Initial Environmental Examination

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Pakistan: Balochistan Water Resources Development Sector Project

Manyalo Raiko & Rind Ali PIS Subproject

Prepared by Irrigation Department, Government of Balochistan of the Islamic Republic of Pakistan for the Asian Development Bank (ADB).

IRRIGATION DEPARTMENT
GOVERNMENT OF BALOCHISTAN

PROJECT DESIGN, CONSTRUCTION SUPERVISION AND IMPLEMENTATION SUPPORT FOR BALOCHISTAN WATER RESOURCES DEVELOPMENT SECTOR PROJECT

(LOAN 3700-PAK)

INITIAL ENVIRONMENTAL EXAMINATION REPORT MANYALO RAIKO & RIND ALI (PIS) SUBPROJECT

August 2024

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PROJECT DESIGN, CONSTRUCTION SUPERVISION AND IMPLEMENTATION SUPPORT FOR BALOCHISTAN WATER RESOURCES DEVELOPMENT SECTOR PROJECT
MANYALO RAIKO & RIND ALI (PIS) SUBPROJECT

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ACRONYMS

ADB	Asian Development Bank
AJK	Azad Jammu Kashmir
BEPA	Balochistan Environmental Protection Agency
BHUs	Basic Health Units
BID	Balochistan Irrigation Department
BOQ	Bill of Quantities
CAD	Command Area Development
CCR	Community Complaint Register
CC	Construction Contractor
CSC	Construction Supervision Consultant
DO	Dissolved Oxygen
EA	Executing Agency
EHS	Environment Health & Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPC	Environmental Protection Council
FOs	Farmer Organizations
GIS	Geographic Information System
GoB	Government of Balochistan
GRC	Grievance Redress Committee
GRM	Grievance Redressal Mechanism
IEE	Initial Environmental Examination
EHS	Environment, Health and Safety
IWRM	Integrated Water Resources Management
M&E	Monitoring and Evaluation
MCM	Million Cubic Meter
NCS	National Conservation Strategy
NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
NOx	Oxides of Nitrogen
NTU	Nephelometric Turbidity Unit
PAPs	Project Affected People
PEPA	Pakistan Environmental Protection Act
PEPO	Pakistan Environmental Protection Ordinance
PIS	Perennial Irrigation Schemes
PMD	Pakistan Meteorological Department
PPC	Pakistan Penal Code
PPEs	Personal Protection Equipment
PPTA	Project Preparatory Technical Assistance

PIU	Project Implementation Unit
BID	Balochistan Irrigation Department
REA	Rapid Environmental Assessment
RHCs	Rural Health Centers
SOx	Oxides of Sulfur
SPS	Safeguard Policies
SC	Supervision Consultants
TA	Technical Assistance
TDS	Total dissolved solids
TSS	Total Suspended Solids
UNEP	United Nation Environment Program
VLD	Voluntary Land Donation
VOCs	Volatile Organic Compounds
WHO	World Health Organization

EXECUTIVE SUMMARY

A. INTRODUCTION

1. This report presents the findings of an Initial Environmental Examination (IEE) study for the proposed Manyalo Raiko and Rind Ali Sub-projects located in the Mula River Basin. The project is funded by the Asian Development Bank (ADB), with the Balochistan Irrigation Department (BID) acting as the Executive Agency (EA).

2. The sub-project is situated in Khuzdar district, approximately 50 km northeast of Khuzdar. Manyalo and Raiko are located on the right bank of the river, while Rind Ali is situated on the left bank. Access to the sub-project site from Khuzdar is through the M-8 motorway, which connects to a dirt road crossing the Mula River Basin boundary on the northeast side of M-8. The Manyalo Raiko and Rind Ali Sub-projects are among the 11 sub-projects of the two river basins. The prefeasibility study of Manyalo Raiko and Rind Ali Sub-projects was conducted by PPTA Consultants. The report at hand is the Feasibility Report of Manyalo Raiko and Rind Ali Sub-projects and contains the analysis of studies carried out by the consultants. Manyalo, Raiko, and Rind Ali perennial irrigation schemes will bring 680 hectares under cultivation, of which 314 hectares are already under cultivation, and an additional 366 hectares will be added to the command area. After the construction of the sub-projects, 10 villages, namely Manyalo, Khair, Karrech, Raiko on the right bank, and Malki, Bhoko, Jakhar, Saboz, Thatt, and Rind Ali on the left bank, will come under cultivation.

3. The main components of the sub-projects include (i) a weir structure on the Mula River with four channels: the Left Main Channel of Manyalo (7,110 meters), Manyalo Right Channel (9,263 meters), Rind Ali Channel (4,370 meters), and Raiko Channel (5,800 meters). (ii) The construction of hydraulic structures, including Time Division Structures/Flow Division structures, Fall Structures, Sump, Culverts, Aqueducts, Syphons, Super Passages, and Flood Protection Bunds. (iii) The construction of social structures and command area development in the sub-project area.

4. The broader objectives of this project are:

- Increasing the command area to cultivable land,
- Ensuring sustained water supply to the current command area.

Policy Legal and Administrative Framework

5. This report is prepared in accordance with Pakistan Environmental Protection Act 1997, Balochistan Environmental Protection Act, 2014 and the ADB SPS which requires that environmental considerations be incorporated into ADB's funded project to ensure that the project will have minimal environmental impacts and be environmentally sustainable.

6. The proposed project is governed by a host of national and provincial statutes and regulations. Furthermore, as the Asian Development Bank (ADB) is involved as a donor / financier, its relevant policies and guidelines will also govern this project.

7. Amongst the various rules and statutes, as summarized in Chapter-2 of this IEE Report, the most pertinent from an environmental perspective are as follows:

- National Policy on the Environment;
- National Biodiversity Strategy & Action Plan;
- The Land Acquisition (Balochistan Amendment) Act, 1985;
- National & Provincial Conservation Strategy;
- Pakistan Environmental Protection Act, 1997;
- Balochistan Environmental Protection Act, 2012;
- Pakistan EPA Review of IEE and EIA Regulations, 2000;
- Balochistan Forest Regulation 1890;
- The Balochistan Antiquities Act, 2014;
- The Balochistan Wildlife (Protection, Preservation, Conservation and Management) Act, 2014; and
- ADB's Safeguard Policy Statement (2009).

B. DESCRIPTION OF PROJECT

8. In Manyalo Raiko and Rind Ali, a weir is proposed to divert perennial flow to command area, which will assure extension of command area on higher elevations. The available perennial water will be utilized for irrigating extended command area so that farm income and livelihood of local people will be improved. The sub-project will also provide protection bunds along some reaches of channel, which is located in toe of hills, to preserve it from floodwater. Availability of water round the year will increase productivity of area and enhance income generation activities in area.

9. Two options were considered for command the area. The first being two separate infiltration galleries one on each side along with irrigation channels, with flood protection for command area with cross drainage structures. The other option being weir along with lined irrigation channel up to command area. From economic analysis, option 2, a weir with conveyance system and flood protection bunds, were opted for Manyalo Raiko and Rind Ali for irrigating command area of 680 ha. The subproject will improve 314.0 ha of existing command area of Manyalo, Raiko & Rind Ali whereas 366.0 ha new area of Karecho will be brought under cultivation. After construction of subproject, it will significantly improve the agricultural production and rural livelihood. The interventions of sub-project are given in Table.

Sr. No	Type of structure	Weir
1.	Coordinates of Weir	282525.34 m E, 3111470.28 m N Zone 42R
2.	Length of Weir (m)	394
3.	Crest Width (m)	4
4.	Total Length of Canal (m)	26,543
5.	Left Main Channel of Manyalo (m)	7,110
6.	Manyalo Right Channel (m)	9,263
7.	Rind Ali Channel (m)	4,370
8.	Raiko Channel (m)	5,800
9.	Time Division Structures/ Flow Division structure (Nr.)	59
10.	Fall Structures (Nr.)	22
11.	Sump (Nr.)	10
12.	Culverts (Nr.)	8

Sr. No	Type of structure	Weir
13.	Aqueducts (Nr.)	5
14.	Syphon (Nr.)	1
15.	Super Passage (Nr.)	4
16.	Flood Protection Bund (m)	1,845
17.	Social Structures (Nr.)	8
18.	Command Area (ha)	678

C. PROJECT ALTERNATIVES

10. Based on a comprehensive analysis of alternatives between the Weirs and infiltration gallery, recommended option is construction of weir. Weirs tend to be more cost-effective, offer precise flow control, and have a positive impact on flood mitigation and water quality. They also align better with local cultural practices and provide opportunities for recreational and social gatherings. In contrast, infiltration galleries have higher initial construction costs, lack immediate flow control, and may not be culturally compatible or socially engaging.

D. BASELINE CONDITIONS

Topography: The valley slopes of the Project Site are moderate to steep. The average altitude of the Manyalo, Raiko and Rind Ali PIS sub-project site command area is 830~875m above mean sea level. The overall relief at subproject site is 710 m (830~1540m).

Geography: Balochistan is situated in the southwest of Pakistan and covers an area of 347,190 square kilometers (134,050 sq. mi). It is Pakistan's largest province by area, constituting 44% of Pakistan's total land mass. The province is bordered by Afghanistan to the north and northwest, Iran to the south-west, Punjab and Sindh, and Khyber Pakhtunkhwa and the Federally Administered Tribal Areas to the north-east. To the south lies the Arabian Sea.

Geology: Tectonically the sub-project site is situated in the vicinity of a number of active faults like Kakar Khorasan fault in the north and the Zhob Valley Thrust in the south. Both these faults are trending northeast-southwest. The area is in the near vicinity of subduction zone of Pakistan- India Plate and Eurasian Plate.

Surface Water Quality: Surface water samples were collected from Mula River and tested. The results show that all the parameters are within permissible level according to National Environmental Quality Standards and WHO guidelines. The river water is fresh in this reach having TDS value less than 500 ppm.

Ambient Air Quality: Air quality monitoring results showed that these are within NEQS. As there are no potential sources of air and Noise pollution i.e. no industries and little vehicular traffic in the project area, so ambient air and air quality are good.

Ambient Noise Quality: Ambient noise level was measured at Mula River, which range between 32-41 dB(A). This range corresponds to a low-level noise atmosphere of the rural areas, associated with some of vehicular traffic.

Protected Sites: As per assessment during the baseline surveys there are no protected sites and protected forests within or close to the potential impact zone of this scheme.

Flora of sub-Project area comprises of Khajoor, Babbur, Kandi, Devi, Kirri, Ber, Gujo, Merin, Gugul, Chill,Kulumurak, Grass: Nadak

Fauna of the Project area includes; Mammals: Asiatic Jackal (*Canis aureus*), Cape hare (*Lepus capensis*), Porcupine (*Hystrix indica*), Hedgehog (*Hemiechinus auritus megalotis*), Bush rat (*Goluda ellioti*) etc. Birds: Black Bittern (*Dupetor flavicollis*), Lesser Kestrel (*Falco naumanii*), See see partridge (*Ammoperdix griseogularis*), Grey Partridge (*Francolinus pondicerianus*), a number of sparrows, Finches, buntings, seasonal/migratory waterfowls, hawks, and sand grouse etc. Reptiles: Indian Cobra (*Naja oxiana*), Easter dwarf skink (*Ablepharus pannonicus*), Leaf nose viper (*Eristicophis macmahonii*) etc.

Archaeology and Cultural Heritage: Sites of importance in regard to cultural heritage are not reported from the specific area of the project.

Demographic Characteristics of the Project Area: The focused area belongs to beneficiaries of 10 main villages called Minyalo, Khair, Raiko, Rind, Siaboz, Karrecho, Bhoko, Jhakkar, Thatt and Malki. About 461 households of 10 killies with Population of 4446 persons were reported in sub-project according to baseline and socioeconomic survey.

