do corresponding important human uses of the river and dependent economic conditions. The uppermost section of the river flows east-west in the mountain peak zone for about 850 km before it reaches the KKH Project area. The catchment in that area is mountainous and characterized by towering peaks covered with snow and glaciers. The river is mainly fed by melting of mountain snow; flow is high during summer and contribution from rainfall is exceedingly small.

Physio-chemical conditions of river water changes between the summer and winter seasons. During summer, river water is very turbid and carries a high sediment load.

Several river tributaries join the Indus between Basha and Tarbela. Catchment areas vary greatly. All streams pass along steep gradients through rocky areas of high mountains,

exhibiting variable cascades. At confluences with other tributaries and the Indus River they discharge gravel and sand from river bed erosion. Water quality in the main tributaries was also surveyed during the field visit. The water in these nullahs/streams was generally colorless, odorless, transparent, and cool. During winter months' temperatures were reported to be substantially lower: data averaged around 8°C, against some 20°C during summer. The banks of some tributaries show patches of vegetation.

Fish and Fisheries: The Gilgit - Baltistan has many rivers, streams and alpine lakes fed by snowmelt and glacier waters. The freshwater resources contain several fish species which are an important component of the region's biodiversity. The fish diversity in Gilgit - Baltistan is not yet described with greater detail despite its biological and evolutionary significance. However, some recent studies report that there are about 17 species of native fish and 3 of exotic fish. Out of 17 native species, four are endemic to Gilgit - Baltistan, while several others have ranges confined to one or two localities.

The number of fish species found in high altitude streams and lakes is low. Deosai Lake is one of the highest lake in the world located at an elevation of 4,142m, have only three fish species namely Triplophysa stoliczkai, Diptyichus maculatus, and Ptychobarbus conirostis.

Among exotic species, brown trout was introduced in Gilgit agency during the early 1900s. This species is now well established and is found in most of the rivers and lakes of Gilgit and Ghizar districts Other exotic species include North American rainbow trout and Chinese carp, introduced for aquaculture. However, it is not clear that these exotics breed naturally, but their distribution is very limited and they are found only in those water bodies where they were stocked.

Being a carnivorous in nature, the trout take food from natural environment, which includes protozoan, coelenterates, rotifers, insects, crustaceans, mollusks and larvae of many insects. It has also been observed that trout fish eat local fishes, while the eggs of trout are being eaten up by local fishes. There is no commercial fishing in the area. Fish caught by the locals are consumed at household level.

4.4 Socio-Economic Environment

This provides baseline description regarding socio-economic and cultural environment of the project area. It includes information regarding population distribution, households, socioeconomic status and livelihood activities, state of education and health facilities. Assessment of socioeconomic condition of the project area, forming an important part of the base line environment, has been made on the basis of data collected from secondary source (desk review of available reports, documents etc.) and primary source (field survey).

A field survey was carried out to collect Socio-economic and cultural data through questionnaire and focused group interviews with residents, shopkeepers, and village heads, landowners, pedestrians, farmers & laborers, school-teachers/employees in the project area.

Most people living in the villages surrounding the project area are residents/locals, farmers, businessmen, running their own shops/khokha/laborers (skilled, semi-skilled and unskilled workers). Shalwar Kameez is the common dress for males and Shalwar Kameez with Chaddar for females. Shina, Kohistani, Gujjro & Pashto are the common languages spoken in the project area.

4.4.1 Administrative Units

The KKH realignment is starting from Tkhakot which is in District Shangla and ends at Raikot in District Diamer. The Diamer is a district in Gilgit-Baltistan territory of Pakistan. The headquarters of the district is the town of Chilas. The district is bounded on the north by the Tangir and the

Gilgit districts, on the east by the Astore District, on the south by the Mansehra district of Pakistan's Khyber Pakhtunkhwa Province and the Neelum District of Azad Kashmir, and on the west by the Upper Kohistan District of Khyber Pakhtunkhwa Province. The Karakoram Highway passes through the Diamer District. Cumulatively KKH realignment spreads on an area of approximately 270 km, in which 70 km is coming under the jurisdiction of GB. with 7.3 m RoW. Sensitive receptors such as Human settlements, mosques, and buildings are found close to the proposed KKH realignment.

4.4.2 Historic Context

Ancient India

Thalpas, located opposite to the Chilas town, bears the most abundant collection of rock-art in Pakistan, the Pakistan-German Archaeological Mission has published about them in six dedicated volumes and traced them to Greco-Buddhist antiquity. Buddhist Stupas and anthropomorphic Buddhas remain the most common subject of rock-carvings in and around Chilas.

Karl Jettmar suggests that Chilas might have had been a Buddhist sanctuary while Harald Hauptmann hypothesizes Thalpas to be the "Talilo" of Chinese sources; however, in absence of excavations, such claims remain in the realm of speculations.

British India

During the British Raj, the area was known as Chilas and regarded as a tribal area, a subsidiary of the princely state of Jammu and Kashmir. Its original name was apparently Shiltās.

The region was brought under the control of the Maharaja of Jammu and Kashmir in 1851, and an agent of the Kashmir durbar was stationed there. In 1893, Chilas was taken over by the British-run Gilgit Agency. An Assistant Political Agent of the Agency was stationed in Chilas town. The Raja was soon deposed and Chilas functioned as a 'republican community' under the aegis of jirga, a body of local landowning men.

Pakistan

Prior to 2019, the Darel District and the Tangir District were part of the Diamer District but were subsequently elevated to district status. The jirga continues to play a significant role in governance.

4.4.3 Demography

Total population of the project area is 214,000 with a growth rate of 3.83% as recorded in Multiple Indicator Cluster Survey 2016-17.[4] Population composition was 99.7 females compared to 100 males. Only 14.3% of the population resided in urban areas whereas 85.7% of the population lived in rural areas. Average household size was 7[5]. The district is the only Sunni-majority district in Gilgit-Baltistan.

4.4.4 Income and Livelihood Analysis

The major source of livelihood for the project population is agriculture. Other occupations and income-generating activities are being practiced in the project area include farming, employment in government and private sectors, daily wage labour, operating businesses such as running a grocery shop and working abroad. Details of livelihood sources of sampled households are given in the below Table 4-9.

[4] citypopulation.de/en/pakistan/cities/gilgitbaltistan/

[5]Chrome extension://efaidnbmnnnibpcajpcglclefindmkaj/https://gilgitbaltistan.gov.pk/system/files?file=MICS_GB_1617%281%29.pdf

Table 4-9: Livelihood Sources of Sampled Households (in percent)

Farming	Govt. Servant	Private Servant	Own Business	others
36.88	16.88	3.13	11.38	25.00

Although agriculture is the main livelihood source for the majority of the households, the availability of the agricultural land is limited to the valley along the riverbanks. The average landholding of 74 % of the surveyed households is less than one Kanal. About 26% of the households have a land holding of 1 to 5 Kanals. The graphical representation is shown in the below Figure 4-9.

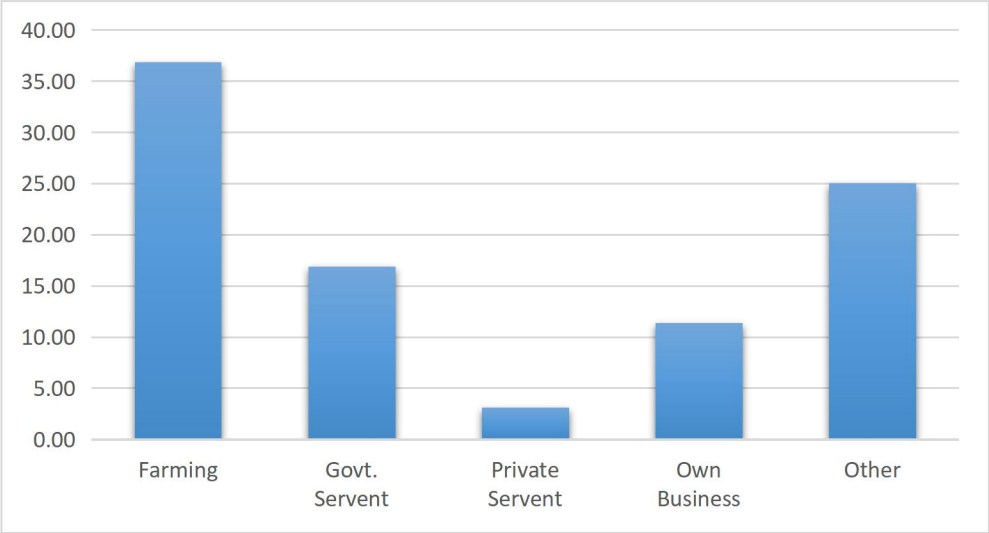


Figure 4-9: Livelihood Sources of Sampled Households (in percent)

4.4.5 Average Income of Surveyed House

The assessment of annual household income is one of the important indicators to measure the well-being/livelihood of the household. The survey results shown in Table 4-10 reveal that a major proportion (20%) of the surveyed households fall in the income category of Rs. 20,000 to Rs. 40,000, while 6% come under the income bracket of less than Rs. 25,000 and 4% above Rs. 50,000 per month, respectively.

Table 4-10: Average Income % of Surveyed Households

Income	Household Income Bracket		
	Up to Rs. 20,000	Above Rs. 20,000- Rs. 40,000	Above Rs. 50,000
Percentage of HHs	30%	50%	20%

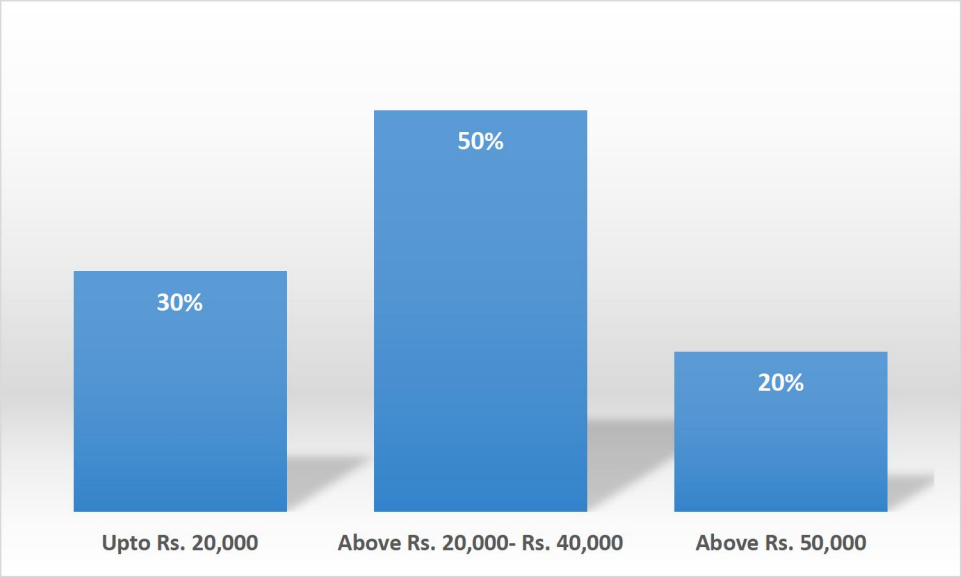


Figure 4-10: Average Income % of Surveyed Households

4.4.6 Land Tenure, Land Use, and Natural Resources

Most of the land is allocated to individuals using informal methods of identification of plots like placing stones/markers at the boundaries and is also accepted by the local community. In general, the area is mostly Hilly area with terraces land. About 15% of the land is under cultivation in the form of flat land and terraces. The land tenure system is mostly Owner cum Tenants, while the only tenants a secondary position.

4.4.7 Castes

Major Caste in the Project area are Soniwal, Yashkund, Shin, Syeds, Yashkund, Mughal, and Shin.

4.4.8 Religion

Almost whole population of the project area is Muslim. Cultural festivals are mostly linked with traditional religious events. There are no shrines (or Ziarats) in the project area.

4.4.9 Education and Literacy

In GB, district Hunza-Nagar is on top of the list with a 97.6% enrollment rate, then comes district Ghizer with 96.9% enrollment followed by district Astore with 92.8% enrollment rate in class 1 to 10. But ironically, district Diamer is worst performing with respect to enrollment of children having an age range of 5 to 16. This is badly affecting the overall enrollment rate of GB.

In Diamer district, enrollment in is highly skewed in favor of boys as the out-of-school-children are more than In-School children in class 1 to 10 and only 16% of Girls from these enrolled students can read at least a sentence. In ECE class only 9% children are enrolled whereas, 91% of ECE level kids are out of school in Diamer[6].

According to the Bureau of Statistic, the number of primary schools, middle, high, secondary high, college and Universities institute are provided in Table 4-11 and graphical presentation in Figure 4-11. The literacy rate in the project area is very low.

Table 4-11: Number of Educational Institute in the Project area

[6]https://pamirtimes.net/2016/04/27/status-of-education-in-gilgit-baltistan-pakistan/#:~:text=In%20Diamer%20district%2C%20enrollment%20in,out%20of%20school%20in%20Diamer.

District	Primary	Middle	High	High Sec.	College	Uni.	Total
Diamer	188	24	15	2	1	-	230

Source: Bureau of Statistics,

4.4.10 Types of Construction of Houses

The below figure show housing condition in the project area with 13% Peeca, 62% Semi Pecca, and 25% are Kacha houses.

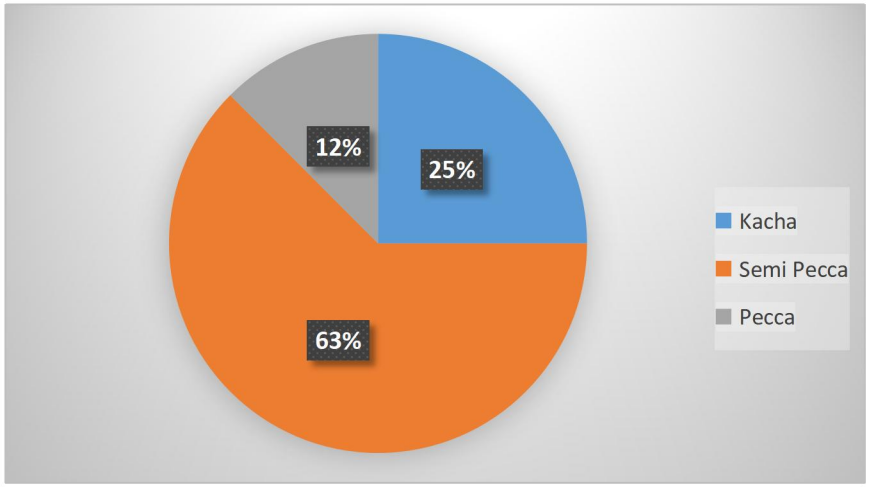


Figure 4-11: Types of Houses in the Project Area

4.4.11 Agriculture and livestock

Livestock holding with agriculture (mainly subsistence farming) is the main source of income, together with some income obtained from the sales of forest products. There is hardly any flat or gently sloping cultivable land. Small terraces have to be built on steep slopes to grow one crop per year (mostly wheat) at altitudes above 1,200 m and double cropping (predominantly maize, rice and vegetables) is possible on the lower valley terraces. Livestock holding with goat, sheep, cattle, bullocks and some poultry is the main activity and more important than farming, due to the scarcity of cultivable land. Families are in principle pastoralist and most of them migrate during summer to higher altitudes in search of pastures and a cooler climate. The seasonal migration between the winter residences at the valley bottom and the higher summer residences at elevations between 1,500 m and 3,000 m is typical for the area.

4.4.12 Income from Forests

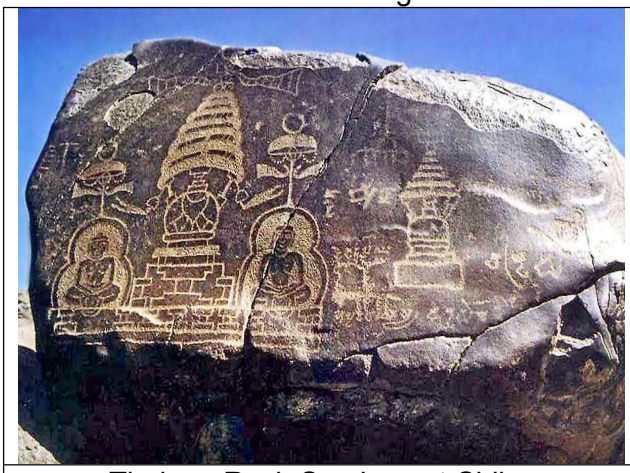
Forests, though essentially located on high elevation, are the most important natural resource of the area. Firstly, they meet the fuel wood requirements of the local inhabitants. Secondly, forests are quite significant source of income for communities as private owners; woodchoppers; and timber cutting. Some people are involved in timber business. Another rather common business in the area is sales of sand and gravel. A seasonal source of income is the collection and sale of Pine nut (Chilghoza), walnuts, honey, mushrooms and medicinal plants and other forest products.

4.4.13 Tourism

The project area has a potential for development of tourism, but supporting tourist facilities are hardly available. Most tourists are passing the project area on their way to popular tourist destination in Gilgit Baltistan. District Diamer is gateway to Gilgit-Baltistan. The area manifests prehistoric traces of human species and advancement in the shape of rock carvings, rock

inscripons and petroglyphs etc. These features make Diamer district an important desnaon with over 35000 prehistoric inscripons and carvings. The biggest power generator project of the country.

Famous Tourist Spots: The important valleys of Diamer district include Tangir, Darel, Chilas (hub of archeological sites in the area), Bunar Das, Gonar Farm and Raikot. The beautiful Fairy Meadows is the most pleasing desnaon for naonal and international tourists. Popular activities: The famous and capvang Nanga Parbat (8125m) that cheers trekkers and mountaineers is a feather in the crown of this region.



Thalpan Rock Carvings at Chilas

Fairy Meadows & Nanga Parbat

4.4.14 Skilled and Unskilled Workers

The literacy rate in the project area is very low. The majority of the population is unskilled and working as self-employed worker in agriculture and livestock holding, often with different sources of secondary income coming from the sale of fuelwood, timber and various forest products. There is a lack of vocational education and training in the area. Parents are forced to send their children to work at an early stage instead of sending them to school. Young males usually unmarried are working in other parts of the country, usually in other parts of KP, Islamabad, Lahore or in Karachi. Most of these jobs include drivers, construction workers, cleaners, cooks and others.

4.4.15 Government Employment

The Government headquarters of project area provide jobs for civil servants, contractual staff and daily-wages support staff. The Educational department is the largest employer in the district headquarter and the police department is second in providing job opportunities to all kind of people. Other people are employed through the Forest Department, Agriculture, District Administration, Health, Social Welfare & Women Development Department, Population Welfare, Fisheries, Banks, and Archaeology departments.

4.4.16 Private Jobs

Some employment exists in the area through contractors involved in implementing the National Program for Water Management, National Data Base Registration Authority (NADRA), however, most of the jobs under these contracts are of technical nature with limited scope for locals due to the low illiteracy rate.

People of the project area are also doing private jobs. Most of the young, educated people of the area are working with some national and international NGOs (AKRSP, GBRSP, SRSP etc).

These NGOs are working for the development of the local population. Some people are working in schools run by NGOs.

4.4.17 Soniwal

A special commercial activity is carried out by the Soniwal, which are tribes living in the northern area of Pakistan. They are earning their livelihood through gold extraction from sand which is deposited on the banks of the Indus River. The vicinity of the project area has a number of Soniwal. Soniwal extracts some 6-7 tolas (1 tola = 11.78 gram) of gold in one season. All members of the family take part in the extraction of gold from river sand. There is also a village name “Soniwal Khund” where the entire village is dependent on the extraction of gold from the Indus River.

4.4.18 Social Amenities

The Figure 4-12 shows availability of social amenities in the project area.

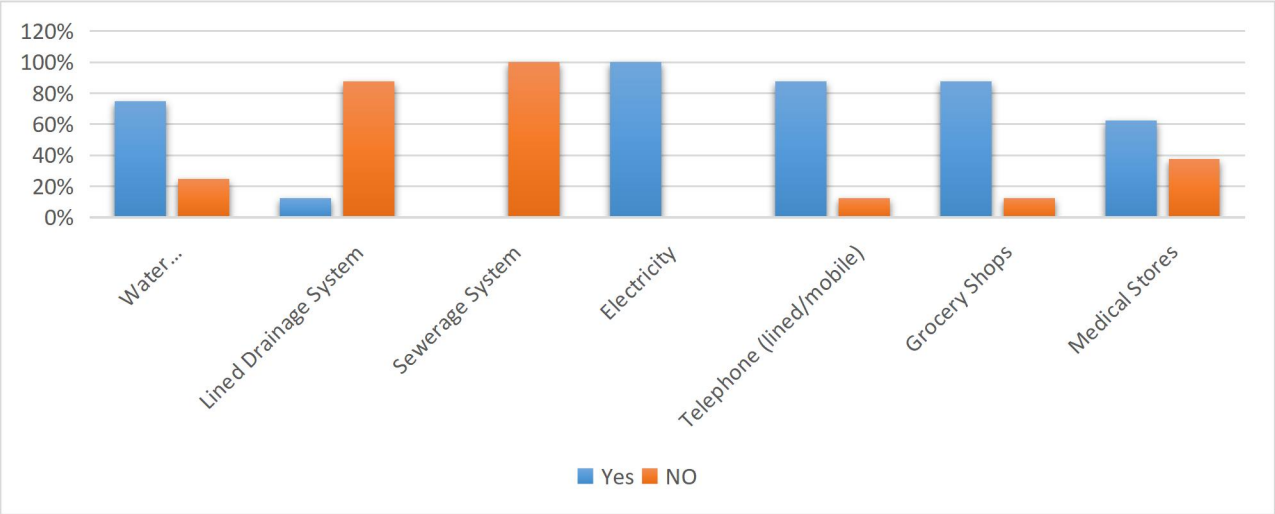


Figure 4-12: Social Amenities in the Project Area

4.4.19 Institutional Facilities

The below Figure 4-13 graphically present depict the institutional facilities in the project area.

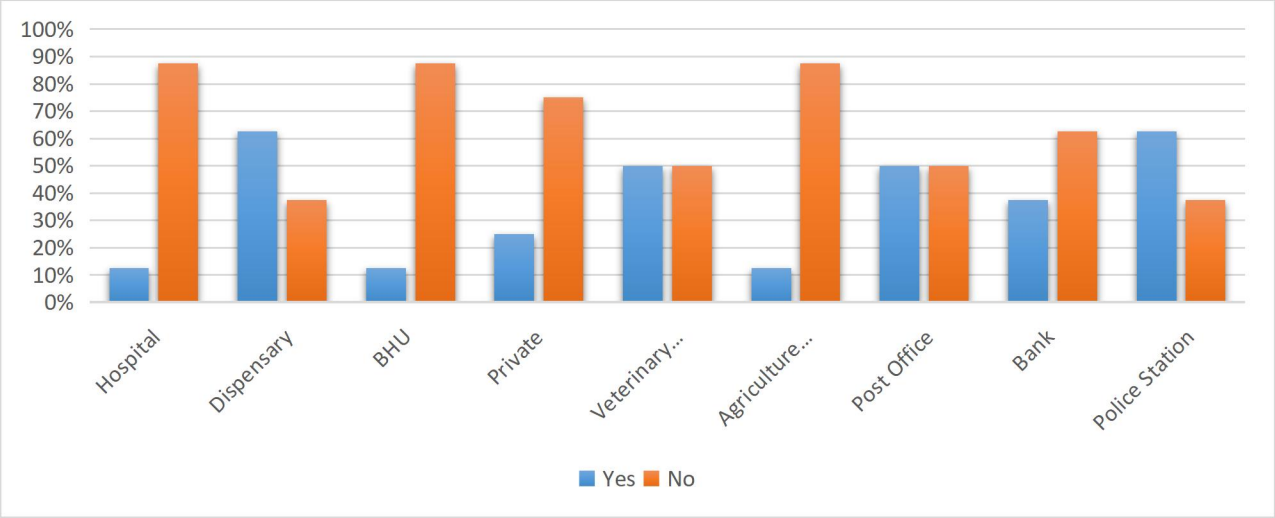


Figure 4-13: Institutional Facilities in the Project Area

5. ANALYSIS OF ALTERNATIVES

5.1 General

The discussion and analysis of alternatives in Environmental Impact Assessment (EIA) should consider other practicable strategies that will promote the elimination of negative environmental impacts identified. This section is a requirement of the Gilgit EPA and is critical in consideration of the ideal development with minimal environmental disturbance. This report has identified the major environmental impacts noted by scientific experts. The findings of these impacts were utilized to analyze possible options for the final development.

The following alternatives have been identified and are discussed in further detail below:

- Zero Alternative “No Project Option”
- Alternative-II ‘Other Transport Modes’
- Alternative-III ‘Realignment of Thakot-Raikot Section of KKH

5.2 Zero Alternative ‘No Project Option’

The “no action” alternative is required to ensure the consideration of the original environment without any development. This is necessary for the decision-makers in considering all possibilities. The development will have a minimal effect on the physical environment. In terms of the social environment, the “no-action” alternative would result in traffic detours during rains, increase travel hazard, eliminate job opportunities, higher transport costs, higher travel time, increase the dust nuisance created by driving on deteriorated road and increase the wear and tear on the vehicles.

KKH serves as a major trade route between China and Pakistan and contributes substantially in the economy of the country. In the absence of a well-developed highway, all goods carrying vehicles going to and from China experience difficulties in commuting between the section of Thakot and Raikot. They have to face delays due to land sliding and narrow sections of the road. Thus, there is a long-felt need to provide a safer and shorter link to Gilgit and other parts of northern areas. In addition, a number of major and minor bridges exist which require up gradation. There are scattered settlements that fall on the alignment which can be categorized as small to medium size towns. Population in these town is increasing with time and is a source of congestion on the road.

The existing road from Thakot-Raikot (Part of N-35) will continue to be the main transportation corridor in the area. Traffic congestion is expected to increase, and road conditions are expected to deteriorate resulting in traffic congestions and traffic Jams with the passage of time. Residents of the northern belt will also suffer from degraded transportation access. The no project conditions will result in further worsening the present environmental conditions and increased disturbance to residents of area and the road users. Socio-economic conditions will also be deteriorated due to lack of proper link between North and South of Pakistan.

Additionally the approx. 292 kilometers (181mi) long, 2 lane highway between Thakot and Raikot section of KKH, falls in an area in which the Government of Pakistan is either currently planning or actively constructing several hydropower project (Diamer-Bhasha Dam, Dasu Dam, Dam at Pattan and Thakot). Work on Dasu and Diamer-Bhasha Dams has already started. Due to construction of dams, the existing KKH will be submerged in Dam Lake and hence needs relocations. The approximate length of KKH submerged due to the construction of four dams is approx. 292km (20km at Thakot, 10km at Pattan, 70km at Dasu and 150km at Bhasha). Keeping in view the construction of Dam Projects in Raikot – Thakot Section, it is important that the existing road link should be improved to cater for the increased vehicular movement carrying the construction material for the Dam project.

5.3 Alternative-II 'Other Transport Modes'

The alternative transport mode includes Air access and railway between Thakot-Raikot that is not found feasible due to small population base and huge construction cost. Even Road construction is very difficult in this project area, so railway construction will be more difficult comparatively because Railway needs mild grade, while in road sharp turns can be given that are not possible in Railway projects. So, lot of tunneling will be involved for Railway option, that will involve huge cost. Usually for the construction of a project, cost versus benefits are considered and project area between Thakot-Raikot Section of KKH has very low population base, so Railway option will not be feasible from commercial point of view. Only construction of Railway project of strategic importance could be possible, in which Government does not focus on Cost /benefit but on long term overall benefits.

Regarding Air access option, Space will not be available for construction of airport. As in Pakistan, Commercial air transport is not so common that could fly small aero planes for provision of pick and drop to common public. So, Road option will be most feasible that has comparatively lot of flexibility, as every size of vehicle can move on road. In addition, people living in surroundings of road, can ride in their small vehicles/ pickups, motorcycle etc on the road. Road repair is also easy as compared to Railway. For Road, turn, grade and slope don't need to be mild like railway, so road option is best and viable in Project areas like KKH.

5.4 Alternative-III Realignment of Thakot-Raikot Section of KKH

NESPAK opted three alternative options and considered to select amongst the most feasible one for further study and detailed design procedures. Description of these alternatives is given below:

Construction of KKH Road **Alternative-1**, starting from Thakot city passing through existing KKH Mountainous Road, built up areas, valley crossings, nullahs, for a route Length of 320km and it ends at Raikot bridge. This alternative falls in the category of Chinese Class-3 highway for a minimum design speed of 30km/hr. No of curves/ bends improved, short span bridges provided keeping in mind the minimum radii required for the subject design speed.

Construction of KKH Road **Alternative-2**, starting from Mansehra expressway, passing through existing Mountainous Road, bypassing built up areas for a route Length of 270km and it ends at Raikot bridge. This alternative falls in the category of Chinese Class-2 highway for a minimum design speed of 60km/hr. A large tunnel provided through Mountains by avoiding built-up area of Thakot. No of bends has been replaced with a fairly straight tangent along with long span bridges to shorten the length up to Raikot.

Construction of KKH Road **Alternative-3** starting from Mansehra expressway passing through existing Mountains, built up area for a route Length of 258km and it ends at Raikot bridge. This alternative falls in the category of Chinese Class-2 highway for a minimum design speed of 60km/hr. No. of large tunnel provided through Mountains, avoided built-up areas, no of bends has been replaced with a fairly straight tangent along with long span bridges up to Raikot.

Figure 5-1 to 5-7 shows three different alternative options i.e with Alternative -1 (Pink Color, alternative -2 (yellow color) and Alternative-3 (White color).

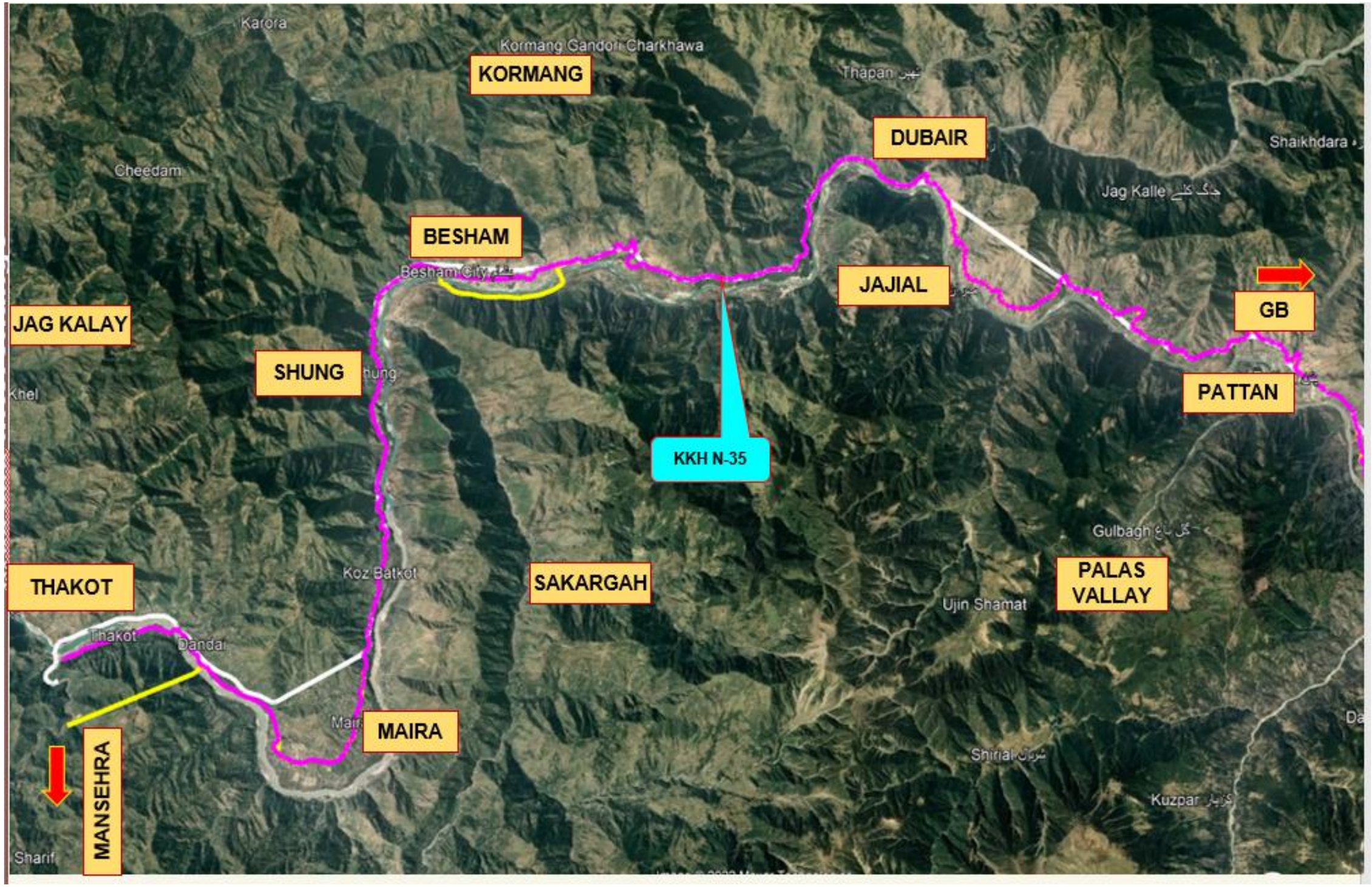


Figure 5-1 : Alternative Alignments (1,2,3)

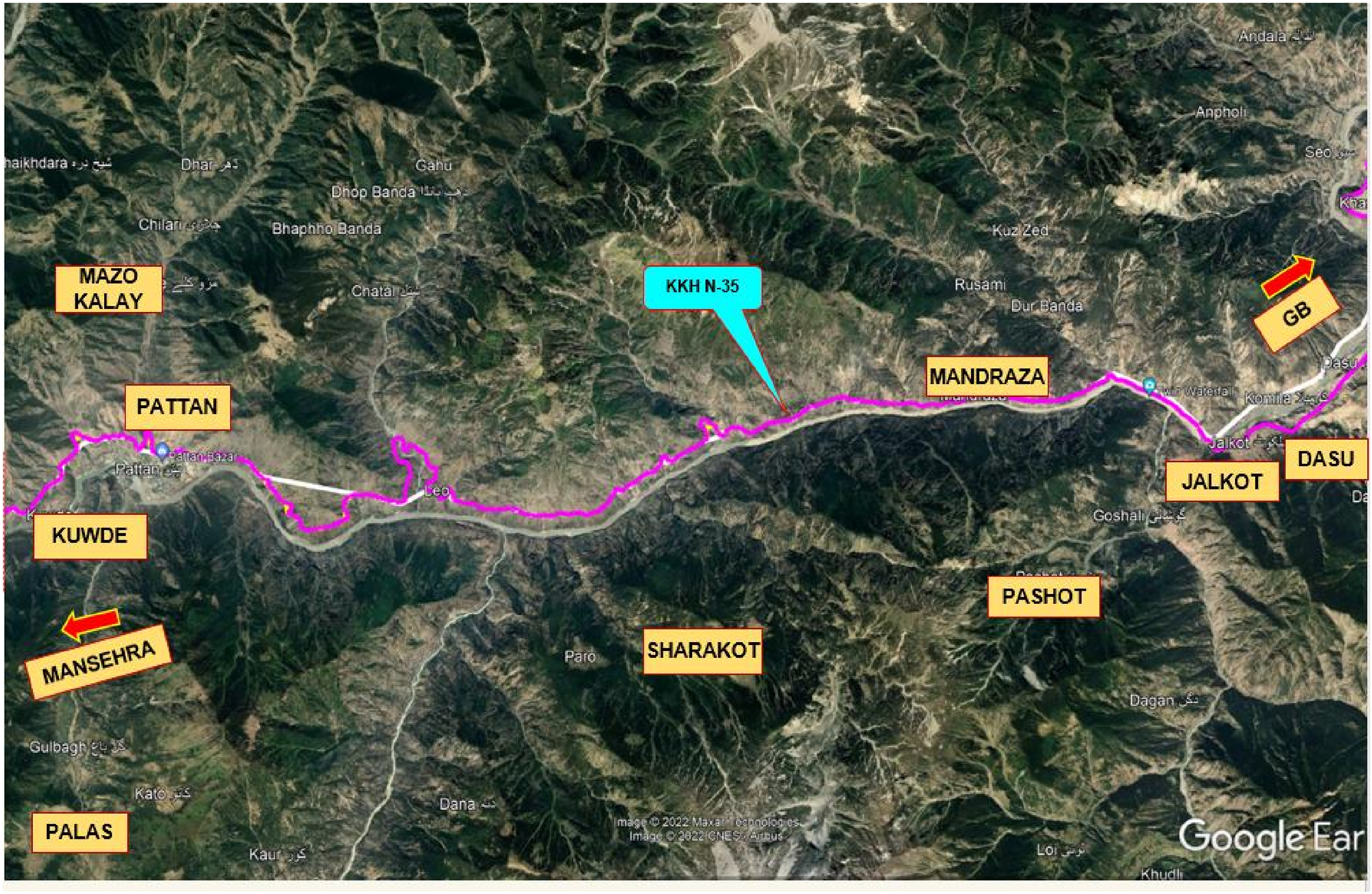


Figure 5-2: Alternative Alignments (1,2,3)