Tribes/Caste, Language and Religion: Main clans of Zehri tribe including Musiani, Jatak and Mengal. Brohi is spoken as the major language in the area while small number of the people can speak Urdu. The communities belong to Muslim religion group.

Literacy Ratio: A person was treated as literate if he or she could read newspaper and write a simple letter in any language. According to the current social survey, the literacy rate of the studied killies was 51 percent. As far as educational level of male is concerned, 43 out of 52 males (82 %) were found primary and middle-class education. Amongst the female, out of 36 respondents, all were illiterate.

Main Occupation of the Respondents: The main occupation of the people of the project areas are agriculture and livestock rearing followed by Govt. services and small businesses. The most of the farmers supplement their income from labor and shop keeping, transporters, private and government jobs etc. For cattle and sheep rearing large tracts of grazing land are still available. The monthly farm income ranged from Rs.8000 to 10000 while Rs.10000- to 15000 from off-farm income was recorded.

Water Rights: The source is Mula river water diverted through kacha traditional diversion bund. Significant perennial flow can be seen in the Mula river but farmers can divert only few cusecs in earthen channels. There is no conflict prevailing in sub-project related to water rights and water distribution. The available water is being diverted to each of farm and water allocation is based on land holding.

Consensus on Water Use: The approach of community participation was shared with the beneficiaries of each sub-project and no dispute was reported on land and water rights and farmers agreed to participate in development of sub-project. Community demanded separate head regulator for each killi especially for Khair and Karrecho killies.

Social Facilities & Pressing Needs: The situation regarding social facilities is very alarming in the sub-project area. No social and civic facilities were available in the surveyed

killies. There was no facility of health in the local villages and residents have no direct access to the metaled road. Facilities of public transport are also very poor. Facilities of drinking water, sanitation and health are also missing. The facilities of primary school for boys and girls were available in all surveyed killies, but local communities were not satisfied because of poor buildings and non-availability of trained teaching staff.

E. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

11. The risk assessment matrix is provided as Table 2 below.

Table 2: Impact Assessment Matrix

Activity / Impact	Likelihood	Consequence	Impact (Consequence x likelihood)	Residual Impact
Design Phase				
Flooding	Likely	Major	High	Low
Seismic damage	Likely	Moderate	Medium	Low
Land Acquisition	Unlikely	Minor	Low	Low
Construction Phase				
Air Quality	Likely	Moderate	Medium	Low
Noise Pollution	Likely	Moderate	Medium	Low
Vibration impacts	Likely	Minor	Medium	Low
Solid waste generation incl. Spoil material	Likely	Moderate	Medium	Low
Resource Conservation	Likely	Minor	Medium	Low
Soil Contamination	Likely	Moderate	Medium	Low
Soil erosion/ silt run-off	Likely	Moderate	Medium	Low
Community Health and Safety	Likely	Minor	Medium	Low
Occupational Health and Safety	Likely	Moderate	Medium	Low
Traffic management	Likely	Minor	Medium	Low
Flora	Likely	Minor	Medium	Low
Fauna	Likely	Moderate	Medium	Low
Use of local water resources	Likely	Moderate	Medium	Low
Contamination of water resources	Likely	Moderate	Medium	Low
Social and Cultural Conflicts	Likely	Minor	Medium	Low
Religious and Cultural Heritage	Unlikely	Minor	Low	Low
Operation Phase				
Adequacy of O&M	Likely	Major	Medium	Low
Waste disposal in Canal	Unlikely	Minor	Medium	Low

F. ENVIRONMENTAL MANAGEMENT PLAN

12. The EMP sets out mitigation actions, monitoring actions, responsibilities, and schedules for impact mitigation and monitoring. Environmental monitoring will be undertaken during both

the construction and operational phases to ensure the effectiveness of the proposed mitigation measures.

13. The EMP provides its implementation mechanism during construction and operational phases:

- **Implementation during Construction phase**: The BID, having core implementation responsibility, will overall monitor the environment related activities of Supervision Consultant and Construction Contractor and report to BEPA regarding implementation status of EMP. Construction Contractor will be in direct coordination with Supervision Consultant through its HSE department and the Contractor's HSE department will be required to be on-board prior to mobilization.
- **Implementation during O&M**: The key players involved during operation of the proposed project are EA (BID) and District Environmental Officers of Khuzdar BID, who will randomly check the project operation in context of EMP and report to District Environmental Officers annually.

14. The EMP has been prepared taking into account the environmental consequences of the proposed action and the required mitigation measures have been proposed at different stages of the activities along with performance indicators to mitigate any potential impacts along with a comprehensive Environmental Monitoring Plan as part of the EMP. A suitable training program is also proposed to train the Contractor(s) staff, who will be involved in the construction phase and the BID staff at the project operational phase. All required permits shall be obtained from the concerned departments before starting the related activity and any grievances will be addressed promptly, as suggested in the EMP.

EMP Budget

15. The EMP budget for the construction and operation phases of the project is 11.85 million PKR including training cost.

G. Public Consultation and Information Disclosure

16. In order to ascertain the perceptions of different stakeholders about the project (during construction/operation), consultation meetings were held with them Consultation meetings were carried during the site visits with local communities of Killi Manyalo, Killi Raiko and Killi Siaboz etc. The comments and feedback received from the different stakeholders were incorporated into the IEE study and it was ensured that their comments and/or concerns are considered during the different stages of the proposed project activity.

H. Grievance Redressal Mechanism

17. The Grievance Redressal Mechanism (GRM) has been developed under ADB Policy (SPS 2009), to deal with complaints at any stage of the proposed project. The GRM will help to receive and resolve the concerns/complaints of any project affected persons regarding the project's social and environment performance. The measures have been identified to mitigate any potential environmental and social impacts due to implementation of proposed project and the mechanism for information disclosures has been provided in the GRM.

I. CONCLUSION

18. The report provides conclusions based on the impacts assessed and the mitigation measures suggested. It is recommended that the EMP and IEE will be made a part of all bidding/tender documents. Also, the Contractor will be bound to completely implement relevant mitigation measures set out in the EMP and the cost related to these mitigation measures will be borne by the Contractor, who shall prepare all required documentation such as the Site Specific Environmental Management Plan (SSEMP).

19. No Land acquisition and involuntary settlement is involved. No indigenous persons reside or will be affected by the proposed interventions in the areas of influence. NOC from BEPA for construction phase of this project has been obtained.

20. Environmental impacts identified during the design phase, including seismic activity and flooding are of high significance. To mitigate these impacts, the project has taken specific steps based on the findings of the hydrological study. The study has estimated the discharge of streams and nullahs in the project area against a 100-year return period. To address seismic hazard challenges, the structural designs for the dam body, spillway, and other related structures will adhere to the recommended criteria for Zone 2B as outlined in the Building Code of Pakistan, 2021.

21. The Integrated Environmental and Occupational Health and Safety (OHS) approach outlined in the IEE report addresses various construction phase hazards such as noise, traffic, welding and hot work and eye hazards, through comprehensive mitigation strategies. These include implementing safety protocols, providing adequate training and personal protective equipment, conducting regular monitoring, and ensuring compliance with international standards, thereby promoting a safe and secure environment for construction personnel and minimizing potential health impacts.

22. Environmental impacts during the construction phase are largely temporary in nature and can be minimized with effective management. Construction of worker camps will necessarily be required in view of the scale and scope of works while all efforts shall be made to engage locals for employment for the proposed project activities. It is concluded that the proposed project should proceed, with appropriate mitigation measures and monitoring programs identified in the IEE study.

1. INTRODUCTION

1.1 PROJECT BACKGROUND

23. Balochistan is the largest province in Pakistan in terms of land area, covering approximately 44% of the country's total land area. The province spans over 347,185 square kilometers and is known for its diverse landscapes, including deserts, mountains, and a long coastline along the Arabian Sea. The population of Balochistan has been estimated to be around 12.34 million as of 2017. Balochistan's population is relatively sparse compared to its vast land area. The majority of the population, approximately 85%, resides in rural areas and is primarily engaged in agriculture and livestock farming. Due to its arid and semi-arid climate, agriculture in Balochistan is often dependent on irrigation systems, and the province's agricultural activities include the cultivation of crops such as wheat, barley, dates, and fruits. It is considered to be relatively less developed, and the primary reason for this is the scarcity and paucity of water in the region.

24. Islamic Republic of Pakistan received a loan (3700-PAK) from the Asian Development Bank (ADB) for financing the Balochistan Water Resources Development Sector Project (BWRDSP). This project will support the implementation of the integrated water resources management policy of the Government of Balochistan (GOB). The policy provides a comprehensive framework for the province to address the issues of water management and development in the context of basin approach, with water harvesting, and groundwater recharging as an integral part of watershed management. About 11 potential subprojects in the Zhob and Mula river basins were selected for potential ADB financing based on a set of criteria such as water and land availability, economic viability, and a balanced approach to extending development support to different tribal groups. The proposed project will construct and improve irrigation land of about 16,592 hectares (ha) and benefit about 42,900 farmers in the Balochistan province. Manyalo Raiko and Rind Ali Sub-project is one of 11 sub-projects of the BWRDSP.

This document presents the findings of the Initial Environmental Assessment (IEE) study for the proposed rehabilitation/strengthening of the water conservation structures and flood protection schemes in these two districts of Balochistan province.

1.2 NATURE SIZE AND LOCATION OF THE PROJECT

25. The Manyalo sub-project comprises a proposed concrete weir to be constructed across the river to raise the water level and supply irrigation water through channels that will be built on each side of the river. Cross drainage structures have been provided at each crossing or intersection of canals with natural streams. Nurr Jhal and Ghathri Jhal are major wide stream crossings in the right and left canal alignment.

26. Manyalo, Raiko, and Rind Ali's perennial irrigation schemes will bring 680 hectares under cultivation, of which 314 hectares are already under cultivation, and an additional 366 hectares will be added to the command area. After the construction of the sub-project, ten villages, namely Manyalo, Khair, Karrech, and Raiko on the right bank, and Malki, Bhoko, Jakhar, Saboz, Thatt, and Rind Ali on the left bank, will come under cultivation.

27. Manyalo, Raiko, and Rind Ali's perennial irrigation sub-project is located on the Mula River in the Khuzdar district, approximately 50 km northeast of Khuzdar. Manyalo and Raiko are

situated on the right bank of the river, while Rind Ali is located on the left bank of the river. Access to sub-project site from Khuzdar is through M-8 motorway which connects to a dirt road crossing Mula river basin boundary on north-east side of M-8. Location map and layout plans are as shown in Figure 1-1 and 1-2.

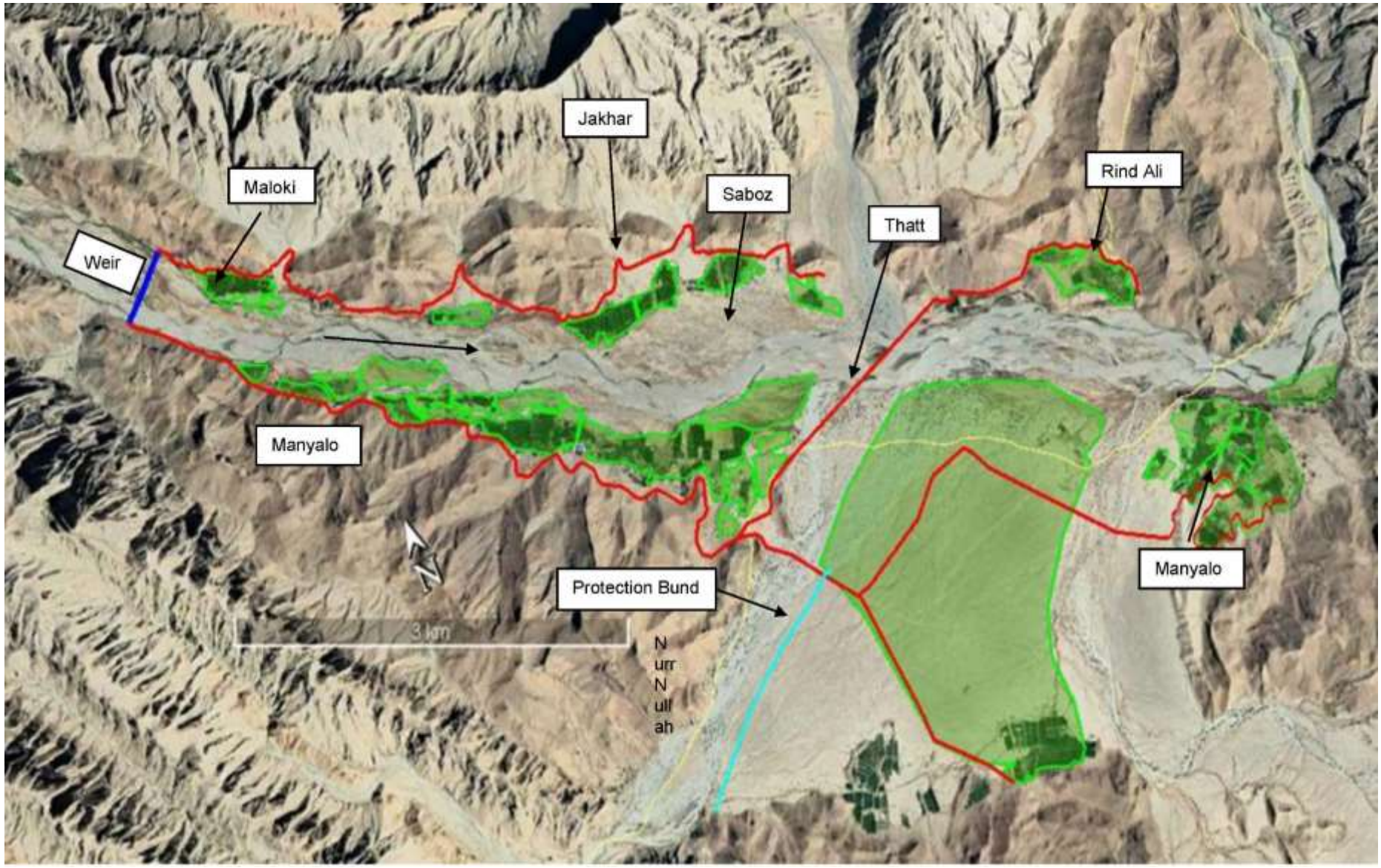

Figure 1-1 Project Location Map

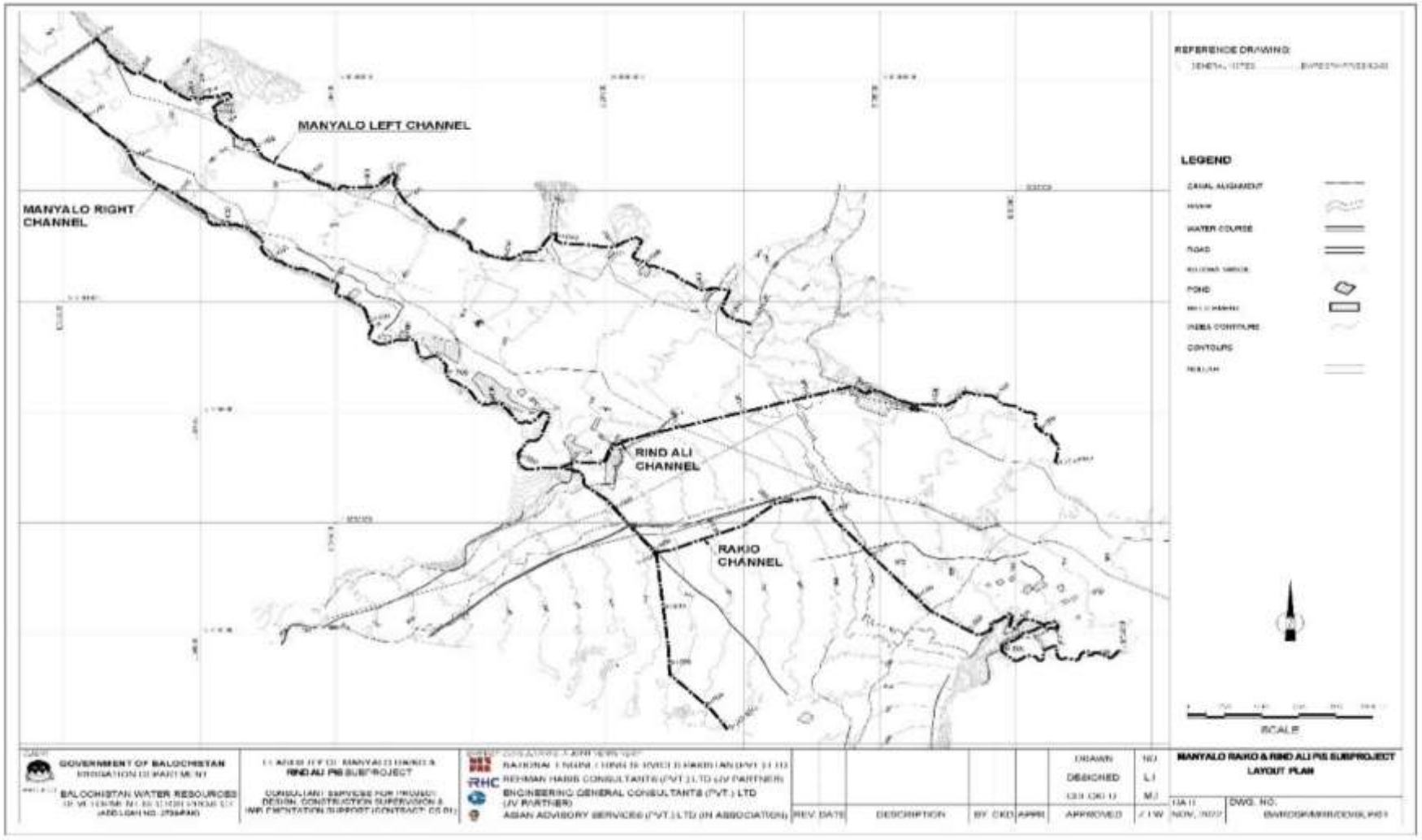

Figure 1-2 Layout of the Sub-project

1.3 ENVIRONMENTAL CATEGORY OF PROJECT

28. After the 18th amendment to the constitution of Pakistan, environment became a provincial subject, and the environmental law governing the proposed project activity is the “Balochistan Environmental Protection Act, 2012”.

29. The Balochistan EIA / IEE regulations of 2020 provide categories of projects for which IEE or EIA needs to be conducted. The proposed project falls under the category of “Water management, dams, irrigation & flood protection” and hence the environmental study has been conducted and an IEE report has been prepared.

30. For ADB’s SPS, all loans and investments are subject to categorization to determine environmental assessment requirements. Categorization has been undertaken using Rapid Environmental Assessment (REA) and the completed the environmental categorization form is attached as Annexure-1 and the proposed project has been categorized as ‘B’ for Environment.

31. The IEE report complies with both the BEPA requirements as well as the ADB Safeguard Policies SPS – 2009 for environmental management of projects.

1.4 OBJECTIVES OF IEE REPORT

32. The objectives of this IEE report are as follows:

(i) Meet the statutory requirements set forth by the Pakistan Environmental Protection Act (PEPA) 1997 and the Balochistan Environmental Protection Act, 2012.

(ii) Comply with ADB policies and safeguards for environmental and social management of Projects.

(iii) Facilitate proponents and financiers of the project in ensuring environmental and social acceptability of the project.

(iv) Establish a baseline of existing environmental status at the project site prior to project initiation by collecting secondary and primary data/information on physical, biological and social environment of the project area.

(v) Help the BID to incorporate necessary measures for legally compliant and socially acceptable environmental performance of their project.

(vi) Identify significant environmental impacts (both positive and negative) during all stages of the project implementation and propose mitigation measures for negative impacts.

1.5 SCOPE OF IEE STUDY

33. The scope of this IEE study is the collection and analysis of data related to the physical, biological and socio-economic environment of the project area and the preparation of the baseline environmental profile. It also aims at the identification, prediction and evaluation of the possible environmental impacts of the proposed project on its immediate surroundings on both short- and long-term basis. Based on the nature and scale of those impacts, appropriate mitigation measures are proposed in this IEE report.

1.6 PURPOSE OF IEE REPORT

34. The purpose of this IEE report is to assess significant adverse environmental and social impacts and to suggest mitigation and remedial measures to make the project environmentally friendly and sustainable during the construction and operational stages of the project and to initiate the process of NOC from the BEPA as well as clearance from ADB prior to mobilization of the Contractor.

1.7 STUDY TEAM

35. A multidisciplinary team was formulated to conduct the study. The team comprised the following experts:

Dr. Akhtar Iqbal	:	Environment Specialist
M. Hussnain Azam	:	Jr. Environmentalist
Ahmed Hassan	:	Environmentalist /Sociologist
Umar Raza	:	GIS Expert

1.8 METHODOLOGY

36. The following methodology was adopted for carrying out the IEE study of the proposed project:

a) Orientation

37. Meetings and discussions were held among the members of the IEE consulting team. This activity was aimed at achieving a common ground of understanding of various issues of the study.

b) Planning for Data Collection

38. Subsequent to the concept clarification and understanding obtained in the preceding step, a detailed data acquisition plan was developed for the internal use of the IEE consulting team. The plan identified specific data requirements and their sources; determined time schedules and responsibilities for their collection; and indicated the logistics and facilitation needs for the execution of the data acquisition plan.

c) Data Collection

39. In this step, primary and secondary data were gathered through field observations, concerned departments and published materials to establish baseline of physical, biological and socio-economic environmental conditions.

- Site reconnaissance
- Analysis of maps and plans
- Literature review
- Meetings with concerned department

- Public consultation

d) Physical Environment

40. Information was gathered on the existing physical environment, particularly as related to geology, topography, soils, hydrology and drainage, water quality, air quality, climate, seismology. and noise, through available secondary and primary data about water, air and noise, and field surveys.

e) Biological Environment

41. The status of the flora and fauna of the study area were determined by a review of literature of the area and an assessment of both terrestrial and aquatic environments.

Flora

42. The vegetative communities were identified and classified into community types. Identification was carried out of dominant tree species, assessment of stage of growth (mature or sapling) and assessment of canopy cover.

Fauna

43. Information on fauna was gathered from existing literature on reported species as well as observations in the field.

f) Socio-Cultural Environment

44. The consultants utilized a combination of literature, field investigations, census report, meetings through public consultation and interviews to describe the existing social environment and assessment of the potential impact of the construction of the proposed sub-projects. Data was gathered on the following aspects of the social environment:

- Land use and municipal status
- Demographics
- Livelihoods
- Community facilities
- Solid waste management
- Proposed developments
- Archaeological and cultural heritage
- Identification and evaluation of environmental impacts

45. The impacts of the proposed project on the physical, biological and socio-economic environments prevalent in the project area are identified at the design, construction and operational phases.

g) Mitigation Measures and Implementation Arrangements

46. The adequate mitigation measures and implementation framework were proposed so that the BID can incorporate them beforehand in the design phase.

1.9 STRUCTURE OF THE REPORT

Section 1 **"Introduction"** briefly presents the project background, objectives, methodology and need of the IEE study.

Section 2 **"Policy, Legal and Administrative Framework"** comprises policy guidelines, statutory obligations and roles of institutions concerning the IEE study of the proposed project.