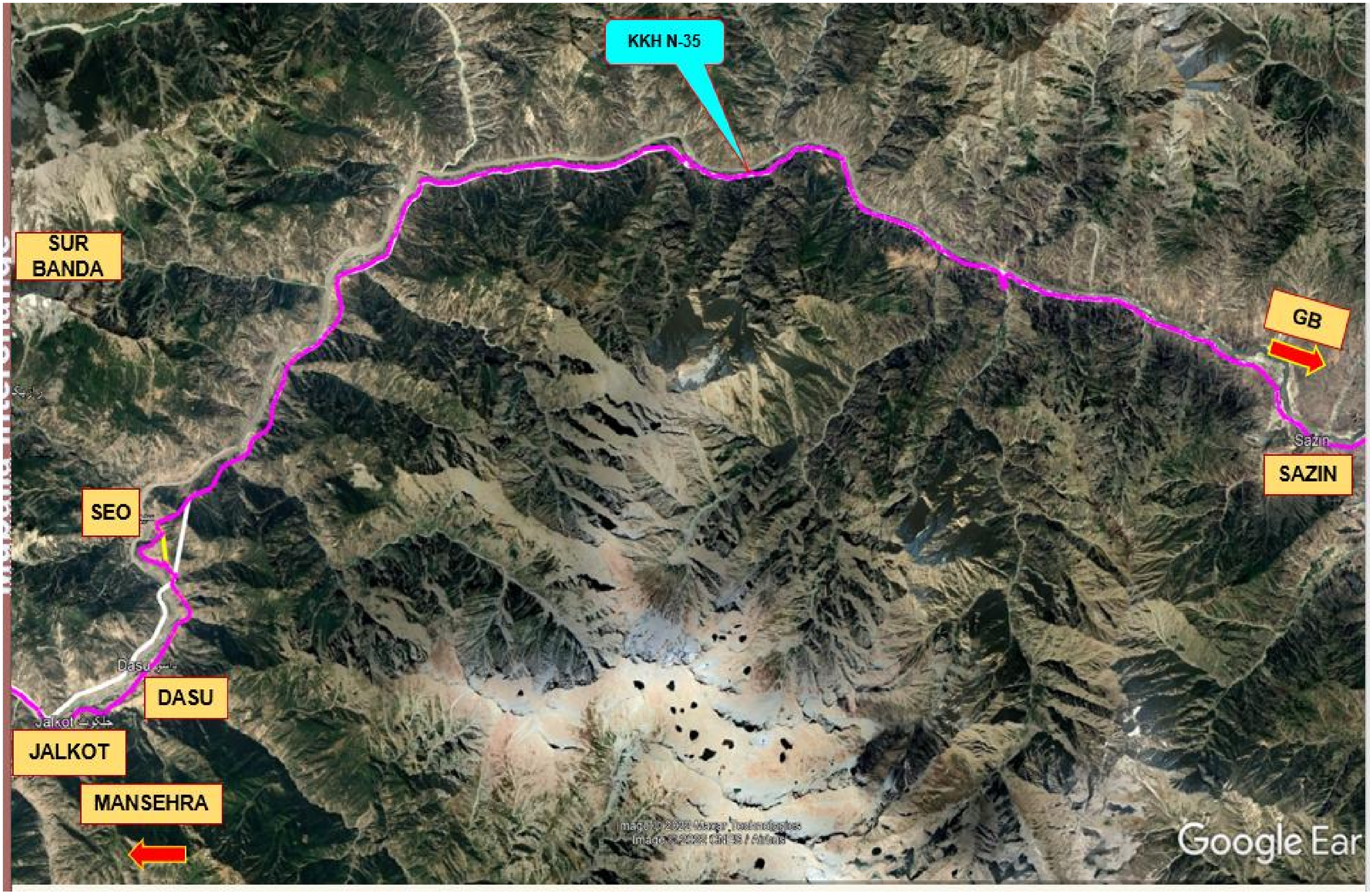


Figure 5-3: Alternative Alignments (1,2,3)

Figure 5-4: Alternative Alignments (1,2,3)

Figure 5- 5: Alternative Alignments (1,2,3)

Figure 5-6:Alternative Alignments (1,2,3)

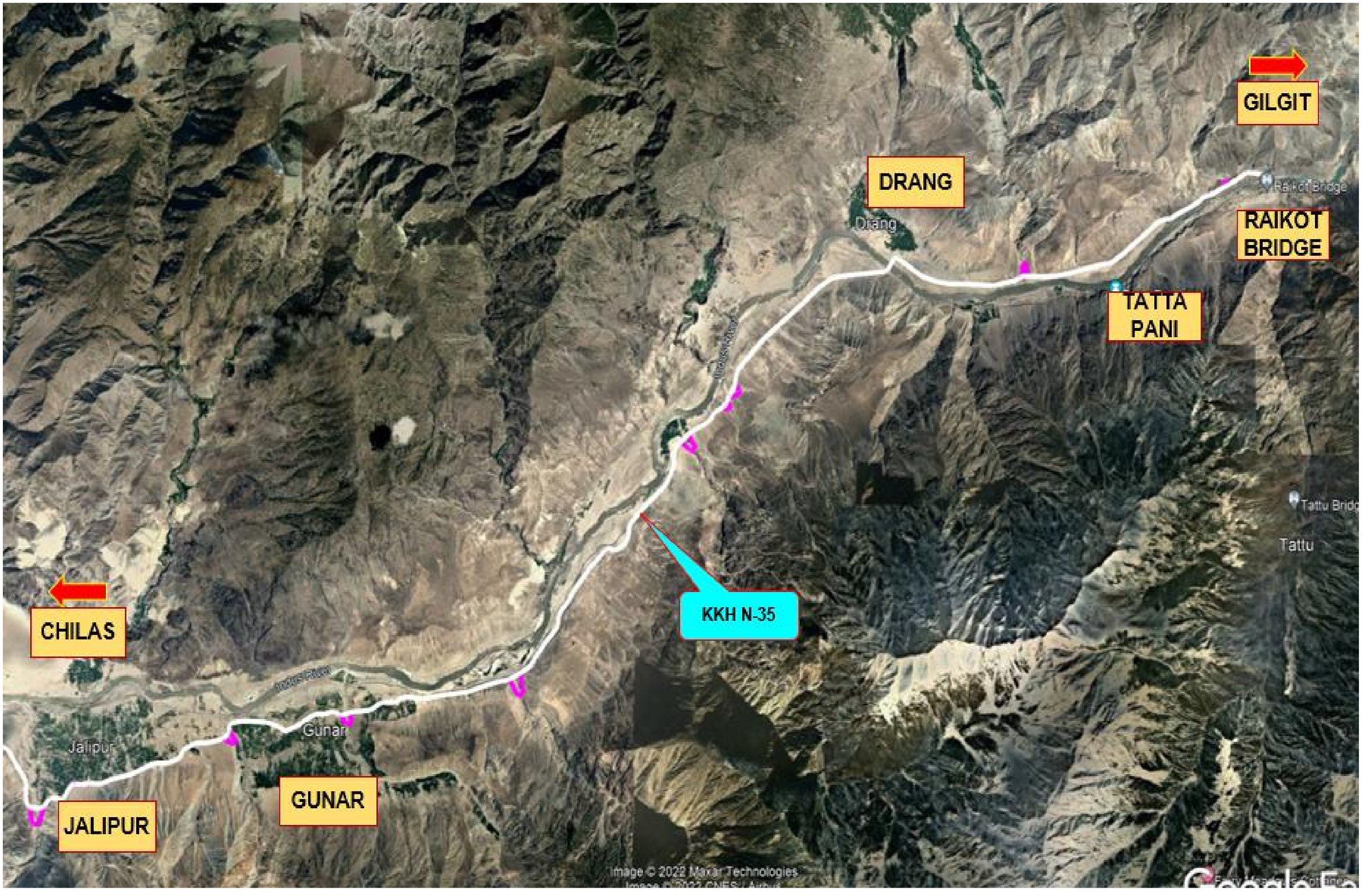


Figure 5-7: Alternative Alignments (1,2,3)

Above three alternatives have been developed by NESPAK, which nearly run parallel, traverses through existing KKH, rolling and hilly terrain involving major cut sections.

In continuation to above working, an additional Alignment was handed over to NESPAK by the Authority, referred as **Chinese Alternative** consisting of a route which also passes through existing KKH, with high cut sections along mountains, provision of large tunnels, avoided built-up areas, bends replaced with a fairly straight tangent, provision of long span bridges up to Raikot.

Ideally the proposed corridor:

- Should pass through the existing highway of KKH by considering the complete utilization of existing road formation width.
- Sharp bends to be replaced by straight tangents to fulfill the design speed criteria by providing medium or long span bridges.
- Tunnels at appropriate locations be provided where grades limits exceed 8% or landslide prone areas exists.
- Achievement of shortest possible route and economically viable option of KKH.

RECOMMENED OPTION:

Chinese Option-4 for a length of approx. 292km is the most suitable, feasible and viable option for the KKH realignment. It not only bypasses major cities like Thakot, Besham, Pattan, Dasu, Chilas and Jalipur but also improve sharp curves with a considerable reduction in overall length of the project by providing 190 no. of bridges. It also contains 17 number of tunnels which not only improve the grade of the alignment but also reduce the impact due to landslide areas with bypassing rugged hilly terrain of existing KKH.

Table 5-1: Summary of Alignment from Thakot to Raikot

Description	Option-4 (Red)
Design Speed	40 to 80KPH
Road Class	II
Length (Km.)	292.3
Maximum Gradient (%)	3.0 to 7.0
Min. Horizontal Radius (m)	60
Tunnels	17
Bridges	190
Effect on Built-up area	Chilas, Governor Farm. Dandai, Maira, Koz Batkot, Shung, Besham, Dubair, Jajial, Pattan, Mandraza, Jalkot, Dasu, Gunar

5.5 Comparison Analysis of Alternatives

The comparison between three different alternatives i.e No Project option, other transport Mode and realignment of KKH based on the environmental, social and economic impacts are described in **Table 5-2**.

Table 5-2: Comparative analysis of Project alternatives

Project Alternatives	Impacts		
	Environmental	Social	Economic
Alternative 1: No Project option	Increased air and noise pollution due to traffic jams on the existing N-35 – Higher emissions of	• Traffic delays and longer travelling times • Traffic accidents • Health impacts	The increased traffic load on the existing N-35 Road in future will not only cause traffic jams but also

Project Alternatives	Impacts		
	Environmental	**Social**	**Economic**
	CO, NO_x, SO_x, PM_{10}, and Photochemical Oxidants will affect the environment.	due to air and noise pollution caused by increased traffic on existing N-35	deteriorate its condition thus affecting trade activities in different parts of the country. This will be a major negative impact.
Alternative 2: Other transport Modes	• Comparatively less negative impacts on air but create more noise and vibrations. • Ground and surface water will not be contaminated	• Air travelling not feasible due to small distance between towns/settlements • Unfeasible due out of reach of majority of population • Train can be more suitable option in case of strategic project	• It will open-up new areas for Industrial Development subject to the provision of necessary infrastructure support. • This route would include construction of expensive and time-consuming Railway bridges over rivers and Major Streams crossings over the alignment, which could jeopardizem the implementation schedule.
Alternative 3: Realignment of Thakot-Raikot Section of KKH	• Cutting of Trees • Negative impact on air, increased vibration and noise • Contamination of water bodies due to run off • No dust pollution due to improved surface • Migration of fauna habitat • Faster transit flow	• Less resettlement • Bifurcation of settlements Increased access problems • Reduction in travelling time and rate of accidents • It will open up new areas for possible development • Fewer security risks due to patrolling of Motorway Police. • Damage to existing utilities	• High cost due to completely new remodeled Alignment • Accelerated trade activities • More development and investment chances • Saves fuel and travelling cost • Less wear and tear of vehicles • Uplift of the economic conditions of the area • More opportunities for development of the project area

5.6 Overview of Alternative Analysis

Based on the above comparison, the most environmentally sound and most economical alternative is the Construction of Remodeled Thakot-Raikot Section of KKH while considering the future developments.

6. ANTICIPATED IMPACTS AND MITIGATION MEASURES

6.1 General

This section provides the analysis of the potential impacts during preconstruction/ design, construction and operational phases of the proposed project on the physical, biological and socio-economic environment of the project area. Environmental sensitivity of the project area is described through the thematic sensitivity map and evaluation of significance of impacts is carried out through Environmental Matrices. In addition, it also narrates the measures that will mitigate the project's potential environmental impacts. Environmental impacts have been considered not only as they pertain to road ROW, but also to the site associated with the road project

6.2 Impact Matrices

Primarily, anticipated impacts have been categorized as direct, indirect and induced impacts. These groups of impacts can be further broken down according to their nature into:

- Positive and negative impact;
- Minor, major and moderate impact;
- Local and widespread impact;
- Temporary and permanent impact;
- Short- and long-term impact; and
- Reversible and Irreversible impact

Characterization of potential impacts during construction and operation stage of the project has been classified based on the above characteristics and is given in Table 6-1 and 6-2.

Furthermore, the environmental impact evaluation matrices have also been developed to indicate magnitude of the impacts on different environmental settings for both construction and operational phases (see Tables 6-1 and 6-2). The following scale has been used for the evaluation of potential impacts on different environmental settings:

Table 6-1: Characterization of Environmentally Potential Impacts for Construction Phase

"EIA of Realignment of KKH from Thakot to Raikot, Gilgit Baltistan section"

Sr. No.	Environmental Components / Project Activities	Physical Environment							Biological Environment		Social Environment							
		Topography and Drainage	Soil Erosion/Quality	Landscape	Surface Water Quality	Groundwater Quality	Air Quality	Noise & Vibration	Flora	Fauna	Agricultural Land	Health & Safety	Disruption of Public Utilities	Employment	Population Disturbance	Social Disorder	Cultural / Religious Values	Traffic Management
1	RoW/ Site Clearance	LA	MA	MA	MA	LA	HA	HA	HA	MA	LA	HA	MA	B	LA	MA	LA	MA
2	Construction camps, workshops etc.	O	LA	O	LA	O	LA	O	LA	O	LA	MA	O	B	MA	LA	O	O
3	Excavation operations at burrow & quarry area	MA	MA	MA	MA	O	LA	MA	O	O	O	MA	O	B	O	O	O	O
4	Transportation of construction materials	O	O	O	LA	O	LA	MA	O	O	O	LA	O	B	LA	O	O	MA
5	Open storage of construction materials, fuel etc.	O	HA	LA	MA	LA	LA	O	O	O	O	MA	O	B	O	O	O	O
6	Earthwork operations	MA	MA	MA	LA	O	LA	MA	LA	LA	MA	LA	HA	B	HA	LA	LA	HA
7	Operation of concrete batching plants	O	LA	MA	O	O	MA	MA	LA	LA	O	MA	O	B	O	LA	O	O
8	Operation of asphalt plants	O	LA	LA	O	O	MA	MA	LA	LA	O	MA	O	B	O	LA	O	O
9	Crushing operations	O	LA	LA	MA	O	HA	HA	LA	LA	O	MA	O	B	MA	MA	O	LA

10	Use of generators	O	LA	LA	LA	LA	MA	MA	LA	LA	O	LA	O	B	LA	O	O	O
11	Construction of Embankments	LA	LA	LA	LA	O	LA	LA	MA	O	O	MA	LA	B	LA	O	O	O
12	Construction of Culverts and Bridges	LA	LA	LA	MA	O	LA	MA	O	LA	MA	MA	O	B	LA	MA	LA	HA

Environmental Components

Ta :erization of Environmentally Potential Impacts for Operational Phase

"EIA of Realignment of KKH from Thakot to Raikot, Gilgit Baltistan section"

Sr. No.	Project Activities	Physical Environment								Biological Environment		Socioeconomic Environment					
		Topography	Soil Quality	Landscape	Surface Water Quality	Groundwater Quality	Air Quality	Noise & Vibration	Climate	Flora	Fauna	Public Safety	Land Use	Employment	Population Disturbance	Economic Activity	Communication System
1	Road Maintenance	O	LA	O	LA	LA	LA	LA	O	LA	LA	LA	O	B	LA	B	O
2	Commercial/Industrial Development	LA	LA	LA	MA	LA	MA	MA	LA	MA	LA	LA	LA	B	MA	B	B
3	Traffic	O	LA	O	LA	LA	LA	LA	LA	LA	LA	LA	O	B	O	B	B

Legends

O = Insignificant / no impact LA = Low Adverse MA = Medium Adverse HA = High Adverse B= Beneficial

The criteria used to define the high medium and low adverse impacts are as follows:

Negligible/No Impact: The impact which has unapparent and negligible influence on natural and socio-economic environment.

Low Adverse Impact: The impact which has a slight influence on the natural and socio-economic environment.

Medium Adverse Impact: The impact which can be eliminated/ mitigated after applying the appropriate mitigation measures.

High Adverse Impact: The impact which can be partially/ but not fully mitigated by applying the mitigation measure.

Positive/Beneficial Impact: The impact which improve/enhance the natural and socio-economic environment.

6.3 Pre-Construction/Design Phase

Following is the brief description of impacts envisaged and the recommended mitigation measures during Pre-construction and Design Phases.

6.3.1 Topography

The topography in the project area will change but only to some extent due to the construction of project related structures such as embankments, bridges, flyovers and interchanges. Visual changes to the topography will be of permanent but slightly adverse in nature and need no mitigation measures except that the project design should consider aesthetic concerns.

6.3.2 Land Acquisition and Resettlement

Larger part of RoW for the proposed Project is already available and owned by NHA, however realignment of KKH will involve land acquisition. Permanent acquisition of various categories of land, i.e. agricultural, residential and barren land for the Proposed road will be required. In addition, land will also be required temporarily for contractor's camps/ office/ labour colonies, batching plant, material storage etc. This impact would be of high significance. The detail of land under the impact and record of ownership status will be prepared by the Revenue Department. NESPAK will prepare Land Acquisition and Utility Infrastructure Report after detailed field investigations that will contain details of land, structures, utilities and trees falling within right of way. Findings of that report will be made part of the updated EIA report.

This impact will be high significant.

Mitigation Measures.

- Mitigation measures will involve careful alignment and route selection by the designer to minimize the impact;
- The LAA of 1894 is the main law regulating land acquisition for public purpose. This impact can be mitigated by ensuring compliance of LAA, 1894, addressing community grievances on priority basis and timely compensation to affectees as per LARP document.

6.3.3 Temporary Acquisition of Land

The Contractors will require temporary land acquisition for:

- The development of Contractor camps and facilities i.e. storage, workshops, equipment parking, asphalt plant, batching plant and washing areas;
- Aggregate quarries; soil borrow areas and
- Access roads/tracks for haulage, transportation etc.

The approximate area required for the establishment of one Contractor's camp facilities will be 1500 m^2 at the different locations. Land utilization for Project activities and subsequent operation of Project may induce temporary as well as permanent changes in the existing land use pattern. Moreover, the contractor will provide the estimated quantity of excavation material during the construction phase. This impact will be low significant.

Mitigation Measures.

It is the foremost option to establish the Contractor camps at the acquired land to eliminate the issues of land leased etc. however, if this option is not feasible then the land for above mentioned facilities will be selected and leased prior to the start of construction phase.

Land for above mentioned facilities will be directly rented from the private landowners by the Contractors. The provisions of the Land Acquisition Act (LAA), 1894 will not be involved as the acquisition of the land will be temporary and will be covered by short-term lease

agreements between the landowners and Contractor. Rental terms will be negotiated to the satisfaction of the concerned landowners and the agreement will be in local language to make the process clear.

In addition, these Project facilities will be located at a minimum distance of 500 m from the existing settlements, built-up areas, archaeological and cultural monuments as the case may be. Prior to the commencement of the construction activities, the Contractor will submit a construction camp development/management plan to the Engineer-in charge and the PEPA (if required) for its scrutiny and approval. As far as possible, waste/barren land i.e. areas not under agricultural or residential use and natural areas located at high elevation will be used for setting up the contractor camps. The location and layout of camps, asphalt and batching plant sites must be approved by the Supervision Consultant's Environment Specialist.

6.3.4 Physical Cultural Resources

Several mosques, Houses, Shops are falling within the Right of Way (ROW) of the proposed alignment of the KKH. Realignment of KKH is anticipated that these religious and physical cultural resource may be affected. Shifting and demolishing of these structures may cause serious social issues

Mitigation Measures:

Following measures shall be adopted to mitigate the adverse impacts:

- Incorporate technical design features to minimize the Project construction activities to avoid any interference with cultural heritage site and public property as far as possible;
- In case of unavoidable interference prior notification and consultation needs to be made to reach consensus on procedures and options (e.g. re-location/re-building) or any other form of agreed compensation; and
- Provide pedestrian and vehicular underpasses in the design to minimize the social issues.

6.3.5 Seismicity

The Project Road falls under zone 3 of the seismic zone map of Pakistan. As per seismic categorization, Zone-3 is a highly severe damage zone where distant earthquake for short duration may cause severe damage to structures. This means that the Road will suffer heavy damage if it is designed without consideration of seismic activity. This would be permanent and major negative impact.

Mitigation Measures

At the detailed design stage, the safety of the proposed road against the damages due to seismic activity need to be ensured. As such structural designs of bridges, roads and others need to follow the applicable criteria for the zone 3 as recommended in the Building Code of Pakistan 2007.

6.3.6 Change in Hydrologic Regime

The proposed Project comprised of around One hundred and two (102) bridges over storm drains and nullahs. Construction of bridges and road widening might cause a change in water flow pattern and disturbance to water flow that will lead to create an impact on downstream of these drains and nullahs.

Mitigation Measures

- Bridges shall be properly designed to accommodate design flows. Provision of culverts to control flood damages and provision of safety of embankments will be considered during the design phase.

- **Public Utilities**

Due to the proposed Project public utilities i.e electric poles, water pipes may be affected (especially in Chilas Town) creating disruption of public services and inconvenience to the local residents. This impact will be medium significant.

Mitigation Measures.

Mitigation measures will include:

- Incorporate technical design features to minimize effect on public utilities
- The provision in the design and budget for the relocation of the existing utility infrastructures wherever required shall be finalized in consultation with the concerned department; and
- All public utilities (e.g. electric lines, water pipes etc.) likely to be affected by the proposed project will be relocated well ahead of time before the actual commencement of the construction work. In order to proceed the advance warnings will be given to the locals well before the start of relocation works.

6.4 Construction Phase

Following is the brief description of impacts and their mitigation envisaged during the Construction Phase.

6.4.1 Soil Erosion and contamination

Soil erosion may occur on the roadside, in contractors' camps and in wetlands as a result of unregulated run-off from laundry facilities, earth excavation/cutting operations and vegetation clearing; while soil pollution may be caused by oil and chemical spills at asphalt plant sites, workshop areas and laundry facilities. Furthermore, due to illegal use of borrowed areas and quarries, soil erosion can result in land degradation. This will restrict the potential use of land for agricultural purposes. However, this effect is of a temporary and mild negative in nature.

Mitigation Measures.

- Minimizing the area of soil clearance;
- Low embankments will be protected by planting vetiver grass that can grow in relatively dry conditions;
- High embankments would be covered by the building of stone pitching or tearing through the bank. This strategy would also be extended through cross-draining systems where the reservoirs are most vulnerable to water run-off erosion;
- The soil pollution from asphalt can be reduced from putting all containers in a bundled field away from water sources;
- Provision of an impervious base with oil and grease trap to capture spillage during assembly and repair of the vehicle;
- Collection of oil and tube drips in container during repairing construction equipment vehicles;
- Providing impervious platform and collection tank for spillage of liquid fuel and lubes at storage area;
- Decanting and or controlled disposal of oil and grease as collected at collection tanks of maintenance yard and chemical storage areas;
- All spoils will be disposed of as desired and the site will be restored back to its original conditions before handing over;
- Non-bituminous wastes from construction activities will be dumped in openly, it must be in line with the legal prescriptions for dumpsites;
- In areas with strong sheet flow, high embankments will be provided with chutes and drains/culverts to minimize soil erosion. Stone pitching and retaining walls will be made at high embankments in critical areas;

- As applicable and needed, plantation of grasses and shrubs will be done for slope protection;
- Soil erosion checking measures such as the formation of sediment basins, slope drains, etc., will be carried out;
- Productive land or land adjacent to agricultural/irrigated land may not be preferred for excavation;
- Non-productive, barren lands in broken terrain, nullahs and publicly recognized waste lands should be given preference for borrowing materials; and
- Aggregate required for construction procured from quarries and riverbeds will need approval from authorities.
- Unwanted materials from topsoil such as roots of trees, rubble and waste removed prior to stockpiling;
- To ensure stability, the soil piles shall not be higher than 2 meters. The piles must be placed and managed so as to avoid erosion and washing off. Drainage trenches around the piles must be provided.
- Any temporary fuel tank (if contractor decided to have small stock of fuel on the site) shall be placed in a covered area with berms or dikes to contain any spills. Capacity of containment must be 110% of capacity of the tank. Any spill shall be immediately contained and cleaned up with absorbent material;
- Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing fluids from vehicles or equipment. Drip pans or absorbent materials shall be provided. On small spills absorbent materials shall be used;
- All valves and trigger guns shall be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use;
- Waste collection area will be sited so as to avoid receiving a substantial amount of runoff from upland areas and draining directly to a water body;
- In case of the fuel/oil spills risk, an oil trap shall be additionally provided;
- Contractor will confine operation of heavy equipment within the ROW, as much as possible, to avoid soil compaction and damage to privately owned land. If private lands are disturbed, the contractor should promptly inform the owner and agree on the ways to mitigate the situation;
- Adequate training on environmental protection and safety shall be provided to the staff; and
- Soil compaction may be reduced by strict keeping to temporary roads, camp/operation ground boundaries;

6.4.2 Borrow/ Open Pits

Borrow/ open pits and its excavation activities may result in land disputes, soil erosion, loss of potential cropland, loss of vegetation, landscape degradation, and damage to road embankments. The excavation of earth from borrows areas and for clearance of ROW may result in change of edaphic characteristics, loss of fertile topsoil of ROW and may affect the agriculture of the project area. The fertile plough layer will be wasted if the construction of the proposed project is carried out on top of the fertile layer. Borrow/ Open pits may also result in potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the project area. This impact is permanent and minor negative in nature.

Mitigation measures

Mitigation measures will include:

- Plain agricultural land will be avoided for borrowing of materials, as far as possible by the landowners for lowering the land to create new irrigation polders;

- Contractor needs to obtain approval for excavation and submit the plan of rehabilitating the site after excavation; and
- The top one-meter plough layer could be excavated, stored and used during the rehabilitation of the borrow areas.
- Necessary permits must be obtained for any borrow pits from the competent authorities;
- No excavations should allow within distance of 500 m to ROW;
- In borrow pits, the depth of the pit will be regulated so that the sides of the excavation will have a slope not steeper than 1:4;
- Soil erosion along the borrow pit shall be regularly checked to prevent/mitigate impacts on adjacent lands; and
- In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites.
- The Contractor shall undertake an initial environmental and social audit of the facility to ensure that:
  - ✓ The facility has a license to operate in the location.
  - ✓ Air emissions and noise are not impacting upon sensitive receptors.
  - ✓ Waste materials are being managed appropriately.
  - ✓ All staff are wearing appropriate PPE.
  - ✓ No child labour is employed at the site.
- The results of the audit will be submitted to the Engineer for review before any site is used.
- The audit shall be repeated on a six-monthly basis.

6.4.3 Air Quality

❑ **Fugitive Dust Emissions**

Air quality will be affected by fugitive dust emissions from excavating activities of construction machinery, material stockpiles & material transportation, dust from the unpaved surfaces and movement of construction vehicles, which can be very harmful for the site worker, local population living in close proximity to the site and natural vegetation. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability.

Mitigation Measures

The mitigations measures include the following:

- The material being transported or stored at the stockpiles will be kept covered with plastic to ensure protection of ambient air from fugitive emission during wind storm emissions.
- The contractor will monitor air quality on regular basis near the plant.
- Preventive measures against dust should be adopted for unloading operations. Regular water sprinkling of all excavation work the site should be carried out to suppress excessive dust emission(s);
- Grading operation will be suspended when the wind speed exceeds 20 km /hr.
- The plant should be located at least 500m away from any living area.
- Enforce the maximum speed limit to 20km/h for vehicles using embankments and access road.
- Road damage caused by project activities will be promptly attended to with proper road repair and maintenance work

- Proper Personal Protective Equipment (PPE) should be issued to the site worker and make sure the worker wears the PPE properly during working on site.

❑ **Smoke from Burning of Waste Material or Burning Firewood**

A number of big and small fires in the labor camp can produce smoke and smog, which can cut off visibility, reduce traffic ability and cause suffocation along with causing diseases of respiratory tract.

Mitigation Measures

The mitigations measures include the following:

- It is contractor's contractual obligation to use and provide clean and smoke free fuel in the labour camp.
- Cutting and burning trees or shrubs for fuel should be prohibited.
- Gas cylinders should be used in the labor camp for cooking purposes.

❑ **Vehicular and Generator Exhaust Emissions**

Emissions of noxious gases from movement of heavy machinery, asphalt plant and generators etc. would release emissions which would certainly add to the ambient air levels of the immediate vicinity. Especially the movements of heavy machinery and vehicles of old make and poor engine condition tends to release more than new well-tuned vehicles. Use of low-grade fuels and lubricants also increases the emission levels.

Mitigation Measures

The mitigations measures include the following:

- All vehicles during construction activities will be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions;
- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair are needed to minimize the hazardous emissions.
- Batching plant should be set up considering the wind direction so that the nearby communities are not affected by the emissions from batching plant.
- NEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works.
- Best quality fuel and lubes should be purchased where possible lead-free oil and lubes should be used.

6.4.4 Noise and Vibration from Construction Activities

During baseline survey, the recorded ambient noise level as found to below acceptable limit of 85 dB (A). When the Project activities would start, it is very likely that the existing noise level would be amplified. The major sources of noise pollution during construction activities would be during slope cutting, excavation, loading, transportation, loading/unloading of materials and operation of construction equipment etc. The vibrators used for concreting also produce noise. This impact will, however, be temporary and moderate negative in nature.

Mitigation Measures

The mitigation measures will include the following:

- Vehicles and equipment used should be well fitted, as applicable, with silencers and properly maintained; that will reduce noise hazards according to permissible limits as fixed by Pak EPA (noise is 85 dB (A) while the WHO noise guidelines prescribed a limit of 55 dB (A).
- Construction workers will be provided suitable hearing protection like ear cap, or earmuffs and will be trained about their usage.
- In and near populated areas, the construction activities will be restricted to be carried out between 6 a.m. and 20:00 p.m.
- Hedges and high boundary walls will be used as noise barriers in sensitive areas such as schools, hospitals and mosques.
- Public hearings will be held to discuss appropriate solutions and techniques to control noise (e.g., mud or brick walls, bushes, etc.). Such hearings consultations should also be regularly conducted to solicit public feedback, to avoid public inconvenience and suggestions for improvement in working strategy / working environment and progress of project activities; and
- In accordance with the Environmental Monitoring Plan, noise measurements will be carried out on regular basis at locations and schedule specified to maintain the level within the NEQS level and to ensure the effectiveness of mitigation measures.

The implementation of the above measures will generate impacts of low significance.

6.4.5 Contamination of Water Resources

The water resources (surface and sub-surface water) may get polluted from hazardous construction materials, wastewater effluent, solid waste, silt from construction and soil erosion, etc. both during construction and operation phases. This normally occurs when waste material is disposed of improperly. Pollution of water resources and its consequences may occur through following ways:

- Implementation of the Project may aggravate the pollution of surface water resources of the Project area through contamination by the wastewater effluent and solid waste material generated from the kitchens and toilets at construction campsites.
- Subsurface water may be contaminated from the spills of chemicals, oil, lubricants, detergents, etc. through runoff from the construction area, construction camp, workshops and equipment washing-yards.

This impact would be of moderate significance.

Mitigation Measures

Measures to prevent contamination of surface and ground water will include the following.

- Camps will be located at least 500 m away from the nearest local settlement to prevent the contamination of community-owned water resources like springs, hill torrents, etc.
- Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through an oil skimmer and to gravel/sand beds to remove oil/grease contaminants before discharging it into natural streams. Similarly, the wastewater effluent from the campsite will be treated before disposal into a stream.
- Borrow pits and natural depressions lined with impervious liners will be used to dispose of scraped obnoxious material, and then covered with soil. This will check potential groundwater contamination. Such measures will also be provided at stream side disposal of waste material in addition to retaining walls or gabions. Available

stone (boulders) from excavated rocks will be used for retaining walls as well as for gabions. It will reduce the quantity of dumping material. However, all types of hazardous waste will have to be collected on site separately and stored in appropriate containers to be finally removed from site and be brought to adequate handling, recycling or disposal facilities.

Specific measures for water quality protection to be taken on the construction site will be the following:

- Fuels, lubricants and other hazardous material will have to be properly stored in adequate containers in sites equipped with retaining structures, including oil skimmers for the treatment of contaminated runoff water.
- Repair and maintenance work on machines and vehicles will only be done in specific places designed and equipped for this purpose (oil skimmer). These must be at a safe distance from the stream/nullah. No washing of vehicles will be done in or near the stream/nullah.
- Water contaminated with concrete will have to be collected in sedimentation ponds and, if required, will have to neutralized before being discharged to the natural streams/Wetlands. Contamination of the stream/nullah with concrete or cement must be avoided.
- Sewage water from the camp will have to be collected and treated in a suitable waste water treatment plant before being released into the streams.
- Generally, waste should be reduced, re-used, recycled and the disposal has to be controlled

6.4.6 Use of Local Water Resources

The water resources of the project area mainly comprised of surface water i.e River Indus, Streams/Nullas and Springs. Surface water especially of Springs is being used by all communities for drinking purpose. Water shall be used during the project construction in the labor camps for the everyday use of the laborers for cooking, drinking and bathing etc. Also, water shall be used at the sites along the project corridor for sprinkling to suppress dust emissions. In addition, water shall also be used during the construction activity itself for mixing of gravel in the batching plant etc. It is obvious that these needs will be met from the existing resources of the areas in close proximity to dam and canal. This impact would be of moderate significance.

Mitigation Measures

Mitigations measures regarding use of local water supplies as follow.

- Availability of water for camp site facilities and construction purposes will be ensured by the contractor prior to start of construction activities. As per Local Government Act, the contractor will seek approval from the Local Government for exploitation of the water resources.
- The Contractor will be required to act as a go-between closely with local communities to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly.
- The contractor will prepare guidelines for the workers for minimizing the wastage of water during construction activities and at campsites.

  By adopting the aforementioned measures, the impact would be of low significance.

6.4.7 Flora

Trees are vital ecosystem, which perform variety of functions for the improvement of environment such as reduction in air pollution, noise abatement, cooling effect on earth, supply of oxygen etc. A highly negative impact of permanent nature is to be caused by proposed project is the loss of tress within the ROW of the road alignment. Hundreds of Trees/poles are estimated to be cut or removed within the ROW of the proposed project road. Large number of Shesham, Shahtoot, Wild Olive, shrubs and bushes etc will be removed in this section. The size and type of trees to be cut can be determined at the project execution stage.

During construction the destruction of some flora would also take place due to construction of approach roads, areas of labour camps, oil and vehicles storage area. Project labour can also remove or use the trees for labour cooking. During the entire construction period, dust laden polluted air will form a dust film on the leaves, thus blocking sunshine and stomata, thereby hindering photosynthesis process and cause quaintly causing detrimental effect on the plant health. Also, during the construction activities, the contractor's workers may damage the vegetation including trees (for use as firewood to fulfill the camp's requirements). This may affect the ecological habitat of the Area. This impact will be permanent and moderate negative in nature.

Mitigation Measures

Following measures will be adopted during construction and operation stages.

- Campsites and Elevated Ground Storage Tanks (EGST) will be established on waste/barren land rather than on forested or agriculturally productive land. However, if such type of land is not available, it will be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth or agricultural area.
- Construction vehicles, machinery and equipment will remain confined within their designated areas of movement.
- The Contractor's staff and labour will be strictly directed not to damage any vegetation such as small trees or bushes. They will use the paths and tracks for movement and will not be allowed to trespass through farmlands.
- Contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel will not be allowed.
- The compaction of trenches should also be done properly. Inadequate compaction of trenches will result in flow of soil during rainy season resulting in increased soil erosion
- As far as possible digging in the cultivated land should be done when the land is barren to avoid damage to agricultural crops.
- Open fires should be banned in the area to avoid hazards of fire in the project area.
- The collaboration with Forest Department would be helpful in choice of appropriate species, identification of available space and planning the plantation work in right planting season (spring and monsoon);
- Avoid dumping material in vegetated areas and avoid unnecessary loss of vegetation;
- Get approval from Supervision Consultant for clearance of vegetation. Provide adequate knowledge to the workers regarding protection of nature and the need to avoid felling trees during construction;
- Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest in practically possible time.