Section 3 **"The Project"** furnishes information about the studied alternatives, location of the proposed project, cost and size of the project, its major components and alternatives considered for the proposed project to select at the preferred alternative for detailed environmental assessment.

Section 4 **"Environmental and Social Baseline"** describes physical, biological and socioeconomic conditions prevalent in the project area.

Section 5 "**Analysis of Alternatives"** describes the proposed alternatives of the project and identified the environmentally, socially and economically viable project design.

Section 6 **"Public Consultation"** identifies the main stakeholders and their concerns raised through scoping sessions and deals with the measures to mitigate the social impacts.

Section 7 **"Environmental Impacts Assessment and Mitigation Measures"** identifies and evaluates impacts of the project activities during the construction and operation stages and recommends with the measures proposed to mitigate potential environmental impacts of the proposed sub-project activities.

Section 8 **"Environmental Management Plan"** outlines institutional arrangements for the implementation of the proposed mitigation measures, training needs of the staff for implementation of the mitigation measures, monitoring requirements, monitoring cost etc.

Section 9 **"Conclusion and Recommendation"** describes the conclusion of this IEE report and recommendations for the proposed sub-project activities.

2. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

2.1 GENERAL

47. This chapter provides the current legal framework which is applicable on the proposed project in context of environment and sustainable development. The institutional arrangement that exists in Pakistan and may influence the environmental management of the proposed project is also discussed in this chapter. This IEE report also conforms to the guidelines as provided in ADB's Safeguard Policy Statement (SPS), 2009.

2.2 BACKGROUND

48. The enactment of PEPA 1997 took up the key issues of PEPO and in addition provided for a considerable strengthening of institutions at the national and provincial level for the formulation, execution and enforcement of environmental policies and conferred broad-based enforcement powers to the EPA. NEQS for municipal and liquid industrial effluent, industrial gaseous emissions and motor vehicle exhaust and noise, were issued by Pakistan EPA in 1994.

49. Balochistan EPA review of IEE and EIA Regulations, 2020 and Pakistan Environmental Assessment Procedures were published, to provide necessary guidelines for preparation, submission and review of IEE and EIA studies.

2.3 NATIONAL ENVIRONMENTAL POLICY

50. The National Environment Policy aims to protect, conserve and restore Pakistan’s environment in order to improve the quality of life of the citizens, through sustainable development. The Policy provides broad guidelines for addressing environmental concerns and ensuring effective management of their environmental resources. The provincial, AJK, Northern Areas and local governments, however may devise their own strategies, plans and programs in pursuit of this Policy.

51. Enforcement of the policy is being carried out through National Environmental Quality Standard (NEQS) and Self-Monitoring & Reporting Tools (SMART) in order to optimize energy and environmental resource consumption within the industries; encourage reduction, recycling and reuse of municipal and industrial solid and liquid wastes; introduce discharge licensing system for industry; devise and implement master plans for treatment of municipal and industrial wastewater in urban and rural areas. The policy has not been revised since 2005.

2.4 IWRM POLICY

52. The Integrated Water Resources Management (IWRM) Policy in Balochistan was approved in 2006 which highlighted the reforms needed for water resources monitoring and planning in the province. The policy also enforces the adoption of IWRM approach for basin sustainability.

53. As per draft Balochistan Comprehensive Development Strategy 2013 -2020, the water sector development will be as follows:

54. “For the irrigation water, the strategy is clear that evolving Water Resource Management System and Institutional Framework will be central to sustainable water use in the province.

The theme is pillared on undertaking river basin wide management of water with greater focus on the flood irrigation and creating water storages on all strategic locations in the river basins and handling the irrigation and dams command area in an integrated manner. Under the Strategy, GoB will support construction of weir, Flood Protection Bund and Command Area Development for flood control and water conservation.

2.5 ENVIRONMENTAL LEGISLATION

55. The key environmental regulations and legislation that are applicable to the proposed project are discussed below.

2.5.1 National Regulations

56. The environmental policy framework, which will govern the project, is the NCS of Pakistan. The Pakistan NCS is a broad-based policy statement aimed at achieving environmentally sustainable social and economic development in Pakistan. The three overriding objectives of the NCS are:

- Conservation of natural resources
- Sustainable development
- Improved efficiency in the use and management of resources

57. Three operating principles are identified to achieve these objectives. These are:

- Greater public participation in development and environmental management
- A merging of environmental and economic decision making
- Lasting improvements in the quality of life

The NCS specifies the basic guidelines for an integrated effort aimed at protecting the environment and the natural resources of the country. This broad framework provides a comprehensive point of reference for all agencies, departments, private sector companies, financial institutions, and donor agencies for undertaking systematic efforts to bring about an effective change for sustainable development.

2.5.2 Pakistan Environmental Protection Act, 1997

58. The PEPA 1997 is the apex environmental law of the country. 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 provincial EPA.

59. The following rules and regulations have been issued under the Pakistan Environmental Protection Act, 1997.

Rules:

- National Environmental Quality Standards (Self-monitoring and Reporting by Industries) Rules, 2001.
- Provincial Sustainable Development Fund (Procedure) Rules, 2001.
- Pakistan Sustainable Development Fund (Utilization) Rules, 2001.
- Pollution Charge for Industry (Calculation and Collection) Rules, 2001.

- Environmental Tribunal Procedures and Qualifications Rules, 2000.
- Environmental Samples Rules, 2001.
- Hazardous Substance Rules, 2000

Regulations:

- Review of IEE / EIA Regulations, 2020.
- National Environmental Quality Standards (Certification of Environmental Laboratories)

2.5.3 Balochistan Environmental Protection Act, 2012

60. After the 18th Constitutional amendment, the subject of environment vide Notification No.4-9/2011-Min dated 29th June, 2011 stand devolved to the provinces with effect from 1st July, 2011. Even after the deletion of the subject of environment from the concurrent list, the Pakistan Environmental Protection Act 1997 remained intact as per Article 270-AA, Sub Article (6). However, there is provision that the province, through an appropriate legislature / competent authority, may alter, repeal and amend the laws related to the subject.

61. To regulate and effectively address the peculiar environmental issues of the province of Balochistan this act namely “Balochistan Environmental Protection Act, 2012” is submitted as per provisions of the Article 270-AA, Sub-Article (6) of 18th Constitutional amendments.

62. The proposed project falls under the jurisdiction of the Balochistan Environmental Protection Agency (BEPA).

63. This IEE report will need to be submitted to EPA (B) for grant of environmental NOC. An interesting provision of the provincial Act, which is relevant for the proposed project, is given in its section 20. Sub-section 2 of Section 20 states that “When preparing water resource management plans, Departments and other relevant institutions shall at least take the following into account:

- Provisions for integrated watershed management;
- Regulation of sustainable abstraction of groundwater;
- Regulation of the use of ground or surface water for agricultural, industrial, mining, and urban purposes;
- Measures to protect human health and ecosystems;
- Measures to protect wetlands and their associated ecosystems;
- Any other provision necessary for the sustainable use and management of water resources.

2.5.4 Balochistan EPA Review of IEE and EIA Regulations, 2020

64. Two types of environmental assessments can be carried out i.e. IEE and EIA. EIAs are carried out for the projects that have a potentially significant environmental impact, and IEEs are conducted for relatively smaller projects with some relatively lesser significant impacts.

65. The Review of IEE and EIA Regulations 2020, prepared by BEPA under the powers conferred upon it by PEPA-97, categorizes projects for IEE and EIA, respectively. The proposed interventions are likely to fall under the Category B as defined in Schedule – I. According to these guidelines, the proposed project would require an IEE to be conducted.

66. According to the details provided in the regulations regarding preparation, submission, and review of IEEs and EIAs, following is a brief description of the approval process.

- A project is categorized as requiring an IEE or EIA using the two schedules attached to the regulations.
- An EIA or IEE is conducted as required and following the BEPA guidelines.
- The EIA, or IEE, is submitted to BEPA.
- A non-refundable review fee, depending on the cost of the project and the type of the report, is submitted along with the document as per the rates shown in Schedule III.
- The submittal is also accompanied by an application in the format prescribed in Schedule IV of the regulations.
- The BEPA conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, (i) confirming completeness, or (ii) asking for additional information, if needed, or (iii) returning the report requiring additional studies, if necessary.
- The BEPA is required to make every effort to complete the IEE and EIA review process within 45 and 90 days, respectively, for the issue of confirmation of completeness.
- When the BEPA accord their approval subject to certain 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 BEPA a written confirmation of compliance with the approval conditions and requirements of the IEE.
- An environmental management plan (EMP) is to be submitted with a request for obtaining confirmation of compliance.
- The BEPA is required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.
- The IEE approval is valid for three years from the date of accord. The proponents are required to complete the construction and installation within this time period and start operations. In case of any delays, the proponents are required to obtain extension from EPA.

2.5.5 Land Acquisition Act 1894

67. The primary law for acquisition of land for public purposes in Pakistan is the “Land Acquisition Act, 1894” (hereinafter referred as the Act). The land acquired under the Act vests in the Province and it is only thereafter that the Province may transfer it to someone else.

68. This law is no relevant to this project, because it involves construction of Water conservation structures within existing RoW owned by BID, and Land acquisition is not involved in this project.

2.5.6 Forest Act 1927

69. The Forest Act, 1927 was largely based on previous Indian Forest Acts implemented under the British. The first and most famous was the Indian Forest Act of 1878. Both the 1878 act and the 1927 one sought to consolidate and reserve the areas having forest cover, or

significant wildlife, to regulate movement and transit of forest produce, and duty leviable on timber and other forest produce. It also defines the procedure to be followed for declaring an area to be a Reserved Forest, a Protected Forest or a Village Forest.

70. This Act is not relevant as the project does not lie in any of the notified forest land of Balochistan.

2.5.7 The Antiquities Act, 1975

71. This act basically defines how to repeal and re-enact the law relating to the preservation and protection of antiquities. The Federal Government may, by notification in the official Gazette, declare any antiquity to be a protected antiquity for the purposes of this Act. No person shall put any neon signs or other kinds of advertisement, including bill posting, commercial signs, poles or pylons, electricity or telephone cables and television aerials, on or near any protected immovable antiquity. No person shall, for any commercial purpose, make a cinematograph film of any protected antiquity or any part thereof except under, and in accordance with, a license granted by the Director. A contravention of any provision of this Act or the rules shall, where no punishment has been specification provided, be punishable with rigorous imprisonment for a term which may extend to six months, or with fine which may extend to five thousand rupees, or with both.

2.5.8 Pakistan Penal Code, 1860

72. The Pakistan Penal Code usually called PPC is a penal code for all offences charged in Pakistan. It was originally prepared on the behalf of the Government of British India. After the partition of India in 1947, Pakistan inherited the same code and subsequently after several amendments by different governments, it is now a mixture of Islamic and English Law. Presently, the Pakistan Penal Code is still in effect and can be amended by the Senate of Pakistan.

2.5.9 The Balochistan Wildlife Protection (Amendment) Ordinance, 2001

73. The Wildlife Protection Ordinance empowers the government to declare certain areas reserved for the protection of wildlife and control activities within these areas. It also provides protection to endangered species of wildlife. As no activities are planned in notified protected areas, no provision of this law is applicable to the proposed project.

2.5.10 Balochistan Goats (Restriction) Ordinance 1959

74. This law may come into play, if any of the proposed intervention falls in any informal grazing pasture, as livestock rearing is an important occupation in the project area. The ordinance empowers the Government to restrict movement and / or grazing etc. of livestock in certain areas.

2.5.11 Balochistan Ground Water Rights Administration Ordinance, 1978

75. This law was promulgated to ensure efficient and site-specific management of scarce water resources in Balochistan. The background to the law suggests admission that hydrological conditions in the entire Balochistan vary a great deal from place to place. Hence

this Ordinance requires establishment of a Provincial Water Board and District Level Water Committees. The Provincial Water Board shall have representation from the Planning & Development Department, Revenue Department, and Irrigation Department etc., thereby clearly identifying major stakeholders. The Ordinance also calls for registration of all water sources and establishes protocols for grant of permits by water committees for use of such sources. The statement of objectives for the Ordinance stipulates that the Provincial Water Board shall identify areas with ground water resources and declare them as Designated Ground Water Basins. It also calls for establishment of suitable laws for all designated ground water basins.

2.5.12 The Canal and Drainage Act, 1873

76. This is an act to regulate Irrigation, navigation and drainage. The Provincial Government is entitled to use and control for public purposes the water of all rivers and streams flowing in natural channels, and of all lakes, sub-soil water and other natural collections of still water.

2.6 INSTITUTIONAL SETUP FOR ENVIRONMENTAL MANAGEMENT

77. The structural setup of agencies/departments in the environmental sector is such that the Provincial Ministry of Environment governs and regulates environment-related work at the government level. The BEPA works directly under the control of ministry.

2.6.1 Provincial Environmental Protection Council (Provincial EPC) and the Balochistan Environmental Protection Agency (BEPA)

78. After devolution of the subject environment to provincial level under 18th amendment, these two organizations are primarily responsible for administering the provisions of the Balochistan Environmental Protection Act, 2012. The EPC oversees the functioning of the BEPA. Its members include the representatives of the government, industry, nongovernmental organizations and the private sector. The EPA is required to ensure compliance with the National Environmental Quality Standard (NEQS), establish monitoring and evaluation systems, and both identify the need to, as well as initiate legislation, whenever necessary. It is thus the primary implementing agency in the hierarchy. Another function of the provincial EPA are the review and approval of environmental assessment reports.

2.7 ASIAN DEVELOPMENT BANK SAFEGUARD POLICIES

2.7.1 ADB Requirements for Preparation of Environmental Assessments of Projects

79. The ADB SPS, 2009 affirms that “environmental and social sustainability is a cornerstone of economic growth and poverty reduction in Asia and the Pacific” (p 14). Furthermore, the document underlines the ADB’s Strategy 2030, promoting the “sustainability of project outcomes by protecting the environment and people from project’s potential adverse impacts”.

80. This IEE study is fully committed to the requirements determined in the “ADB Safeguard Policy Statement”. The environmental works carried out by RHC on behalf of project proponents have been essentially guided by these rules as enunciated in the “Outline of an Initial Environmental Examination Report”.

81. In the light of significance attached by ADB to various environmental impacts, Project is classified as Category B project, wherein an Initial Environmental Examination is required.

82. The main reason is that the interventions are basically the upgradation and rehabilitation of existing irrigation systems, and no resettlement is envisaged. However, an environmental assessment using ADB's Rapid Environmental Assessment (REA) checklist for urban development and water supply, was filled by PPTA consultants, and the results of the assessment show that the projects are unlikely to cause significant adverse impacts. This initial environmental examination (IEE) has been prepared in accordance with ADB SPS's requirements for environment category B projects and provides mitigation and monitoring measures to ensure no significant impacts as a result of the subprojects.

83. Thus, an Initial Environmental Examination (IEE) of the project has been conducted, through the following documents: -

- Review and data collection;
- Field visits and public consultation;
- Derive Baseline Condition for the area of influence of proposed work scheme;
- Alternative Analysis
- Impact identification and analysis, and planning and recommendation of mitigation measures;
- Preparation of an environmental management and monitoring plan.

2.7.2 ADB Safeguard Policy 2009

84. Safeguard policies are generally understood to be operational policies that seek to avoid, minimize, or mitigate adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process. ADB's Safeguards Policy Statement 2009 (SPS) consists of three Safeguard Policies on the environment, involuntary resettlement and indigenous peoples. These are accompanied by Operations Manual sections on Environmental Considerations in ADB Operations; Involuntary Resettlement; and Indigenous Peoples. All three safeguard policies involve a structured process of impact assessment, planning, and mitigation to address the adverse effects of projects throughout the project cycle. The safeguard policies require that

- Impacts are identified and assessed early in the project cycle;
- Plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and
- Affected Persons (AP) are informed and consulted during project preparation and implementation.

  The Project will need to comply with all the Safeguard Policies in the subproject or activities, irrespective of whether or not they are being funded in whole or in part by the ADB, the GoP or any other donor. A brief synopsis of these policies and their relevance for the proposed project is given in the **Table 2-1.**

Table 2-1 ADB Safeguard Policy 2009 Relevant to Project

S. No.	Safeguard Policies	Key Requirements	Remarks

1.	Environment	Projects and subprojects need IEE to address important issues not covered by any applicable regional or sectoral EA.	Applicable to proposed project
2.	Involuntary Resettlement	Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs. Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.	no involuntary resettlement is envisaged for the proposed project.
3.	Indigenous Peoples	Measures to avoid potentially adverse effects on the Indigenous Peoples' communities; and when avoidance is not feasible, minimize, mitigate, or compensate for such effects. Bank-financed projects are also designed to ensure that the Indigenous Peoples receive social and economic benefits that are culturally appropriate and gender and intergenerationally inclusive.	There are no groups of people in the project area who could be categorized as indigenous people, therefore, this policy does not apply to the proposed project.

2.7.3 ADB's Accountability Mechanism Policy 2012

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

86. In the event that Project Affected People (PAPs') grievances/complaints are unaddressed by multi-tiered Grievance Redressal Committee, ADB provides an independent forum for all the affected personnel to register their complaints directly. However, ADB may refer the case back to multi-tiered GRC for consideration if any complainant approaches ADB without utilizing the project-based GRM first.

2.7.4 ADB's Access to Information Policy 2018 (AIP)

87. The objective of the AIP is to promote stakeholder trust in ADB and to increase the development impact of ADB activities. The policy reflects ADB's commitment to transparency, accountability, and participation by stakeholders in ADB-supported development activities in Asia and the Pacific. It also recognizes the right of people to seek, receive, and impart information about ADB's operations.

The policy applies to documents and information that ADB produces, requires to be produced by its borrowers or clients, or are produced and provided to ADB by other parties in the course

of ADB operations. The policy will be implemented in accordance with detailed arrangements approved by ADB Management and made publicly available in accordance with ADB's normal procedures.

2.8 COMPARISON OF INTERNATIONAL AND LOCAL ENVIRONMENTAL LEGISLATIONS

88. The ADB's SPS 2009 requires application of pollution prevention and control technologies and consistency with international good practice, as reflected in internationally recognized standards. The SPS states that when host country regulations differ from these standards, the EA will achieve whichever is more stringent.

89. In order to select the most stringent standards applicable, a comparison of local (NEQS) and international i.e. International Financing Corporation (IFC)/ World Health Organization (WHO) and United States Environmental Protection Agency (USEPA) regulations have been made, as shown in Table 2-2 below. For air quality, comparison was only possible for pollutants having same averaging periods in NEQS, IFC and WHO. WHO for ambient air quality are more stringent in comparison to USEPA and NEQS standards, in the case of most pollutants. So, WHO standards will be used.

90. Similar to the standards for air quality, the comparison of noise standards provided in Table 2-3 clearly shows that NEQS for noise are more stringent in comparison to the WHO/IFC standards so these will be used to compare with baseline noise values. The only exception is the daytime noise level standard for Industrial areas where the WHO/IFC standard is more stringent (70 dB (A)) in comparison to NEQS (75 dB (A)) and so for this particular parameter, the WHO/IFC standard will be used.

91. As far as regulations regarding other environmental parameters are concerned such as acceptable effluent disposal parameters, the local regulations i.e. NEQS are more stringent and would be preferred over any other international regulations such as WHO/IFC.

92. Similar to the standards for air and noise quality, the comparison of drinking water quality standards provided in Table 2-4 clearly shows that NEQS for biological and physical parameters of drinking water quality are the same as for WHO standards except for Total hardness as CaCO3. NEQS for chemical, toxic inorganic and organic parameters are mostly similar/comparable to zinc, residual chlorine, Phenolic compounds (as Phenols) mg/l, Poly-nuclear aromatic hydrocarbons (as PAHs) g/l. WHO for Lead and Zn are more stringent comparatively. No WHO standards will be used to compare with baseline values.

Table 2-2 Applicable Most Stringent Air Quality Standards*

Pollutants	WHO/IFC		Pak. NEQS	
	Avg. Time	Standard	Avg. Time	Standard
SO2	24 hr. 10 min	20 up/m^3 500 up/m^3	Annual Mean 24 hrs.	80 up/m^3 120 up/m^3

Pollutants	WHO/IFC		Pak. NEQS	
	Avg. Time	Standard	Avg. Time	Standard
CO	-		8 hrs. 1 hr.	5 mg/m^3 10 mg/m^3
NO2	1 yr. 1 hr.	40 up/m^3 200 up/m^3	Annual Mean 24 hrs.	40 up/m^3 80 up/m^3
O3	8 hrs.	100 up/m^3	1 hr.	130 up/m^3
TSP	-	-	Annual Mean 24 hrs.	360 up/m^3 500 up/m^3
PM10	1 yr. 24 hr.	20 up/m^3 50 up/m^3	Annual Mean 24 hrs.	120 up/m^3 150 up/m^3
PM2.5	1 yr. 24 hr.	10 up/m^3 25 up/m^3	Annual Average 24 hrs. 1 hr.	15 up/m^3 35 up/m^3 15 up/m^3

Table 2-3 Applicable Most Stringent Noise Standards

Category of Area/Zone	Limit in dB(A) Leq			
	NEQS		WHO	
	Day Time 06:00 – 22:00	Night Time 22:00-06:00	Day Time 07:00 – 22:00	Night Time 22:00-07:00
Residential area (A)	55	45	55	45
Commercial area (B)	65	55	70	70
Industrial area (C)	75	65	70	70
Silence zone (D)	50	45	55	45

93. There are no national standards for surface water quality. Instead, drinking water quality and effluent discharge (to inland waters) are listed below. The latter standard assumes a dilution factor of 10 to 1 at discharge and this dilution is taken as an indicator of acceptable

surface water quality. The WHO standards will be used for comparison with baseline water quality values.