- Ensure excavation works occur progressively and re-vegetation done at the earliest.
- Supply appropriate fuel in the work camps to prevent fuel wood collection
- NOC from Forest department Diamer District should be taken. Tree removal should be compensated by carrying out tree plantation on large scale in consultation with Forest Department.

6.4.8 Fauna

The usual fauna found in the project area have already been mentioned earlier in Baseline. Due to the implementation of the proposed roads Project, the free movement of fauna would be disturbed as the construction and expansion of the roads will restrict their free movement. Another impact on the fauna of the project area will be the probable dislocation of the birds/animals (rodents) from their nests and burrows.

Reptiles like snakes and lizards, living in the holes or underground shall either get killed or move to the adjacent areas. Similarly, birds like sparrows, mynas, crows, who have nests on the trees located in the ROW or who frequently visit the project area in search of food shall receive a negative impact and shall have to move to adjoining areas. These trees provide resting and nesting places to the animals and birds, so the cutting of these trees will have negative effect on fauna.

Also, due to the leakages/spills from the construction equipment/machinery the local ponds/water storages and water courses where the animals/birds drink water may get contaminated; thus, affecting/endangering the fauna of the project area

Mitigation Measures

Mitigation measure will include:

- Contractor will warn their labour accordingly.
- The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly, wastes of the camps will be properly disposed off to prevent the chances of eating by wild animals, which may become hazardous to them.
- NOC from Wildlife department should be taken as part of Wildlife sanctuary will be submerged by dam raising.
- Special measures will be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding.
- Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.
- Plantation of large number of trees along the proposed roads to regain the ecological habitat;
- New and good condition machinery with minimum noise will be used in construction;
- Animal corridors must be provided along the whole alignment wherever necessary;
- Noisy work will not be carried out in nighttime so that there should be no disturbance to local birds and animals;
- Contractor will ensure that the no hunting, trapping of animal will be carried out during construction;
- Borrow pits will be fenced so that no large animal can fell into these;
- The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly waste of the camps will be properly disposed-off to

prevent the chances of eating by wild animals, which may prove hazardous to these species;

- Special measures will be adopted to minimize impacts on wild birds such as avoiding noise generating activities during the critical period of breeding;
- Alternate nesting facilities shall be tried for those birds disturbed during hatching season; and
- Pits and excavations will be filled in as soon as possible following works. Trenches and pits to be created for longer than 48h periods will have 45O ground ramps to allow escape by fauna should they fall in. A pre-start check for fauna will be completed prior to works commencing in the morning if trenches are left open overnight. Regular crossing points will be installed to ensure wildlife can cross excavations, berms and drainage channels.

6.4.9 Physical Cultural Resources

There are no physical cultural resources as listed in UNESCO World Heritage list of archeological sites exist along the whole alignment.

Mitigation Measures:

As the project involves excavation work and in case of any accidently discovered archeological/ historical heritage during the construction phase, contractor should stop the activities immediately and inform the SC and chance find procedures should be adopted as given in Annexure VIII.

6.4.10 Disruption of Existing Public Utilities/ Infrastructure

There may be some disruption to the already existing utilities like electricity poles, underground telephone lines, power transmission lines, water courses, small village roads, etc. in the project area during the construction phase. These impacts are, however, temporary and minor negative in nature.

Mitigation measures

Mitigation measures will include rehabilitation of existing utilities before construction to avoid any inconvenience to the residents of the project area or provide them with alternate arrangement during the construction period.

6.4.11 Construction Camps/Camp Sites

The project will involve the establishment of new campsites at project area. Due to the proposed camp sites, loss of vegetation and assets on the selected land and dissatisfaction of rehabilitation measures during and after completion of construction phase may occur. However, it will be a temporary and minor negative impact. However, a range of impacts those either remain likely to occur or are unavoidable. For theses impacts, mitigation measures have been developed to minimize the likelihood, extent or duration of their occurrence, and any associated adverse effects.

Mitigation Measures:

The Mitigation measures will include:

- The construction contractor will be required to assess the environmental/social sensitivity of any additional or alternative sites prior to their approval for adoption;
- The project will seek to avoid sitting camps where their presence might contribute to any conflicts between villages;
- Individual trees and shrubs of high conservation value to be marked and preserved wherever possible.

- Implement landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures;
- Limit the working hours of noisy activities when near identified sensitive receptors to normal daytime working hours;
- Operate equipment in a manner sympathetic to the ambient noise environment. Do not leave equipment idling unnecessary;
- Eliminate tonal, impulsive or low frequency noise through noise control engineering techniques where practicable (fitting of mufflers, damping, etc.), and substitute for a different method if necessary (e.g., instead of hammering actions, use hydraulics);
- Provide adequate warnings of impeding works to all potential receptors within a 1 km corridor surrounding the ROW via public notices and local news;
- Implement Waste Management Plan to include procedures for the classification, storage and disposal of all construction wastes and the training of employees who handle hazardous materials;
- Ensure that discharge of sewage from temporary construction facilities to surface courses does not impact surface water ecology. This will be achieved through the provision of treatment facilities and by enforcing the discharge standards; and
- In order to minimize social disturbances as a result of rehabilitation workers, existing camps from previous projects were identified as a first preference. State land was a second preference for Worker Camp locations, followed by land where there is a lessee.

6.4.12 Waste and Hazardous Waste

Due to construction activities, waste will be generated at construction and contractors camp site. The construction waste will include wastewater, oil spillage from machinery, domestic waste and solid waste etc. As the project deals with the construction of the road, so no hazardous waste will be generated during the construction waste. But the handling and storage of oil, asphalt/bitumen may be a source of environmental pollution as a hazardous waste. This will result in unhygienic conditions, health risk to work force and public at the camp site. This impact is temporary and minor negative in nature.

Mitigation measures:

Mitigation measures will include:

- The solid waste generated from the camp site will be disposed-off through Municipal Committee or approved landfill site, however hazardous waste will be treated as per GB EPA;
- Burning of waste will be prohibited at project site;
- Solid Waste will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan;
- Planning for disposal sites with reasonable distance from the human settlements;
- Disallow siting for work camps, including waste dump sites, in a distance closer than one kilometer to any nearby community;
- Incorporate technical design features for refuse collection containers at sites that would minimize burning impacts;
- Devise plan(s) for safe handling, storage and disposal of harmful materials; and - Burning of waste will not be allowed in any case.
- Wastewater effluent from contractor’s workshop and equipment washing yards would be passed through gravel/ sand beds to remove oil/ grease contaminants before discharging it into natural streams;
- Training of work force in the storage and handling of materials and chemicals that can potentially cause soil contamination;

- Solid Waste generated during construction and camp sites will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan;
- Proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.;
- Emergency Response plan should be prepared to address the accidental spillage of fuels and hazardous goods;
- Immediate collection of spilled oils/fuels/lubricants by collection of contaminated soils and skipping oils from surface water by applying appropriate technologies;
- Reusing bitumen spillage;
- Disposing non-usable bitumen spills in a deep trench providing clay linings at bottom and filled with soil at the top (for at-least 0.5m);
- Used oil should be collected in separate containers stored on impervious platform with restricted access and must be sold to licensed contractor and the burning of waste oil should be strictly restricted;
- Segregating and stockpiling scarified/ milled bituminous material and reusing this material in sub grade/shoulders;
- Collecting and stockpiling excessive bituminous material for reuse or controlled disposal;
- Providing the necessary means for emergency response on call 24 hours/day;
- The sewage system for camps will be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters; and
- Lined wash areas will be constructed within the camp site or at site, for the receipt of wash waters from construction machinery.

6.4.13 Occupational Health and Safety

Health risks and worker's safety problems may result at the workplace if the working conditions provide unsafe and/or unfavorable working environment due to storage, handling and transport of hazardous construction material. Workers will be provided with safe and healthy working environment taking into account risks inherent to the particular sector and specific classes of hazards in Project area.

Mitigation measures:

Mitigation measures will include;

- Providing basic medical training to specified work staff and basic medical service and supplies to workers;
- Layout plan for camp site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;
- Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborer; Protection devices (ear muffs) will be provided to the workers doing job in the vicinity of high noise generating machines;
- Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction;
- Proper maintenance of facilities for workers will be monitored;
- Provision of protective clothing for laborer handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc;
- Ensure strict use of wearing these protective clothing during work activities;
- Elaboration of a contingency planning in case of major accidents;
- Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites;
- Adequate signage, lightning devices, barriers, yellow tape and persons with flags during construction to manage traffic at construction sites, haulage and access roads;

6.4.14 Community Health and Safety

The construction activities and vehicular movement at construction sites and access service roads may result in road side accidents particularly inflicting local communities who are not familiar with presence of heavy equipment. This is a temporary and minor negative impact. Quality of groundwater and surface water resources available in the nearby local communities may be affected due to the construction activities, oil spillage and leakage, roadside accidents etc. The labour works with different transmittable diseases may cause spread out of those diseases in the local residents. The borrow pit areas located near the residential, settlements, may cause accident for the people moving near to those areas.

Mitigation measures:

Mitigation measures will include;

- There should be proper control on construction activities and Oil spillage leakage of vehicles.
- The Borrow areas should be fenced properly and banned for the movement of the residents.
- The labour works with different transmittable diseases should be restricted within the construction site.
- Efforts will be made to create awareness about road safety among the drivers operating construction vehicles;
- Timely public notification on planned construction works;
- Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity & social links;
- Seeking cooperation with local educational facilities (school teachers) for road safety campaigns;
- Provision of proper safety and diversion signage, particularly at urban areas and at sensitive/accident-prone spots.
- Setting up speed limits in close consultation with the local stakeholders; and
- If identified, consider additional guard rails at accident-prone stretches and sensitive locations (schools).
- The communicable disease of most concern during construction phase, like sexually-transmitted disease (STDs) such as HIV/AIDS, should be prevented by successful initiative typically involving health awareness; education initiatives; training heath workers in disease treatment; immunization program and providing health service.
- Reducing the impacts of vector borne diseases on long-term health effect of workers should be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which includes
- Prevention of larval and adult propagation of vectors through sanitary improvements and elimination of breeding habitat close to human settlements.
- Eliminate any unusable impounding of water
- During construction work, pedestrian and vehicular passages should be provided for crossing near settlement
- Bridges and other structures have to be structurally stable enough to bear maximum ground acceleration recorded for the area in past.
- Fencing should be strong enough so that it cannot be broken easily by local people for making passages.
- Discharge of any wastewater at upstream of the point of public supply should be restricted.
- Batching plants should be installed away from settlements
- Use of water should not disturb public water availability. Source of water should be selected carefully.

6.4.15 Management of Traffic

The project corridor is quite congested with a high level of traffic volumes due to its importance for strategic point of view and tourism as well. Traffic volume has also increased due to construction of two mega dams i.e Bhasha and Dasu along it. The efficient management of traffic once the construction activity commences will be critical in order to minimize the risk of possible road accidents and construction related hazards.

Mitigation measures:

Mitigation measures will include;

- Traffic signs and warning instructions shall be displayed at the sites and along the proposed routes being used by the construction traffic for the information of another road traffic as well.
- Public awareness campaigns through radio and newspaper advertisements shall be conducted to educate the public and sensitize them to cooperate with the construction staff and project focal staff in order to try and avoid the areas under construction as far as possible, particularly during the peak times when traffic volumes and pedestrian movement is the highest.
- The potential risks of accidents to pedestrians and commuters while in the immediate vicinity of construction sites shall be conveyed to them in order to educate them and gain their cooperation and minimize the risk of accidents.
- Employ flag persons to control traffic at the work sites for safety reasons when construction equipment is entering or leaving the work area.
- Lanes shall be created through the work site using rope or flagging to minimize risks and injuries from falling objects.
- Post traffic advisory signs (to minimize traffic build-up) in coordination with local authorities.
- Provide road signs indicating the lane is closed 500 m before the worksite.
- Use traffic cones to direct traffic to move to the open lane.
- Provide sufficient lighting at night within and in the vicinity of construction sites.
- Regularly monitor traffic conditions along access roads to ensure that project vehicles are not causing congestion.
- Define and observe schedules for different types of construction traffic trips (e.g., transport of pre-cast sections, haulage of spoils, delivery of construction materials, etc.).
- As much as possible, schedule delivery of construction materials and equipment as well as transport of spoils during non-peak hours.
- Avoid movements of noisy vehicles during night time in vicinity of sensitive receivers.
- Implement suitable safety measures to minimize risk of adverse interactions between construction works and traffic flows through provision of temporary signals or flag controls, adequate lighting, fencing, signage and road diversions.
- Ensure relocation of any affected public transport infrastructure (but stops, shelters etc.) prior to commencement of works.
- Provide advance notification to the community regarding changes to public transport facilities or routes.
- Schedule construction works to minimize extent of activity along linear construction site at any one time.
- Comply with traffic regulations and avoid, where possible, roads with the highest traffic volumes, high density of sensitive receivers or capacity constraints are not used as access to and from the construction areas and spoil disposal sites.
- Install temporary accesses to properties affected by disruption to their permanent accesses.
- Reinstate good quality permanent accesses following completion of construction.

6.4.16 Lifestyle and Culture

There are chances of arising of issues related to cultural differences/conflict between the Contractor's workforce and the local inhabitants, conflicts arising due to the mix of local and migratory job seekers as the use of local resources and products will be increased. In this situation, local residents may resist Contractor's workforce attitudes, cultural clashes particularly when local/international contractors are engaged, social disturbance and dissatisfaction with employing outsiders, competition for natural resources e.g., with farmer's/livestock raisers etc may arise. This impact is temporary and minor negative in nature.

Mitigation Measures

This impact can be mitigated by adopting the following mitigation measures:

- Timely and full public consultation and announcement of mobilizing equipment;
- Establishment of formal links with affected communities;
- Plan for social grievance redress mechanisms including the Nazims of Union Councils and community leaders;
- Seek assistance from and cooperation with local NGOs;
- Familiarize outside laborer on local etiquettes;
- Local labour should be employed for construction works; and
- Water supply and sanitation facilities, Contractor's workforces should exacerbate the existing shortages and environmental hazards; contractor should primarily seek their own sources of water in due distance (min. 1 km) from local user's wells.

6.4.17 Blasting

Blasting will be required where the alignment is passing through the hills. Blasting will generate short-term impacts such as noise and vibration, and long-term potential impacts on land stability.

Mitigation Measures:

To minimize the short-term impacts, control blasting should take place at predetermined times notified to communities and local residents. Blasting should also be conducted in accordance with best international practices, in which the explosive charges are controlled to minimize the vibrations and noise. To minimize the long-term impacts, geological and soil conditions should be carefully assessed to avoid blasting in sensitive locations.

6.4.18 Gender Issues

Construction workers are predominantly younger males. Those who are away from home on the construction job are typically separated from their family and act outside their normal sphere of social control. This can lead to inappropriate and criminal behavior, such as sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors from the local community. A large influx of male labor may also lead to an increase in human trafficking whereby women and girls are forced into sex work. During construction phase gender-based violence might arise due to discrimination made against women by unequal work distribution and unequal pay structure among others. Sexual harassment against women might occur as a consequence of mixing of men and women at the construction site, and moving on the roads, bus stops and markets.

Mitigation measures:

Mitigation measures will include;

- The contractor will be required to provide qualified key personnel to address the specific risks identified in the project. Contractors will specify key staff with the technical skill and experience to implement the mitigation measures;

- The bidding documents will include specific requirements that minimize the use of expatriate workers and encourage hiring of local workers, thereby minimizing labor influx;
- The bidders will be required to submit Codes of Conduct (CoCs) with their bids. The CoCs will set clear boundaries for acceptable and unacceptable behaviors of all individuals and companies and will be signed by companies, managers and individuals;
- All project consulting firms will also be required to submit Codes of Conduct with their proposals;
- The contractor will be required to establish anti-sexual harassment policies that governs conduct in the workplace;
- The contractor will be required to provide mandatory and repeated training to workers on sexual exploitation and abuse and HIV/AIDS prevention and on the content and obligations derived from the code of conduct; and
- Provisions will be set in contracts for dedicated payments to contractors for SEA prevention activities (e.g. training) against evidence of completion. The portion of the contract price will be guaranteed by a performance security linked to environmental and social contractor performance

6.4.19 Communicable Diseases

The laborers in the Contractor Camp, truck drivers and like personnel who interact with each other have the potential for the spread of communicable diseases like HIV/AIDS. Majority of the people living in the surrounding of the Project, and potential labor are not aware of the source, mode of communication or consequences of HIV/AIDS. Although their religious and cultural value system, to a large extent excludes the outbreak or rapid communication of HIV/AIDS, yet its occurrence in such a situation cannot be precluded. It is necessary that awareness and preventive campaigns are run from time to time in the labor camps and the field offices of the Project to prevent the communicable diseases.

Mitigation measures:

Mitigation measures will include;

- Arrange to run an active campaign, in the labour camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS;
- Strengthen the existing local health and medical services for the benefit of labour as well as the surrounding villages;
- Ensure cleanliness and hygienic conditions at the labour camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by the Health Department;
- Locating a labour camp at least away from the villages (local settlement), and
- Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents.

6.4.20 Socio-Economic Environment

During construction, there will be a number of activities which, if not mitigated, are likely to cause disturbance to communities in the project area; these are:

- Due to the proposed Project, entry and exit problems may occur for the residents as well as a hindrance in agricultural activities, i.e., hindrance in movement of agricultural machinery and transportation of agricultural products. This will result in causing inconvenience to the residents/farmers and affect their daily activities; also reducing the frequent interactions between families;
- Increased traffic on public routes;
- Health and safety risk will also be posed to the community due to the existence of a construction site(s) and the storage and use of hazardous chemicals; and

- Movement of plant and vehicles throughout the project area, especially along haulage routes passing alongside private land during disrupting local movement and posing traffic safety issues.

Mitigation measures:

Mitigation measures will include;

- Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities;
- Maintaining a grievance procedure to facilitate stakeholders in expressing concerns;
- Proper traffic diversion plans before the start of the construction;
- Proposal of pedestrian underpass/bridge for the locals;
- Appropriate budget for traffic/safety sign boards;
- Timely completion of the project; and
- Maximum the unskilled labour and where possible skilled labour will be arranged locally.

6.5 Anticipated Impacts during Operational Phase

The anticipated environmental impacts related to the proposed Project have been studied for the operational stage of the Project as discussed hereunder.

6.5.1 Air Quality and Noise

Increase vehicle movements will affect air and noise quality. There will be some local air and noise pollution. Planting of trees along the road and increase the vegetation cover on the embankments will absorb CO_2 emitted from vehicles.

On the other hand the proposed project will create positive impact on air quality by reducing emissions. Increase of width, proper alignment and even surface of the road will allow smooth run of vehicles considerably in higher speeds with minimum accelerations and decelerations. Therefore the emissions will be reduced and consequently the air quality would not adversely affected by vehicle emissions.

During the operational phase, the noise levels are anticipated to increase due to traffic related noise pollution; vibrations from engines and tires and mainly use of pressure horns. This impacts permanent and moderate negative in nature. Clear sign and warning boards should be placed at sensitive locations such as schools, religious places, hospitals etc.

Mitigation Measures

- Setting up of a system to monitor air quality along project area in accordance with the applicable standards/limits;
- Afforestation should be done immediately along the ROW once the construction phase is completed; plants should be selected in accordance to their ability to absorb emissions;
- Regular road maintenance to ensure good surface condition;
- Speed limits at sensitive locations;
- Monitoring air quality at defined schedule;
- Regular vehicle checks to control/ensure compliance with NEQS; and
- Enforcement and penalties against traffic rules violators.
- Signs for sensitive zones (health centers / educational institutions etc.) to disallow the use of pressure horns.

6.5.2 Road Safety

The rehabilitation of the surface conditions and straight alignment of the road induce high vehicular speed. As a result, there will be a risk of increased of road accidents. The proposed road passes small towns, schools, hotels, religious places where students and people gather frequently. These places are susceptible to accidents. Moreover there are

many local restaurants and shops are located closer to the ROW. Therefore high speed vehicular movements will cause road accidents easily. This impact is permanent but moderately adverse in nature, since the frequency of accidents may be lowered, but their intensity may be quite severe due to enhanced speeds at which vehicles will move.

Mitigation Measures:

- Speed limits, warning and sign boards must be placed near sensitive areas and identified places, which are susceptible to accidents
- Road furniture and road marking should be done immediately after completion construction work
- Kerbed footpaths should be preferred to facilitate local inhabitants
- Installation of speed guns and channelization of traffic with respect to categories (heavy vehicle traffic and light vehicle traffic) and enforcement of penalties for the violators.

6.5.3 Impact in Drainage Pattern

During the operational phase, poor maintenance of the road drainage system, particularly during the monsoon season can cause nuisance to the travelers and public due to flooding in the existing drainage line. In case of chocking of road drainage, the increased surface runoff due to heavy rains will accumulate at the start and end point of the proposed project and can cause traffic jams.

Mitigation Measures:

- The impact can be controlled/reduced by timely and continuous maintenance/ cleaning of the drainage system; and
- Placement of sign boards instructing not to dispose of solid waste to avoid chocking of drain around the bridge and at grade road alignment.

6.5.4 Impacts on Land Environment

During the operation phase the routine impacts to soils would be limited largely to soil erosion impacts caused by vehicular traffic. Any excavations required for maintenance would cause impacts similar to those from construction phase, but at a lesser spatial and temporal extent. The accidental spill of product such as accidental fuel and material spills would likely cause soil contamination. Except in the case of a large spill, soil contamination would be localized and limited in extent and magnitude.

Mitigation measures:

- The top soil that will be excavated from the area will be preserved and reused for the horticulture purpose.
- Proper solid waste management program is prepared and executed to ensure and Land waste containment, collection, transfer and disposal.
- Monitoring is carried out at specific locations for strict compliance to the developed EMP in implementing measures to waste management.

6.5.5 Floral species maintenance

No negative impacts are envisaged on the flora of the area during the operational phase. However, improper maintenance of the saplings planted against the trees cut for the proposed Project may adversely affect the growth of those saplings which were planted to improve the environmental aesthetics of the project area. Raising of new trees in two rows available space on either side of the KKH (except the bridges), shall render a positive impact on the flora of the area and will also cause a positive impact on the landscape of the area, which shall be of permanent in nature.

Presence of adequate flora will absorb CO2 gas, through photosynthesis, emitted from an expected large number of cars, vehicles and public transport, thus purifying air of hazardous particles.

Mitigation measures:

Mitigation measures will include;

- The saplings planted in the project area against the trees cut should be properly maintained throughout their initial growth period in terms of water requirement and necessary nutrients.
- Therefore, proper care of newly planted trees will need special care;
- An awareness campaign targeted on the neighborhood farmers will be carried to popularize the planting of trees, and saplings should be provided on subsidized costs;
- Organic farming will be encouraged to minimize the use of chemical fertilizers and pesticides; and raising of dense plantation on both sides of the KKH will not only mitigate the ill effects of construction of KKH on flora, but it will also improve the landscape of the area and enhance its aesthetic beauty.

6.5.6 Faunal species conservation

The Project activities will bring some negative impacts on the fauna of the project area such as the uneasiness of movement and increased probability of accidents, if the animals/livestock approach the proposed Construction of KKH. This impact is permanent and minor negative in nature.

Noise and air pollution caused due to heavy and fast traffic on KKH, shall be a source of disturbance to the fauna of the area and especially to the avifauna of the area, which is another minor negative impact.

Mitigation measures:

Mitigation measures will include;

- Raising of dense plantation of shady trees along available suitable places along KKH shall provide resting, nestling and roosting habitat to the fauna and especially to the avifauna which is a major positive impact.
- Mitigation measure will include provision of animal/livestock under road crossings after every 2 to 3 kilometers to facilitate their movement;

6.6 Positive Impacts of the Project .

Due to the implementation of the proposed project components following benefits will be attained in terms of environmental, social, public health and economic sustainability:

- ✓ Smooth flow of traffic;
- ✓ Saving of vehicle travel time and vehicle operating costs of commuters;
- ✓ Reduction in traffic accidents and casualties by traffic congestions;
- ✓ Efficient movement of trade, goods and traffic in relatively shorter time;
- ✓ Quicker transports of agricultural products including perishable goods to final destination;
- ✓ Reduction in the fuel consumption and transportation cost caused by traffic congestion and bumpy roads;
- ✓ Reduction in air emissions from vehicular exhaust especially in case of traffic congestion; and

7. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

7.1 Environmental Management

Environmental Management Plan (EMP) is a tool for the implementation of the all the committed measures to make the Project environmentally sustainable. It provides an overall approach for managing and monitoring the environmental, ecological and socio-economic issues of the Proposed Project, and describes the institutional framework and reporting mechanism to implement EMP for the Project.

7.2 EMP COMPONENTS

Following functionaries will be involved in the implementation of EMP:

The EMP comprises following main components:

- EMP Objectives;
- Scope of the EMP;
- Environmental Policy, Legislation and Framework;
- Institutional Requirements;
- Environmental Mitigation and Management Matrix;
- Environmental Monitoring Plan;
- Planning for EMP Implementation;
- Training and Capacity Building;
- Communication & Documentation;
- Management Plans;
- Chance Find Procedure;
- Public Disclosure;
- EMP Cost; and
- Summary of Environmental Cost.

7.3 EMP OBJECTIVES

The main objectives of the EMP are:

- To provide Project impacts along with the proposed mitigation measures, and a corresponding implementation phase;
- To ensure that all necessary corrective actions are carried out in time to counter any adverse environmental impact;
- To ensure the regular monitoring of those factors which may affect the safety of the environment under a systematic monitoring approach;
- Define the roles and responsibilities of the Project Proponent and Contractor in order to effectively communicate environmental issues among them;
- Provide a procedure for timely action in the face of unanticipated environmental situation;
- Identify training requirements at various levels including Project Proponent, Contractor and Supervision Consultant (SC);
- Provide a monitoring mechanism in the form of an environmental monitoring program, which includes monitoring parameters, monitoring frequency to ensure that all the mitigation measures are completely and effectively implemented;
- Provides estimation of environmental cost for the implementation of EMP;
- Define the requirements necessary for documenting compliance with EMP and communicating it to all the concerned regulatory agencies; and
- Provide other plans considering the Project specific requirements.

7.4 SCOPE OF THE EMP

The scope of the EMP includes the following phases of the proposed realignment of KKH section:

- Pre-construction Phase;
- Construction Phase; and
- Operation and Maintenance Phase.

All the activities performed during these phases will be controlled and monitored according to this EMP.

7.5 ENVIRONMENTAL POLICY, LEGISLATION AND FRAMEWORK

The applicable polices, legislation, acts and guidelines are discussed in detail in **Chapter-2** of EIA.

7.6 INSTITUTIONAL REQUIREMENTS

The institutional requirements for the construction and Operation & Maintenance (O&M) phases of the Proposed Project are provided in below sections.

The key players involved during construction phase of the proposed Project are the EALS (NHA), as employer/proponent, the Supervisory Consultant (SC) and the Contractor. The roles and responsibilities of these organizations are outlined below.

The following staff will be involved in the implementation of EMP:

- EALS(NHA)/Proponent Employer;
- SC's and
- Contractor's Environmental Manager.

The employer will make Contractor bond through contract documents to implement the EIA including EMP and other terms and conditions of the Environmental Permit. The whole EMP will be included as a clause of the contract documents. Construction camps will be established after necessary approvals and submission of Site-Specific EMPs to be developed in the light of the relevant agencies' requirements, before commencement of new works. The organizational setup for implementation of EMP during construction phase is provided in Figure 7-1.

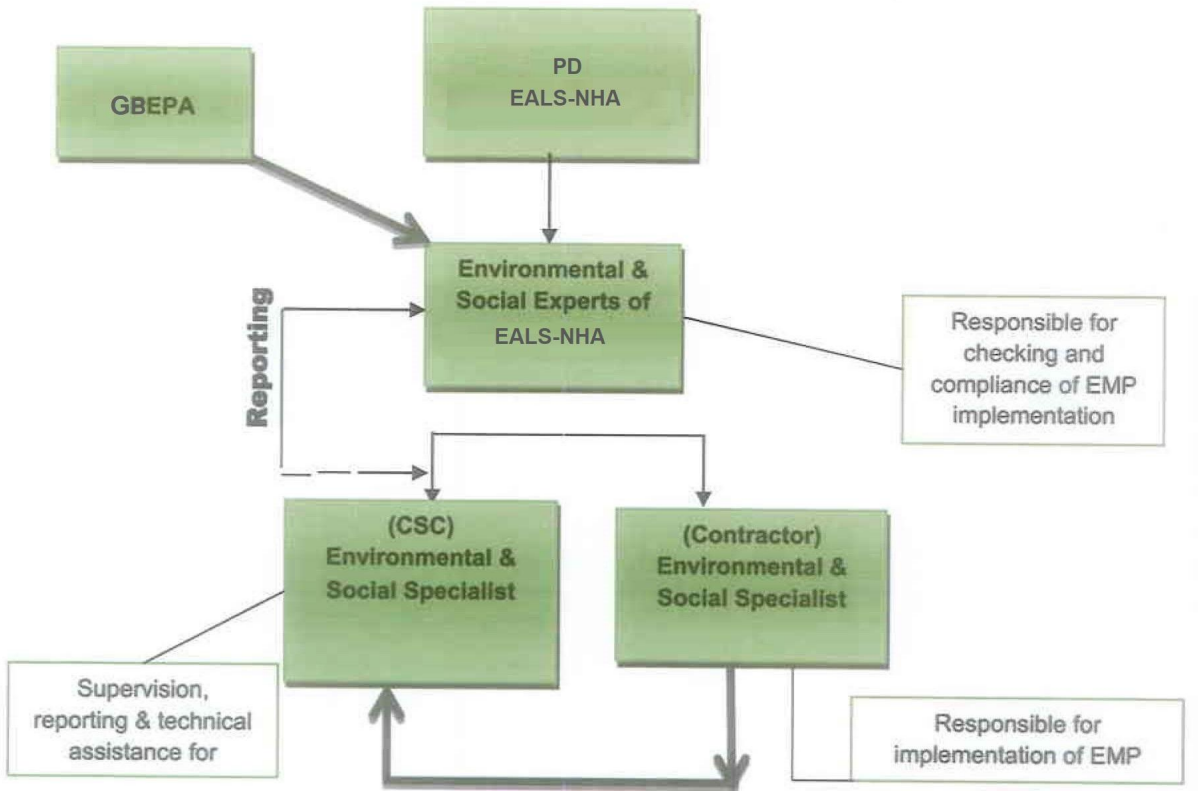


Figure 7-1: Organizational Setup for Implementation of EMP at Construction Phase

7.7 Roles and Responsibilities

7.7.1 GB-EPA

As per Gilgit-Baltistan Environmental Protection Act of 2014, GB-EPA is responsible for environmental protection and pollution control. These are responsible for the approval of the EIA and IEE of all the developmental Projects under their jurisdictions. EPA will undertake audits (as and when required) of the Proposed Project activities with respect to the protocols as defined in EMP.

7.7.2 Employer Concerned Staff(EALS-NHA)

NHA (EALS) will be responsible for the environmental management and supervisory affairs during the construction phase of the proposed Project. Director Environment (EALS) will designate the Deputy Director Environment who will look after the environmental related issues during the construction phase. The responsibilities of DD Environment are as follows:

- Coordinating and planning of activities of EALS;
- Monitoring progress of the project as per planned schedule of activities;
- Exercising oversight over the implementation of environmental mitigation measures by the contractor;
- Assisting the Environmental Specialist by providing appropriate environmental advice and solutions;
- Documenting the experience in the implementation of the environmental process;
- Preparing training materials and implementing programs;
- Maintaining interfaces with the other lined departments/ stakeholders; and

• Reporting to the GB-EPA on status of EMP implementation;

7.7.3 Responsibilities of Environmental Engineer of Contractor

Site Environmental Engineer of contractor will carry out the implementation of the mitigation measures at construction site. Contractor will be bound through contract documents to appoint the Site Environmental Engineer/Specialist with relevant educational background and experience. The responsibilities of EE of Contractor are as follows:

- EE of contractor will prepare SSEMP, monitoring plan, traffic control/diversion plan, and asphalt and batching plant area plans and will submit all the plans to the EE of SC.
- EE of contractor will be responsible for the implementation of EMP and to take effective measures against corrective actions plan;
- EE will prepare the compliance reports as per schedule and will submit it to the SC;
- Provision of proper Personal Protective Equipments (PPEs) to the workers and trained them for their proper use; and
- EE will conduct the environmental and health & safety trainings to the workers/labor.

7.7.4 Responsibilities of Environmental Engineer of Supervision Consultant

Environmental Engineer/specialist of SC will oversee the performance of contractor to make sure that the contractor is carrying out the work in accordance with SSEMP/EMP as mentioned in the contract documents. The Environmental Engineer/Specialist will also provide assistance to the Contractor's Staff to implement EMP. Package wise Site-Specific Environmental Management Plan (SSEMP) will be prepared by the contractor under the supervision of EE of SC. The SSEMP would be approved by the EALS (NHA). EE of SC will provide guidance to the contractor's EE for implementing each of the activity as given in EMP. EE of SC will be responsible for record keeping providing instruction through the Resident Engineer (RE) for corrective actions and will ensure the compliance of various statutory and legislative requirements. EE will maintain the close coordination with the contractor and EALS for successful implementation with environmental safeguard measures. However, overall responsibilities of EE of SC are as follows:

- Directly reporting to the RE;
- Discussing various environmental issues and environmental mitigation, enhancement and monitoring actions with all concerned directly or indirectly;
- Review contractor's SSEMP as part of their work program;
- Inspect, supervise and monitor all the construction and allied activities related to the EMP for the project;
- Visiting construction sites including incomplete construction work sites, where there are no contractor's activities, active construction work sites, completed areas of work sites as well as ancillary sites such as borrow areas, quarries, asphalt and crusher sites, hot mix plant sites, construction camps and work shop areas etc. to ensure contractors compliance with EMP stipulations and conditions of statutory bodies;
- Assist the RE to ensure the environmental sound engineering practices;
- Assisting contractor and EALS in all matters related to public contacts including public consultation pertaining to environmental and community health & safety issues;
- Assisting EALS to carry out environmental monitoring;
- Organizing training to the EE of contractor and field staff; and
- Preparing and submitting monthly and quarterly environmental progress/compliance reports to the EALS.

7.7.5 Reporting Mechanism

EE of contractor will prepare and submit the environmental compliance reports to the SC. EE of SC after reviewing the reports will submit the Due Diligence reports based on the contractors and his supervision to the EALS. Deputy Director of EALS will submit the reports to GBEPA. At the completion of the project, EE of SC will prepare the project completion report based on the periodical progress reports and will submit it to the EALS.

7.7.6 Institutional Arrangement for Implementation of EMP during O&M Phase

The Proposed Project will be administrated by EALS-NHA during the O &M phase. The PD and his Environment and Social staff will be responsible for following

- Coordinating with the operational staff working under the Regional General Manager to monitor environmental compliance during operation phase;
- Advising on, and monitoring tree plantations along the road alignment as suggested in EMP;
- Reporting on the progress of environmental compliance to the Regional General Manager and GB-EPA;
- Assess and propose mitigation measures for unforeseen long-term environmental and social impacts of operation; and
- Sustaining a working partnership among the EALS-NHA, GB-EPA, Agriculture, Irrigation, Forest and Wildlife departments.

7.7.7 ENVIRONMENTAL MITIGATION AND MANAGEMENT MATRIX

Environmental Mitigation and Management Matrix (EMMM) is considered as one of the main elements of EMP. It will be used as the management tool for the implementation of mitigation measures. The plan includes following:

- The envisaged impacts as identified in IEE and their recommended mitigation measures; and
- The person/organization directly responsible for adhering to or executing the required mitigation measures.

It is highlighted that although the responsibilities for executing and monitoring the mitigation measures have been delegated to different organizations, EALS-NHA will hold the primary responsibility for ensuring the full implementation of EMP. **Table 7-1** provides information

about all impacts to be raised due to Project activities during different phases of the Project i.e., pre-construction, construction and O&M.

The Contractor(s) will be responsible for the preparation of Site Specific EMP (SSEMP) on the same format of this EMP along with the site-specific plans based on the guidelines provided in this chapter.

Table 7-1: Environmental Management Plan

Sr. No	Aspect	Mitigation	Responsibility	Monitoring Frequency	Monitoring	Time Frame
A. Design/ Pre-Construction Phase						
	Public and Cultural Properties	• Incorporate technical design features to minimize the Project construction activities to avoid any interference with cultural heritage site and public property as far as possible; • In case of unavoidable interference prior notification and consultation needs to be made to reach consensus on procedures and options (e.g., re-location/re-building) or any other form of agreed compensation; and • Provide pedestrian and vehicular underpasses in the design to minimize the social issues.	Design Consultant	Once (after completion of Detailed Design)	Proponent	Design/ Pre-Construction Phase
	Shifting of Public Utilities	• Incorporate technical design features to minimize effect on public utilities • The provision in the design and budget for the relocation of the existing utility infrastructures wherever required shall be finalized in consultation with the concerned department; and • All public utilities (e.g., electric lines, water pipes etc.) likely to be affected by the proposed project will be relocated well ahead of time before the actual commencement of the construction work. In order to proceed the advance warnings will be given to the locals well before the start of relocation works.	Design Consultant, Construction Contractor	Once (after completion of Detailed Design)	Proponent	Design/ Pre-Construction Phase
	Land Acquisition	• Mitigation measures will involve careful alignment and route selection by the designer to minimize the impact; • The LAA of 1894 is the main law regulating land acquisition for public purpose. This impact can be mitigated by ensuring compliance of LAA, 1894, addressing community grievances on priority basis and timely compensation to affectees as per LARP document.	Design Consultant, Construction Contractor	Once (after completion of Detailed Design)	Proponent	Design/ Pre-Construction Phase
	Change in Hydrologic Regime	• Bridges shall be properly designed to accommodate design flows. Provision of culverts to control flood damages and provision of safety of	Design Consultant, Construction	Once (after completion of Detailed	Proponent	Design/ Pre-Construction Phase

		embankments will be considered during the design phase.	Contractor	Design)		
	Seismicity	• At the detailed design stage, the safety of the proposed road against the damages due to seismic activity need to be ensured. As such structural designs of bridges, roads and others need to follow the applicable criteria for the zone 3 as recommended in the Building Code of Pakistan 2007.	Design Consultant, Construction Contractor	Once (after completion of Detailed Design)	Proponent	Design/ Pre-Construction Phase
B. Construction Phase						
	Soil Erosion and contamination	• Minimizing the area of soil clearance;	CC	Daily	Proponent	Throughout Construction Period
		• Low embankments will be protected by planting vetiver grass that can grow in relatively dry conditions;	CC	Weekly	Proponent	
		• High embankments would be covered by the building of stone pitching or tearing through the bank. This strategy would also be extended through cross-draining systems where the reservoirs are most vulnerable to water run-off erosion;	CC	Weekly	Proponent	Throughout Construction Period
		• To mitigate soil pollution stemming from asphalt, it's essential to place all containers in a designated area, ensuring they're positioned away from water sources.	CC	Daily	Proponent	Throughout Construction Period
		• Provision of an impervious base with oil and grease trap to capture spillage during assembly and repair of the vehicle;	CC	Daily	Proponent	During Construciton Camp
		• Providing impervious platform and collection tank for spillage of liquid fuel and lubes at storage area;	CC	Weekly	Proponent	During Construciton Camp
		• Decanting and/or controlled disposal of oil and grease collected at collection tanks in the maintenance yard and chemical storage areas.	CC	Daily	Proponent	Throughout Construction Period
		• Non-bituminous wastes from construction activities will be dumped in openly, it must be in line with the legal prescriptions for dumpsites	CC	Weekly	Proponent	Throughout Construction Period
		• In areas with strong sheet flow, high embankments will be provided with chutes and drains/culverts to minimize soil erosion. Stone pitching and retaining walls will be	CC	Once	Proponent	Throughout Construction Period

		made at high embankments in critical areas;				
		• As applicable and needed, plantation of grasses and shrubs will be done for slope protection;	CC	Once	Proponent	After completion of the works
		• "Measures to prevent soil erosion, such as constructing sediment basins and slope drains, will be implemented.	CC	Weekly	Proponent	Throughout Construction Period
		• Productive land or land adjacent to agricultural/irrigated land may not be preferred for excavation;	CC	Daily	Proponent	Throughout Construction Period
		• Non-productive, barren lands in broken terrain, nullahs and publicly recognized waste lands should be given preference for borrowing materials; and	CC	Once	Proponent	Throughout Construction Period
		• Aggregate required for construction procured from quarries and riverbeds will need approval from authorities.	CC	Once	Proponent	Before the start of Construction
		• Unwanted materials from topsoil such as roots of trees, rubble and waste should be removed prior to stockpiling;	CC	Once	Proponent	Throughout Construction Period
		• To ensure stability, the soil piles shall not be higher than 2 meters. The piles must be placed and managed so as to avoid erosion and washing off. Drainage trenches around the piles must be provided.	CC	Monthly	Proponent	Throughout Construction Period
		• Any temporary fuel tank (if contractor decided to have small stock of fuel on the site) shall be placed in a covered area with berms or dikes to contain any spills. Capacity of containment must be 110% of capacity of the tank.	CC	Once	Proponent	During Construciton Camp
		• Any spill shall be immediately contained and cleaned up with absorbent material;	CC	Daily	Proponent	Throughout Construction Period
		• Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing fluids from vehicles or equipment. Drip pans or absorbent materials shall be provided. On small spills absorbent materials shall be used;	CC	Daily	Proponent	Throughout Construction Period
		• All valves and trigger guns shall be resistant to unauthorized interference and vandalism and be turned	CC	Weekly	Proponent	Throughout Construction Period

		off and securely locked when not in use;				
		• Waste collection area will be sited so as to avoid receiving a substantial amount of runoff from upland areas and draining directly to a water body;	CC	Once	Proponent	Before the start of Construction
		• In case of the fuel/oil spills risk, an oil trap shall be additionally provided;	CC	Once	Proponent	Before the start of Construction
		• Contractor will confine operation of heavy equipment within the ROW, as much as possible, to avoid soil compaction and damage to privately owned land. If private lands are disturbed, the contractor should promptly inform the owner and agree on the ways to mitigate the situation;	CC	Daily	Proponent	Throughout Construction Period
		• Adequate training on environmental protection and safety shall be provided to the staff; and	CC	Monthly	Proponent	Throughout Construction Period
		• Soil compaction may be reduced by strict adhering to temporary roads, camp/operation ground boundaries	CC	Weekly	Proponent	Throughout Construction Period
	Borrow/ open pits	• Plain agricultural land will be avoided for borrowing of materials, as far as possible by the landowners for lowering the land to create new irrigation polders;	CC	Daily	Proponent	Before the start of Construction
		• Contractor needs to obtain approval for excavation and submit the plan of rehabilitating the site after excavation; and	CC	Once	Proponent	Before the start of Construction
		• The top one-meter plough layer could be excavated, stored and used during the rehabilitation of the borrow areas.	CC	Once	Proponent	On Start and completion of works
		• Necessary permits must be obtained for any borrow pits from the competent authorities;	CC	Once for each borrow pit	Proponent	Before the start of Construction
		• No excavations should allow within distance of 500 m to ROW;	CC	Daily	Proponent	Throughout Construction Period
		• In borrow pits, the depth of the pit will be regulated so that the sides of the excavation will have a slope not steeper than 1:4;	CC	Weekly	Proponent	Throughout Construction Period
		• Soil erosion along the borrow pit shall be regularly	CC	Daily	Proponent	Throughout

		checked to prevent/mitigate impacts on adjacent lands; and				Construction Period
		• In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites.	CC	If needed	Proponent	Throughout Construction Period
		• The Contractor shall undertake an initial environmental and social audit of the facility to ensure that:				
		• The facility has a license to operate in the location.	CC	Once	Proponent	Throughout Construction Period
		• Air emissions and noise are not impacting upon sensitive receptors.	CC	Daily	Proponent	Throughout Construction Period
		• Waste materials are being managed appropriately.	CC	Weekly	Proponent	Throughout Construction Period
		• All staff are wearing appropriate PPE.	CC	Daily	Proponent	Throughout Construction Period
		• No child labour is employed at the site.	CC	Daily	Proponent	Throughout Construction Period
		• The results of the audit will be submitted to the Engineer for review before any site is used.	CC	Six months	Proponent	Throughout Construction Period
		• The audit shall be repeated on a six-monthly basis.	CC	Six months	Proponent	Throughout Construction Period
	Air Quality	**Fugitive Dust Emissions** • The material being transported or stored at the stockpiles will be kept covered with plastic to ensure protection of ambient air from fugitive emission during wind storm emissions.	CC	Weekly	Proponent	Throughout Construction Period
		• The contractor will monitor air quality on regular basis near the plant.	CC	Quarterly	Proponent	Throughout Construction Period
		• Preventive measures against dust should be adopted for unloading operations. Regular water sprinkling of all	CC	Daily	Proponent	Throughout Construction

		excavation work the site should be carried out to suppress excessive dust emission(s);				Period
		• Grading operation will be suspended when the wind speed exceeds 20 km /hr.	CC	When Needed	Proponent	Throughout Construction Period
		• The plant should be located at least 500m away from any living area.	CC	Once	Proponent	At mobilisation
		• Enforce the maximum speed limit to 20km/h for vehicles using embankments and access road.	CC	Daily	Proponent	Throughout Construction Period
		• Road damage caused by project activities will be promptly attended to with proper road repair and maintenance work	CC	Once (After the project completion)	Proponent	Throughout Construction Period
		• Proper Personal Protective Equipment (PPE) should be issued to the site worker and make sure the worker wears the PPE properly during working on site.	CC	Daily	Proponent	Throughout Construction Period
		Smoke from Burning of Waste Material or Burning Firewood • It is contractor's contractual obligation to use and provide clean and smoke free fuel in the labour camp.	CC	Weekly	Proponent	Throughout Construction Period
		• Cutting and burning trees or shrubs for fuel should be prohibited.	CC	Daily	Proponent	Throughout Construction Period
		• Gas cylinders should be used in the labor camp for cooking purposes.	CC	Weekly	Proponent	Throughout Construction Period
		Vehicular and Generator Exhaust Emissions • All vehicles during construction activities will be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions;	CC	Daily	Proponent	Throughout Construction Period
		• Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair are needed to minimize the hazardous emissions.	CC	Weekly	Proponent	Throughout Construction Period
		• Batching plant should be set up considering the wind direction so that the nearby communities are not affected by the emissions from batching plant.	CC	Once	Proponent	At mobilisation

		• NEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works.	CC	Quarterly	Proponent	Throughout Construction Period
		• Best quality fuel and lubes should be purchased where possible lead-free oil and lubes should be used.	CC	Monthly	Proponent	Throughout Construction Period
	Noise and Vibration	• Vehicles and equipment used should be well fitted, as applicable, with silencers and properly maintained; that will reduce noise hazards according to permissible limits as fixed by Pak EPA (noise is 85 dB (A) while the WHO noise guidelines prescribed a limit of 55 dB (A).	CC	Weekly	Proponent	Throughout Construction Period
		• Construction workers will be provided suitable hearing protection like ear cap, or earmuffs and will be trained about their usage.	CC	Daily	Proponent	Throughout Construction Period
		• In and near populated areas, the construction activities will be restricted to be carried out between 6 a.m. and 20:00 p.m.	CC	Daily	Proponent	Throughout Construction Period
		• Hedges and high boundary walls will be used as noise barriers in sensitive areas such as schools, hospitals and mosques.	CC	Weekly	Proponent	Throughout Construction Period
		• Public hearings will be held to discuss appropriate solutions and techniques to control noise (e.g., mud or brick walls, bushes, etc.). Such hearings consultations should also be regularly conducted to solicit public feedback, to avoid public inconvenience and suggestions for improvement in working strategy / working environment and progress of project activities; and	CC	Monthly	Proponent	Throughout Construction Period
		• In accordance with the Environmental Monitoring Plan, noise measurements will be carried out on regular basis at locations and schedule specified to maintain the level within the NEQS level and to ensure the effectiveness of mitigation measures.	CC	Fortnightly	Proponent	Throughout Construction Period
	Blasting	• **A minimum buffer of 500 m will be provided between the settlements and point of blasting.**	CC	When needed	Proponent	Throughout Construction Period
		• Conduct a pre-construction survey of structures at risk of blasting impacts on houses and other structures. If they	CC	When needed	Proponent	Throughout Construction

		are located close to the blasting area (100 m) then they need to be relocated, if the distance is more than 100 m, awareness will be created and residents must be notified in advance prior to every blast. Following completion of the blasting, the survey will be repeated to determine the condition of the buildings and verify that they are safe for re-occupation. Contractor will prepare Blasting Management Plan prior to construction and obtain approval. The survey will cover the following aspects: – Overall condition of the structures, both exterior and interior. – Documentation of defects observed in the structure using digital imagery along with notes, measurements, and sketches. – Documentation of pre-existing cracks using digital imagery along with notes, measurements, and sketches. – Blasting will be scheduled during the day only. – Local communities will be informed of blasting timetable in advance and will be provided adequate notice of when blasts are required outside of the planned schedule. – A Blasting Management Plan will be developed by the Construction Contractor. The Plan will be reviewed and approved by the Supervision Contractor before the initiation of the blasting work. – **Throughout the blasting activity, vibration sensors will be installed at strategic locations to monitor the impact of blasting and to ensure that the vibration levels are within the adopted criteria. The monitoring plan will be part of the Blasting Management Plan.** – Unscheduled blasting will be strictly prohibited in any case.				Period
	Quarrying and Mining	• Reuse of excavated material to the extent feasible. Use of licensed quarry sites.	CC	Daily	Proponent	Throughout Construction Period

		• Use only quarry and borrow sites that are licensed by the provincial government and approved by the project management unit/Implementation Consultants	CC	Weekly	Proponent	Throughout Construction Period
		• Identify new borrow and quarry areas in consultation with Project Director, if required.	CC	If Required	Proponent	Throughout Construction Period
		• The use of explosives will be used in as much minimum quantity as possible to reduce noise, vibration and dust.	CC	When Needed	Proponent	Throughout Construction Period
		• Although the material is widely available, the quarrying/mining activities will be limited to fewer areas to reduce the area of extent affected by quarrying activities. If any mining activities are to be carried out outside the project area, they will not be located in any sensitive areas. A survey of the area to identify sensitive receptors and permission from the PMU must be obtained before mining in any unplanned locations.	CC	Once	Proponent	Throughout Construction Period
	Contamination of Water Resources	• Camps will be located at least 500 m away from the nearest local settlement to prevent the contamination of community-owned water resources like springs, hill torrents, etc.	CC	Once	Proponent	During Construciton Camp
		• Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through an oil skimmer and to gravel/sand beds to remove oil/grease contaminants before discharging it into natural streams. Similarly, the wastewater effluent from the campsite will be treated before disposal into a stream.	CC	Monthly	Proponent	Throughout Construction Period
		• Borrow pits and natural depressions lined with impervious liners will be used to dispose of scraped obnoxious material, and then covered with soil. This will check potential groundwater contamination. Such measures will also be provided at stream side disposal of waste material in addition to retaining walls or gabions. Available stone (boulders) from excavated rocks will be used for retaining walls as well as for gabions. It will reduce the quantity of dumping material. However, all types of hazardous waste will have to be collected on site separately and stored in appropriate	CC	Monthly	Proponent	Throughout Construction Period

		containers to be finally removed from site and be brought to adequate handling, recycling or disposal facilities.				
		• Specific measures for water quality protection to be taken on the construction site will be the following: • Fuels, lubricants and other hazardous material will have to be properly stored in adequate containers in sites equipped with retaining structures, including oil skimmers for the treatment of contaminated runoff water.	CC	Daily	Proponent	Throughout Construction Period
		• Repair and maintenance work on machines and vehicles will only be done in specific places designed and equipped for this purpose (oil skimmer). These must be at a safe distance from the stream/nullah. No washing of vehicles will be done in or near the stream/nullah.	CC	Weekly	Proponent	Throughout Construction Period
		• Water contaminated with concrete will have to be collected in sedimentation ponds and, if required, will have to neutralized before being discharged to the natural streams/Wetlands. Contamination of the stream/nullah with concrete or cement must be avoided.	CC	Weekly	Proponent	Throughout Construction Period
		• Sewage water from the camp will have to be collected and treated in a suitable waste water treatment plant before being released into the streams.	CC	Monthly	Proponent	Throughout Construction Period
		• Generally, waste should be reduced, re-used, recycled and the disposal has to be controlled	CC	Monthly	Proponent	Throughout Construction Period
	Use of water resources	• Availability of water for camp site facilities and construction purposes will be ensured by the contractor prior to start of construction activities. As per Local Government Act, the contractor will seek approval from the Local Government for exploitation of the water resources.	CC	Once	Proponent	At mobilisation
		• The Contractor will be required to act as a go-between closely with local communities to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly.	CC	Monthly	Proponent	Throughout Construction Period
		• The contractor will prepare guidelines for the workers for minimizing the wastage of water during construction	CC	Once	Proponent	Before the start of Construction

		activities and at campsites.				
	Flora	• Campsites and Elevated Ground Storage Tanks (EGST) will be established on waste/barren land rather than on forested or agriculturally productive land. However, if such type of land is not available, it will be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth or agricultural area.	CC	Once	Proponent	At mobilisation
		• Construction vehicles, machinery and equipment will remain confined within their designated areas of movement.	CC	Daily	Proponent	Throughout Construction Period
		• The Contractor's staff and labour will be strictly directed not to damage any vegetation such as small trees or bushes. They will use the paths and tracks for movement and will not be allowed to trespass through farmlands.	CC	Daily	Proponent	Throughout Construction Period
		• Contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel will not be allowed.	CC	Weekly	Proponent	Throughout Construction Period
		• The compaction of trenches should also be done properly. Inadequate compaction of trenches will result in flow of soil during rainy season resulting in increased soil erosion	CC	If Needed	Proponent	Throughout Construction Period
		• As far as possible digging in the cultivated land should be done when the land is barren to avoid damage to agricultural crops.	CC	Daily	Proponent	Throughout Construction Period
		• Open fires should be banned in the area to avoid hazards of fire in the project area.	CC	Daily	Proponent	Throughout Construction Period
		• The collaboration with Forest Department would be helpful in choice of appropriate species, identification of available space and planning the plantation work in right planting season (spring and monsoon);	CC	When Needed	Proponent	After completion of the works
		• Avoid dumping material in vegetated areas and avoid unnecessary loss of vegetation;	CC	Daily	Proponent	Throughout Construction Period
		• Get approval from Supervision Consultant for clearance	CC	Where	Proponent	Throughout

		of vegetation. Provide adequate knowledge to the workers regarding protection of nature and the need to avoid felling trees during construction;		Needed		Construction Period
		• Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest in practically possible time.	CC	Monthly	Proponent	Throughout Construction Period
		• Ensure excavation works occur progressively and re-vegetation done at the earliest.	CC	Monthly	Proponent	
		• Supply appropriate fuel in the work camps to prevent fuel wood collection	CC	Weekly	Proponent	Throughout Construction Period
		• NOC from Forest department Diamer district should be taken. Tree removal should be compensated by carrying out tree plantation on large scale in consultation with Forest Department.	CC	Once	Proponent	Before the start of Construction
	Fauna	• Contractor will warn their labour accordingly.	CC	Monthly	Proponent	Throughout Construction Period
		• The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods.	CC	Once	Proponent	During camp construction
		• Similarly, wastes of the camps will be properly disposed off to prevent the chances of eating by wild animals, which may become hazardous to them.	CC	Daily	Proponent	Throughout Construction Period
		• NOC from Wildlife department should be taken as part of Wildlife sanctuary will be submerged by dam raising.	CC	Once	Proponent	Before the start of Construction
		• Special measures will be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding.	CC	Weekly	Proponent	Throughout Construction Period
		• Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.	CC	Weekly	Proponent	Throughout Construction Period
		• Plantation of large number of trees along the proposed roads to regain the ecological habitat;	CC	Monthly	Proponent	After completion of the works
		• New and good condition machinery with minimum noise will be used in construction;	CC	Fortnightly	Proponent	Throughout Construction Period
		• Animal corridors must be provided along the whole	CC	Once	Proponent	Throughout

		alignment wherever necessary;				Construction Period
		• Noisy work will not be carried out in nighttime so that there should be no disturbance to local birds and animals;	CC	Daily	Proponent	Throughout Construction Period
		• Contractor will ensure that the no hunting, trapping of animal will be carried out during construction;	CC	Daily	Proponent	Throughout Construction Period
		• Borrow pits will be fenced so that no large animal can fell into these;	CC	Weekly	Proponent	Before the start of Excavation
		• The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly waste of the camps will be properly disposed-off to prevent the chances of eating by wild animals, which may prove hazardous to these species;	CC	Once	Proponent	During camp construction
		• Special measures will be adopted to minimize impacts on wild birds such as avoiding noise generating activities during the critical period of breeding;	CC	When Needed	Proponent	During camp construction
		• Alternate nesting facilities shall be tried for those birds disturbed during hatching season; and	CC	When Needed	Proponent	During camp construction
		• Pits and excavations will be filled in as soon as possible following works. Trenches and pits to be created for longer than 48h periods will have 45O ground ramps to allow escape by fauna should they fall in. A pre-start check for fauna will be completed prior to works commencing in the morning if trenches are left open overnight. Regular crossing points will be installed to ensure wildlife can cross excavations, berms and drainage channels.	CC	Monthly	Proponent	Throughout Construction Period
	Physical Cultural Resources	• As the project involves excavation work and in case of any accidently discovered archeological/ historical heritage during the construction phase, contractor should stop the activities immediately and inform the SC and chance find procedures should be adopted	CC, DC	If Needed	Proponent	Throughout Construction Period
	Disruption of Existing Public Utilities/ Infrastructure	• Rehabilitation of existing utilities before construction to avoid any inconvenience to the residents of the project area or provide them with alternate arrangement during the construction period.	CC	Once	Proponent	At mobilisation

	Construction Camps/Camp Sites	• The construction contractor will be required to assess the environmental/social sensitivity of any additional or alternative sites prior to their approval for adoption;	CC	Once	Proponent	At mobilisation
		• The project will seek to avoid sitting camps where their presence might contribute to any conflicts between villages;	CC	Daily	Proponent	Throughout Construction Period
		• Individual trees and shrubs of high conservation value to be marked and preserved wherever possible.	CC	When Needed	Proponent	Throughout Construction Period
		• Implement landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures;	CC	When Needed	Proponent	Throughout Construction Period
		• Limit the working hours of noisy activities when near identified sensitive receptors to normal daytime working hours;	CC	Daily	Proponent	Throughout Construction Period
		• Operate equipment in a manner sympathetic to the ambient noise environment. Do not leave equipment idling unnecessary;	CC	Daily	Proponent	Throughout Construction Period
		• Eliminate tonal, impulsive or low frequency noise through noise control engineering techniques where practicable (fitting of mufflers, damping, etc.), and substitute for a different method if necessary (e.g., instead of hammering actions, use hydraulics);	CC	When Needed	Proponent	Throughout Construction Period
		• Provide adequate warnings of impeding works to all potential receptors within a 1 km corridor surrounding the ROW via public notices and local news;	CC	When Needed	Proponent	Before the start of Construction
		• Implement Waste Management Plan to include procedures for the classification, storage and disposal of all construction wastes and the training of employees who handle hazardous materials;	CC	Monthly	Proponent	Throughout Construction Period
		• Ensure that discharge of sewage from temporary construction facilities to surface courses does not impact surface water ecology. This will be achieved through the provision of treatment facilities and by enforcing the discharge standards; and	CC	Daily	Proponent	Throughout Construction Period
		• In order to minimize social disturbances as a result of	CC	Once	Proponent	At mobilisation

		rehabilitation workers, existing camps from previous projects were identified as a first preference. State land was a second preference for Worker Camp locations, followed by land where there is a lessee				
	Waste and Hazardous Waste	• The solid waste generated from the camp site will be disposed-off through Municipal Committee or approved landfill site, however hazardous waste will be treated as per GB EPA;	CC	Monthly	Proponent	Throughout Construction Period
		• Burning of waste will be prohibited at project site;	CC	Daily	Proponent	Throughout Construction Period
		• Solid Waste will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan;	CC	Monthly	Proponent	Throughout Construction Period
		• Planning for disposal sites with reasonable distance from the human settlements;	CC	Once	Proponent	Throughout Construction Period
		• Disallow siting for work camps, including waste dump sites, in a distance closer than one kilometer to any nearby community;	CC	Daily	Proponent	Throughout Construction Period
		• Incorporate technical design features for refuse collection containers at sites that would minimize burning impacts;	CC	Once	Proponent	Throughout Construction Period
		• Devise plan(s) for safe handling, storage and disposal of harmful materials; and - Burning of waste will not be allowed in any case.	CC	Daily	Proponent	Throughout Construction Period
		• Wastewater effluent from contractor's workshop and equipment washing yards would be passed through gravel/ sand beds to remove oil/ grease contaminants before discharging it into natural streams;	CC	Weekly	Proponent	Throughout Construction Period
		• Training of work force in the storage and handling of materials and chemicals that can potentially cause soil contamination;	CC	Monthly	Proponent	Throughout Construction Period
		• Solid Waste generated during construction and camp sites will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan;	CC	Weekly	Proponent	Throughout Construction Period

		• Proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.;	CC	Monthly	Proponent	Throughout Construction Period
		• Emergency Response plan should be prepared to address the accidental spillage of fuels and hazardous goods;	CC	Once	Proponent	Throughout Construction Period
		• Immediate collection of spilled oils/fuels/lubricants by collection of contaminated soils and skipping oils from surface water by applying appropriate technologies;	CC	Monthly	Proponent	Throughout Construction Period
		• Reusing bitumen spillage;	CC	If needed	Proponent	Throughout Construction Period
		• Disposing non-usable bitumen spills in a deep trench providing clay linings at bottom and filled with soil at the top (for at-least 0.5m);	CC	Monthly	Proponent	Throughout Construction Period
		• Used oil should be collected in separate containers stored on impervious platform with restricted access and must be sold to licensed contractor and the burning of waste oil should be strictly restricted;	CC	Monthly	Proponent	Throughout Construction Period
		• Segregating and stockpiling scarified/ milled bituminous material and reusing this material in sub grade/shoulders;	CC	Monthly	Proponent	Throughout Construction Period
		• Collecting and stockpiling excessive bituminous material for reuse or controlled disposal;	CC	Weekly	Proponent	Throughout Construction Period
		• Providing the necessary means for emergency response on call 24 hours/day;	CC	Weekly	Proponent	Throughout Construction Period
		• The sewage system for camps will be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters; and	CC	Once	Proponent	Throughout Construction Period
		• Lined wash areas will be constructed within the camp site or at site, for the receipt of wash waters from construction machinery	CC	Once	Proponent	Throughout Construction Period
	Occupational Health and Safety	• Providing basic medical training to specified work staff and basic medical service and supplies to workers;	CC	Monthly	Proponent	Throughout Construction Period

		• Layout plan for camp site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;	CC	Once	Proponent	Before camp construction
		• Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborer; Protection devices (ear muffs) will be provided to the workers doing job in the vicinity of high noise generating machines;	CC	Daily	Proponent	Before camp construction
		• Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction;	CC	Daily	Proponent	Throughout Construction Period
		• Proper maintenance of facilities for workers will be monitored;	CC	Weekly	Proponent	Throughout Construction Period
		• Provision of protective clothing for laborer handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc;	CC	Daily	Proponent	Throughout Construction Period
		• Ensure strict use of wearing these protective clothing during work activities;	CC	Daily	Proponent	Throughout Construction Period
		• Elaboration of a contingency planning in case of major accidents;	CC	If Needed	Proponent	Throughout Construction Period
		• Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites;	CC	Weekly	Proponent	Throughout Construction Period
		• Adequate signage, lightning devices, barriers, yellow tape and persons with flags during construction to manage traffic at construction sites, haulage and access roads;	CC	Daily	Proponent	Throughout Construction Period
	Community Health and Safety	• There should be proper control on construction activities and Oil spillage leakage of vehicles.	CC	Daily	Proponent	Throughout Construction Period
		• The Borrow areas should be fenced properly and banned for the movement of the residents.	CC	Monthly	Proponent	Throughout Construction Period

		• The labour works with different transmittable diseases should be restricted within the construction site.	CC	If Needed	Proponent	Throughout Construction Period
		• Efforts will be made to create awareness about road safety among the drivers operating construction vehicles;	CC	Monthly	Proponent	Throughout Construction Period
		• Timely public notification on planned construction works;	CC	When Needed	Proponent	Throughout Construction Period
		• Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity & social links;	CC	If Needed	Proponent	Throughout Construction Period
		• Seeking cooperation with local educational facilities (school teachers) for road safety campaigns;	CC	Once	Proponent	Throughout Construction Period
		• Provision of proper safety and diversion signage, particularly at urban areas and at sensitive/accident-prone spots.	CC	Daily	Proponent	Throughout Construction Period
		• Setting up speed limits in close consultation with the local stakeholders; and	CC	Daily	Proponent	Throughout Construction Period
		• If identified, consider additional guard rails at accident-prone stretches and sensitive locations (schools).	CC	Daily	Proponent	Throughout Construction Period
		• The communicable disease of most concern during construction phase, like sexually-transmitted disease (STDs) such as HIV/AIDS, should be prevented by successful initiative typically involving health awareness; education initiatives; training heath workers in disease treatment; immunization program and providing health service.	CC	Monthly	Proponent	Throughout Construction Period
		• Reducing the impacts of vector borne diseases on long-term health effect of workers should be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which includes	CC	Weekly	Proponent	Throughout Construction Period
		• Prevention of larval and adult propagation of vectors through sanitary improvements and elimination of	CC	Daily	Proponent	Throughout Construction

		breeding habitat close to human settlements.				Period
		• Eliminate any unusable impounding of water	CC	Daily	Proponent	Throughout Construction Period
		• During construction work, pedestrian and vehicular passages should be provided for crossing near settlement	CC	Daily	Proponent	Throughout Construction Period
		• Bridges and other structures have to be structurally stable enough to bear maximum ground acceleration recorded for the area in past.	CC	Once	Proponent	
		• Fencing should be strong enough so that it cannot be broken easily by local people for making passages.	CC	Once	Proponent	Throughout Construction Period
		• Discharge of any wastewater at upstream of the point of public supply should be restricted.	CC	Weekly	Proponent	Throughout Construction Period
		• Batching plants should be installed away from settlements	CC	Once	Proponent	
		• Use of water should not disturb public water availability. Source of water should be selected carefully.	CC	When Needed	Proponent	Throughout Construction Period
	Management of Traffic	• Traffic signs and warning instructions shall be displayed at the sites and along the proposed routes being used by the construction traffic for the information of other road traffic as well.	CC	Daily	Proponent	During Construction
		• Public awareness campaigns through radio and newspaper advertisements shall be conducted to educate the public and sensitize them to cooperate with the construction staff and project focal staff in order to try and avoid the areas under construction as far as possible, particularly during the peak times when traffic volumes and pedestrian movement is the highest.	CC	Once	Proponent	Throughout Construction Period
		• The potential risks of accidents to pedestrians and commuters while in the immediate vicinity of construction sites shall be conveyed to them in order to educate them and gain their cooperation and minimize the risk of accidents.	CC	Once at start of each construction site	Proponent	Throughout Construction Period

		• Employ flag persons to control traffic at the work sites for safety reasons when construction equipment is entering or leaving the work area.	CC	Daily	Proponent	Throughout Construction Period
		• Lanes shall be created through the work site using rope or flagging to minimize risks and injuries from falling objects.	CC	Daily	Proponent	Throughout Construction Period
		• Post traffic advisory signs (to minimize traffic build-up) in coordination with local authorities.	CC	Daily	Proponent	Throughout Construction Period
		• Provide road signs indicating the lane is closed 500 m before the worksite.	CC	Daily	Proponent	Throughout Construction Period
		• Use traffic cones to direct traffic to move to the open lane.	CC	Daily	Proponent	Throughout Construction Period
		• Provide sufficient lighting at night within and in the vicinity of construction sites.	CC	Daily	Proponent	Throughout Construction Period
		• Regularly monitor traffic conditions along access roads to ensure that project vehicles are not causing congestion.	CC	Daily	Proponent	Throughout Construction Period
		• Define and observe schedules for different types of construction traffic trips (e.g., transport of pre-cast sections, haulage of spoils, delivery of construction materials, etc.).	CC	Weekly	Proponent	Throughout Construction Period
		• As much as possible, schedule delivery of construction materials and equipment as well as transport of spoils during non-peak hours.	CC	Daily	Proponent	Throughout Construction Period
		• Avoid movements of noisy vehicles during night time in vicinity of sensitive receivers.	CC	Daily	Proponent	Throughout Construction Period
		• Implement suitable safety measures to minimize risk of adverse interactions between construction works and traffic flows through provision of temporary signals or flag controls, adequate lighting, fencing, signage and road diversions.	CC	Daily	Proponent	Throughout Construction Period
		• Ensure relocation of any affected public transport	CC	Once (Where	Proponent	Before the start of Construction

		infrastructure (but stops, shelters etc.) prior to commencement of works.		Needed)		
		• Provide advance notification to the community regarding changes to public transport facilities or routes.	CC	Once (Where Needed)	Proponent	Before the start of Construction
		• Schedule construction works to minimize extent of activity along linear construction site at any one time.	CC	Once	Proponent	Before the start of Construction
		• Comply with traffic regulations and avoid, where possible, roads with the highest traffic volumes, high density of sensitive receivers or capacity constraints are not used as access to and from the construction areas and spoil disposal sites.	CC	Monthly	Proponent	Throughout Construction Period
		• Install temporary accesses to properties affected by disruption to their permanent accesses.	CC	If Needed	Proponent	During Construction
		• Reinstate good quality permanent accesses following completion of construction.	CC	Once	Proponent	At completion of works
	Damage to Cross Drainage	Contractor will prepare standard operating procedures and impose strict control over operators and drivers of all types of heavy machinery/vehicles to minimize any damage to roads or structures. If any damage takes place, the contractor will carry out repairs immediately.	CC	If Needed	Proponent	Throughout Construction Period
	Resource Conservation	• Wastage of water should be reduced by training the workers involved in water use.	CC	Monthly	Proponent	Throughout Construction Period
		• Wastage of water should be controlled through providing proper valves and through controlling pressure of the water.	CC	Monthly	Proponent	Throughout Construction Period
		• Water jets and sprays should be used for watering surfaces rather than using overflow system.	CC	Daily	Proponent	Throughout Construction Period
		• Source of water should be carefully selected. Water use should not disturb the existing community water supplies.	CC	Once	Proponent	Throughout Construction Period
		• Unnecessary equipment washings should be avoided	CC	Daily	Proponent	Throughout Construction Period
		• Use minimum amount of bitumen for road surfacing	CC	Monthly	Proponent	Throughout

						Construction Period
	Life Style and Culture	• Timely and full public consultation and announcement of mobilizing equipment;	CC	Once	Proponent	At mobilisation
		• Establishment of formal links with affected communities;	CC	If needed	Proponent	Throughout Construction Period
		• Plan for social grievance redress mechanisms including the Nazims of Union Councils and community leaders;	CC	Weekly	Proponent	Before the start of Construction
		• Seek assistance from and cooperation with local NGOs;	CC	If Needed	Proponent	Throughout Construction Period
		• Familiarize outside laborer on local etiquettes;	CC	Monthly	Proponent	Throughout Construction Period
		• Local labour should be employed for construction works; and	CC	Monthly	Proponent	Throughout Construction Period
		• Water supply and sanitation facilities, Contractor's workforces should exacerbate the existing shortages and environmental hazards; contractor should primarily seek their own sources of water in due distance (min. 1 km) from local user's wells.	CC	Once	Proponent	Throughout Construction Period
	Socio-economic Environment	• Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities;	CC	Monthly	Proponent	Throughout Construction Period
		• Maintaining a grievance procedure to facilitate stakeholders in expressing concerns;	CC	Weekly	Proponent	Throughout Construction Period
		• Proper traffic diversion plans before the start of the construction;	CC	Once	Proponent	During Construction
		• Proposal of pedestrian underpass/bridge for the locals;	CC	Once	Proponent	Throughout Construction Period
		• Appropriate budget for traffic/safety sign boards;	CC	Once	Proponent	Throughout Construction Period

		• Timely completion of the project; and	CC	Once	Proponent	Throughout Construction Period
		• Maximum the unskilled labour and where possible skilled labour will be arranged locally.	CC	Monthly	Proponent	Throughout Construction Period
	Communicable Diseases	Arrange to run an active campaign, in the labour camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS; Strengthen the existing local health and medical services for the benefit of labour as well as the surrounding villages; Ensure cleanliness and hygienic conditions at the labour camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by the Health Department; Locating a labour camp at least away from the villages (local settlement), and Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents.	CC	Quarterly	Proponent	Throughout Construction Period
	Gender Issues	The contractor will be required to provide qualified key personnel to address the specific risks identified in the project. Contractors will specify key staff with the technical skill and experience to implement the mitigation measures; The bidding documents will include specific requirements that minimize the use of expatriate workers and encourage hiring of local workers, thereby minimizing labor influx; The bidders will be required to submit Codes of Conduct (CoCs) with their bids. The CoCs will set clear boundaries for acceptable and unacceptable behaviours of all individuals and companies and will be signed by companies, managers and individuals; All project consulting firms will also be required to submit Codes of Conduct with their proposals; The contractor will be required to establish anti-sexual harassment policies that governs conduct in the workplace; The contractor will be required to provide mandatory and repeated training to workers on sexual exploitation and	CC	Monthly	Proponent	Throughout Construction Period

		abuse and HIV/AIDS prevention and on the content and obligations derived from the code of conduct; and Provisions will be set in contracts for dedicated payments to contractors for SEA prevention activities (e.g. training) against evidence of completion. The portion of the contract price will be guaranteed by a performance security linked to environmental and social contractor performance				
C. Impacts during Operational Phase						
	Air and Noise quality	Setting up of a system to monitor air quality along project area in accordance with the applicable standards/limits; Afforestation should be done immediately along the ROW once the construction phase is completed; plants should be selected in accordance to their ability to absorb emissions; Regular road maintenance to ensure good surface condition; Speed limits at sensitive locations; Monitoring air quality at defined schedule; Regular vehicle checks to control/ensure compliance with NEQS; and Enforcement and penalties against traffic rules violators. Signs for sensitive zones (health centers / educational institutions etc.) to disallow the use of pressure horns.		Quarterly	Proponent	Throughout the Operational Phase
	Road Safety	Speed limits, warning and sign boards must be placed near sensitive areas and identified places, which are susceptible to accidents Road furniture and road marking should be done immediately after completion construction work Kerbed footpaths should be preferred to facilitate local inhabitants installation of speed guns and channelization of traffic with respect to categories (heavy vehicle traffic and light vehicle traffic) and enforcement of penalties for the violators.		Once	Proponent	Throughout the Operational Phase
	Impact in Drainage Pattern	The impact can be controlled/reduced by timely and continuous maintenance/ cleaning of the drainage system; and Placement of sign boards instructing not to dispose of solid waste to avoid chocking of drain around the bridge and at grade road alignment.		Yearly	Proponent	Throughout the Operational Phase
	Floral species	The saplings planted in the project area against the trees cut		Weekly	Proponent	Until the saplings

	maintenance	should be properly maintained throughout their initial growth period in terms of water requirement and necessary nutrients. Therefore, proper care of newly planted trees will need special care; An awareness campaign targeted on the neighborhood farmers will be carried to popularize the planting of trees, and saplings should be provided on subsidized costs; Organic farming will be encouraged to minimize the use of chemical fertilizers and pesticides; and Raising of dense plantation on both sides of the KKH will not only mitigate the ill effects of construction of KKH on flora, but it will also improve the landscape of the area and enhance its aesthetic beauty.				are replenished
	Faunal species conservation	Raising of dense plantation of shady trees along available suitable places along KKH shall provide resting, nestling and roosting habitat to the fauna and especially to the avifauna which is a major positive impact. Mitigation measure will include provision of animal/livestock under road crossings after every 2 to 3 kilo meter to facilitate their movement;		Once	Proponent	Until the saplings are replenished

7.8 PLANNING FOR EMP IMPLEMENTATION

7.8.1 NOC and Other Approvals

EPA Approval Process

An EIA report of the proposed Project needs to be prepared and to be submitted to GB-EPA to get No Objection Certificate (NOC). The EIA report duly reconciled with NHA is to be submitted to GB -EPA for obtaining NOC. A demand draft of required EIA review fee has to be deposited along with the report by the Proponent to GB -EPA for initiating the review and EIA approval process. The approval from GB-EPA is the mandatory requirement before commencement of the proposed Project activities.