Table 2-4 Comparison of International and Local Drinking Water Quality Standards

Parameter	Unit	NEQS	WHO/IFC
Bacterial			
E-Coli	numbers/ml	Must not be detectable in any 100	Must not be detectable in any 100
Total Coliform	numbers/ml	Must not be detectable in any 100	Must not be detectable in any 100
Physical			
Color	TCU	≤ 15 TCU	≤ 15 TCU
Taste	No objectionable/Acceptable	No objectionable/Acceptable	No objectionable/Acceptable
Odor	No objectionable/Acceptable	No objectionable/Acceptable	No objectionable/Acceptable
Turbidity	NTU	< 5 NTU	< 5 NTU
Total Hardness	mg/l	< 500 mg/l	--
TDS	mg/l	< 1000	< 1000
pH		6.5-8.5	6.5-8.5
Chemical			
Aluminum	mg/l	≤0.02	0.2
Antimony	mg/l	≤0.005 (P)	<0.02
Arsenic	mg/l	≤0.05 (P)	0.01
Barium	mg/l	0.7	0.7
Boron	mg/l	0.3	0.3
Cadmium	mg/l	0.01	0.003
Chloride	mg/l	<250	250
Chromium	mg/l	≤0.05	0.05
Copper	mg/l	2	2
Cyanide	mg/l	≤0.05	0.07
Fluoride	mg/l	<1.5	1.5

Lead	mg/l	≤0.05	0.01
Manganese	mg/l	≤0.5	0.5
Mercury	mg/l	≤0.001	0.001
Nickel	mg/l	≤0.02	0.02
Nitrate	mg/l	≤50	50
Nitrite	mg/l	≤3	3
Selenium	mg/l	0.01)P)	0.01
Residual Chlorine	mg/l	0.2-0.5 at consumer end	-
Zinc	mg/l	5.0	3

94. The NEQS for vehicular emissions and wastewater are given in Table 2-5 and 2-6 respectively.

Table 2-5: NEQS for Motor Vehicle Exhaust and Noise

Sr. No.	Parameter	Standards (maximum permissible limit)	Measuring method
1	Smoke	40% or 2 on the Ringelmann Scale during engine acceleration mode.	To be compared with Ringlemann Chart at a distance of 6 meters or more.
2	Carbon Monoxide	Emission Standards: New Used Vehicles 4.5% 6%	Under idling conditions: Non-depressive infrared detection through gas analyzer
3	Noise	85 db (A)	Sound-meter at 7.5 meters from the source

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Table 2-6: National Environmental Quality Standards for Municipal and Liquid Industrial Effluents (Mg/L, Unless Otherwise Defined)

Sr. No.	Parameter Standards	Value
1.	Temperature	40^{O}C
2.	pH value (acidity/basicity)	6-10pH
3.	5-days Biochemical Oxygen Demand (BOD) at 20^{O}C	80mg/L
4.	Chemical Oxygen Demand (COD)	150 mg/L
5.	Total Suspended Solids	150 mg/L
6.	Total Dissolved Solids	3500 mg/L
7.	Oil and Grease	10 mg/L
8.	Phenolic compounds (as phenol)	0.1 mg/L
9.	Chloride(as Cl^{-})	1000mg/L

10.	Fluoride (as F^-)	20mg/L
11.	Cyanide (as CN^-)	2mg/L
12.	An-ionic detergents (2) (as MBAS) (5)	20mg/L
13.	Sulphate($SO4^{2-}$)	600mg/L
14.	Sulphide (S^{2-})	1.0mg/L
15.	Ammonia (NH_3)	40mg/L
16.	Pesticides, herbicides, fungicides and	0.15mg/L
17.	insecticides Cadmium(4)	0.1mg/L
18.	Chromium(4) (trivalent and hexavalent)	1.0 mg/L
19.	Copper (4)	1.0mg/L
20.	Lead (4)	0.5mg/L
21.	Mercury (4)	0.01mg/L
22.	Selenium (4)	0.5mg/L
23.	Nickel (4)	1.0mg/L
24.	Silver (4)	1.0mg/L
25.	Total toxic metals	2.0 mg/L
26.	Zinc	5.0mg/L
27.	Arsenic	1.0mg/L
28.	Barium	1.5mg/L
29.	Iron	2.0mg/L
30.	Manganese	1.5mg/L
31.	Boron	6.0mg/L
32.	Chlorine	1.0mg/L

Explanations:

1. Assuming minimum dilution 1: 10 on discharge. Lower ratios would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency.
2. Assuming surfactant as biodegradable.
3. MBAS means Methylene Blue Active Substances.
4. Subject to total toxic metals discharge as at S. No. 25.

3. PROJECT DESCRIPTION

3.1 BACKGROUND

95. Balochistan is the largest province of Pakistan in terms of area and the smallest in terms of population. It is considered to be comparatively less developed, and the sole reason is the scarcity and paucity of water. The Islamic Republic of Pakistan received a loan (3700-PAK) from the Asian Development Bank (ADB) to finance the Balochistan Water Resources Development Sector Project (BWRDSP). The project will support the implementation of the integrated water resources management policy of the Government of Balochistan (GoB).

96. The BWRDSP project will support the implementation of the integrated water resources management policy of the Government of Balochistan (GoB). The policy provides a comprehensive framework for the province to address the issues of water management and development in the context of a basin approach, with water harvesting and groundwater recharging as integral parts of watershed management. About 11 potential subprojects out of over 300 on the long list in the Zhob and Mula river basins were selected for potential ADB financing based on a set of criteria such as water and land availability, economic viability, and a balanced approach to extending development support to different tribal groups. The proposed project will construct and improve irrigation land of about 16,592 hectares (ha) and benefit about 42,900 farmers in Balochistan province.

97. Manyalo Raiko and Rind Ali PIS Sub-project is one of the 11 sub-projects in the two river basins. The Manyalo Raiko and Rind Ali perennial irrigation sub-project is located in the Khuzdar district. Schemes were bundled as one sub-project due to the close proximity of smaller schemes. The infrastructure, including head regulators, channels, and other hydraulic structures, was designed in isolation.

3.2 LOCATION OF THE PROJECT

98. The scheme is located on the Mula River, in the Khuzdar district, approximately 50 km northeast of Khuzdar. The proposed Manyalo Raiko and Rind Ali weir is situated in UTM Zone 42N at 3096496.83 North and 293914.18 East, with an average altitude of the sub-project's command area at 850 m above mean sea level. Manyalo and Raiko are located on the right bank of the river, while Rind Ali is situated on the left bank of the river. Access to the sub-project site from Khuzdar is via the M-8 motorway, which connects to a dirt road crossing the Mula River basin boundary on the northeast side of the M-8, as shown in Figure 3-1 and Figure 3-2.

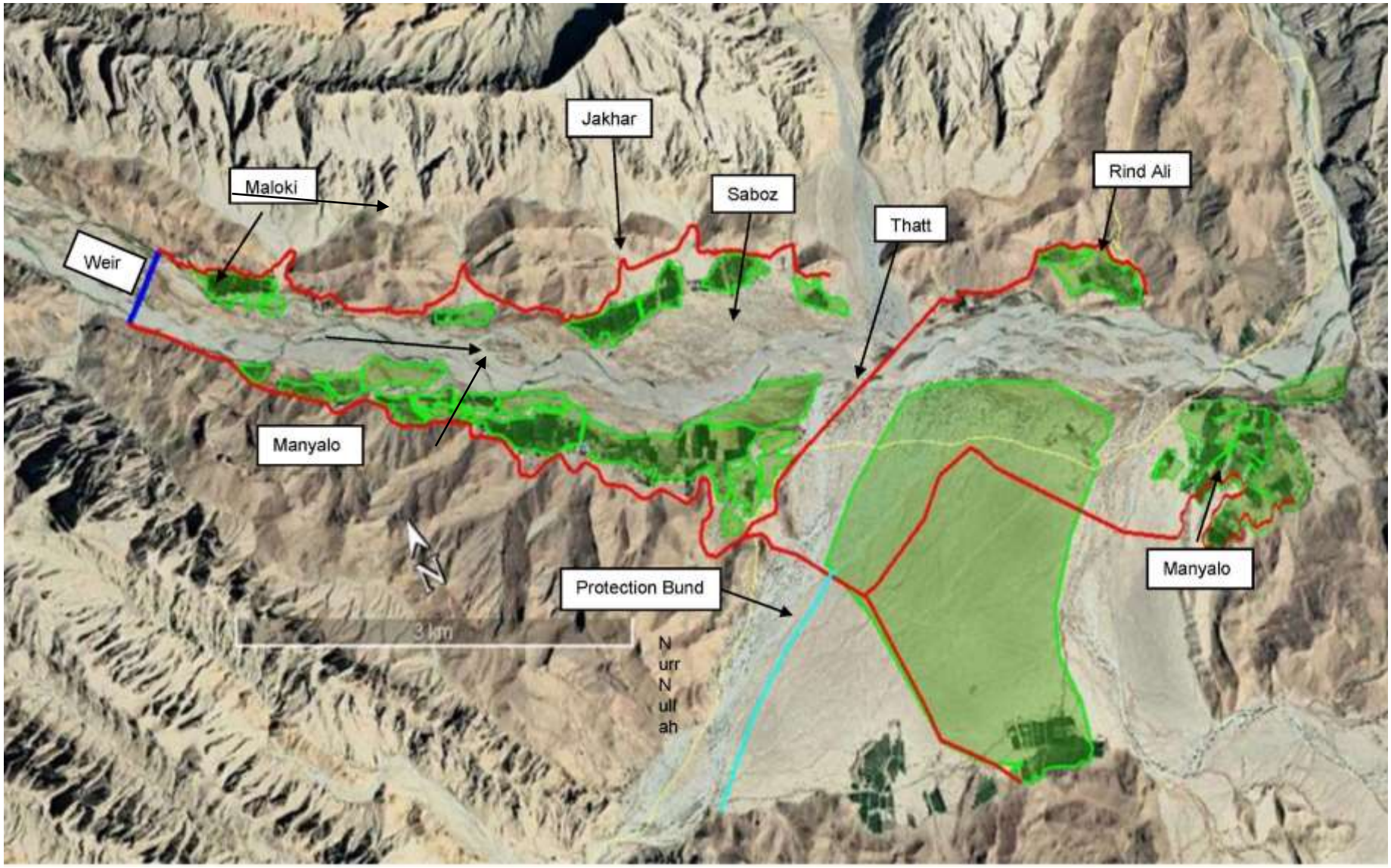


Figure 3-1: Location of the Subproject

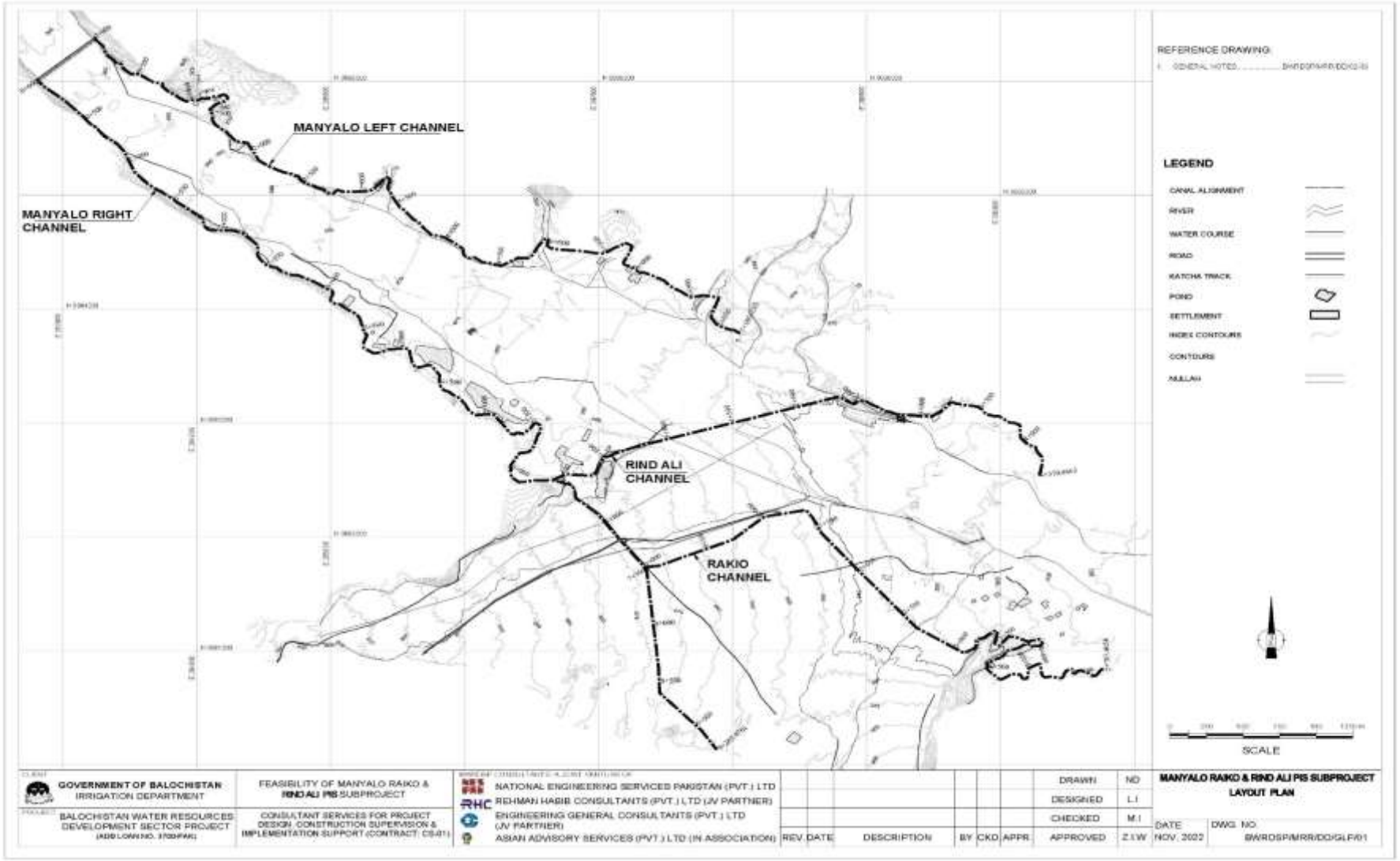


Figure 3-2: Layout of the Sub-project

3.3 EXISTING IRRIGATION SYSTEM

99. At Manyalo, Raiko, and Rind Ali, the flow is diverted to the existing command area, locally constructed head up bund called ganda for each village, which is made of stone, debris and bushes. The river flow is guided by an earthen unlined channel (Figure 3-3 I to iii) to the command area.