Provincial Departments of Wildlife, Forest, Archaeology and Irrigation

At the feasibility stage of the Project as per the requirement of EPA guidelines for the Sensitive and Critical Areas, concerned provincial departments are informed through letters for the proposed project.

During the construction stage, if the implementation of the proposed Project involves the clearing of vegetation and trees which belongs to the forest or wildlife department, the Project Contractor will be responsible for acquiring a NOC from the provincial forest department. The application for a NOC will need to be endorsed by NHA, Govt. of Gilgit Baltistan. Similarly, if any Archaeological monument or site is crossed by or near to the KKH Project, the concerned provincial department needs to be contacted for NOC. There is no protected area or any archaeological site affected by the proposed Project

Where construction is to be carried out in the close proximity of the forest (if any) and Wildlife and Archaeology sites, the NHA, Govt. of Gilgit Baltistan is required to coordinate with the concerned departments to ensure that the impacts on vegetation and wildlife are minimized. The Contractor is also required to contact with concerned department before the start of the construction work.

NOC from Irrigation Department will be taken by NHA when the construction status is confirmed.

Provincial Revenue Departments

Under the national law, matters relating to the land-use and ownership are the provincial subjects and the revenue department of the concerned province is empowered to carry out the acquisition of private land or built-up property for public purposes, including on behalf of other provinces. For this purpose, the concerned department must lodge an application with the concerned provincial government to depute a Land Acquisition Collector (LAC) and other revenue staff, who will be responsible for handling the matters related to the acquisition and disbursement of compensation. However, no land acquisition is involved for this project, only some structures will be affected which are encroached within the RoW.

7.8.2 Stakeholder Coordination

Notwithstanding the efforts so far put in for public participation, this activity will have to be pursued through the forthcoming implementation phases of the Project. In particular, the focus will be on the improvement and modification of the proposed intervention designs.

Participation mechanisms facilitate the consultative process and include information sharing and dissemination, disclosure, and participation of affected people and other stakeholders in the proposed Project related activities. In the peculiar social set-up of the Project Area, it is also important to involve the religious leaders as representatives of the public as well as part of effective communication process. They can provide a very effective medium to bring information

to the affected male population through Friday prayers. Local business community, especially the affected one, will also be brought into the process of awareness and participation.

The related institutional arrangements will also be in place for continuous consultation throughout the process of planning and implementation. During construction, NHA, Govt. of Gilgit Baltistan will have to implement EMP.

The construction schedule will be established / updated before the commencement of construction work considering the activities specifically suggested in EMP for its implementation.

7.9 TRAINING AND CAPACITY BUILDING

To enhance the capacity of the Proponent as well as the Contractor, training will be imparted by a trained professional that will be hired for the trainings related to the environmental and social issues of the proposed Project, implementation of mitigation measures and the monitoring protocols and reporting mechanism will also be carried out.

In-house training for the project staff including contractor, consultant and the supervisory staff of the Proponent will be ensured through the provision of basic training and three days of advanced training, covering environmental and social aspects of the development projects in general, and implementation requirements with emphasis on the roles and responsibilities of the proponent and the contractor staff while executing the environmental management and monitoring plan in particular. The training protocols will include the following aspects:

- Procedures for monitoring the air quality parameters and measures to be adopted for avoiding or minimizing air pollution, particularly from the concrete batching plant, haul-trucks, etc.;
- Procedures for monitoring water quality parameters and measures to be adopted for avoiding or minimizing water pollution, particularly from the wastewater effluent generated from the workshops, machinery washing yards, and other obnoxious chemicals;
- Safe waste management and disposal practices;
- Safe noise levels from the construction machinery etc.;
- General housekeeping and cleanliness;
- Communicable diseases;
- Safety measures against hazards for workforce and the local communities arising from the construction activities; and
- Use of safety gadgets by the workforce.

A comprehensive training manual will be developed and implemented by the Contractor with prior consent of SC environmental staff.

Table 7-2 provides brief detail of the capacity building and training plan for the proposed project.

Table 7-2: Capacity Building Programs and Technical Assistance Services

Provided By	Contents	Trainees	Duration
Consultants and Organizations specializing in Environmental Management and Monitoring	Short Seminars and Courses on: • Environmental laws and regulations; • Environmental Sustainability; and • EMP	NHA Staff and Contractor Workers	3 Days
Consultants and	Short Seminars and	NHA Staff and	5 Days

Provided By	Contents	Trainees	Duration
Organizations specializing in Social Management and Monitoring, and Occupational Health and Safety	Courses on: • SSEMP; • Labour Influx Management; • OHS; • Basic First Aid; • Occupational and Community Health and Safety Management; • Labour Camp Management; • Traffic Management; • Dengue Prevention and Control; • Use and Importance of PPEs; and • Fire Safety and Emergency Response Measures.	Contractor Workers	
Consultants and Organizations specializing in Environmental and Social Management and Monitoring	Short Seminars and Courses on: • EMP; • Environment Health and Safety Management; • OHS; • Basic First Aid; • Waste Management; • Fire Safety and Emergency Response Measures; • Electrical Safety; and • Use and Importance of PPEs	Operation and Maintenance Staff of NHA	3 Days

7.10 COMMUNICATION & DOCUMENTATION

Communication and documentation are an essential feature of EMP. The key features of such mechanism are:

7.10.1 Data Recording and Maintenance

All forms to be used for recording information during the environmental monitoring will follow a standard format which will correspond to the data base in to which all the gathered information will be placed. Check boxes will be used as much as possible to facilitate data entry. Tracking system will be developed for each form.

7.10.2 Database

The database may include the following information:

- Training programs;
- Staff deployment;
- Non-compliances;
- Corrective actions
- List of environmental data; and
- List of environmental data to be maintained:
  - Soil and land pollution;
  - Disposal of waste; o Water resources;
  - Fuel oil and chemical spills;
  - Vegetation record;
  - Noise pollution;
  - Air and dust pollution;
  - Socio-economic data; and
  - Ecological sensitivities.

7.10.3 Meetings and Reporting

Monthly meetings will be held at site during the construction phase. The purpose of these meetings will be to discuss the routine activities, non-compliances and their remedial measures. Various reports will also be produced at periodic time intervals, as provided in Table 7-3 along with information regarding persons responsible for report preparation and review process. Additionally, minutes of meeting will also be submitted as part of routine environmental reports.

Table 7- 3: Periodic Table Mechanism

Sr. No.	Report Category	Prepared By	Reviewed By
1	Monthly	Contractors' environmental staff	NHA, Govt. of GB / SC
2	Quarterly	Contractors' environmental staff	NHA, Govt. of GB / SC
3	Semi-Annual Environmental Monitoring Report (SAEMR)	Supervision Consultant (SC)	NHA, Govt. of GB / SC
4	Annual Report	Contractors' environmental staff	NHA, Govt. of GB / SC
5	Completion Report	Contractors' environmental staff	NHA, Govt. of GB / SC

7.10.4 Photographic Records

Contractors will maintain photographic records during the implementation of the proposed Project. As a minimum, the photographic records will include the site photographs, all the roads, camp sites and monitoring activities, etc.

7.10.5 Non-Compliance of the EMP

The implementation of the proposed EMP involves inputs from various functionaries. The Contractor will be primarily responsible for ensuring implementation of the mitigation measures proposed in the EMP, which will be part of the contract documents. The provision of the environmental mitigation cost will be made in the total cost of Project, for which the Contractor will be paid on the basis of monthly compliance reports. However, if the Contractor fails to comply with the implementation of EMP and submission of the monthly compliance reports, deductions will be made from the payments to the Contractor claimed under the heads of environmental components.

If any of the non-compliance found with respect to the conditions of the EMP, then contractor will develop the corrective action plan on the direction of the supervision consultant (SC). The corrective action plan will be approved by supervision consultant and submitted to the NHA. The implementation of corrective action plan done by the contractor in the given timeline. The compliance of the corrective action plan will be reported and submitted to NHA by supervision consultant.

If the contractor fails to compliance with the corrective action plan, then immediate stoppage of work until the corrective action plan will be in compliance with the complete stratification of supervision consultant

7.10.6 Review of Recorded Data

All the data and communication recorded and maintained by the Contractor will be periodically reviewed and checked by SC and NHA, Govt. of GB and necessary action will be recommended to Contractor to improve the recording and documentation.

7.11 MANAGEMENT PLANS

Various management plans have been prepared as a part of EMP for the better management and implementation of EMP during all phases of the proposed Project. However, these plans will be updated by Contractor and approval from NHA, Govt. of GB will be sought before start of construction activities. These plans are listed below:

1) Tree Plantation / Reforestation Plan;
2) Health, Safety and Environment (HSE) Management Plan;
3) Emergency Preparedness and Response Plan;
4) Restoration and Rehabilitation Plan;
5) Waste Management Plan;
6) Disaster Management Plan;
7) Drinking Water Supply and Sanitation Plan
8) Traffic Management Plan; and
9) Change Management Plan.
10) Dust Control/ Water Sprinkling Plan

7.11.1 HSE Management Plan

Health risks and work safety problems may result at the workplace if the working conditions provide unsafe and/or unfavorable working environment due to storage, handling and transport of hazardous construction material. Workers will be provided with safe and healthy working environment taking into account risks inherent to the particular sector and specific classes of hazards in Project Area. During construction phase, Contractor will be responsible for all HSE related issues and to comply with national laws and international standards for occupational health and safety. The ultimate goal of the plan is to eliminate any injury to human and damage to facilities, materials and the environment.

The following measures are identified for health, safety, and environment protection during all activities of the proposed Project to minimize risk of accidents, which could endanger the life of personnel, cause damage to properties and environment:

- All contractor staff shall be well informed and trained on the HSE policies and guidelines;
- Contractor shall provide adequate health services as well as site first aid services for its workforce;
- The main priority of the contractor shall be to prevent accidents during mobilization, construction phase of the proposed Project. Prevention of workplace accidents during the construction activities will be achieved using approved work plan/instructions by the supervisors;
- Work safety measures and good workmanship practices shall be followed by the contractor to ensure no health risks for workers;
- Provision of adequate sanitation, washing, cooking and dormitory facilities;
- Proper maintenance of facilities for workers shall be monitored;
- Provision of protective clothing for laborer handling hazardous materials, e.g., helmet, adequate footwear for bituminous pavement works, protective goggles, etc. and contractor will ensure strict use of wearing these protective clothing during work activities;
- Elaboration of a contingency planning by the contractor at work site in case of major accidents shall be carried out. A comprehensive emergency preparedness and response plan will be developed and implemented at site;
- A site-specific fire-fighting plan also needs to be developed and implemented by Contractor during construction phase;
- Accidents shall be reported to and investigated by the Contractor. All personnel shall be encouraged to report all accidents/incidents and to cooperate in the investigation of such occurrence. A comprehensive accident/incident report will be produced to NHA, Govt. of GB for its review and necessary action;
- Adequate signage, lightning devices, barriers, and persons with flags during construction to manage traffic at haulage and access roads shall be conducted;
- The communicable disease of most concern during construction phase, like sexually transmitted diseases such as HIV/AIDS, will be prevented by successful initiative typically involving health awareness, education initiatives, training heath workers in disease treatment, immunization program and providing health service;
- Reducing the impacts of vector borne diseases on long-term health effect of workers will be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease;
- All construction activities shall be properly managed through careful planning and the applicable and relevant HSE policies; and
- Prior approval from NHA, Govt. of GB's environment team will be sought before starting any construction related activity.

7.11.2 Emergency Preparedness and Response Plan

Emergency Preparedness and Response Plan provides an overview of the procedures to mitigate and control the impacts on community, on occupational health and safety, on the environment and on the Project in the event of emergency situations and to respond in life threatening situations usually occurring suddenly and unexpectedly during the construction and operational phases of the proposed project. The contractor will be responsible for the preparation of plan and implemented at site after prior review and approval from the supervisory consultant and proponent.

7.11.3 Restoration and Rehabilitation Plan

The implementation of the proposed Project would involve construction workers' camp for staff and laborers, establishment of fences around construction site, over usage of access roads for movement of heavy machinery/motor vehicles linking to various components of project, offices, borrow/quarry areas, etc. During construction, these activities could also result in accumulation of large amount of unused or spoil material at various sites such as at access roads, muck dumping sites, quarry sites, colonies, offices, etc. which will change the existing land cover in the project area. After completion of the construction work, it is required to restore the disturbed area to its original conditions wherever it is possible that is the sole responsibility of the Contractor. Various engineering and biological measures have been suggested for the restoration of these areas:

- Top soil will be stored at designated areas before performing excavation activities at quarry sites (if these are agriculture land) and after the completion of all the construction activities, quarry sites (if applicable) and construction sites will be covered with the top soil to support the growth of plant species;
- The area will be planted with indigenous vegetation that would require the initial establishment of fast-growing grasses along with annuals and perennials, nitrogen fixing herbaceous legumes and non-legume shrubs to increase the soil conditioning and to stabilize the project site;
- Material stockpiles shall be removed as soon as the construction work will be completed;
- All the construction, toxic and hazardous chemicals/materials shall be completely removed from the site;
- All fencing and gates shall be removed and pits shall be backfilled;
- The reconstruction of interrupted drainage channels and pipes shall be carried out;
- Rehabilitation of affected roads will be carried out to avoid any inconvenience to the road commuters; and
- A clearance certificate from the NHA, Govt. of GB has to be taken by the Contractor in this regard.

7.11.4 Waste Management Plan

Management of solid and hazardous waste is one of the most important issues during construction phase of the Project. It is estimated that around 60 workers will be accommodated at construction camps (total of about 02 camp sites) during construction phase.

The major components of the workers' camp waste are garbage, putrescible waste, rubbish and small portion of ashes and residues, wastewater from camps toilets and washing yards, etc. The construction waste will include wastewater, oil spillage from machinery and solid waste (damaged or spoiled materials, temporary and expendable construction materials, etc.). Insecure and unhygienic disposal of the wastes may cause degradation of soil, land and water resources. However, a criterion has been developed for the solid and hazardous waste management at site. The criterion for plan is as follows:

- All the anticipated solid wastes will be collected through a properly designed solid waste management system. Enough number of containers will be placed inside the camps and within the construction area for the collection of various types of waste;
- These containers will help the component separation of various types of waste at source. Classification will be based on organic waste, recyclable waste, reusable waste (for resource and recovery) and waste for disposal site. Based on the conditions of the region, organic waste will be frequently collected to avoid odor problems;

- Recyclable, reusable and waste for disposal site will be collected twice a week and on alternate days and will be transferred to a properly designed disposal site;
- The special strategy for safe handling, storage and use of hazardous substances/material will be developed and ensured at site;
- The sewage system for camps shall be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters;
- Lined wash areas shall be constructed within the camp site or at site, for the receipt of wash waters from construction machinery;
- Medical waste and construction waste will be handled with care;
- The pesticide use shall not be allowed at site and for clearance of RoW;
- Construction waste i.e. waste concrete, bricks, cement, etc. will be disposed of at the designated areas; and
- Construction workers and supervisory staff will be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of the waste for disposal.

Based on the above guidelines, Contractor(s) will be responsible for the preparation of Waste Management Plan before the commencement of construction activities and its implementation at site after the prior review and approval from SC and proponent.

7.11.5 Disaster Management Plan

A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community ‘s or society ‘s ability to cope using its own resources. Disasters are of two types i.e., Natural and Manmade.

The flooding, earthquake, wind storms are the major disastrous phenomena in the region. The mountainous terrain makes the community as well as worker more vulnerable to disasters. The development of poor infrastructural measures, poses greater vulnerability risk in relation to the onset of potential disasters. In such cases, even a moderate disaster could bring devastating effects on communities.

The Provincial Disaster Management Authorities (PDMAs) of Government of GB are mandated for planning, implementing and coordinating all activities in case of the onset of a disaster. Therefore, there is a specific requirement for developing a plan that effectively responds to any Monsoon induced emergency. PDMA specialize in mitigation, preparedness and an organized response to a disaster. The most important role of PDMA lie in providing a platform to come together and strategize management and response to disasters and calamities.

7.11.6 Drinking Water Supply and Sanitation Plan

Separate water supply and sanitation provisions will be needed for the temporary facilities including offices, labour camps and workshops in order not to cause shortages and/or contamination. A Plan will be prepared by the Contractor on basis of the mitigation plans. The Plan will be submitted to the SC for their review and approval before contractor mobilization.

7.11.7 Traffic Management Plan

A comprehensive Traffic Management Plan (TMP) will be developed by Contractor mentioning routes to be followed for transportation of construction machinery and materials e.g., cement, steel, gravels, sand, etc. Traffic Management Plan will comprise following contents necessarily:

- Goals and objectives of plan;
- Purpose & Scope;
- Project specific traffic;

- Roles & responsibilities of contractors' environmental personnel;
- Routes to be followed along with necessary maps;
- Transportation timing; and
- Mechanism to address road accidents (if occurs).

7.11.8 Change Management Plan

The present EIA has been carried out on the basis of the Project information available at this stage. It is however possible that the changes are made in some components of the Project during the design and construction phases. In order to address the environmental and social implications of these changes, a simple framework has been devised, which is described in this section. The change management framework recognizes the three broad categories (A, B & C) of the changes in the Project as detailed below:

Category 'A' Change: The 'Category A' change is one that will lead to a significant departure from the Project described in the EIA and consequently requires a reassessment of the environmental and socioeconomic impacts associated with the change. In such an instance, NHA, Govt. of GB will be required to conduct a fresh EIA of the changed aspect of the Project design and send the updated report to the relevant agencies for approval. Some of the examples of category "A" changes are briefed below:

Change in the route of Hasilpur-Bahawalnagar Road by more than 05 km of the original alignment or a change in the route by less than 10 km, but the changed route has environmental and/or social sensitivity more than the original route. Increase in the Project length exceeding 20 % of the original design, or increase in the length by less than 20% but involving areas which are more sensitive – environmentally and/or socially – than the original route.

Category 'B' Change: The Category 'B' change is one that will entail Project activities not significantly different from those described in the EIA, which may result in the Project effects with overall magnitude to be similar to the assessment made in this report. In case of such changes, the EIA will be required to reassess the environmental and socioeconomic impacts of the activity, specify additional mitigation measures, if necessary and report the changes to the relevant agencies (Contractors & GB-EPA). Examples of such changes are provided below.

Changes in the Hasilpur-Bahawalnagar Road Project route by more than 01 km but less than 05 Km of the original alignment or increase in the Project length exceeding 10 % of the original design, but not exceeding 20%, provided that the extended route does not have environmental or social sensitivity.

Category 'C' Change: A Category 'C' change is one that is of little consequence to the EIA findings such as change in alignment less than 01 km. This type of change does not result in effects beyond those already assessed in the EIA; rather it may be made onsite to minimize the impact of an activity, such as re-aligning a particular section to avoid cutting a tree, or relocating construction campsites to minimize clearing vegetation. The only actions required for such changes are informing all the key personnel and document the change.

7.11.9 Dust Control/ Water Sprinkling Plan

During construction stage, the dust level may increase considerably. All earthworks construction, site clearing, stockpiling, operation of batching plants and hauling of materials will generate dust and affect the local air shed. Local people and the workers may be exposed to high dust levels during landscaping, access road and site preparation. Therefore, a separate dust control / water sprinkling plan will be developed by the Contractor on the basis of mitigations provided in Chapter-7 particularly for active construction sites. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

7.12 Chance Find Procedure

The purpose of these guidelines is to address the possibility of archaeological deposits, finds and features becoming exposed during earth removing and ground altering activities associated with the construction and to provide procedures to follow in the event of a chance archaeological find. The detail is given in Annex VIII

7.13 Codes of Practice

The Contractor will seek to develop codes of practice for its staff and employees in order to ensure that the intrusion of workers in the Project Area does not result in any social and environmental and social issues between the workers and locals which can harm the Project by causing unnecessary delays.

These codes will be based on the principles of environmental protection, occupational health and safety, good engineering practices, respect, integrity and sound ethical values. Each code will include, at minimum, the purpose and objectives, a policy statement from the in charge explaining the importance of this code for the success of the Project, and examples of such conduct. Guidelines for the code of practices are discussed below.

7.13.1 General

General code of conduct will be developed for the Project and will include, at minimum, the following practices:

- Rules and guidelines will be given to the workers regarding the use of common resources such as wood, plants, water sources etc. to ensure their sustainable use;
- The code will also include provisions of the solid waste management plan to address solid waste collection and disposal in order to prevent unhygienic conditions and contamination of soil and water;
- The Contractor will be made arrangements to avoid accidental risks such as traffic signs board and speed control measures for the safety of locals;
- In construction camps, amenities of life including clean food, water and sanitation facilities must be provided to these camps, and the workers will be provided with guidelines on how to dispose of their waste and maintain a sense of hygiene;
- The training of workers in the construction safety procedures, equipping all construction workers with Personnel Protective Equipment (PPE) i.e., safety boots, helmets, gloves, ear plugs, and protective masks also and monitoring their proper and sustained usage;
- The Contractor will ensure that the construction labor is trained in safety procedures for all relevant aspects of construction;
- Formal emergency procedures will be developed for construction site in case of an accident. First Aid Kits and other necessary equipment will be kept available at site along with the list of emergency phone numbers at the construction site to be contacted in case of any accident; and
- The safety of the public at all stages of the construction and operation will be ensured by appropriate public education and safety measures such as use of sign boards, barriers and flags and use of proper illumination at night.
- Construction workers are predominantly younger males. Those who are away from home on the construction job are typically separated from their family and act outside their normal sphere of social control. This can lead to inappropriate and criminal behavior, such as sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors from the local community. Contractor will be bound to chalk out the code of conduct and keep provisions of construction workers' trainings with regard of gender-based violence.

7.13.2 Good Engineering Practices

Good engineering practices will be developed for the Project and will include, at minimum, the following practices;

- Standard Operating Procedures (SOPs) for handling, storage and transportation of oil leakages, chemicals and other toxic materials will be strictly followed;
- Workers must be familiar with the Material Safety Data Sheets (MSDS) of each chemical used at site. MSDS are provided with each chemical drum. Chemicals will be stored as per their MSDS. Utmost care will be taken during the handling of these chemicals;
- Precautions will be taken to prevent spills and all workers will be trained in proper handling, storage and disposal of hazardous or toxic materials; and
- Proper disposal plans of excavated material.

7.13.3 Cultural Norms

Cultural Code of Practice will be developed for the Project and will include, at minimum, the following practices:

- Self-respect and sensitivity to insult is an important trait of the locals. The poorest among them has his own sense of dignity and honor and he vehemently refuses to submit to any insult. In fact, every inhabitant considers himself equal if not better than his fellow tribesmen and an insult is, therefore, taken as scurrilous reflection on his character. So, the contractor will be careful to avoid any unceremonious interaction with the locals and inform their staff to be humble and polite.
- The Contractor will also take care of the norms of local community and their sensitivity towards local customs and traditions;
- The Contractor will brief the staff about local culture and norms;
- Contractor will strictly warn the staff not to involve in any unethical activities and to obey the local norms and cultural restrictions particularly with reference to women;
- The Contractor will be required to maintain close liaison with the local elders and religious scholars of nearby local community to ensure that any potential conflicts related to common resource utilization for the Project are resolved easily;
- Privacy of women is a major cause of concern for the communities of the Project Area. Due to the Project activities, local women may not be able to perform their daily outdoor chores. Women in the Project are participating in other outdoor activities such as livestock rearing, bringing of potable water, collection of fire wood etc. that may be affected by the Project activities;
- The Contractor will have to select the specific timings for the construction activities so as to cause least disturbance to the local population particularly women considering their peak movement hours; and
- The Contractor will warn the staff strictly not to indulge in any un-ethical activities and to obey the local norms and cultural restrictions particularly with reference to women.
- Awareness will be created among the local communities about the adverse impacts of child labor. For the public awareness, meetings will be held in the project area, and announcements will be made using the available local platforms with the involvement of all sectors of the society; and
- Contractor through contractual agreement will be bound to follow the labor standards, rules and regulations during hiring the labor force and all activities will be monitored by the social and environmental staff of the implementing agency.

If privacy of the nearby households is to be affected, the Contractor will inform the house owner in advance to make some alternative arrangements. Similarly, the Contractor will have to take

great care that the construction activities will not affect the privacy particularly with reference to women.

7.14 Public Disclosure

NHA, Govt. of GB will disclose this EIA to all the stakeholders prior to the start of the construction. This report will be made available to the stakeholders at places as designated by the GB-EPA. This will ensure the locals to be aware of the Project impacts, its mitigation, responsible staff and mode of implementation. In addition, the executive summary will also be published on NHA, Govt. of GB website.

7.15 EMP Cost

The cost for EMP will be part of the contract document with the Contractor. It must be noted that environmental cost will not be a separate entity because all of its components will be addressed in the bidding document under various heads of account. For instance, tree plantation will be a part of landscaping, etc. The annual estimated cost for the implementation of environmental monitoring for both sections of the proposed Project is given in Table 7-4 along with sampling parameters and frequency during construction and operational phases.

The total estimated cost for the environmental and social management, monitoring and auditing during pre-construction, construction and O&M (annual cost and will be updated for next upcoming years accordingly) comes to about PKR 102 million. The cost is inclusive of preliminary resettlement budget.

7.16 Environmental Mitigation (Plantation) Cost

EMP Cost

The cost for EMP will be a part of the contract document with the Contractor. The same may also be included in the total project cost for the implementation of EMP. The cost required for PPEs for one hundred (100) staff including skilled and unskilled during the whole construction stage for twenty-four (24 months) is given in the Table 7.4

Table 7-4: Cost of PPEs

Items	Quantity	Cost/Item (Rs)	Total Cost (Rs)
Dust Masks	19200	20	384,000
Safety Shoes	800	2000	1,600,000
Gloves	9600	300	2,880,000
First Aid Box	4	5000	20,000
Ear Plugs	800	30	24,000
Safety Helmets	400	1500	600,000
Safety Jackets (Hi Vis)	800	600	480,000
		Total	**5,988,000**

Table 7- 5: Cost of Implementation of EMP

Sr. No	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKR)	Remarks
A. Pre-Construction Phase							
A-1	Environmental management Cost						
1.	Water Resources/ Water Quality	Discrete grab sampling and laboratory testing of water samples by EPA approved Laboratory for monitoring	Once	20,000	12	500,000	One-time monitoring shall be carried out before the Mobilization of Contractor. Groundwater Samples=3 Wastewater/ Surface water Samples=3
2.	Noise Levels	dBA Leq. as per NEQS	Once	5,000	12	125000	
3.	Ambient Air Monitoring	Monitoring of Parameters as NEQS (for Vehicular emissions) & (for ambient Air and Noise) by EPA approved Laboratory	Once	70,000	6	840,000	
	Sub-Total (A-1)					**1,465,000**	
	B. Construction Phase						
B-1	**Environmental Monitoring Cost**						
1.	Water Resources/ Water Quality	Discrete grab sampling and laboratory testing of water samples by EPA Laboratory for monitoring.	Once	20,000	12x4	900,000	Quarterly monitoring cost for the one (01) years construction period and will be updated each year based on latest rates during construction timeline of the proposed Project. • **Drinking** Water/Groundwater Samples=3

Sr. No	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKR)	Remarks
							Wastewater / Surface water Samples=3
2.	Noise Levels	dBA Leq. as per NEQS	Once	6,000	12x4	288,000	
3.	Ambient Air Monitoring	Monitoring of Parameters as NEQS (for Vehicular emissions) & (for ambient Air and Noise) by EPA approved Laboratory	Once	70,000	6x4	1,680,000	
Sub-Total (B-1)						**2,868,000**	Environmental Monitoring Cost for one (01) year
						5,736,000	Environmental Monitoring Cost for two (02) year
B-2. Environmental and Social Management Cost							
1.	Environmental Officer	Environment Personnel will monitor/ conduct all environment and HSE related activities e.g. monitoring, PPEs, housekeeping, safety signage, emergency preparedness, etc.	Monthly	100,000		2,400,000	This is the tentative monthly cost for two (02) years period for one senior and one junior expert along with their monthly logistics
			Lump sum (5,000,000)			5,000,000	Cost for PPEs, extinguishers, emergency lights, housekeeping equipment, safety Signage and barricade, emergency preparedness kit, first aid kit, etc.
2.	Social Officer	Monitoring of social related issues, carry out consultations with locals, Assess the resettlement implementation	Monthly	100,000		2,400,000	This is the tentative monthly cost for two years period for one senior and one junior expert along with their

Sr. No	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKR)	Remarks
		efficiency, effectiveness, impact and its sustainability, Status of redressed of community complaints and time spent to resolve the community grievances etc					monthly logistics.
3.	Training Cost	R4a.	Monthly	150,000		3,600,000	This is the tentative monthly cost for two years period.
4.	Communicable Diseases	Tests should be performed by approved laboratory	Yearly	2000,000		4,000,000	This is the tentative cost for two (02) years period for medical tests of kitchen staff at each came site.
5.	Personal Protective Equipment (Face masks, gloves, sanitizers, safety helmet etc.)	Ensure the provision of PPEs to combat with Covid-19 and health and safety issues.	yearly	2,994,000		5,988,000	This is the tentative cost for two years period.
Sub-Total (B-2)						**23,388,000**	
Sub-Total B ((B-1) +(B-2))						**29,124,000**	Tentative for two (02) years project construction period. The cost shall be updated based on the current market prices during construction chase.
C. OPERATION & MAINTENANCE PHASE (One Year cost)							
C-1	**Environmental Monitoring Cost**						

Sr. No	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKR)	Remarks
1.	Water Resources/ Water Quality	Discrete grab sampling and laboratory testing of water samples by EPA approved Laboratory for monitoring.	Once	20,000	3	60,000	Biannually monitoring cost for the one-year O&M Phase and will be reproduced for next years of O&M based on updated rates. Groundwater Samples=3 Wastewater/ Surface water Samples=3 Noise Samples=3 Ambient Air Samples = 3 Biannual monitoring cost for the one-year of operational period will be updated based on latest rates
2.	Noise Levels	dBA Leq. as per NEQS	Once	5,000	1	5,000	
3.	Ambient Air Monitoring	Monitoring of Parameters as NEQS (for Vehicular emissions) & (for ambient Air and Noise) by EPA approved Laboratory for monitoring.	Once	70,000	1	70,000	
	Sub-total (C-1)					**135,000**	
C-2	**Environmental and Social Management Cost (Optional)**						
1.	Environmental Officer	Environment Personnel will monitor/ conduct all environment and HSE related activities e.g. monitoring, PPEs, housekeeping, safety signage, emergency preparedness, etc.	Monthly		100,000	2,400,000	This is the tentative monthly cost for two (02) years period for one senior and one junior expert along with their monthly logistics

Sr. No	Parameter	Mechanism	Frequency	Unit Rate (PKR)	Quantity	Cost (PKR)	Remarks
2.	Social Officer	Monitoring of social related issues, carry out consultations with locals, Assess the resettlement implementation efficiency, effectiveness, impact and its sustainability, Status of redressed of community complaints and time spent to resolve the community grievances etc	Monthly		150,000	2,400,000	This is the tentative monthly cost for two years period for one senior and one junior expert along with their monthly logistics.
Subtotal(C-2)						**4,800,000**	
Subtotal C (C-1 +C-2)						**4,935,000**	
Grand Total (A+B+C)						**35,524,000**	
Contingency Cost (10%)						**3,552,400**	
Grand Total with Contingencies						**39,076,400**	

7.17 Environmental Technical Assistance and Training Plan

In order to raise the level of professional and managerial staff, there is a need to upgrade their knowledge in the related areas. Director Environment (EALS) should play a key role in this respect and arrange the training programs.

NHA (EALS) will train the SC to effectively implement the EMP, and SC will train the contractor to prepare the site specific EMP and its implementation. The contractors will train its staff about the best environmental management practices at the construction site and implementation of the EMP.

The training modules will include air, noise and water pollution monitoring, social awareness, Environmental Laws, National Environmental Quality Standards (NEQS), Usage of personal protection equipment's, and health and safety related issues on the construction site.

The contractor will train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of Sexually Transmitted Infections (STI) HIV/AIDS and in general health and safety matters, and on the specific hazards of their work. Training should also consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation.

8. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

8.1 General

Consultations initiated during the scoping reconnaissance visits was continued during the whole field survey for EIA studies. Stakeholders are identified, categorized and consulted at district and village levels, including, both direct and indirect stakeholders. The consultation methodology is comprised of village meetings with presentations and focus group discussions.

Given the dimension and nature of the Project, project management are committed for undertaking public consultation at all levels from Government to locals as a part of Project planning/design, getting necessary environmental permissions/NOCs, land acquisition, compensation for land and other assets and management of infrastructures.

Under the proposed Project, public consultation was carried out with all the relevant Government departments, concerned individuals, institutions, and locals of all accessible villages in the AOI. These consultations were conducted during the baseline survey which was carried out during the month of March 2023.

During the consultations with the locals, the major categories participated in public consultation were local population, community groups, landowners, businessmen and tenants belonging to the AOI.

Feedback received during reconnaissance and scoping included land acquisition and resettlement issues, impact on livelihood, archaeological aspects of the area and inclusion of chance find procedures in EIA, compliance with local norms and privacy of women, solid waste generation, vibrations in the area, potential contamination of surface and groundwater, air emissions, compliance with National Environmental Quality Standards (NEQS).

8.2 Objectives

Stakeholder consultations were carried out keeping in view the following major objectives:

- Sharing information with government authorities, local communities and affected persons on the proposed Project activities and expected impacts on the physical, ecological and socio-economic conditions of the AOI.
- Promote better understanding of the project, its objective, and its likely impact.
- Identify and address concerns of all interested and affected parties of project area.
- Provide a means to identify and resolve issues before plans are finalized and development commences, thus avoiding public anger and resentment and potential costly de- lays.
- Encourage transparency and inculcate trust among various stakeholders to promote cooperation and partnership with the communities and local leadership.
- Recording the feedback of public, in order to develop a mechanism to address their issues and other local level concerns and incorporation of the outcomes in final decision making.

8.3 Stakeholders Mapping

The first step involved for the stakeholder consultation, is the identification of stakeholders. Identification of stakeholder is an important step which ensures that all stakeholders are identified and classified as per their role about the Project. The Project identified primary as well as secondary stakeholders which as defined below:

8.3.1 Primary and Secondary Stakeholders

As per definition, stakeholder is an entity which is concerned with the proposed Project in any way. As per the Pakistan EPA Guidelines for Public Consultations and legal procedures, stakeholder consultations were carried out with the indirect Affected Persons, general public, relevant Government departments in Gilgit Baltistan. Interviews of key informants were also conducted during these consultations. To collect data, important social indicators such as gender, ethnicity, caste, age, decision making, access to basic amenities, resources, opportunities, and ability to cope with the disasters.

Project has both primary as well as secondary stakeholders. Primary stakeholders are those who are directly concerned with the Project. The primary stakeholders include all those who are the direct affected due to the loss of assets and conditions, general public and women that are located in the Area of Impact. Moreover, during the construction stage, nearby population of the project will be affected due to construction activities.

Under the proposed Project, public consultations with the locals were carried out in the nearby villages of AOIs in the valley. Similarly, other stakeholders of this Project include the local Governments of both the provinces, District level concerned departments (public or private) which are involved in the planning, implementation and operation of the Project such as SMART/Concessionaire, Mining, Tourism, Forest, Agriculture, and Wildlife.

8.3.2 Concerned Agencies/Departments

Table 8-1: Role of Concerned Agencies/Departments

Project Stakeholders	Roles
EPAs	Recently due to the 18th amendment Pak EPA has delegated all its Powers to the provincial EPAs. Now the Provincial EPAs are the responsible for the protection of the environment as per GB Environmental Protection Act of 2014, respectivelyand all its provisions. EPA are responsible for the issuance of NOCs for the Proposed Project.
National Highway Authority	National Highway Authority is the Project Proponent of the proposed Project. SMART/ Concessionaire will operate and maintain proposed project.
GB Forest & Wildlife Departments	The project is expected to involve clearing of vegetation and trees within the proposed project area. The project Proponent will be responsible for acquiring a "No- Objection Certificate' (NOC) from the respective Forest Departments and Local Administration. The application for a NOC will need to be endorsed by the proponent. Where construction is to be carried out in proximity of protected community forests and wildlife areas, the proponent is required to coordinate with the departments to ensure that impacts on vegetation and wildlife are minimized.
Mining Departments	For excavation, Blasting and Use of aggregate proper approval will be taken by the proponent before the execution of works.

Tourism Department	As the KKH is the busy highway during summer season, Thousands of local tourists as well as international tourist also visit GB, the contractor will ensure a traffic management plan in all his active construction sites for smooth flow of traffic.

8.3.3 Consultation Process

Stakeholders are consulted during informal and formal meetings held in the project area. The consultation process is carried out in the Urdu, and Pashto languages. During these meetings, a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact. This was followed by an open discussion allowing participants to voice their concerns and opinions. In addition to providing stakeholders with information on the proposed project, their feedback was also documented during the stake-holder consultation. The issues and suggestions raised were recorded in field notes for analysis and interpretation.

By reaching out to a wider segment of the population and using various communication tool such as participatory needs assessment, community consultation meetings, focus group discussions, in-depth interviews, and participatory rural appraisal. EIA will involve the community in active decision-making. This process will continue even after the EIA has been submitted to EPA.

Stakeholder consultations are more formal with representatives from Government departments including NGOs, Mining Department, Disaster Management Department, Forest Department, etc.

8.3.4 Information Disclosure

A series of public consultations was required to get the feedback/ concerns of the different category of stakeholders including potentially affected persons, local community and other general public located in the AOI and concerned officials. Thus, total 11 formal consultations/ group discussions were carried out with the local community & general public, followed by data collection & census activities. Summary of consultations/ consultative meetings is presented in below Table.

Table 8-2: Summary of Participants

Sr. No.	Village	Number of Participants	Co-ordinates
1.	Raikot	08	35°29’29.20” N 74°35’30.21” E
2.	Drang	09	35°28'58.33" N 74°30'39.85" E
3.	Gohar Abad	10	35°29’10.25” N 74°30’39.34” E
4.	Sunai Wal Khund	06	35°24’33.94” N 74°22’53.78” E
5.	Governor Farm	10	35°24’13.28” N 74°12’30.24” E
6.	Gheeni	05	35°24'14.57" N 74°12'36.55" E
7.	Thore	06	35°29'4.32" N 73°55'6.10" E
8.	Jalipur	07	35°24’26.84” N 74°19’45.16” E
9.	Chilas	12	35°25’22.71” N 74° 5’37.93” E

10.	Hadur	05	35°30’59.20” N 73°47’11.26” E
11.	Marsuki	04	35°29’11.52” N 73°51’38.05” E

8.3.5 Stakeholder Consultation Program

Detailed and comprehensive meetings were conducted with landowners of all the agricultural land likely to be acquired for this project, followed by consultation with direct affectees i.e., landowners.

It was noted that most of the stakeholders, both primary (affected people) as well as secondary (government departments) were well aware of the project interventions and most of them were already consulted at earlier visits.

8.3.6 Consultation with Project Affected Persons

The primary stakeholder’s i.e., landowners, whose land will be acquired due to the construction of the Highway will be consulted throughout the project cycle, up to the construction. Detailed consultative meetings were held with landowners followed by the census activities to assess extents of their actual demands. The list of all consulted persons and their concerns is presented in Below Table 8-3.

Table 8-3: Concerns of the local/affected persons in the project area

Sr. No.	Village	Name	Father Name	Remarks
1	Raikot	Mehboob Ur Rehman	M.kamal	• Livelihood & access to rest of the land will be affected. • It will affect agriculture land. • Livelihood of the people will be affected. • Compensation should be given on market rate.
		Muhammad Yousaf	Haji Sulaiman	
		Najeeebullah	Laiqat Ali	
		Rehmat Hussain	M.Yousaf	
2	Gohar Abad	Maqsood	Guldad	• Agriculture land is the only source of income for most of us. • It will affect agricultural land. • Livelihood of the people will be affected. • Compensation on market rate.
		Lateef	Shaber Khan	
		Waqar Younas	M.Nawaz	
		Alamzeb	Malak Jan	
		Mir Afzal	Rehayash Khan	
		Saif Ur Rehman	Akhbar Khan	
3	Drang	Rahmanullah	Bakht Reham	• Agriculture land in the valley is limited, there-fore, protect agriculture land as much as possible. • The proponents should immediately repair water courses affects during construction. • No industries and other sources of income in this area, majority people are dependent on agriculture.
		Razal Rehamn	Gul Rehman	
		Anwar Ullah	Nasir Uddin	
		Ihsan Ullah	Gul Rangez	
		Fazal Rehman	Sarwar Khan	
4	Gheeni	Yousaf Khan	Sharbaz	• Compensation should be paid on market rates. • Total destruction of agriculture land. • Livelihood of the people will be affected due to loss of agricultural land.
		Amanullah	Sultan e Room	
		Rozimand	Dilaaf	
		Shakeel	Ayoub Khan	
5	Hadur	Abdur Rehman	Muhammad Jan	• No industries and other sources of income in this area, majority people are dependent on agriculture. • Privacy of the villagers will also be disturbed. • No other source of income for people who will lose their agricultural land. • Livelihood of the people will be affected.
		Zardad Khan	Muhammad Dar	
		Pir Dad Khan	Muhammad Dar	
		Syed Rehmat	lajeel	
		Liaqat Wali	Ghulam Haider	
6	Sunai Wal Khund	Zaboor	Said Khan	• Privacy of the villagers will also be disturbed. • Compensation should be made on or above the
		M.Zaman	Inayat Khan	

Sr. No.	Village	Name	Father Name	Remarks
		Sher Jehan	M.zaman	market rates. • Agriculture land is the only source of incomefor the affectees. • No other source of income.
		Amir Khan	Faqeer Khan	
7	Pattan	Shah Nawaz	Fazal Haq	• Water courses will affect during construction. • Local people should be hired in the construction and operational phase. • Disturbance to local people to be avoided.
		Noor Rehman	Syed Jamil	
		Khan Bahadar	Syed Johar	
		Saren Zeb	Gul Muhammad	
8	Chilas	Mir Hassan	Daali	• Local people should be hired in the construction and operational phase. • Disturbance to local people to be avoided. • Privacy of the villagers will also be disturbed. • Compensation should be made on or above the market rates.
		Sohail Ahmad	Saeed Ahmad	
		Alam	M.Taajil	
		Fazal Sadiq	Mustaqeem	
9	Burandas	M.Ayub	Baber Khan	• Agriculture land is the only source of incomefor most of us. • It will affect agricultural land. • Livelihood of the people will be affected. • Compensation on market rate.
		Idress Ahmad	Baber Khan	
		M.Ismail	M.Ibrahim	
		M.Zakir	Khushal	
		Raza Khan	Sharam	
		Kiramat Ullah	M.Wakeel	
10	Governor Farm	Ihsan Ullah	Jumoor Khan	• Livelihood & access to rest of the land will be affected. • It will affect agriculture land. • Livelihood of the people will be affected. • Compensation should be given on market rate.
		Kiramat Ullah	Nawab Khan	
		Imran	Walayat Said	
		Khan Muhammad	Abdur Razaq	
		Mumtaz Khan	Lajbar Khan	
11	Thore Das	Abdul Ghayas	Abdul Wakeel	• Compensation should be paid on market rates. • Total destruction of agriculture land. • Livelihood of the people will be affected due to loss of agricultural land.
		Raanzeb	Abdul Nasir	
		Barkat	Jamadar	
		Sana	Abdul Majid	
		Sadam Hussain	M.Hussain	

8.3.7 Summary of Stakeholders Concerned

These are the followings concerns of the affectees people:

- Priority should be to Rehabilitate the existing Highway.
- Devaluation of the remaining property.
- Livelihood & access to rest of the land will be affected.
- If it's not possible than market rate compensation should be paid to the affectees.
- There should be proper safety walls/parapet/fencing to be built along the Highway.
- Agriculture land (i.e., extremely limited land) is the only source of income for most of us.
- Service lanes/corridor to connect both sides of the valley.
- Construction of Bridges should be considered for all villages in the project area.

Fair compensation will be provided to the project affectees before the commencement of the project along with all the above-mentioned concerns will be duly encountered during construction and operational phase.

8.3.8 Consultation with Government Officials

A series of consultations in detail were held with various stakeholders to get their feedbacks regarding environmental, social issues and other project related concerns during the months of March 2023. Below table respectively present consultation details in government departments/. Non-governmental departments. The photolog is presented to the end of this chapter.

The consultants` experts explained the proposed project and its impacts to the Government officials in concerned districts. Following are the main points of discussion in the below Table during the consultation.

8.3.9 Follow-up Consultations

EIA surveys were carried out in March 2023 in the AOI. During surveys, detailed consultations were conducted with the locals. Stakeholder consultations are proposed to be conducted at construction and operational stages of the Project. The institutional responsibilities for construction and post-construction stage consultation lie with the Executing Agency (EA), i.e., NHA.

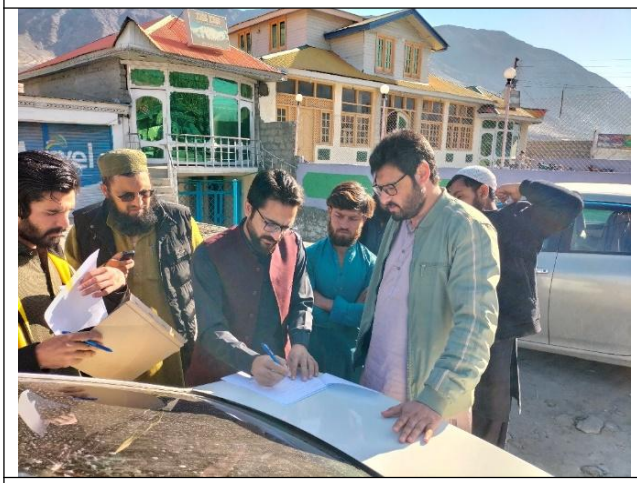
Table 8-4: Consultation with Govt. Departments

Sr. No.	Name	Designation & Department	Contact Info	Views
1.	Munawar Hussain	Deputy Director GB-EPA	0312-9730340	• Considering Sharps curves in design to be replaced by Tunnels. • The width of the road should be widened. • Retaining walls should be constructed as per slope stability. • Slope stability management plan to be prepared during the construction stage.
2.	Safiullah	Deputy Director Development Tourism Department	058-11920573	• Traffic management plan to be prepared on priority basis to avoid traffic hurdles for tourist. • Tourist police must be support during the construction phase. • Proper solid waste management system should be established during the construction phase. • Enhanced tourism activities in the area and state which in many terms will boost the local economy. • Travel time for tourists will decrease after the construction of Swat KKH realignment from approximately 3 hours.
3.	Osaf Ahmad	Deputy Director Exploration, mines & Minerals Department	0355-5555540	• Coordination with mines and minerals department will be on regular basis to get approval for aggregate/ • Before finalization of design, a joint visit to be conducted to identify minerals sites.
4.	Haroon Gul	Assistant Director, District Disaster Management Authirity	0321-5513897	• Tatta pani area to be visit before design phase by the engineers, as this area is slide prone and accident are occurred on regular basis. • During excavation, the rocks should not be dumped down to the river. • As in GB part of the project the slide occurs on regular basis, also this area is on fault line and earthquake are occurred on routine base. Therefore, an Electrical Resistivity Survey should be conducted before the design stage. • Flash floods also to be consider in the design phase.
5.	Khalid Amwar	Assistant Commissioner Darail	0355-5611165	• The locals should be compensated as per market base rate, most of the people have already been suffered by the construction of Diamer Basha Dam.

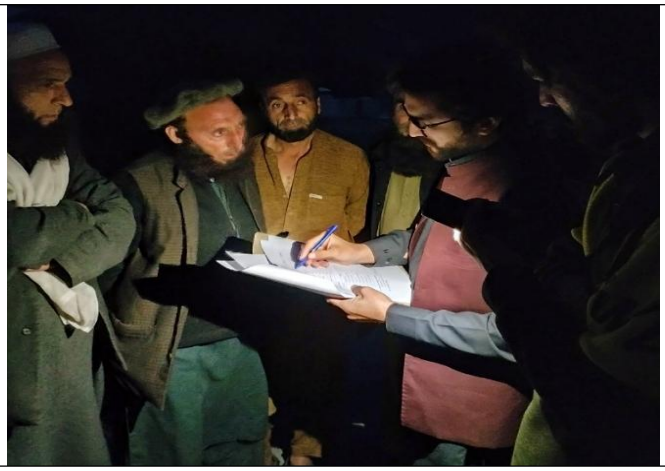
Sr. No.	Name	Designation & Department	Contact Info	Views
				• Lightning and security to be prioritized during the construction phase to avoid emergencies and accidents.
6.	Piyar Ali	Program Manager, AKRSP	0355-5723899	• As the project is proposed in a mountainous area, and the local people have limited area for agriculture, therefore the agriculture land should be avoided whereas it is possible. • Desert plantation to be made a part of the project. • Tourism spots should be avoided.
7.	Naeemullah	Agriculturist AKRSP	0355-5723899	
8.	Fazal Haq	Divisional Operational Manager	0333-5712966	• Control blasting management plan to be implemented during construction phase. • Water sprinkling to be done on regular basis to avoid bust pollution. • Along the highway trees must be planted.
9.	Shertullah	Agriculture Officer, ETI	0355-4165444	• Agriculture land should be avoided in the design of the project. • As some part of the project falls in arid region, so there is a chance that the temperature will be increase dur to high traffic flow and it will ultimately affect the glaciers in the region, and it will cause flooding in the area.
10.	Dr. Didar Ahmad	District Climate Officer	0314-5077945	• Local Species should be protected. • During construction phase local cultural should be projected as there will a lot of peoples come from outside of the project area. • Blasting should be controlled to avoid disturbance to wildlife in the project area, as the project area is rich in wildlife diversity, also there are some birds that is near to extinct, that should be protected. • Also, excess number of explosive materials will be used for blasting that will directly affect the human health in the project area. • In the alignment of the proposed project, private land should be avoided, as the locals are already suffered from the Diamer Basha Dam. • Local community should be trained regarding environment and social issues arising from the project, as well as regarding safety. • Crime rate will also be increase with this project as the local people has no other source of income except agriculture. Therefore, agriculture land should be avoided during the design of the project.

Sr. No.	Name	Designation & Department	Contact Info	Views
11.	Shabir khan	Forest Officer	0355-5380611	• Community forest should be protected during construction phase as all the local are totally depended by the forest. • Roadside plantation should be made a part of the project. • Tunnel should be prioritized in the design phase where the cures are sharp and steep. • The area is mostly arid region so, Poplar, Kikar, Deodar and Eucalyptus must be planted along the road side.
12.	Muhammad Shafi	Deputy Director (ILC) Mines and Minerals Department, Chilas	0355-4480044	• Project must be complied with Child Labour Act 2020, Force Law, Minimum wadges Policy and Industrial Law. • Harassment of women should be considered in the Social Development Plan. • Technical college/training center must be included in the SDP schemes. • Vocational training should be given to local before the execution of works that local people may hired in the construction phase. • Also, the project has some positive impacts on the area, it will boost the economy, tourism, industry and also the good will be transported easily to the area.

Photolog: Community Consultation and Institutional Consultation

Community Consultation	
	
Consultation with the Community in Raikot	**Consultation with the Community in Sonai Wal Khund Village**
	
Consultation with the Community in Governor Farm Village	**Consultation with the Community in Gheeni Village**
	
Consultation with the Community in Chilas	**Consultation with the Community in Hadur Village**

Consultation with the Community in Jalipur Village



Consultation with the Community in Marsuki

Institutional Consulatation

Meeting with Deputy Director and Assistant Director GB-EPA

Meeting with Deputy Director Tourism Department

Meeting with Deputy Director Mining and Minerals Department

Joint Meeting with Assistant Commissioner Darel and Assistant Director District Disaster Management Authority

	
Meeting with Program Manager and Agriculture Officer at Agha Khan Rural Support Program (AKRSP)	**Meeting with Divisional Operational Manager GBRSP**
	
Meeting with Agriculture and Admin Officer of ETI	**Meeting with District Climate Officer**
	
Meeting with Forest Department at Chilas	**Meeting with Deputy Director (ILC) Mines and Minerals Department Chilas**

8.4 GRIEVANCE REDRESS MECHANISM

8.4.1 General

A Grievance Redress Mechanism (GRM) will be established to prevent and redress community concerns, reduce risks, and assist the project to maximize social and environmental benefits, in addition to serving as a platform to resolve grievances. Generally, all project staff, management staff involved in the project, and government administrators will take on grievance handling as a responsibility. The GRM members should be qualified, experienced and competent personnel who can win the respect and confidence of the affected communities. Criteria for selecting members of GRM could include the following: knowledge of the project, its objectives, and outcomes; technical knowledge and expertise, e.g., engineering, environmental, geological; understanding of the social, economic, and cultural environments and the dynamics of the communities; capacity to absorb the issues dealt with and to contribute actively to decision-making processes; social recognition and standing; and an equitable of the community.

8.4.2 Objectives of GRM

The main objective of establishing GRM is to resolve problems in an efficient, timely and cost- effective manner in a cordial environment with the participation of all stakeholders including affected parties. The GRM shall describe the options available to the project for grievance redress. Any environmental or social impacts that would be adversely affecting the general public in the project area should be resolved through the GRM.

8.4.3 Awareness of GRM

GRM should be widely publicized among stakeholder groups such as the affected communities, government agencies, and community organizations. Lack of knowledge about GRM results in people not approaching and using it, and they eventually lose the importance and the validity of the purpose for which they were created. People should also be informed about their options, depending on the types of complaints, but should not be encouraged to submit false claims. Criteria for eligibility need to be communicated. An effective awareness campaign should be launched to give publicity to the roles and functions of the GRM and should includethe following components:

How complaints can be reported in the GRM and to whom, e.g., phone, postal address and email addresses of the GRM as well as information that should be included in a complaint; procedures and time frames for initiating and concluding the grievance redress process; and boundaries and limits of GRM in handling grievances.

8.4.4 Composition of GRC

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

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

- DD Environment
- Representative from APs
- Environmental Engineer of Supervision Consultant
- Environmental Engineer of Construction Contractor

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

8.4.5 Implementation of GRM

Stage 1:

When a grievance arises, (social, environmental or any other) the affected person may contact directly with the EPC Contractor and the project manager to resolve the issue of concern. If the issue is successfully resolved, no further follow up is required.

Stage 2:

If a solution is not found, the affected person/s will submit an oral or written complaint to the QA/QC & IE. In case of an oral complaint, the QA/QC & IE must make a written record and will instruct the EPC contractor to take corrective action. It will then review the EPC contractor'sresponse and undertake additional monitoring. The contractor during construction and the Operator during operation should convey the outcome to the QA/QC & IE.

Stage 3:

If no solution can be identified by the QA/QC & IE, or if the complainant is not satisfied with the suggested solutions under stage 2, the QA/QC & IE will organize a meeting under the auspices of Concessionaire/SMART, where all relevant stakeholders will be invited. The meeting should result in a solution acceptable to all and identify responsibilities and action plan. The contractor during construction phase and operator during operation phase should implement the agreed upon redress solution and convey the outcome.

Stage 4:

If the multi stakeholder hearing process is not successful, the client will inform the Project Directorate of Karakoram Highway (PDKKH). The PDKKH will organize special meetings to address the problem and identify its solution.

8.4.6 Type of Grievance

The following are some of the environmental issues could be subject for grievance from the affected people, concerned public and NGOs.

- Dust, noise and air pollution from construction activities
- Nuisance
- Intensive schedule of construction activities
- Inappropriate timing of construction vehicle flow
- Traffic Movement
- Water Pollution
- Waste disposal
- Disturbances to flora and fauna
- Health and safety
- Criminal activities
- Failure to comply with standards or legal obligations.

9. CONCLUSIONS AND RECOMMENDATION

9.1 General

The project envisaging realignment of Thakot-Raikot of KKH (Section-II), falls under category D (Other projects) specified in Schedule II of Pak-EPA Review of IEE and EIA Regulations 2000 and Gilgit Baltistan Environmental Protection, Act of 2014, for which EIA Study is required. This EIA study is conducted to fulfill the local legal requirements.

Three different alternatives have been developed for KKH by consultants, which nearly run parallel, traverses through existing KKH, rolling and hilly terrain involving major cut sections.

In continuation to above working, an additional Alignment was handed over to the consultants by the Authority, referred as Chinese Alternative consisting of a route which also passes through existing KKH, with high cut sections along mountains, provision of large tunnels, avoided built-up areas, bends replaced with a fairly straight tangent, provision of long span bridges up to Raikot. Chinese Option-4 for a length of approx. 292km is the most suitable, feasible and viable option for the KKH realignment. It not only bypasses major cities like Thakot, Besham, Pattan, Dasu, Chilas and Jalipur but also improve sharp curves with a considerable reduction in overall length of the project by providing 215 no. of bridges. It also contains 17 number of tunnels which not only improve the grade of the alignment but also reduce the impact due to landslide areas with bypassing rugged hilly terrain of existing KKH.

During the field surveys, significant efforts were made to identify the main physical, ecological, social, cultural and environmental issues related to the construction and operation of the proposed Project. Various stakeholders including government departments, agencies, local residents were also contacted for obtaining salient information in this regard. Following is the list of main issues and concerns:

- Permanent land acquisition;
- Relocation and resettlement;
- Cutting of trees/bushes falling within the proposed ROW;
- Disturbance to infrastructure and public utilities;
- Disturbance to the public movement during construction;
- Reduction in the daily routine activities of local residents during construction;
- Noise and air pollution due to the working of construction machinery during construction and traffic operation phases of the Project;
- Solid waste and wastewater generation during construction;
- Surface water bodies contamination due to soil erosion and construction activities; and
- Occupational and community health and safety issues.

After the construction of the proposed Project, people living in the Project Area and the road users / travelers will get the following benefits:

- Reduction in travelling time due to road remodeling;
- To accelerate the economic activity by providing smooth access to nationwide markets;
- During the construction phase, local labour will be accommodated in the construction activities leading to poverty alleviation; and
- To provide sustainable delivery of a productive and efficient national highway system contributing to decreasing transportation cost.

- To provide as a quick link between Gilgit Baltistan and rest of the country but will also help in improving trade between Pakistan and China.

9.2 RECOMMENDATIONS

The EMP, its mitigation and monitoring programs, contained herewith will be included within the Bidding documents for project works of all Project components. The Bidding documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own SSEMP which will adopt all of the conditions of the EMP and add site specific elements that are not currently known, such as the Contractors borrow pit locations. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

The EMP and all its requirements will then be added to the Contractors Contract, thereby making implementation of the EMP a legal requirement according to the Contract. Contractor will then prepare its SSEMP which will be approved and monitored by the Engineer with the assistance of SC environmental specialist. Will the Engineer note any non-conformance with the SSEMP (and the EMP) the Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the SSEMP the Contractor will employ an Environmental Manager to monitor and report Project activities throughout the Project Construction phase.

The proposed Project activities will have both positive and negative impacts to the environment. The EIA findings clearly show that Project will have socioeconomic benefits and, provided that the mitigation and monitoring actions defined in the EMP are fully implemented during the construction and operation periods, the Project will not have significant adverse environmental effects. Environmental management and monitoring plans have been prepared and responsibilities for implementation assigned.

Annexures

Annexure:I

Environmental Monitoring at Site Realignment of KKH (section-II) (HARZA Consultants (SMC-Pvt Limited)

GREEN ENVIRONMENTAL
laboratory & solutions

Ambient Air Quality Monitoring

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Raikot
Date of Intervention	03-March-2023 to 04-March-2023
Coordinates	35°29'24.5"N 74°35'01.2"E

Sr. #	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)
1.	17:00	0.32	9.75	23.47	33.23	13.13
2.	18:00	0.47	9.74	23.46	33.19	11.95
3.	19:00	0.62	9.40	22.40	31.81	11.52
4.	20:00	0.54	10.03	23.02	33.05	12.33
5.	21:00	0.55	10.41	23.40	33.81	12.82
6.	22:00	0.61	9.03	22.03	31.06	12.70
7.	23:00	0.77	10.70	23.70	34.39	12.26
8.	0:00	0.68	9.32	21.12	30.43	11.83
9.	1:00	0.60	10.98	21.50	32.48	12.64
10.	2:00	0.65	10.80	22.60	33.40	13.34
11.	3:00	0.67	9.99	22.17	32.16	13.01
12.	4:00	0.41	10.54	22.01	32.56	11.64
13.	5:00	0.74	9.88	21.35	31.23	12.14
14.	6:00	0.48	10.50	22.30	32.80	13.37
15.	7:00	0.43	10.64	22.44	33.09	12.20
16.	8:00	0.55	9.83	21.31	31.14	13.74
17.	9:00	0.57	9.17	22.65	31.82	12.46
18.	10:00	0.62	10.12	21.49	31.61	11.51
19.	11:00	0.46	9.13	21.55	30.68	13.26
20.	12:00	0.62	10.67	21.09	31.76	13.17
21.	13:00	0.79	10.14	22.23	32.36	13.63
22.	14:00	0.52	10.69	21.11	31.80	12.26
23.	15:00	0.36	10.24	21.61	31.85	14.00
24.	16:00	0.51	9.69	21.07	30.76	11.90
Average Concentration		**0.56**	**10.06**	**22.13**	**32.19**	**12.62**

Analyzed By (Analyst)

Verified By (Chief Analyst)

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Ambient Air Quality Monitoring

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Raikot
Date of Intervention	03-March-2023 to 04-March-2023
Coordinates	35°29'24.5"N 74°35'01.2"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO_2)	µg/m³	24 Hours	1.00	22.13	80.0
Nitrogen oxide (NO)	µg/m³	24 Hours	1.00	10.06	40.0
NO_X	µg/m³	24 Hours	1.00	32.19	120.0
Sulphur Dioxide (SO_2)	µg/m³	24 Hours	1.00	12.62	120.0
Carbon Monoxide (CO)	mg/m³	08 Hours	0.01	0.56	05.0*
Ozone (O_3)	µg/m3	01 Hour	-	12.49	130.0**
Particulate Matter (PM_{10})	µg/m³	24 Hours	1.00	109.54	150.0
Particulate Matter ($PM_{2.5}$)	µg/m³	24 Hours	1.00	17.08	35.0
Suspended Particulate Matter (SPM)	µg/m³	24 Hours	1.00	159.62	500.0
Lead Airborne Particles	µg/m³	24 Hours	-	0.18	1.5

Abbreviations:
LDL= Lowest Detection Limit
NEQS= National Environmental Quality Standards
*(8 Hours standard for CO)
**(1 Hour standard for O_3)
µg/m³= Micrograms per Cubic Meter
mg/m³= Milligram per Cubic Meter

Analyzed By (Analyst)

Verified By (Chief Analyst)

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Meteorological Data

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Raikot
Date of Intervention	03-March-2023 to 04-March-2023
Coordinates	35°29'24.5"N 74°35'01.2"E

Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
17:00	11	N	1.1	34	763.3
18:00	11	N	1.0	32	762.4
19:00	10	N	1.1	35	764.3
20:00	9	N	1.0	37	764.3
21:00	8	N	0.8	36	764.9
22:00	6	N	0.8	40	764.2
23:00	5	N	0.7	42	764.1
0:00	5	N	0.6	41	764.3
1:00	6	N	0.9	44	763.3
2:00	7	N	0.7	45	763.2
3:00	7	N	1.1	46	761.4
4:00	8	N	1.4	42	763.6
5:00	10	N	1.7	47	762.5
6:00	11	N	1.3	48	763.3
7:00	11	N	0.9	50	763.5
8:00	12	N	0.7	52	763.9
9:00	12	N	0.6	41	763.2
10:00	13	N	0.9	43	764.1
11:00	14	N	1.2	45	763.2
12:00	15	N	1.5	41	764.5
13:00	15	N	1.1	35	763.8
14:00	14	N	0.9	31	762.4
15:00	13	N	0.6	33	761.3
16:00	12	N	0.9	34	760.9

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Noise Level Monitoring Report

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Raikot
Date of Intervention	03-March-2023 to 04-March-2023
Coordinates	35°29'24.5"N 74°35'01.2"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Commercial)
Night Time					
1.	23:00	Noise Meter	dB	48.5	
2.	00:00	Noise Meter	dB	47.3	
3.	01:00	Noise Meter	dB	42.3	
4.	02:00	Noise Meter	dB	43.6	
5.	03:00	Noise Meter	dB	40.5	55.0
6.	04:00	Noise Meter	dB	36.9	
7.	05:00	Noise Meter	dB	42.5	
8.	06:00	Noise Meter	dB	46.3	
Night Time Average			dB	43.49	55.0
Day Time					
9.	07:00	Noise Meter	dB	47.2	
10.	08:00	Noise Meter	dB	40.9	
11.	09:00	Noise Meter	dB	44.3	
12.	10:00	Noise Meter	dB	42.5	
13.	11:00	Noise Meter	dB	43.8	
14.	12:00	Noise Meter	dB	46.9	
15.	13:00	Noise Meter	dB	42.3	
16.	14:00	Noise Meter	dB	47.3	
17.	15:00	Noise Meter	dB	46.6	65.0
18.	16:00	Noise Meter	dB	49.6	
19.	17:00	Noise Meter	dB	51.3	
20.	18:00	Noise Meter	dB	49.6	
21.	19:00	Noise Meter	dB	52.3	
22.	20:00	Noise Meter	dB	61.3	
23.	21:00	Noise Meter	dB	52.8	
24.	22:00	Noise Meter	dB	51.3	
Day Time Average			dB	48.13	65.0

Analyzed By (Analyst)

Verified By (Chief Analyst)

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Ambient Air Quality Monitoring

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Jalipur
Date of Intervention	04-March-2023 to 05-March-2023
Coordinates	35°24'27.3"N 74°19'39.1"E

Sr. #	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)
1.	17:30	0.68	10.30	20.60	30.90	12.80
2.	18:30	0.69	11.20	18.60	29.80	16.50
3.	19:30	0.67	9.60	19.30	28.90	15.70
4.	20:30	0.72	10.50	18.50	29.00	14.60
5.	21:30	0.75	9.80	16.30	26.10	13.50
6.	22:30	0.72	9.70	18.40	28.10	12.20
7.	23:30	0.62	9.60	19.40	29.00	12.90
8.	0:30	0.56	10.40	18.60	29.00	11.66
9.	1:30	0.61	9.50	16.40	25.90	13.24
10.	2:30	0.76	8.70	20.10	28.80	11.22
11.	3:30	0.79	9.30	18.60	27.90	7.60
12.	4:30	0.70	10.40	19.40	29.80	9.60
13.	5:30	0.78	9.70	16.30	26.00	10.60
14.	6:30	0.70	9.60	15.80	25.40	11.70
15.	7:30	0.64	10.20	16.90	27.10	12.30
16.	8:30	0.63	11.30	19.60	30.90	13.90
17.	9:30	0.78	10.40	16.30	26.70	15.70
18.	10:30	0.52	9.60	17.50	27.10	16.60
19.	11:30	0.48	8.70	16.40	25.10	13.90
20.	12:30	0.53	8.80	18.40	27.20	12.60
21.	13:30	0.56	7.30	19.60	26.90	16.70
22.	14:30	0.48	8.60	20.90	29.50	14.50
23.	15:30	0.54	8.10	19.40	27.50	13.30
24.	16:30	0.69	10.60	18.70	29.30	12.40
Average Concentration		**0.65**	**9.66**	**18.33**	**28.00**	**13.15**

Analyzed By (Analyst)

Verified By (Chief Analyst)

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Ambient Air Quality Monitoring

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Jalipur
Date of Intervention	04-March-2023 to 05-March-2023
Coordinates	35°24'27.3"N 74°19'39.1"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO_2)	µg/m³	24 Hours	1.00	18.33	80.0
Nitrogen oxide (NO)	µg/m³	24 Hours	1.00	9.66	40.0
NOx	µg/m³	24 Hours	1.00	28.0	120.0
Sulphur Dioxide (SO_2)	µg/m³	24 Hours	1.00	13.15	120.0
Carbon Monoxide (CO)	mg/m³	08 Hours	0.01	0.65	05.0*
Ozone (O_3)	µg/m3	01 Hour	-	12.72	130.0**
Particulate Matter (PM_{10})	µg/m³	24 Hours	1.00	107.50	150.0
Particulate Matter ($PM_{2.5}$)	µg/m³	24 Hours	1.00	17.21	35.0
Suspended Particulate Matter (SPM)	µg/m³	24 Hours	1.00	157.71	500.0
Lead Airborne Particles	µg/m³	24 Hours	-	0.16	1.5

Abbreviations:
LDL= Lowest Detection Limit
NEQS= National Environmental Quality Standards
*(8 Hours standard for CO)
**(1 Hour standard for O_3)
µg/m³= Micrograms per Cubic Meter
mg/m³= Milligram per Cubic Meter

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Meteorological Data

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Jalipur
Date of Intervention	04-March-2023 to 05-March-2023
Coordinates	35°24'27.3"N 74°19'39.1"E

Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
17:30	12	N	1.6	41	762.3
18:30	11	N	2.0	43	761.2
19:30	10	N	2.3	39	762.0
20:30	10	N	2.6	40	762.2
21:30	9	NW	2.2	42	762.6
22:30	9	NW	1.8	45	761.9
23:30	8	NW	1.6	43	762.8
0:30	7	NW	1.5	42	761.9
1:30	6	NW	1.8	44	763.2
2:30	5	NW	2.1	45	762.5
3:30	6	NW	2.4	48	761.1
4:30	8	NW	2.0	50	760.0
5:30	7	N	1.8	52	759.6
6:30	8	N	1.5	55	762.0
7:30	9	N	1.8	53	761.1
8:30	11	N	2.0	54	763.0
9:30	12	N	1.9	41	763.0
10:30	14	N	2.0	42	763.6
11:30	15	N	1.9	49	762.9
12:30	17	N	1.7	42	762.8
13:30	16	N	1.7	47	763.0
14:30	15	N	1.6	35	762.0
15:30	14	N	1.5	33	761.9
16:30	12	N	1.8	30	760.1

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Noise Level Monitoring Report

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Jalipur
Date of Intervention	04-March-2023 to 05-March-2023
Coordinates	35°24'27.3"N 74°19'39.1"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Commercial)
		Night Time			
1.	23:00	Noise Meter	dB	50.3	
2.	00:00	Noise Meter	dB	45.2	
3.	01:00	Noise Meter	dB	42.3	
4.	02:00	Noise Meter	dB	45.3	
5.	03:00	Noise Meter	dB	49.3	55.0
6.	04:00	Noise Meter	dB	40.2	
7.	05:00	Noise Meter	dB	43.6	
8.	06:00	Noise Meter	dB	42.5	
	Night Time Average		dB	44.84	55.0
		Day Time			
9.	07:00	Noise Meter	dB	68.7	
10.	08:00	Noise Meter	dB	72.5	
11.	09:00	Noise Meter	dB	69.8	
12.	10:00	Noise Meter	dB	71.5	
13.	11:00	Noise Meter	dB	72.7	
14.	12:00	Noise Meter	dB	67.8	
15.	13:00	Noise Meter	dB	70.3	
16.	14:00	Noise Meter	dB	70.4	
17.	15:00	Noise Meter	dB	71.3	65.0
18.	16:00	Noise Meter	dB	69.6	
19.	17:00	Noise Meter	dB	70.7	
20.	18:00	Noise Meter	dB	67.5	
21.	19:00	Noise Meter	dB	69.2	
22.	20:00	Noise Meter	dB	65.6	
23.	21:00	Noise Meter	dB	68.3	
24.	22:00	Noise Meter	dB	62.1	
	Day Time Average		dB	47.22	65.0