i-Existing bund for diversion of flow for Manyalo

ii-Existing diversion bund for diversion of flow for Malki on left side channel

iii-Existing Malki left side earthen Canal

iv-Existing super passage on left side channel

v- Command Area of Khair village

vi-Command area of Raiko Village

Figure 3-3: Existing Irrigation system and command area

3.4 COMPONENTS OF THE PROJECTAND SCOPE OF WORK

100. The proposed Manyalo, Raiko & Rind Ali subproject comprises (i) a weir to divert perennial flow to command area on Mula River, (ii) Manyalo, Raiko & Rind Ali perennial irrigation scheme along right as well as left bank and (iii) flood protection bund along right bank of Nurr nullah for the protection of channel and command area. The proposed sub-project will use surface/perennial flow for irrigation.

101. The Perennial Irrigation Scheme (PIS) supplies water round the year. The subproject will improve 314.0 ha of existing command area of Manyalo, Raiko & Rind Ali whereas 366.0 ha new area of Karecho will be brought under cultivation. After construction of subproject, it will significantly improve the agricultural production and rural livelihood.

102. The interventions of the sub-project are provided in Table 3-1.

Table 3-1 : Scope of Work for Manyalo Raiko and Rind Ali Scheme

Sr. No	Type of structure	Weir
1.	Coordinates of Weir	282525.34 m E, 3111470.28 m N Zone 42R
2.	Length of Weir (m)	394
3.	Crest Width (m)	4
4.	Total Length of Canal (m)	26,543
5.	Left Main Channel of Manyalo (m)	7,110
6.	Manyalo Right Channel (m)	9,263
7.	Rind Ali Channel (m)	4,370
8.	Raiko Channel (m)	5,800
9.	Time Division Structures/ Flow Division structure (Nr.)	59
10.	Fall Structures (Nr.)	22
11.	Sump (Nr.)	10
12.	Culverts (Nr.)	8
13.	Aqueducts (Nr.)	5
14.	Syphon (Nr.)	1
15.	Super Passage (Nr.)	4
16.	Flood Protection Bund (m)	1,845
17.	Social Structures (Nr.)	8
18.	Command Area (ha)	678

3.4.1 Weir

103. A weir on the Mula River is proposed to divert flow to the command area with proper design and lining of the irrigation channel. Currently, at this location, flow is being diverted for irrigation by a locally constructed diversion embankment/canal. A concrete weir, 400 meters long, including two under sluice bays, each 3.0 meters wide (on the left and right sides), and 1.5 meters high, is proposed at Manyalo. The weir is designed for a 50-year flood of 2480 m^3/s, corresponding to a design head of 2.37 meters.

104. The crest length of the weir has been set at 400 meters, with guide bunds on the left side of the weir. The proposed crest level of both under sluice weirs is 1.0 meter lower than the crest level of the main weir, and there is a 1.0 meter by 3.0-meter (H x W) gate to control the headwater level for irrigation supply. An end sill is provided at the end of the stilling basin to dissipate the energy of flowing water, preventing damage to the structure.

105. The weir has been designed for the design flood with a crest length of 394.0 meters and an additional 3.0 meters of under sluice portion on both sides. Table 3-2 shows design parameters of Weir

Table 3-2: Weir Design Parameters

Sr. No.	Description of Design Parameters	Main Weir	Under sluice
1	Weir Crest Length (m)	394.00	2 x 3.00
2	Crest Width (m)	4.00	4.00
3	Main Weir Crest Elevation (m asl)	904.50	903.50
4	Undersluice Gate Top Level (m asl)	-	903.50
5	Undersluice Gate Size (HxW) m (02 Nos.)	-	2 x (1.0 x 3.0)
6	Design Flood 50 Year Return Period (m^3/s)	2,480.00	2,480.00
7	Safety Check Flood 100 Year Return Period (m^3/s)	2,950.00	2,950.00
8	Highest Flood Level 50 Years Year Return Period (m asl)	906.45	906.45
9	Highest Flood Level 100 Years Year Return Period (m asl)	906.65	906.65
10	Side Wall Top Elevation (m asl)	907.95	907.95
11	Stilling Basin Length (m)	21.00	21.00
12	Stilling Basin Width (m)	400.00	400.00
13	Stilling Basin Elevation (m asl)	900.00	900.00
14	End Sill Elevation (m asl)	901.60	901.60
15	Tail Water Elevation (m asl)	904.30	904.30
16	Upstream Cutoff Depth (m)	2.25	2.25
17	Downstream Cutoff Depth (m)	4.00	4.00
18	Downstream Stone Apron Length (m)	5.00	5.00
19	Upstream Stone Apron Length (m)	3.00	3.00