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(Analyst)

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Ambient Air Quality Monitoring

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Chillas
Date of Intervention	05-March-2023 to 06-March-2023
Coordinates	35°25'44.6"N 74°06'26.1"E

Sr. #	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)
1.	17:30	0.73	9.12	13.04	22.16	12.86
2.	18:30	0.76	9.95	13.95	23.90	14.03
3.	19:30	0.68	10.42	13.58	24.00	14.69
4.	20:30	0.74	9.73	14.46	24.19	13.72
5.	21:30	0.89	10.58	15.45	26.03	14.91
6.	22:30	0.88	9.28	13.95	23.23	13.08
7.	23:30	0.89	11.61	15.40	27.01	16.37
8.	0:30	0.87	9.65	14.57	24.22	13.60
9.	1:30	0.92	10.60	15.58	26.18	14.95
10.	2:30	0.95	11.97	16.99	28.96	16.88
11.	3:30	0.92	10.93	15.60	26.53	15.41
12.	4:30	0.82	11.71	15.15	26.87	16.52
13.	5:30	0.76	10.39	13.67	24.06	14.66
14.	6:30	0.81	11.52	16.01	27.52	16.24
15.	7:30	0.96	10.09	14.42	24.51	14.22
16.	8:30	0.99	12.08	14.70	26.78	17.04
17.	9:30	0.90	12.93	15.76	28.69	18.23
18.	10:30	0.98	10.35	14.05	24.41	14.60
19.	11:30	0.90	11.85	15.43	27.27	16.71
20.	12:30	0.84	11.96	15.58	27.53	16.86
21.	13:30	0.83	10.52	13.92	24.44	14.84
22.	14:30	1.00	11.97	15.25	27.22	16.88
23.	15:30	0.72	11.19	14.83	26.02	15.78
24.	16:30	0.68	10.86	13.94	24.80	15.31
Average Concentration		**0.85**	**10.89**	**14.80**	**25.69**	**15.35**

Analyzed By (Analyst)

Verified By (Chief Analyst)

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Ambient Air Quality Monitoring

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Chillas
Date of Intervention	05-March-2023 to 06-March-2023
Coordinates	35°25'44.6"N 74°06'26.1"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO_2)	µg/m³	24 Hours	1.00	14.80	80.0
Nitrogen oxide (NO)	µg/m³	24 Hours	1.00	10.89	40.0
NOx	µg/m³	24 Hours	1.00	25.69	120.0
Sulphur Dioxide (SO_2)	µg/m³	24 Hours	1.00	15.35	120.0
Carbon Monoxide (CO)	mg/m³	08 Hours	0.01	0.85	05.0*
Ozone (O_3)	µg/m3	01 Hour	-	17.40	130.0**
Particulate Matter (PM_{10})	µg/m³	24 Hours	1.00	137.79	150.0
Particulate Matter ($PM_{2.5}$)	µg/m³	24 Hours	1.00	33.86	35.0
Suspended Particulate Matter (SPM)	µg/m³	24 Hours	1.00	204.65	500.0
Lead Airborne Particles	µg/m³	24 Hours	-	0.21	1.5

Abbreviations:
LDL= Lowest Detection Limit
NEQS= National Environmental Quality Standards
*(8 Hours standard for CO)
**(1 Hour standard for O_3)
µg/m³= Micrograms per Cubic Meter
mg/m³= Milligram per Cubic Meter

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Meteorological Data

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Chillas
Date of Intervention	05-March-2023 to 06-March-2023
Coordinates	35°25'44.6"N 74°06'26.1"E

Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
17:30	17	N	0.9	43	762.2
18:30	18	N	1.1	38	761.8
19:30	18	N	1.0	39	762.4
20:30	17	N	0.8	36	761.6
21:30	16	NW	0.7	34	760.9
22:30	15	NW	0.6	44	761.3
23:30	15	NW	0.5	46	761.6
0:30	13	N	0.4	52	761.5
1:30	13	N	1.0	59	762.3
2:30	12	N	0.8	62	761.9
3:30	12	NW	1.2	66	762.2
4:30	11	NW	1.5	70	762.6
5:30	13	NW	1.8	72	761.7
6:30	13	N	1.4	76	761.2
7:30	12	N	1.0	77	760.9
8:30	12	N	0.8	79	761.3
9:30	11	NW	0.7	82	761.6
10:30	12	NW	0.8	85	762.3
11:30	13	NW	1.1	73	762.8
12:30	14	N	1.4	61	762.4
13:30	14	N	1.0	52	762
14:30	14	N	0.8	49	762.5
15:30	16	NW	0.5	46	762.6
16:30	17	NW	0.8	45	762.3

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Noise Level Monitoring Report

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Chillas
Date of Intervention	05-March-2023 to 06-March-2023
Coordinates	35°25'44.6"N 74°06'26.1"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Commercial)
		Night Time			
1.	23:00	Noise Meter	dB	49.6	
2.	00:00	Noise Meter	dB	47.3	
3.	01:00	Noise Meter	dB	46.5	
4.	02:00	Noise Meter	dB	39.2	
5.	03:00	Noise Meter	dB	38.1	55.0
6.	04:00	Noise Meter	dB	33.5	
7.	05:00	Noise Meter	dB	33.7	
8.	06:00	Noise Meter	dB	36.2	
	Night Time Average		dB	40.51	55.0
		Day Time			
9.	07:00	Noise Meter	dB	37.4	
10.	08:00	Noise Meter	dB	35.3	
11.	09:00	Noise Meter	dB	37.1	
12.	10:00	Noise Meter	dB	38.7	
13.	11:00	Noise Meter	dB	41	
14.	12:00	Noise Meter	dB	44.4	
15.	13:00	Noise Meter	dB	54.5	
16.	14:00	Noise Meter	dB	55.2	
17.	15:00	Noise Meter	dB	56.7	65.0
18.	16:00	Noise Meter	dB	53.6	
19.	17:00	Noise Meter	dB	55	
20.	18:00	Noise Meter	dB	56.9	
21.	19:00	Noise Meter	dB	57.8	
22.	20:00	Noise Meter	dB	53.5	
23.	21:00	Noise Meter	dB	51.2	
24.	22:00	Noise Meter	dB	50.9	
	Day Time Average		dB	48.70	65.0

Analyzed By
(Analyst)

Verified By
(Chief Analyst)

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Ambient Air Quality Monitoring

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Diamer Base Camp
Date of Intervention	07-March-2023 to 08-March-2023
Coordinates	35°31'48.4"N 73°43'37.7"E

Sr. #	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)
1.	18:00	0.32	4.75	12.47	17.23	8.13
2.	19:00	0.47	4.74	12.46	17.19	6.95
3.	20:00	0.62	4.40	11.40	15.81	6.52
4.	21:00	0.54	5.03	12.02	17.05	7.33
5.	22:00	0.55	5.41	12.40	17.81	7.82
6.	23:00	0.61	4.03	11.03	15.06	7.70
7.	0:00	0.77	5.70	12.70	18.39	7.26
8.	1:00	0.68	4.32	11.32	15.63	6.83
9.	2:00	0.60	5.98	11.70	17.68	7.64
10.	3:00	0.65	5.80	12.80	18.60	8.34
11.	4:00	0.67	4.99	12.37	17.36	8.01
12.	5:00	0.41	5.54	12.21	17.76	6.64
13.	6:00	0.74	4.88	11.55	16.43	7.14
14.	7:00	0.48	5.50	12.50	18.00	8.37
15.	8:00	0.43	5.64	12.64	18.29	7.20
16.	9:00	0.55	4.83	11.51	16.34	8.74
17.	10:00	0.57	4.17	12.85	17.02	7.46
18.	11:00	0.62	5.12	11.79	16.91	6.51
19.	12:00	0.46	4.13	11.85	15.98	8.26
20.	13:00	0.62	5.67	11.39	17.06	8.17
21.	14:00	0.79	5.14	12.53	17.66	8.63
22.	15:00	0.52	5.69	11.41	17.10	7.26
23.	16:00	0.36	5.24	11.91	17.15	9.00
24.	17:00	0.51	4.69	11.37	16.06	6.90
Average Concentration		**0.56**	**5.05**	**12.01**	**17.06**	**7.62**

Analyzed By (Analyst)

Verified By (Chief Analyst)

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Ambient Air Quality Monitoring

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Diamer Base Camp
Date of Intervention	07-March-2023 to 08-March-2023
Coordinates	35°31'48.4"N 73°43'37.7"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO_2)	µg/m³	24 Hours	1.00	12.01	80.0
Nitrogen oxide (NO)	µg/m³	24 Hours	1.00	5.05	40.0
NO_X	µg/m³	24 Hours	1.00	17.06	120.0
Sulphur Dioxide (SO_2)	µg/m³	24 Hours	1.00	7.62	120.0
Carbon Monoxide (CO)	mg/m³	08 Hours	0.01	0.56	05.0*
Ozone (O_3)	µg/m3	01 Hour	-	8.89	130.0**
Particulate Matter (PM_{10})	µg/m³	24 Hours	1.00	133.53	150.0
Particulate Matter ($PM_{2.5}$)	µg/m³	24 Hours	1.00	31.86	35.0
Suspended Particulate Matter (SPM)	µg/m³	24 Hours	1.00	198.39	500.0
Lead Airborne Particles	µg/m³	24 Hours	-	0.14	1.5

Abbreviations:
LDL= Lowest Detection Limit
NEQS= National Environmental Quality Standards
*(8 Hours standard for CO)
**(1 Hour standard for O_3)
µg/m³= Micrograms per Cubic Meter
mg/m³= Milligram per Cubic Meter

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(Chief Analyst)

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Meteorological Data

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Diamer Base Camp
Date of Intervention	07-March-2023 to 08-March-2023
Coordinates	35°31'48.4"N 73°43'37.7"E

Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
18:00	13	N	1.2	51	745.9
19:00	13	N	1.4	48	745.5
20:00	15	N	1.3	45	746.1
21:00	16	N	1.1	44	745.3
22:00	16	N	1	42	744.6
23:00	12	NE	0.9	37	745.0
0:00	12	NE	0.8	38	745.3
1:00	10	NE	0.8	35	745.2
2:00	10	N	1.1	37	746.0
3:00	11	N	0.9	47	745.6
4:00	9	N	1.3	49	745.9
5:00	10	N	1.6	55	746.3
6:00	12	NE	1.3	62	745.4
7:00	11	NE	1.5	65	745.1
8:00	11	NE	1.1	69	744.8
9:00	10	NE	0.6	73	745.2
10:00	10	N	0.5	74	745.5
11:00	10	N	0.8	78	746.2
12:00	12	N	1.1	79	746.7
13:00	12	N	1.4	81	746.3
14:00	11	NE	1	84	745.9
15:00	12	NE	0.8	87	746.4
16:00	13	NE	0.5	75	746.5
17:00	14	NE	0.8	63	746.2

Analyzed By
(Analyst)

Verified By
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Noise Level Monitoring Report

Job Reference Number	GELS-BSL-205/2023
Monitoring Point	Diamer Base Camp
Date of Intervention	07-March-2023 to 08-March-2023
Coordinates	35°31'48.4"N 73°43'37.7"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Commercial)
		Night Time			
1.	23:00	Noise Meter	dB	54.5	
2.	00:00	Noise Meter	dB	55.4	
3.	01:00	Noise Meter	dB	51.1	
4.	02:00	Noise Meter	dB	48.8	
5.	03:00	Noise Meter	dB	48.5	55.0
6.	04:00	Noise Meter	dB	47.2	
7.	05:00	Noise Meter	dB	44.9	
8.	06:00	Noise Meter	dB	44.1	
	Night Time Average		dB	49.31	55.0
9.	07:00	Noise Meter	dB	36.8	
10.	08:00	Noise Meter	dB	35.7	
11.	09:00	Noise Meter	dB	31.1	
12.	10:00	Noise Meter	dB	36.9	
13.	11:00	Noise Meter	dB	39.4	
14.	12:00	Noise Meter	dB	40.6	
15.	13:00	Noise Meter	dB	38.5	
16.	14:00	Noise Meter	dB	40.3	
17.	15:00	Noise Meter	dB	41.9	65.0
18.	16:00	Noise Meter	dB	44.2	
19.	17:00	Noise Meter	dB	47.6	
20.	18:00	Noise Meter	dB	52.1	
21.	19:00	Noise Meter	dB	52.8	
22.	20:00	Noise Meter	dB	54.3	
23.	21:00	Noise Meter	dB	51.2	
24.	22:00	Noise Meter	dB	52.6	
	Day Time Average		dB	43.50	65.0

Analyzed By (Analyst)

Verified By (Chief Analyst)

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Sample Details			
Job Ref. No:	GELS-BSL-205/2023	**Client Name:**	**Rehman Habib Consultants (Pvt) Ltd**
Telephone No.	+92 300 8381968	**Sample Matrix:**	**Ground Water Sample**
Sample Date:	10-03-2023	**Sampled By:**	GELS
Sample Receipt Date:	11-03-2023	**Date of Completion of Analysis:**	14-03-2023
Grab/Composite:	Grab Sampling		
Sample Identification			
04	Chillas		

Parameters	Analysis Method	Unit	LOR	Results 04	NEQS
PYSICAL & CHEMICAL ANALYSIS					
pH**	APHA-4500H+ B	-	0.01	7.56	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity**	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness**	APHA-2340 B&C	mg/l	0.1	180.0	< 500 mg/l
Total Dissolved Solid (TDS)**	APHA-2540 C	mg/l	1.0	251.0	< 1000
Ammonia	APHA-4500-NH_3-B	mg/l	0.002	<0.002	-
Chloride**	APHA-4500 B	mg/l	0.24	19.56	< 250
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)**	APHA-4500F- D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO2 B	mg/l	0.01	<0.01	≤ 3 (P)
Nitrate**	APHA-4500NO_3 C	mg/l	0.1	0.2	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium**	APHA-3111 B	mg/l	0.0028	<0.0028	0.01
Copper**	APHA-3111 B	mg/l	0.0045	<0.0045	2
Chromium**	APHA-3111 B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008	≤ 0.001
Antimony (Sb)**	APHA-3111 B	mg/l	-	ND	≤ 0.005 (P)
Nickel**	APHA-3111 C	mg/l	0.008	<0.008	≤ 0.02
Zinc**	APHA-3111 B	mg/l	0.0033	<0.0033	5.0
Arsenic	APHA-3111As B	mg/l	0.01	<0.01	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.031	0.7
Manganese**	APHA-3111 B	mg/l	0.0016	<0.0016	≤ 0.5
Iron**	APHA-3111 B	mg/l	0.1	<0.1	-
Boron	APHA-4500-B (C)	mg/l	0.1	<0.1	0.3
Lead**	APHA-3111 B	mg/l	0.013	<0.013	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	ND	0.01 (P)
MICROBIOLOGICAL ANALYSIS					
Total Coliforms	APHA:9222 B	CFU/100ml		05	0/100ml
Faecal Coliforms (Ecoli)	APHA:9222 D	CFU/100ml		Absent	0/100ml

Abbreviations:
ND: Not Detected **LOR:** Limit of Reporting **NEQS:** National Environmental Quality Standards

Note:
** Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per the client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.*

Disclaimer: *The results are sole of the sample provided. ** All starred parameters are PNAC accredited.*

Analyzed By (Analyst)

Verified By (Chief Analyst)

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Sample Details			
Job Ref. No:	GELS-BSL-205/2023	**Client Name:**	**Rehman Habib Consultants (Pvt) Ltd**
Telephone No.	+92 300 8381968	**Sample Matrix:**	**Ground Water Sample**
Sample Date:	10-03-2023	**Sampled By:**	GELS
Sample Receipt Date:	11-03-2023	**Date of Completion of Analysis:**	14-03-2023
Grab/Composite:	Grab Sampling		

Sample Identification	
05	Raikot

Parameters	Analysis Method	Unit	LOR	Results 05	NEQS
PYSICAL & CHEMICAL ANALYSIS					
pH**	APHA-4500H+ B	-	0.01	6.73	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity**	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness**	APHA-2340 B&C	mg/l	0.1	84.0	< 500 mg/l
Total Dissolved Solid (TDS)**	APHA-2540 C	mg/l	1.0	95.0	< 1000
Ammonia	APHA-4500-NH_3-B	mg/l	0.002	<0.002	-
Chloride**	APHA-4500 B	mg/l	0.24	7.82	< 250
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)**	APHA-4500F- D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO2 B	mg/l	0.01	<0.01	≤ 3 (P)
Nitrate**	APHA-4500NO_3 C	mg/l	0.1	0.1	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium**	APHA-3111 B	mg/l	0.0028	<0.0028	0.01
Copper**	APHA-3111 B	mg/l	0.0045	<0.0045	2
Chromium**	APHA-3111 B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008	≤ 0.001
Antimony (Sb)**	APHA-3111 B	mg/l	-	ND	≤ 0.005 (P)
Nickel**	APHA-3111 C	mg/l	0.008	<0.008	≤ 0.02
Zinc**	APHA-3111 B	mg/l	0.0033	<0.0033	5.0
Arsenic	APHA-3111As B	mg/l	0.01	<0.01	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.031	0.7
Manganese**	APHA-3111 B	mg/l	0.0016	<0.0016	≤ 0.5
Iron**	APHA-3111 B	mg/l	0.1	<0.1	-
Boron	APHA-4500-B (C)	mg/l	0.1	<0.1	0.3
Lead**	APHA-3111 B	mg/l	0.013	<0.013	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	ND	0.01 (P)
MICROBIOLOGICAL ANALYSIS					
Total Coliforms	APHA9222 B	CFU/100ml		03	0/100ml
Faecal Coliforms (Ecoli)	APHA9222 D	CFU/100ml		Absent	0/100ml

Abbreviations:
ND: Not Detected **LOR:** Limit of Reporting **NEQS:** National Environmental Quality Standards

Note:
** Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per the client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.*
Disclaimer: *The results are sole of the sample provided. ** All starred parameters are PNAC accredited.*

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Sample Details			
Job Ref. No:	GELS-BSL-205/2023	**Client Name:**	**Rehman Habib Consultants (Pvt) Ltd**
Telephone No.	+92 300 8381968	**Sample Matrix:**	**Ground Water Sample**
Sample Date:	10-03-2023	**Sampled By:**	GELS
Sample Receipt Date:	11-03-2023	**Date of Completion of Analysis:**	14-03-2023
Grab/Composite:	Grab Sampling		

06	Jalipur

Parameters	Analysis Method	Unit	LOR	Results 06	NEQS
PYSICAL & CHEMICAL ANALYSIS					
pH**	APHA-4500H+ B	-	0.01	7.76	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity**	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness**	APHA-2340 B&C	mg/l	0.1	144.0	< 500 mg/l
Total Dissolved Solid (TDS)**	APHA-2540 C	mg/l	1.0	193.0	< 1000
Ammonia	APHA-4500-NH_3-B	mg/l	0.002	<0.002	-
Chloride**	APHA-4500 B	mg/l	0.24	5.87	< 250
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)**	APHA-4500F- D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO2 B	mg/l	0.01	<0.01	≤ 3 (P)
Nitrate**	APHA-4500NO_3 C	mg/l	0.1	<0.1	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium**	APHA-3111 B	mg/l	0.0028	<0.0028	0.01
Copper**	APHA-3111 B	mg/l	0.0045	<0.0045	2
Chromium**	APHA-3111 B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008	≤ 0.001
Antimony (Sb)**	APHA-3111 B	mg/l	-	ND	≤ 0.005 (P)
Nickel**	APHA-3111 C	mg/l	0.008	<0.008	≤ 0.02
Zinc**	APHA-3111 B	mg/l	0.0033	<0.0033	5.0
Arsenic	APHA-3111As B	mg/l	0.01	<0.01	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.031	0.7
Manganese**	APHA-3111 B	mg/l	0.0016	<0.0016	≤ 0.5
Iron**	APHA-3111 B	mg/l	0.1	<0.1	-
Boron	APHA-4500-B (C)	mg/l	0.1	<0.1	0.3
Lead**	APHA-3111 B	mg/l	0.013	<0.013	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	ND	0.01 (P)
MICROBIOLOGICAL ANALYSIS					
Total Coliforms	APHA9222 B	CFU/100ml		Absent	0/100ml
Faecal Coliforms (Ecoli)	APHA9222 D	CFU/100ml		Absent	0/100ml

Abbreviations:
ND: Not Detected **LOR:** Limit of Reporting **NEQS:** National Environmental Quality Standards

Note:
** Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per the client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.*

Disclaimer: *The results are sole of the sample provided. ** All starred parameters are PNAC accredited.*

Analyzed By (Analyst)

Verified By (Chief Analyst)

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Sample Details			
Job Ref. No:	GELS-BSL-205/2023	**Client Name:**	**Rehman Habib Consultants (Pvt) Ltd**
Telephone No.	+92 300 8381968	**Sample Matrix:**	**Ground Water Sample**
Sample Date:	10-03-2023	**Sampled By:**	GELS
Sample Receipt Date:	11-03-2023	**Date of Completion of Analysis:**	14-03-2023
Grab/Composite:	Grab Sampling		

Sample Identification	
07	Diamer Basha Dam

Parameters	Analysis Method	Unit	LOR	Results 07	NEQS
PYSICAL & CHEMICAL ANALYSIS					
pH**	APHA-4500H+ B	-	0.01	8.02	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity**	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness**	APHA-2340 B&C	mg/l	0.1	162.0	< 500 mg/l
Total Dissolved Solid (TDS)**	APHA-2540 C	mg/l	1.0	193.0	< 1000
Ammonia	APHA-4500-NH_3-B	mg/l	0.002	<0.002	-
Chloride**	APHA-4500 B	mg/l	0.24	5.87	< 250
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)**	APHA-4500F- D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO2 B	mg/l	0.01	<0.01	≤ 3 (P)
Nitrate**	APHA-4500NO_3 C	mg/l	0.1	0.3	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium**	APHA-3111 B	mg/l	0.0028	<0.0028	0.01
Copper**	APHA-3111 B	mg/l	0.0045	<0.0045	2
Chromium**	APHA-3111 B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008	≤ 0.001
Antimony (Sb)**	APHA-3111 B	mg/l	-	ND	≤ 0.005 (P)
Nickel**	APHA-3111 C	mg/l	0.008	<0.008	≤ 0.02
Zinc**	APHA-3111 B	mg/l	0.0033	<0.0033	5.0
Arsenic	APHA-3111As B	mg/l	0.01	<0.01	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.031	0.7
Manganese**	APHA-3111 B	mg/l	0.0016	<0.0016	≤ 0.5
Iron**	APHA-3111 B	mg/l	0.1	<0.1	-
Boron	APHA-4500-B (C)	mg/l	0.1	<0.1	0.3
Lead**	APHA-3111 B	mg/l	0.013	<0.013	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	ND	0.01 (P)
MICROBIOLOGICAL ANALYSIS					
Total Coliforms	APHA9222 B	CFU/100ml		22	0/100ml
Faecal Coliforms (Ecoli)	APHA9222 D	CFU/100ml		14	0/100ml

Abbreviations:
ND: Not Detected **LOR:** Limit of Reporting **NEQS:** National Environmental Quality Standards

Note:
** Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per the client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.*

Disclaimer: *The results are sole of the sample provided. ** All starred parameters are PNAC accredited.*

Analyzed By (Analyst)

Verified By (Chief Analyst)

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GREEN ENVIRONMENTAL
laboratory & solutions

CHEMICAL ANALYSIS TEST REPORT (SURFACE WATER)

Sample Details			
Job Ref. No:	GELS-BSL-205/2023	**Client Name:**	**Rehman Habib Consultants (Pvt) Ltd**
Telephone No.:	+92 300 8381968	**Sample Matrix:**	Surface Water Sample
Sample Date:	10-03-2023	**Sampled By:**	GELS
Sample Receipt Date:	11-03-2023	**Date of Completion of Analysis:**	15-03-2023
Grab/Composite:	Grab Sampling		
Sample Identification			

Parameters	Analysis Method	Unit	LOR	Result
				02
Temperature	APHA-2550-B	^{0}C	-	24.7
pH**	APHA-4500-H$^+$ B	pH unit	0.01	7.79
Total Dissolved Solid (TDS)**	APHA-2540 C	mg/l	1.0	216.0
Oil and Grease**	USEPA-1664	mg/l	0.2	<0.2
Biological Oxygen Demand	APHA-5210 B	mg/l	1.0	<1.0
Chemical Oxygen Demand**	APHA-5220-D	mg/l	1.0	4.0
Total Suspended Solid**	APHA-2540-C	mg/l	1.0	12.0
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01
Chloride (Cl)**	APHA-4500 B	mg/l	0.24	13.69
Fluoride (F)**	APHA-4500F$^-$ D	mg/l	0.01	<0.01
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01
Detergent	APHA-5540 C	mg/l	-	ND
Sulphate**	APHA-4500-SO_4^{-2} C	mg/l	0.41	21.40
Sulphide	APHA-4500-S_2-F	mg/l	0.2	<0.2
Ammonia	APHA-4500-NH_3-B,C	mg/l	0.002	<0.002
Silver	APHA-3500Ag-B	mg/l	0.0032	<0.0032
Cadmium**	APHA-3111 B	mg/l	0.0028	<0.0028
Chromium**	APHA-3111 B	mg/l	0.0054	<0.0054
Copper**	APHA-3111 B	mg/l	0.0045	<0.0045
Lead**	APHA-3111 B	mg/l	0.013	<0.013
Mercury	APHA-3500-Hg B	mg/l	0.0008	<0.0008
Nickel**	APHA-3111 C	mg/l	0.008	<0.008
Zinc**	APHA-3111 B	mg/l	0.0033	0.020
Arsenic	APHA-3500As B	mg/l	0.01	<0.01
Barium	APHA-3500Ba B	mg/l	0.031	<0.031
Manganese**	APHA-3111 B	mg/l	0.0016	<0.0016
Iron**	APHA-3111 B	mg/l	0.1	0.412
Boron	APHA-4500B-C	mg/l	0.1	<0.1
Total Chlorine	APHA-4500Cl-B	mg/l	0.1	<0.1
Selenium	APHA-3500Se C	mg/l	-	ND
Pesticides	APHA-6630 B	mg/l	-	ND
Total Toxic Metals	-	mg/l	-	ND

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CHEMICAL ANALYSIS TEST REPORT (SURFACE WATER)

Sample Details			
Job Ref. No:	GELS-BSL-205/2023	**Client Name:**	**Rehman Habib Consultants (Pvt) Ltd**
Telephone No.:	+92 300 8381968	**Sample Matrix:**	**Surface Water Sample**
Sample Date:	10-03-2023	**Sampled By:**	GELS
Sample Receipt Date:	11-03-2023	**Date of Completion of Analysis:**	15-03-2023
Grab/Composite:	Grab Sampling		

Sample Identification

03 | Diarrer End Point

Parameters	Analysis Method	Unit	LOR	Result
				03
Temperature	APHA-2550-B	^{0}C	-	24.7
pH**	APHA-4500-H$^+$ B	pH unit	0.01	7.90
Total Dissolved Solid (TDS)**	APHA-2540 C	mg/l	1.0	213.0
Oil and Grease**	USEPA-1664	mg/l	0.2	<0.2
Biological Oxygen Demand	APHA-5210 B	mg/l	1.0	<1.0
Chemical Oxygen Demand**	APHA-5220-D	mg/l	1.0	4.0
Total Suspended Solid**	APHA-2540-C	mg/l	1.0	4.0
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01
Chloride (Cl)**	APHA-4500 B	mg/l	0.24	13.69
Fluoride (F)**	APHA-4500F- D	mg/l	0.01	<0.01
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01
Detergent	APHA-5540 C	mg/l	-	ND
Sulphate**	APHA-4500-SO_4^{-2} C	mg/l	0.41	22.22
Sulphide	APHA-4500-S_2-F	mg/l	0.2	<0.2
Ammonia	APHA-4500-NH_3-B,C	mg/l	0.002	<0.002
Silver	APHA-3500Ag-B	mg/l	0.0032	<0.0032
Cadmium**	APHA-3111 B	mg/l	0.0028	<0.0028
Chromium**	APHA-3111 B	mg/l	0.0054	<0.0054
Copper**	APHA-3111 B	mg/l	0.0045	<0.0045
Lead**	APHA-3111 B	mg/l	0.013	<0.013
Mercury	APHA-3500-Hg B	mg/l	0.0008	<0.0008
Nickel**	APHA-3111 C	mg/l	0.008	<0.008
Zinc**	APHA-3111 B	mg/l	0.0033	0.018
Arsenic	APHA-3500As B	mg/l	0.01	<0.01
Barium	APHA-3500Ba B	mg/l	0.031	<0.031
Manganese**	APHA-3111 B	mg/l	0.0016	<0.0016
Iron**	APHA-3111 B	mg/l	0.1	0.386
Boron	APHA-4500B-C	mg/l	0.1	<0.1
Total Chlorine	APHA-4500Cl-B	mg/l	0.1	<0.1
Selenium	APHA-3500Se C	mg/l	-	ND
Pesticides	APHA-6630 B	mg/l	-	ND
Total Toxic Metals	-	mg/l	-	ND

Analyzed By
(Analyst)

Verified By
(Chief Analyst)

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Annexure: II

Attendance Sheets

Attendance Sheet List of Participants of Village Thore Das

Sr. No.	Name	Father's Name	Occupation	Education	Sign/Thumb
	Abdul Ghayas	Abdul-wakeel	shopkeeper	—	عبد الوکیل
	Raanzeb	Abdul-Najir	shopkeeper	—	رانزیب
	Barkat	Jamdar	—	Matric	برکت
	Sana	Abdul Majid	student	F.A	ثناء
	Sadam Hussain	M.Hussain	Govt. Contractor	B.A	
	~~Shah w~~				

Attendance Sheet List of Participants of Village Thore Das

Sr. No.	Name	Father's Name	Occupation	Education	Sign/Thumb
	Abdul Ghayas	Abdul-wakeel	shopkeeper	—	عبد الوکیل
	Raanzeb	Abdul-Najir	shop keeper	—	رانزیب
	Barkat	Jamdar	—	Matric	برکت
	Sana	Abdul Majid	student	F.A	ثناء
	Sadam Hussain	M.Hussaen	Govt. Contractor	B.A	
	~~Shah w~~				

Attendance Sheet List of Participants of Village Chilas

Sr. No.	Name	Father's Name	Occupation	Education	Sign/Thumb
	Mir-Hasan	Daali	shopkeeper	عالم	
	Sohail Ahmad	Saeed Ahmad	student	matric	
	Alam	Mohammad Taajil	Hotel caretaker	—	
	Fazal Sadiq	Mustaqeem	imam	حافظ قرآن	
	Hemayat-ullah	Abdul-Manan	Engineer	Engineer	

Attendance Sheet List of Participants of Village Burnadas

Sr. No.	Name	Father's Name	Occupation	Education	Sign/Thumb
	M. Ayub	Babar Khan	Student	BS	
	Idrees Ahmad	Babar Khan	"	Matric	idrees
	M. Ismail	M. Ibrahim	—	—	
	M. Zakir	Khushal	—	—	
	Raza Khan	Sharam	Farmer		
	Kramatullah	M. Wakeel	"	F.A	
	Shafqat ullah	Sayedullah	Student	Matric	
	Naeemullah	M. Ibrahim	"	"	Naeem ulla

(8)

Attendance Sheet List of Participants of Village_____

Sr. No.	Name	Father's Name	Occupation	Education	Sign/Thumb
	Atiqullah	Qamees khan	shopkeeper	F.SC	
	Shafiullah	Nadar khan	Student	matric	
	sheerem	Naseem khan	kissan	—	
	Fidaurahman	Musafar	shopkeeper	عالم	
	Sahibzaela	Mohammad sheeren	—	Middle	
	Attaullah	Bakhtyar	shopkeeper	matric	
	Farhan shah	Ali shah	Teacher	B.S	
	Amjad Ali	Anwar shah	Student	E. Engineering	
	Rehan khan	Ihsenuddin	Teacher	M.A	

Annexure: III

Traffic Management Plan

1. Need for Plan

During the construction period of the project, considerable vehicular movement carrying large amounts of material and machinery is expected. This will definitely interrupt the local traffic and is therefore important to manage the traffic to avoid the nuisance to local residentsin terms of noise, dust, congestion and inconvenience.

2. The Plan

The objective of Traffic Management Plan (TMP) is to define the requirements that should beimplemented to mitigate any potential negative risks to the environment, workers or the community resulting from construction traffic.

The TMP will advise and inform site Contractors and external suppliers of equipment and materials of access and entry points along with other key information such tipping areas andwash-out areas. It is intended to compliment and work alongside relevant EMP. The TMP will be classed as “live” and therefore be subjected to updates as required.

The Contractor, at the time of the execution of the project, will prepare a comprehensive TMP in coordination with local traffic police department, NHA, emergency services and local administrative department. NHA and CSC will review and approve the Contractor’s TMP. The Contractor’s TMP shall include following mitigation measures during its preparation:

- Undertake a road conditions assessment prior to and following the peak construction period, to assess any damage to road infrastructure that can be attributed to Project development.
- Repair damage as appropriate or enter into a voluntary agreement with the relevant roads authority to reimburse the cost of any repairs required to the public road network as aresult of the Project.
- Spoil dumpsites located close to project site to minimize journey distance and limit movements to site access roads.
- Construction of worker accommodation on site to reduce light vehicle movements relating to travel to/ from the site.
- Provision of bus/minibus services for personnel living in nearby settlements.
- Movements of construction workers will be planned to avoid the busiest roads and timesof day when traffic is at its greatest.
- Schedule deliveries and road movements to avoid peak periods.
- Driver training for HGV drivers and refresher course every six months for project drivers.
- Speed restrictions for project traffic travelling through communities (to be agreed with National Highway Authority and Client).

- Run a safety campaign to improve the people's knowledge of the traffic hazard on their roads, public information and other activities to address the issues.2
- Run a pedestrian awareness programme.
- Temporary signage

The traffic management plan for the project corridor is provided below.

3. Other Recommendations

It is important to manage public access routes during construction because it can cause delay to local traffic and create a safety hazard both on and offsite. People working and living near the tower sites would be annoyed by the emissions, noise and visual intrusion of enqueuing vehicles. Some important factors involved in access routes and site traffic are asfollows:

4. Public Access Routes

The use of public road for site access may be restricted in terms of:

- Vehicle size, width and type of load
- Time limits
- Parking
- Pedestrian conflicts

Contractor should have consultation with the local police or local authority to address theseissues and to effectively manage them before the beginning of the construction.

5. Site Workers Traffic

Site personnel should not be permitted to park vehicles right on the road; this will lead to disruption in material deliveries. Designated parking areas with appropriate parking space will be needed for this purpose; any plain area near construction site can be used for this purpose.

6. Site Rules

- Access to and from the site must be only via the specified entrance.
- On leaving the site, vehicles must be directed to follow the directions given.
- Drivers must adhere to the site speed limits.
- All material deliveries to site must keep allocated time limits.
- No material or rubbish should be left in the loading-unloading area.

- Develop a map for alternate routes showing material delivery services.
- Assign designated personnel on site to receive deliveries and to direct the vehicles.
- Monitor vehicle movement to reduce the likelihood of queuing or causing congestion in and around the area.
- Project vehicles should have a unanimous badge or logo on windscreen displaying that they belong to the project.

7. Contractor's Obligation

The traffic management plan of the Contractor should be safe enough and widening of any access roads and construction of the detours (as applicable and practical) must be completed 3 prior to start of project construction activities so that heavy vehicular transportation for

construction activities do not hinder the normal course of traffic lanes. Contractor must ensure that road closures are carried out by a competent person. The Contractor obligation must include the display of traffic signs according to the need to divert the traffic volume and to guide the road users in advance. The traffic sign, traffic light should be placed from any diverting route or road marking.

The Contractor should consider the environmental and social impacts of the traffic during construction. It will be sole responsibility of the Contractor to implement a plan which produces minimum nuisance to the local people and to the environment. Safety of the people should be given due importance. It will be under Contractor obligation to notify the traffic management plan and its later changes to CSC, NHA, emergency services and TrafficPolice, and also publish weekly programme in the local newspaper.

Annexure: IV

Guidelines for Occupational Health and Safety Plan

1. General

Occupational Health and Safety covers all personnel working under the project and will be inline with the World Bank EHS guidelines on health and safety.

The Occupational Health and Safety program will aim to ensure that the workplace is safe and healthy by: addressing the hazards and risks at the workplace; outlining the procedures and responsibilities for preventing, eliminating and minimizing the effects of those hazards and risks; identifying the emergency management plans for the workplace or workplaces; and, specifying how consultation, training and information are to be provided to employees at various workplaces.

Some of the risks/hazards associated with workplaces are due to working close to or at sitesassociated with the various project construction activities. Other risks associated with the project construction phase includes risk of increase of vector borne and other different diseases.

The following sections will be implemented during the construction phase to address and ensure workers' health and safety.

2. Screening and Regular Unannounced Checking of Workers

As per the procedure for hiring workers, all contractors and labor agencies are required to make all prospective workers undergo medical tests to screen for diseases and sicknesses, prior to selection and employment of any worker. The contractor is also responsible for ensuring that no worker who has a criminal record is employed at the project site. It will be ensured that all workers undergo medical tests to screen diseases at source and at sites in consultation with the designated Health Officer.

In addition to this, the Project Management will also undertake sudden, unannounced checks on workers to look for diseases such as COVID-19, HIV, STDs, and hepatitis and take necessary steps as mandated by the Contractual agreement between the Contractor and the Worker(s).

3. Minimizing Hazards and Risks at The Workplace

To ensure safety at all work sites, the following will be carried out:

- Installation of signboards and symbols in risky and hazardous areas, to inform workers to be careful.
- Construction of barricades around construction sites and deep excavated pits, to cordon off and deter entry of unauthorized personnel and workers into these areas.
- Providing a safe storage site/area for large equipment such as power tools and chains, to prevent misuse and loss.
- Proper Housekeeping: Ensuring that materials are all stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling, or collapse. Brick stacks

- will not be more than 7 feet in height and for concrete blocks they will not be more than 6 feet high.
- Removing all scrap timber, waste material and rubbish from the immediate work area as the work progresses.
- Where scaffolds are required, ensuring that each scaffold or its components shall be
- capable of supporting its own weight and at least 4 times the maximum intended load
- applied or transmitted to it. The platform/scaffold plank shall be at least 15 inches wide and 1.5 inches thick. The rope should be capable of supporting at least 6 times
- the maximum intended load applied or transmitted to that rope. Pole scaffolds over 60 feet in height shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with that design. Where scaffolds are not provided, safety belts/safety nets shall be provided;
- Ensure that all ramps or walkways are at least 6 feet wide, having slip resistance threads and not inclined at more than a slope of 1 vertical and 3 horizontal.
- Stacking away all excavated earth at least 2 feet from the pit to avoid material such as loose rocks from falling back into the excavated area and injuring those working inside excavated sites.
- Constructing support systems, such as bracing to adjoining structures that may be endangered by excavation works nearby.
- Only a trained electrician to construct, install and repair all electrical equipment to prevent risks of electrical shocks and electrocution.
- Install fire extinguishers and/or other fire-fighting equipment at every work site to prepare for any accidental fire hazards.

4. Provision of Personal Protective Equipment

Risks to the health and safety of workers can be prevented by provision of Personal Protective Equipment (PPEs) to all workers. This will be included in the construction cost for each Contractor. Depending on the nature of work and the risks involved, contractors must provide without any cost to the workers, the following protective equipment:

- High visibility clothing for all personnel during road works must be mandatory.
- Helmet shall be provided to all workers, or visitors visiting the site, for protection of the head against impact or penetration of falling or flying objects.
- Safety belt shall be provided to workers working at heights (more than 20 ft) such as roofing, painting, and plastering.
- Safety boots shall be provided to all workers for protection of feet from impact or

penetration of falling objects on feet.

- Ear protecting devices shall be provided to all workers and will be used during the occurrence of extensive noise.
- Eye and face protection equipment shall be provided to all welders to protect against sparks.
- Respiratory protection devices shall be provided to all workers during occurrence of mes, dusts, or toxic gas/vapor.
- Safety nets shall be provided when workplaces are more than 25 feet (7.5 m) above the ground or other surfaces where the use of ladders, scaffolds, catch platforms, the specific PPE requirements for each type of work are summarized below.

Table 1: PPE Requirement List

Type of Work	PPE
Elevated work	Safety helmet, safety belt (height greater than 20 ft), footwear for elevated work.
Handling work safety	Helmet, leather safety shoes, work gloves.
Welding and cutting work	Eye protectors, shield and helmet, protective gloves.
Grinding work	Dust respirator, earplugs, eye protectors.
Work involving handling of chemical substances	Dust respirator, gas mask, chemical-proof gloves. Chemical proof clothing, air-lined mask, eye protectors.
Wood working	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Blasting	Hard hat, eye and hearing protection.
Concrete and masonry work	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Excavation, heavy equipment, motor graders, and bulldozer operation	Hard hat, safety boots, gloves, hearing protection.
Quarries	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.

5. Procedures to Deal with Emergencies Such as Accidents, Sudden Illness and Death of Workers

First aid kits will be made available at all times throughout the entire construction period by the respective contractors. This is very important, because most work sites will be at some distance from the nearest hospital. In addition to the first aid kits, the following measures should be in place:

- Provision of dispensaries by the individual EPC contractor.
- A vehicle shall be on standby from the Project Office so that emergency transportation can be arranged to take severely injured/sick workers to the nearest hospital for immediate medical attention.

- A designated Health Officer/worker for the Project will be identified as a focal person to attend to all health and safety related issues. This employee's contact number will be posted at all work sites for speedy delivery of emergency services. The focal person shall be well versed with the medical system and facilities available at the hospital.

- Communication arrangements, such a provision of radios or mobile communication for all work sites, for efficient handling of emergencies, will be made

6. Record Maintenance and Remedial Action

The Project Management will maintain a record of all accidents and injuries that occur at the work site. This work will be delegated by the contractor to the site supervisor and regularly reviewed every quarter by project management. Reports prepared by the contractor shall include information on the place, date and time of the incident, name of persons involved, cause of incident, witnesses present and their statements. Based on such reports, the management can jointly identify any unsafe conditions, acts or procedures and recommend for the contractor to undertake certain mitigative actions to change any unsafe or harmful conditions.

7. Compensation for Injuries and Death

Any casualty or injury resulting from occupational activities should be compensated as per the local labor laws of Pakistan. Where compensation is sought by the injured party, proper procedures for documentation of the case will be followed, including a detailed report on the accident, written reports from witnesses, report of the examining doctor and his/her recommendation for treatment. Each individual contractor will be responsible for ensuring compensation for the respective workers.

8. Awareness Programs

The Project management will undertake awareness programs through posters, talks, and meetings with the contractors to undertake the following activities:

- Dissemination sessions will clarify the rights and responsibilities of the workers regarding interactions with local people (including communicable disease risks, such as HIV/AIDS, COVID-19), work site health and safety, waste management (waste separation, recycling, and composting), and the illegality of poaching.

- Make workers aware of procedures to be followed in case of emergencies such as informing the focal health person

9. Nomination of a Health and Safety Focal Person

Within each site (especially if different sites are being implemented by different contractors),a Health and Safety Focal Person will be appointed. The Terms of Reference for the focal person will mainly be as follows:

- Function as the focal person/representative for all health and safety matters at the

workplace;

- Responsible for maintaining records of all accidents and all health and safety issue at each site, the number of accidents and its cause, actions taken and remedial measures undertaken in case of safety issues;

- Be the link between the contractor and all workers and submit grievances of the workers to the contractor and instructions/directives on proper health care and safety from the contractors back to the workers;

- Ensure that all workers are adequately informed on the requirement to use Personal Protective Equipment and its correct use;

- v. Also responsible for the first aid kit and making sure that the basic immediate medicines are readily available.

1.1 Suggested Contents of Occupational Health and Safety Plan

The suggested contents of Occupational Health and Safety Plan to be developed by the Contractor(s) are described below:

a Purpose
b Scope of Application
c Complying Basis
d Occupational Health and Safety Objectives
e Organization and Responsibility
- Contractor's Project Manager
- HSE Management Department of the Contractor(s)
- Medical Treatment Room of the Contractor(s)
- Subcontractor's Project Manager
- Subcontractor's HSE Managers
- Occupational Health and Safety
- Community Health and safety plan

f Health Plan
- Labour Protection
- Sanitary Epidemic Prevention

g Safety Plan
- Summary
- Qualification Review
- Safety Training
- Construction Plans and Documents
- Control Measures
- Monitoring Measures
- Management of the Key Safety Accidents

h Public Security Plan
i Local Community Health and Safety

Annexure: V

Quarry Management Plan

1. Introduction

After the completion of construction phase of the proposed project, it is the responsibility ofthe contractor to restore the site that has been disturbed due to construction activities.

2. General Quarry Planning and Progressive Rehabilitation

A well-considered quarry development plan prior to starting work, or when opening up new areas will greatly reduce the effort required to achieve appropriate leading practice environmental and safety outcomes for quarry rehabilitation and closure.

The selection of a site, sequencing of quarrying and rehabilitation and final land-use should all be carefully planned prior to commencement of work at a quarry or borrow pit.

3. Progressive Rehabilitation

Progressive rehabilitation refers to the rehabilitation of completed parts of a quarry while extractive operations continue in other parts of the quarry. As new quarry sections are opened, worked out areas should be progressively rehabilitated to avoid increasing the total disturbed area of a quarry. Overburden and topsoil can be stripped from areas being opened up and placed directly onto worked out areas which are being rehabilitated. This will avoid double handling of materials and prevent degradation of the topsoil.

Progressive rehabilitation helps to minimize the visual impact of a quarry, control dust and erosion. It also assists in fostering good landowner and community relations.

Recommended progressive rehabilitation practices are:

- Agree on the final land form and use of a site with the relevant landowner.
- Rehabilitate in accordance with the intended final use of the land.
- Plan and develop the quarry in stages towards terminal areas so that progressive rehabilitation works can commence as soon as possible).
- Once the final landform is established, re-vegetate areas to stabilize the landform and to give the vegetation maximum time to establish while the quarry is still in operation.

4. Re-vegetation

Establishing a self-sustaining cover of vegetation is the best way to stabilize disturbed sites in the long-term. Re-vegetation also minimizes the visual impact of quarries. Generally, the vegetation type which existed before the disturbance, or a similar vegetation type will regenerate most successfully.

Prior to the commencement of a quarrying activity the type of re-vegetation should be agreed with the landowner, and should be consistent with the proposed final land-use.

Some indigenous plant species may not thrive in areas where soil conditions are substantially different after quarrying. If this is the case, and the objective is to re-establish vegetation, which fulfils the function of the original native vegetation, then some species

from outside the quarry area, may have to be introduced. Care must be taken to avoid introducing a species, which could become an unacceptable fire hazard, invade surrounding areas of native vegetation or become agricultural weeds

Where agriculture is the planned land-use then the species planted should be those commonly used for pasture or crops known to be successful on soils of similar texture, drainage status, pH and fertility. Suitable legumes should always be considered for their ability to improve soil fertility

5. Rehabilitation of Borrow Pits

Borrow pits are areas either in a road reserve or adjacent land holdings that have been used to extract materials such as gravels and soils. They can vary considerably in size, depending on the quantity of material taken and the borrow pits' reserve body of remaining material.

The variable size, shape and nature of borrow pits preclude very specific recommendations;however, the following general conditions apply:

- Before extraction commences, licenses and permits should be checked and limits of disturbance and/or clearing must be clearly marked out on the site before any ground disturbing activity takes place; and

- At the completion of extraction, the former borrow pit must be made stable and safe. This usually requires the sides of the pit to be reshaped with gentle safe grades. All disturbed areas associated with borrow pits must be retopsoiled, seeded, fertilized and mulched (if appropriate) as part of the restoration plan. Main Roads has been discouraging the conversion of borrow pits to stock watering points.

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Annexure: VI

Sanitation Management Plan

1. Introduction

This plan outlines the measures that can improve conditions of sanitation at construction sites during construction and operation phase.

2. Purpose of the plan

The plan intends to ensure sanitation including the control of water supplies, excrete and wastewater disposal, refuse disposal, vectors of diseases, housing conditions, food supplies and handling, atmospheric conditions, and the safety of the working environment.

3. Management of Sanitation During Construction Phase:

i. Responsibility:

The health and safety Inspector designated by construction contractor shall also inspect sanitation conditions and ensure safe working environment for workers.

ii. Location of Camp Sites

The construction camps shall be located at least 500 m away from residential community. The accommodation and ancillary facilities for labour shall be constructed and maintained to standards and scales approved by the Resident Engineer.

The camps must be located such that the drainage from and through the camps shall not endanger any domestic or public water supply.

All sites must be managed to avoid ditches/depressions to minimize nuisance due to stagnant water.

iii. Water Supply

An adequate and convenient water supply, approved by the appropriate health authority, must be provided in each camp for drinking, cooking, bathing and laundry purposes. Potable water supply systems for labour camps occupants shall meet the drinking water quality standards of Pakistan. In addition, the design of water system facilities shall be based on the suppliers Engineer's estimates of water demands.

The drinking water must be monitored regularly for drinking water quality parameters. At all construction camps and other workplaces, good and sufficient water supply shall be maintained to eliminate chances of waterborne/water- related/water-based diseases to ensure the health and hygiene of the workers.

iv. Toilet Facilities and Hygiene

According to health and safety guidelines OR-OSHA number of toilets required at construction site is as 1 toilet for 20 workers. Table 1 shows the number of toilets required in accordance with the number of employees at construction site. The total numbers of employees at construction site are estimated to be 800 persons.

Table-1: No. of Toilets Required for Employees at Construction Site:

No. of Employees	No. of Toilets and Urinals by OSHA	Total No. Toilets and Urinals Required at Construction Site
Up to 20	1 toilet	7 toilets
Up to 40 employees	1 urinal	4 urinals

Within the premises of every workplace, toilets and urinals shall be provided in an accessible place, and the accommodation, separately for each of these, as per standards prevailing in the country.

Toilet facilities adequate for the capacity of the camp must be provided. Each toilet room must be located so as to be accessible.

A toilet room must be located within 200 feet of the camp. No toilet may be closer than 100 feet to kitchen and sleeping area.

These toilets must be distinctly marked by signs printed in native language of the persons occupying the camp, or marked with easily understood pictures or symbols. Urinals troughs in privies must drain freely into the pit or vault, and the construction of this drain must be such as to exclude flies and rodents from the pit.

Proper facility for hand washing and other cleaning activities to be provided, e.g.

- Provide individual hand towels from a sanitary dispenser and receptacles for disposing of waste towels;
- Providing hand soap and industrial hand cleaner for removing paints and other contaminants;
- Prohibited use of gasoline or solvent for hand washing; and
- Keep the floor of facilities dry to prevent spills and falls.

v. Waste Disposal

The sewage system for the camp must be designed, built and operated in compliance with the relevant legislation so that no health hazard occurs and no pollution to the air, ground or adjacent watercourse takes place.

Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner.

Unless otherwise arranged for by the local sanitary authority, arrangement for disposal of excreta should be done in the already existing sewerage system in the area. On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor’s expense, to the entire satisfaction of the engineer.

vi. Maintenance of Sanitary Facility

Proper maintenance of toilets and other sanitary facilities should assure by health and safety inspector. Toilets and other sanitary facilities shall be cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition.

Receptacles shall be tarred inside and outside at least once a year.

All buildings, rooms and equipment and the grounds surrounding them shall be maintained in a clean and operable condition and be protected from rubbish accumulation.

All necessary means shall be employed to eliminate and control any infestations of insects and rodents within all parts of any labor camp.

4. Management of Sanitation During Operational phase:

A proper sanitation plan is to be adopted for maintaining the hygienic conditions duringthe operational phase of the project. These includes

- Site Clearance;
- Storm Water Clearance;
- Sewage/ Drainage Clearing and
- Solid Waste Management

i. Site Clearance:

The construction contractor shall assure the clearance of construction machinery, vehicle and other equipments used during the construction period after the completion of the project.

ii. Storm Water/Sewage Clearance:

One of the main issue that may arise during construction and operational phase is the clogging of drainage/sewer pipelines as a result of construction material, oil spillage from vehicles, throwing of solid waste by the road users due to lack of bins into the nearby drainage/sewer pipes, etc. the blockage of these drainage pipes will cause over flow of water on road, which will have negative impacts on the road in form of deterioration of road surface as well as standing water acts as a source of water-through disease in the area.

5. Responsible Authorities:

In case of storm water drains/sewer pipes clogging the concerned department are responsible for un-clogging of these sewer and drainage pipelines.

i. Solid Waste Management:

Municipal solid waste produced as a result of commercial activities, by road users and from nearby residential community should be collected and managed properly by the concerned department. Waste bins should be placed along the road/bridges, regular cleaning of the road should be carried out using mechanical sweepers twice a day and at least one sweeper should be deputed for the whole stretch of project site to assure regular cleaning.

ii. Awareness and Training:

A training and awareness sessions shall be conducted for workers before commencement of the project. The implementation of sanitation plan would be more effective if the importance of hygiene; sanitation and safety are known to the workers.

Annexure: VII

Construction Waste Management Plan

1. General Introduction

Construction work refers to a wide range of materials depending on their origin; they are categorized as excavation material, demolition materials and worksite waste material. Construction waste material of the proposed project consists mainly of concrete, bentonite, masonry, limestone, sandstone, metal, and wood. In addition to this, significant amount of municipal waste will also generate from the construction camps. The solid waste generationestimated to be 520 kilogram per day for 800 construction workers during construction phaseof the proposed project.

2. Origins and Causes of Construction Waste

Origins of Waste	Causes of Waste
Contractual	• Errors in contract documents; and • Contract documents incomplete at commencement of construction.
Design	• Design changes; • Design and detailing complexity; • Design and construction detail errors; • Unclear and unsuitable specifications; and • Poor coordination and communication (late information, last minute client requirements, slow drawing revision and distribution).
Procurement	• Ordering errors (i.e. ordering items not in compliance with specification); • Over allowances (i.e. difficulties to order small quantities); and • Supplier errors.
Transportation	• Damage during transportation; • Difficulties for delivery vehicles accessing construction sites; • Insufficient protection during unloading; and • Inefficient methods of unloading
On-Site Management and Planning	• Lack of on-site waste management plans; • Improper planning for required quantities; • Delays in passing information on types and sizes of materials and components to be used; • Lack of on-site material control; and • Lack of supervision.
Material Storage	• Inappropriate site storage space leading to damage or deterioration; • Improper storing methods; and • Materials stored far away from point of application.
Material Handling	• Materials supplied in loose form; • On-site transportation methods from storage to the point of application; and • Inadequate material handling.
Site Operation	• Accidents due to negligence; • Unused materials and products; • Equipment malfunction; • Poor craftsmanship; • Use of wrong materials resulting in their disposal;

	• Time pressure; and • Poor work ethics.
Residual	• Waste from application processes (i.e. over preparation of mortar); • Off-cuts from cutting materials to length; • Waste from cutting uneconomical shapes; and Packaging.
Other	• Weather • Vandalism Theft

i. Waste Management Goals

The contractor established goal that this project will generate at least 50 percent less waste into landfills and the processes shall be employed to ensure that this goal is met. These shall include prevention of damage to materials to be incorporated into the work due to mishandling, improper storage, contamination, inadequate protection, minimizing poor quantity estimation, and through design.

ii. Responsibility

a) The Contractor shall be responsible for the implementation of the administrative portions of this program, including the notification of subcontractor management, the training of the site supervisor and the onsite posting of this plan.

b) The site supervisor shall be responsible for the implementation of the onsite portions of this program including the training of subcontractor personnel.

iii. Waste Prevention Planning

c) In addition to other requirements specified herein it is a requirement for the work of this project that the contractor comply with the applicable city waste disposal requirements.

d) Of the inevitable waste that is generated, the waste materials designated in this specification shall be salvaged for reuse and or recycling where practical and possible. Waste disposal in landfills shall be minimized as much as possible.

e) Project Construction Documents: The Contractor will contractually require all subcontractors to comply with the Construction Waste Management Plan (WMP)". A copy of the WMP will accompany all subcontractor agreements and require subcontractor participation.

f) The "Construction Waste Management Plan" shall be implemented and executed as follows and as on the chart:

- Salvageable materials will be diverted from disposal where feasible;

- There will be a designated area on the construction site reserved for materialsthat can be recycled;

- Areas shall be marked to designate what recycle materials are to be stored there;and

- Hazardous waste shall be managed by a licensed hazardous waste vendor.

iv. Communication and Education Plan

g) This Waste Management Plan will be posted onsite;

h) Each subcontractor will be made aware of the intent of this project with respect to reduction of waste and recycling. Onsite recycling containers and/or areas will be plainly marked;

i) The subcontractor will be expected to make sure all their crews comply with the Waste Management Plan;

j) All recycling containers and areas will be clearly marked;

k) Lists of acceptable and unacceptable materials will be posted at the site; and

l) All subcontractors will be informed in writing of the importance of non-contamination with other materials or trash.

v. Motivation Plan

The Contractor will conduct a pre-award meeting for subcontractors. Subcontractors under consideration will be required to attend the meeting to review project goals and requirements with the project team. Attendance will be a prerequisite for award of subcontracts. This document will be an attachment to every subcontract. Copies of the attachment will be posted prominently at the job site.

vi. Expected Project Waste, Disposal, and Handling

The following chart identifies waste materials expected on the proposed project, their expected disposal methods and handling procedures. New items may be added as needed.

Material	Disposal Method	Handling Procedure
Land Clearing Debris	Keep separate for reuse and or wood sale. Suitable materials may be delivered to a composting site. Separate topsoil and rock for future landscaping use.	Keep separated in designatedareas onsite.
Clean Dimensional Wood and Palette Wood	Keep separate for reuse by on-site construction or by site employees for either heating stoves or reuse in home projects. May be offered to public.	Keep separated in designatedareas onsite.
Painted or Treated Wood	Reuse, off site recycle, and landfill.	Keep separated in designated areas onsite. Place in “Trash” container.
Concrete	Recycle when possible.	Keep separated in designated areas onsite.

Concrete Masonry Units	Keep separate for re-use by on-siteconstruction or by site employees	Keep separated in designatedareas onsite.
Metals	Recycle off site when possible. Separate copper wire whenpossible.	Keep separated in designated areas onsite. Place in "Metals"container.
Gypsum drywall (unpainted)	Recycle with supplier whenpossible.	Keep scraps separate for recycling stack on pallets in provided onsite. All scrap drywall should be taken back by contractor to drywall supplier
Paint	Reuse onsite; donate to Habitat for Humanity Restore.	Keep separated in designated areas onsite.
Insulation	Reuse and landfill.	Keep separated in designated areas onsite.
Glass	Recycle locally.	Keep separated in designated areas onsite.
Plastics	Plastic Bottles: recycle locally; beaware of plastics that are acceptable to recycle facility.	Keep separated in designatedareas onsite.

vii. Waste Disposal Company:

a) Bahawalnagar Local Government

b) Bahawalpur Local Government

viii. Recycle Hauler

a) To be determined;

b) Contact Address; and

c) Some or all recycle may be hauled by the authorized representative.

ix. Possible Recycle Locations and Acceptable Materials

a) Coordinate with companies in Lahore or which are registered with LWMC that accept materials for recycle; and

b) Using the above as a resource, a list will be kept indicating local opportunities for recycle of expected materials. New locations should be added as needed.

Annexure: VIII

Chance Find Procedure

1. BACKGROUND

The purpose of this document is to address the possibility of archaeological deposits becoming exposed during ground altering activities within the project area and to provide protocols to follow in the case of a chance archaeological find to ensure that archaeological sites are documented and protected as required.

The Antiquities Act, 1975, protects archaeological sites, whether on Provincial Government owned or private land. They are non-renewable, very susceptible to disturbance and are finite in number. Archaeological sites are an important resource that is protected for their historical, cultural, scientific and educational value to the general public and local communities. Impacts to archaeological sites must be avoided or managed by development proponents. The objectives of this „Archaeological Chance Find Procedure‟ are to promote preservation of archaeological data while minimizing disruption of construction scheduling It is recommended that due to the moderate to high archaeological potential of some areas within the project area, all on site personnel and contractors be informed of the Archaeological Chance Find Procedure and have access to a copy while on site.

2. Potential Impacts to Archaeological Sites

Developments that involve excavation, movement, or disturbance of soils have the potential to impact archaeological materials, if present. Activities such as road construction, land clearing, and excavation are all examples of activities that may adversely affect archaeological deposits.

3. Relevant Legislation

It ensures the protection, preservation, development and maintenance of antiquities in the provinces of Pakistan. 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 relevant provincial governments 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, any archaeological discovery made during the course of the project.

4. REMEDIES AND PENALTIES

The Antiquities Act, 1975 provides for heritage inspection or investigation orders, temporary protection orders, civil remedies and penalties to limit contraventions. These powers provide:

‟A contravention of any provision of this Act or the rules shall, where no punishment has been specifically provided be punishable with rigorous imprisonment for a term which may extend to two years, or with fine up to rupees ten hundred thousand, or with both.

5. Archaeological ‘Chance Find’ Procedure

If you believe that you may have encountered any archaeological materials, stop work in the area and follow the procedure below:

The following „chance-find" principles will be implemented by the contractor throughout the construction works to account for any undiscovered items identified during construction works:

- Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance.
- Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area.
- If the site supervisor determines that the item is of potential significance, an officer from the Department of Archaeology (DoA) will be invited to inspect the site and work will be stopped until DoA has responded to this invitation.
- Work will not re-commence in this location until agreement has been reached
- between DoA and NTDC as to any required mitigation measures, which may include excavation and recovery of the item.
- A precautionary approach will be adopted in the application of these procedures.

6. Detailed Procedural Steps

- If the Director, department of Archaeology receives any information or otherwise hasthe knowledge of the discovery or existence of an antiquity of which there is no owner, he shall, after satisfying himself as to the correctness of the information or knowledge, take such steps with the approval of the Government, as he may consider necessary for the custody, preservation and protection of the antiquity.
- Whoever discovers, or finds accidentally, any movable antiquity shall inform forth with the Directorate within seven days of its being discovered or found.
- If, within seven days of his being informed, the Director decides to take over the antiquity for purposes of custody, preservation and protection, the person discoveringor finding it shall hand it over to the Director or a person authorized by him in writing.
- Where the Director decides to take over an antiquity, he may pay to the person by whom it is handed over to him such cash reward as may be decided in consultation with the Advisory Committee.
- If any person, who discovers or finds any movable antiquity contravenes the provisions of the Act, he shall be punishable with imprisonment for a term which may extend to five (05) years, or with fine not less than fifteen hundred thousand rupees or with both and the Court convicting such person shall direct that the antiquity in respect of which such contravention has taken place shall stand forfeited to Government.
- The Director or any officer authorized by him with police assistance may, after giving reasonable notice, enter into, inspect and examine any premises, place or area which or the sub-soil of which he may have reason to believe to be, or to contain an antiquity and may cause any site, building, object or any antiquity or the remains of any antiquity in such premises, place or area to be photographed, copied or reproduced by any process suitable for the purpose.

- The owner or occupier of the premises, place or area shall afford all reasonable opportunity and assistance to the Director.

- No photograph, copy of reproduction taken or made shall be sold or offered for sale except by or with the consent of the owner of the object of which the photograph, copy or the reproduction has been taken or made.

- Where substantial damage is caused to any property as a result of the inspection, the Director shall pay to the owner thereof reasonable compensation for the damagein consultation with the Advisory Committee.

- If the Director after conducting an inquiry, has reasonable grounds to believe that any land contains any antiquity, he may approach the Government to direct the Revenue Department to acquire such land or any part thereof and the Revenue Department shall thereupon acquire such land or part under the Land Acquisition Act, 1894 (I of 1894), as for a public purpose.

Annexure: IX

Location of Material Quarrying sites, Mixing Plants, Borrow areas, and Dumping areas

Number and Location of the Borrow and Dumping area

Realignment of KKH Phase-II (Thakot-Raikot)

S.N.	Code	Position	Chainage
1	Dumping Area	Right	K195+800
2	Dumping Area	Right	K207+500
3	Dumping Area	Right	K215+200
4	Dumping Area	Right	K225+700
5	Dumping Area	Right	K233+100
6	Dumping Area	Right	K261+500
7	Dumping Area	Left	K299+300
8	Dumping Area	Left	K308+500
9	Dumping Area	Right	K316+500
10	Dumping Area	Right	K320+800
11	Dumping Area	Left	K342+500
12	Dumping Area	Left	K382+200
13	Dumping Area	Left	K393+500
14	Dumping Area	Left	K416+500
15	Dumping Area	Left	K445+400
16	Dumping Area	Left	K449+000
17	Dumping Area	Left	K459+600
18	Dumping Area	Right	K470+000
19	Borrow Area	Right	K182+200
20	Borrow Area	Right	K207+100
21	Borrow Area	Left	K233+400
22	Borrow Area	Left	K255+300
23	Borrow Area	Right	K295+000
24	Borrow Area	Right	K366+200
25	Borrow Area	Left	K416+500
26	Borrow Area	Right	K439+300

Number and location of Material Quarrying Site

S.N.	Name	Position	Chainage
1	Stone Quarrying Site	right	K180+500
2	Stone Quarrying Site	right	K221+500
3	Stone Quarrying Site	right	K290+710
4	Stone Quarrying Site	right	K339+650
5	Stone Quarrying Site	right	K384+200
6	Stone Quarrying Site	right	K384+200
7	Stone Quarrying Site	left	K471+120
8	Sand Quarring Site	left	K180+420
9	Sand Quarring Site	right	K215+700
10	Sand Quarring Site	left	K273+000
11	Sand Quarring Site	left	K357+300
11	Sand Quarring Site	left	K397+000
12	Sand Quarring Site	left	K434+000
13	Sand Quarring Site	right	K450+000

Number and location of the Mixing Plant

S.N.	Name	Position	Chainage
1	Mixing Plant	right	K194+800
2	Mixing Plant	right	K219+500
3	Mixing Plant	left	K239+500
4	Mixing Plant	left	K256+100
5	Mixing Plant	right	K286+700
6	Mixing Plant	left	K291+800
7	Mixing Plant	left	K336+600
8	Mixing Plant	left	K343+000
9	Mixing Plant	left	K390+500
10	Mixing Plant	left	K413+200
11	Mixing Plant	left	K442+700

Annexure: X

Summary of Estimated Flood Magnitudes Corresponding to Different Return Periods

Summary of Estimated Flood Magnitudes Corresponding to Different Return Periods

Sr.	RD	Catch Area	Flood Cumecs		
		Sq.km	30 yr	50 yr	100 yr
1	0+443	0.3	11	12.3	14
2	1+163	0.4	16	17.8	20
3	1+431	2.4	97	107.4	122
4	2+315	0.8	15	18	22
5	3+100	1.8	31.6	38	47.4
6	5+551	1.8	34.7	41.4	51.3
7	6+718	23.9	299.5	358	443.6
8	8+030	1.0	19	23	28
9	11+993	50.9	510.4	608.1	750.8
10	14+026	1.3	26	31	39
11	17+091	243.2	952.8	1141.0	1417.4
12	17+844	0.9	18	21	26
13	20+142	0.4	8	9	11
14	22+525	0.7	13.7	16.3	20.1
15	23+483	7.2	102.4	123.5	154.3
16	24+898	3.2	54.8	66	82.3
17	25+311	4.5	70.3	84.5	105.4
18	26+065	1.9	38	45	56
19	27+723	0.8	15	18	22
20	29+899	68.3	361.9	436.9	547.3
21	31+326	0.3	7	8	10
22	34+053	0.6	11	14	17
23	34+794	0.4	9	11	13
24	36+565	3.6	61.2	73.1	90.6
25	36+737	0.3	5	6	7
26	36+994	0.2	4.3	5.1	6.3
27	40+559	5.9	83	99	121
28	41+121	0.2	3	4	5
29	42+272	0.1	2	2	2
30	42+714	0.2	5	5	7
31	43+198	0.1	3	3	4
32	43+604	0.5	9	11	14
33	44+177	0.1	1.1	1.3	1.7
34	44+355	0.01	0.1	0.2	0.2
35	45+236	0.8	17	20	24
36	45+586	0.1	3	3	4
37	46+009	18.3	241.4	288.2	356.6
38	46+184	0.3	7	8	10
39	47+234	0.2	5	6	7
40	48+185	0.5	10	12	14
41	48+397	0.8	16	19	24
42	49+694	0.3	6	7	9
43	50+152	0.1	2	2.4	3
44	50+790	0.2	3.1	3.7	4.6
45	53+285	407.8	1244.5	1496.4	1867.5
46	54+448	27.4	266.9	318.3	393.6
47	56+386	0.5	11	13	16
48	56+532	1.1	22	26	32
49	56+628	0.3	7	8	10
50	57+200	0.03	0.7	0.8	1
51	58+168	0.1	2.8	3.2	3.9
52	60+520	3.7	64.9	76.9	94.3
53	60+833	0.2	4	4.4	5
54	61+368	2.0	41	48	58

Sr.	RD	Catch Area	Flood Cumecs		
		Sq.km	30 yr	50 yr	100 yr
55	61+842	0.8	16	19	23
56	62+132	0.3	6	7	9
57	62+900	51.9	284.8	341.8	425.4
58	64+661	0.5	9	11	14
59	66+209	0.8	18	21	26
60	66+912	0.3	6	8	9
61	67+285	0.4	9.5	11.1	13.4
62	67+446	0.6	15.1	17.7	21.3
63	68+348	1.3	28.5	33.7	41.1
64	68+953	0.2	5.5	6.4	7.7
65	69+808	1.3	30.1	35.3	42.8
66	69+927	1.1	23	27.1	33
67	70+304	4.0	68.3	81.7	101.1
68	71+756	0.4	7.5	8.9	10.9
69	71+899	1.8	37	44	54.1
70	72+783	0.5	9.8	11.6	14.3
71	73+125	0.8	16.4	19.5	24
72	73+357	0.4	7.4	8.8	10.9
73	74+011	0.3	6	7.2	9
74	76+235	2.9	59.8	70.3	85.4
75	76+499	40.2	362.5	434.7	540.6
76	77+830	3.0	36.4	45.5	59.1
77	78+545	1.6	23.5	29	37.2
78	79+132	0.9	14	17.1	21.7
79	80+739	2.8	36	44.6	57.3
80	81+628	0.3	5.1	6.3	8.1
81	82+136	0.6	8.6	10.6	13.7
82	82+524	0.3	4.7	5.8	7.5
83	84+812	266.3	742.9	905.2	1146.6
84	85+417	0.5	7.1	8.8	11.2
85	87+038	4.8	49.6	60.7	78.9
86	89+136	506.2	1171.7	1436.8	1832.9
87	90+955	2.4	26.4	33.1	43
88	91+158	0.4	5.5	6.9	9
89	91+885	3.0	34.9	42.2	52.9
90	92+413	0.4	5.1	6.3	8.2
91	92+863	0.4	6.6	8.1	10.5
92	94+158	13.3	132.9	164.2	210.9
93	95+637	1.3	19.4	24	30.9
94	95+919	0.4	5.4	6.8	8.9
95	96+181	0.8	11.5	14.4	18.7
96	96+673	34.4	304.4	369.2	464.9
97	98+128	1.3	17.7	22.2	29
98	98+640	0.6	7.9	9.9	12.9
99	99+444	1.2	19.3	23.7	30.1
100	100+733	5.7	80.4	95.5	117.4
101	102+668	4.1	60.5	71.2	87.6
102	105+564	6.0	94.2	112.6	139.4
103	106+059	0.2	4.9	5.8	7.2
104	106+507	0.3	8	9.3	11.3
105	106+811	1.4	31.8	37.3	45.1
106	107+032	0.7	16.5	19.2	23.3
107	107+980	0.2	5.8	6.8	8.2
108	108+372	693.5	1660.7	2003.7	2510.8
109	109+543	2.6	46.2	54.8	67.3
110	110+676	0.5	11.5	13.4	16.2

Sr.	RD	Catch Area	Flood Cumecs		
		Sq.km	30 yr	50 yr	100 yr
111	111+095	0.3	7.3	8.6	10.5
112	111+975	4.1	58.4	70	87
113	112+795	21.9	294.6	349.7	430.1
114	114+444	0.9	19.4	23	28
115	114+882	0.4	7.4	8.8	10.7
116	115+579	41.6	405.6	485.1	601.6
117	115+957	0.3	7.5	8.8	10.6
118	117+328	0.2	3.5	4.1	5
119	118+696	0.8	16.1	19.2	23.7
120	119+770	0.3	5.5	6.7	8.5
121	120+460	77.1	397	513	702.3
122	122+344	0.4	4	6	8.0
123	122+571	0.7	7	10	14.0
124	122+902	0.6	6	8	11.5
125	123+348	0.6	7	10	13.2
126	125+490	0.3	4	5	7.1
127	126+727	48.6	276	353	478
128	126+951	1.0	13	16	22.0
129	127+768	1.8	24	30	40.6
130	127+994	0.4	5	7	8.9
131	128+523	3.4	39	51	69.6
132	129+373	0.6	7	9	12.2
133	131+164	1.0	14	18	24.2
134	131+345	0.1	2	2	2.7
135	131+997	0.1	2	3	3.5
136	133+008	0.5	8	10	13.0
137	134+086	0.4	6	8	10.0
138	135+302	34.1	243.1	310	418
139	135+527	0.3	4	5	6.4
140	136+393	0.8	12	15	20.4
141	137+455	0.1	2	2	3.0
142	139+057	3.8	39	50	68.2
143	139+677	4.5	44	56	74.3
144	140+270	0.4	5	7	8.8
145	140+463	0.8	11	15	19.6

Annexure: XI

Land Acquisition & Utility Plan