106. Layout plan and Cross section of weir has been provided as Figure 3-2 and 3-3 respectively.

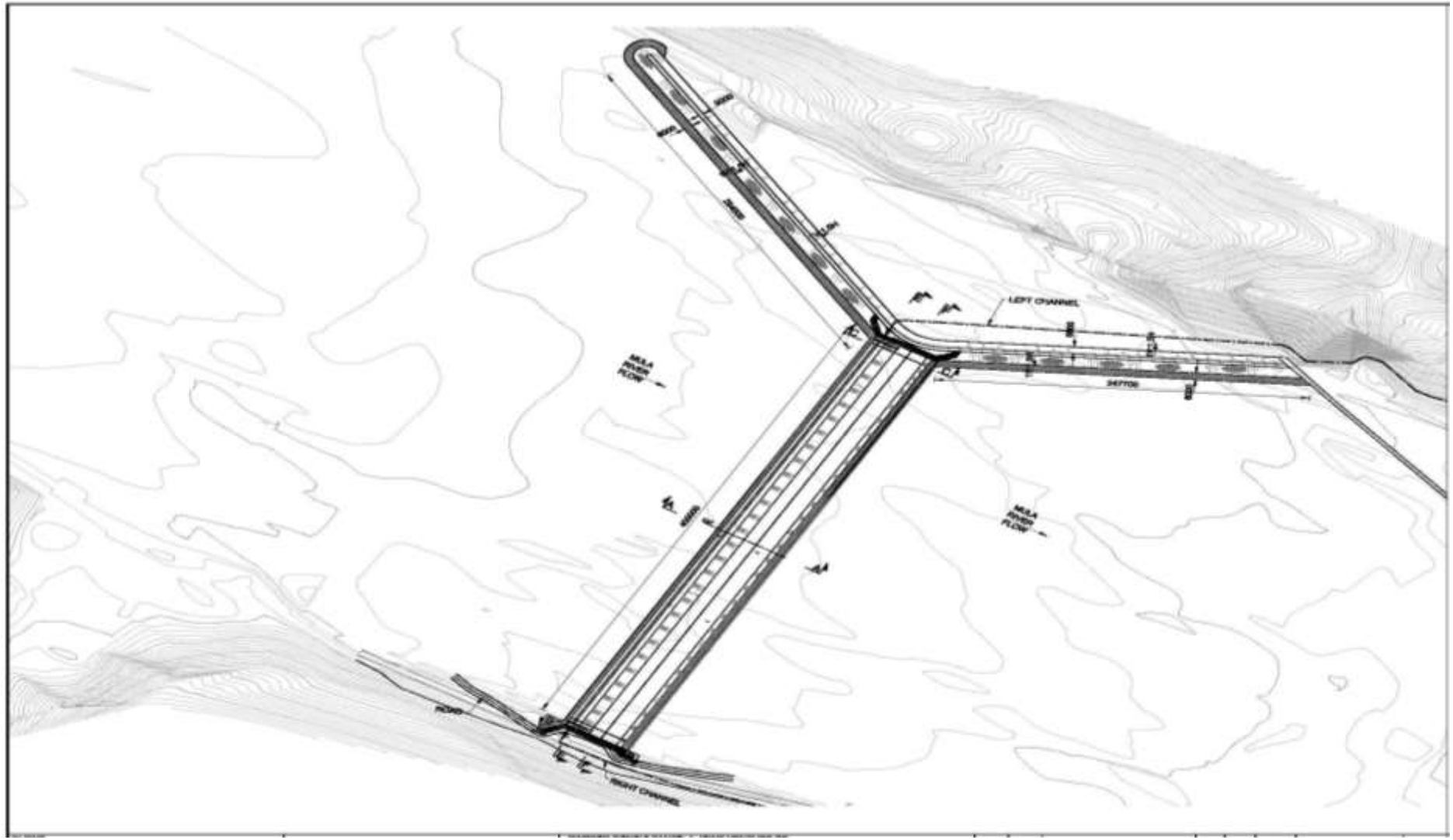


Figure 3-4: General Layout Plan of Manyalo Riko & Rind Ali Weir

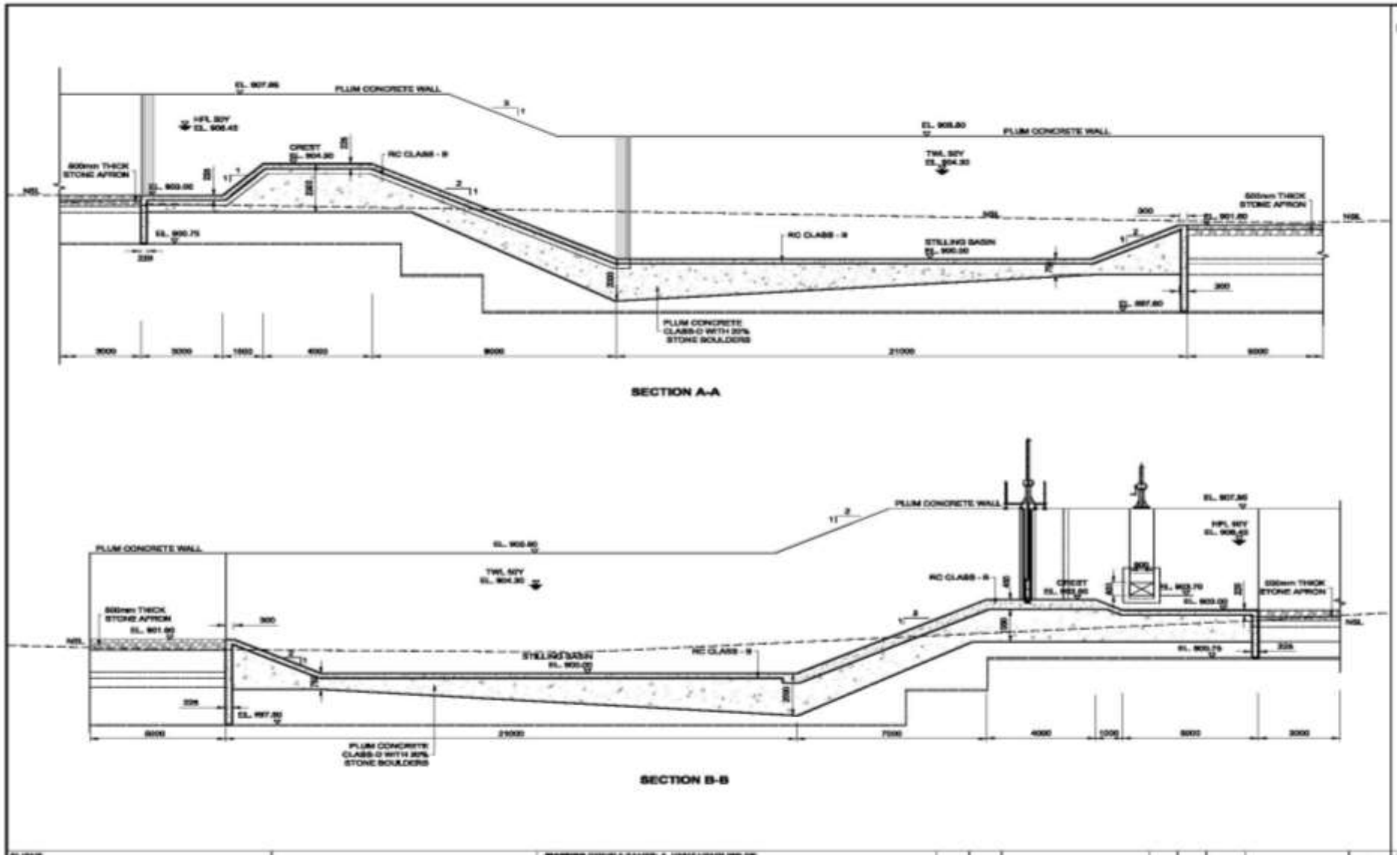


Figure 3-5: Sections of the Weir

3.4.2 Irrigation System

Channels Alignment

107. The proposed Manyalo, Raiko & Rind Ali weir is meant to divert perennial flows of Mula River to use throughout the year. The water from weir, through a system of canals, will be delivered to lands, lying on both sides of Mula River. To command the area of both banks, a stone masonry lined channel with initial reach covered due to steep slope of hill has been proposed at higher contour. The right main channel will command the area of Manyalo, Khair, Rind Ali, Karrach and Raiko villages. Rind Ali command area is located on left bank of Mula River and proposed to be irrigated through left canal in pre-feasibility study. While Rind Ali water rights are established on annual turn basis with Manyalo & Raiko on right bank.

108. During the walk-through survey and the meetings with farmers, the Rind Ali and Raiko wants separate irrigation channels downstream of Manyalo / Khair one for Rind Ali through a river crossing from right bank to left bank instead of left bank canal and other for Raiko along the Mula River bank by passing the Karecho and third irrigation channel is required to feed Karecho. The left side a lined channel has been proposed to irrigate the command area of villages of Malki, Bhoko, Jakhar, Saboz and Thatt.

109. A rectangular cross section with plan concrete in bed and stone masonry inside walls is adopted for lining of perennial channels.

3.4.3 Flood Protection Bund

110. Protection dykes are required along Nurr Nullah (a tributary of Mula river) for parts of land having vulnerable Krecho new command area at relatively lower elevations. Maximum water levels will inundate river flood plains in case of high flood.

111. Earthen embankments, flood levees, and protection bunds are included in the design adjacent to riverbanks for the protection of natural floodplains for a 50-year return period flood and to ensure the safety of protection works for a 100-year return period flood without over topping though free board. With provision of these levees, discharge carrying capacity of Nurr Nullah would be increased providing protection to area adjacent to river. Flood protection works are designed along those reaches where previous large floods have inundated existing command area i.e. flood of 1995. Embankment levees are designed for new command area along/lying in flood plain. The flood modelling shows that lower lying portion of Karecho is vulnerable to flood and requires protection works for existing command area. Therefore, a protection bund having length of 1845m is proposed at the right side of Narr Nullah to protect low lying command areas.

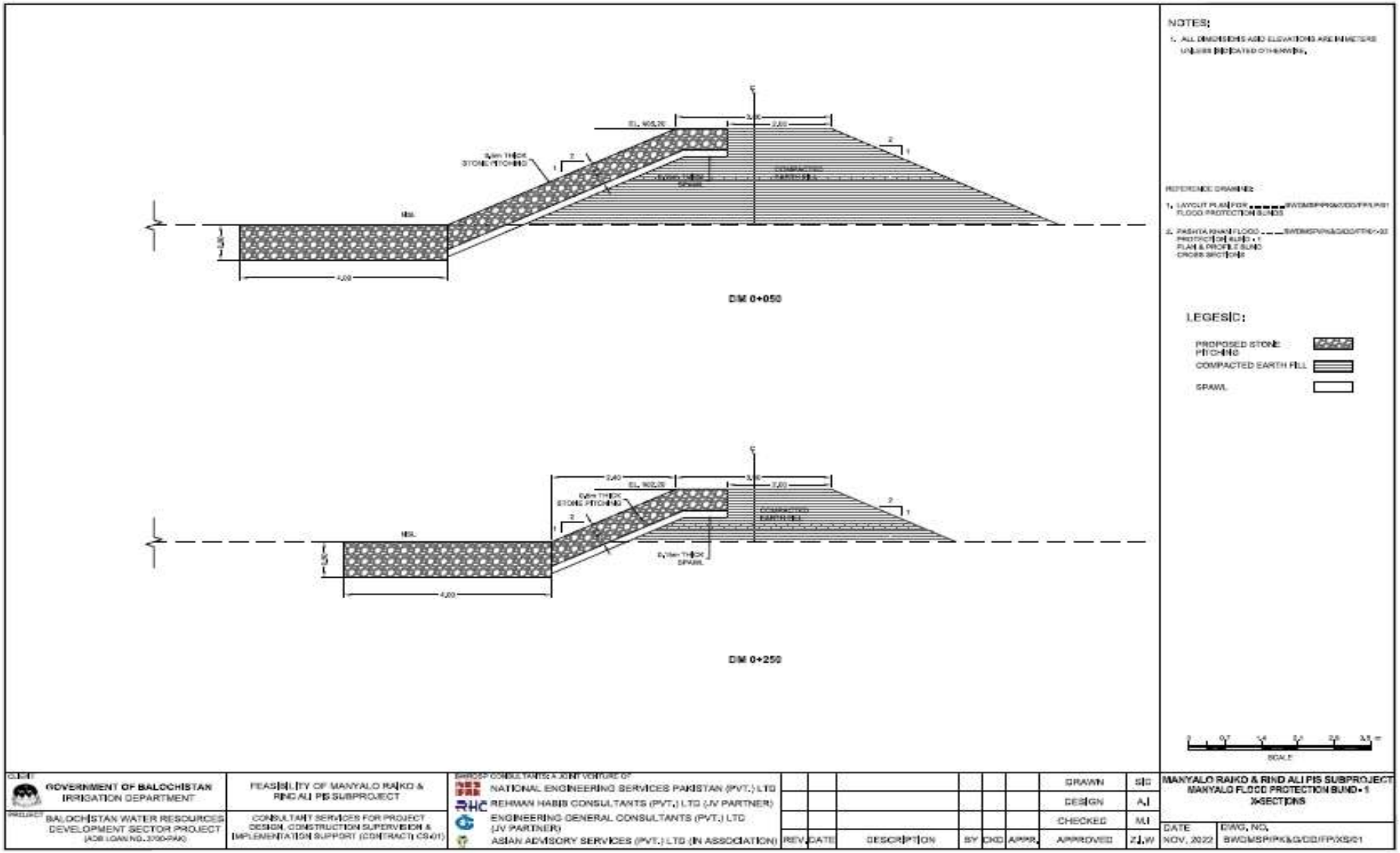


Figure 3-6: Cross Section of Manyalo Flood Protection Bund

3.4.4 Channel Structures

112. A number of structures are proposed on each canal including road crossings, sumps, syphon, supper passage, aqueduct, flow division, and time division / off-take structures. Various structures along the canal length are provided where necessary. Other structures included for water use by community in command areas include washing structure and other social structures are also provided on all channels. Number and type of structures provided on each channel are given in Table 3-3.

Table 3-3 Number of Structures on Channel of Manyalo, Raiko and Rind Ali Sub-project

Name of Channel	Total Length (km)	Fall Structure	Sump	Culvert	Aqueduct	Flow/Time Division Structure	Syphon	Tail Structure	Super Passage	Social Structure
Manyalo Left Chann	7+110	4	4	1	1	18	-	1	4	2
Manyalo Right Chann	9+263	3	6	5	3	26	-	1	-	3
Rind Ali Chann	4+370	7	-	-	-	5	1	1	-	2
Raiko Chann	5+800	8	-	2	1	10	-	1	-	1

Time Division Structures

113. Time division structures have been provided to divert the flow from main channel to secondary channel (water course). The structure comprises stone masonry /concrete walls with concrete floor and gated (shutter) openings to feed flow form distributary channel to water course. The gates used in these structures are simple steel sliding shutters. The size of opening to divert water from main channel to water course has been calculated by using the weir formula.

114. Time division structures has been provided on each channel as per existing locations and as requirement of FO during walk-through survey.

Gates (Steel Shutter)

115. To regulate the flow from canal to water course steel shutter gates are provided to each time division structure. The gates are simple steel shutter, manufactured from one eighth

inch thick steel plate. In order to prevent the gate from rusting both the gate and frame are hot dip galvanised after fabrication. The gates are fixed to the structure by means of a steel chain, one end of which is welded to the gate handle and the other is fixed to a steel ring embedded into the concrete of the structure. The chain must be long enough to able the gate to be used in more than one of the gate frames.

Fall Structures

116. Fall structures are required on the channel where to dissipate the excess head. Where the channels are constructed on steeply sloping ground, the velocity must not be so high as to be disruptive in a lined channel. At times, the ground surface may be steep and at other times, it may be very irregular with an abrupt change of grade. In such cases, a level drop is provided to step down the canal bed and then it is continued with a permissible slope until another step down is necessary. This is done to avoid unnecessary, huge earthwork in filling.

117. These falls allow the upstream water to fall with sudden impact on downstream. The downstream acts like cushion for the upstream water and dissipate extra energy. This cushion will be formed by depressing the floor below the downstream bed of the channel.

118. In vertical type fall the energy of the flowing water is dissipated by means of impact and sudden deflection of velocity from vertical to horizontal direction. A water cushion is provided at the toe of the drop, so as to reduce the impact of the falling jet and thus to save the downstream from scour. The water cushion is formed by depressing the floor below the downstream bed of the channel. Detail drawings of fall structures are given in Volume III of Drawings.

119. Where incoming water fall height is more than 2.0 m, baffle type fall has been provided (Fig 3-7). In baffle fall multiple rows of baffle piers on the chute prevent excessive acceleration of the flow and provide a reasonable terminal velocity, regardless of the height of fall. Since flow passes over, between, and around the baffle piers, it is not possible to define the flow conditions in the chute. The flow appears to slow down at each baffle pier and accelerate after passing the pier depending on the discharge and the height of the baffle piers.

120. The chute slope is designed 2: 1 or flatter, extending to below the channel bottom. Entrancing velocity in the chute are less the critical velocity. Minimum four rows of baffle piers are required for effective energy dissipation. The chute should be extended to below the normal channel bed and one row of baffle should be buried below the bed.

Road Culverts

121. A culvert has been provided to cross the channels to facilitate the vehicular access in the scheme. Reinforced concrete box culvers are provided to cross the road (Figure 3-8). Additional free board has been provided in the channel under the road crossing for cleaning.

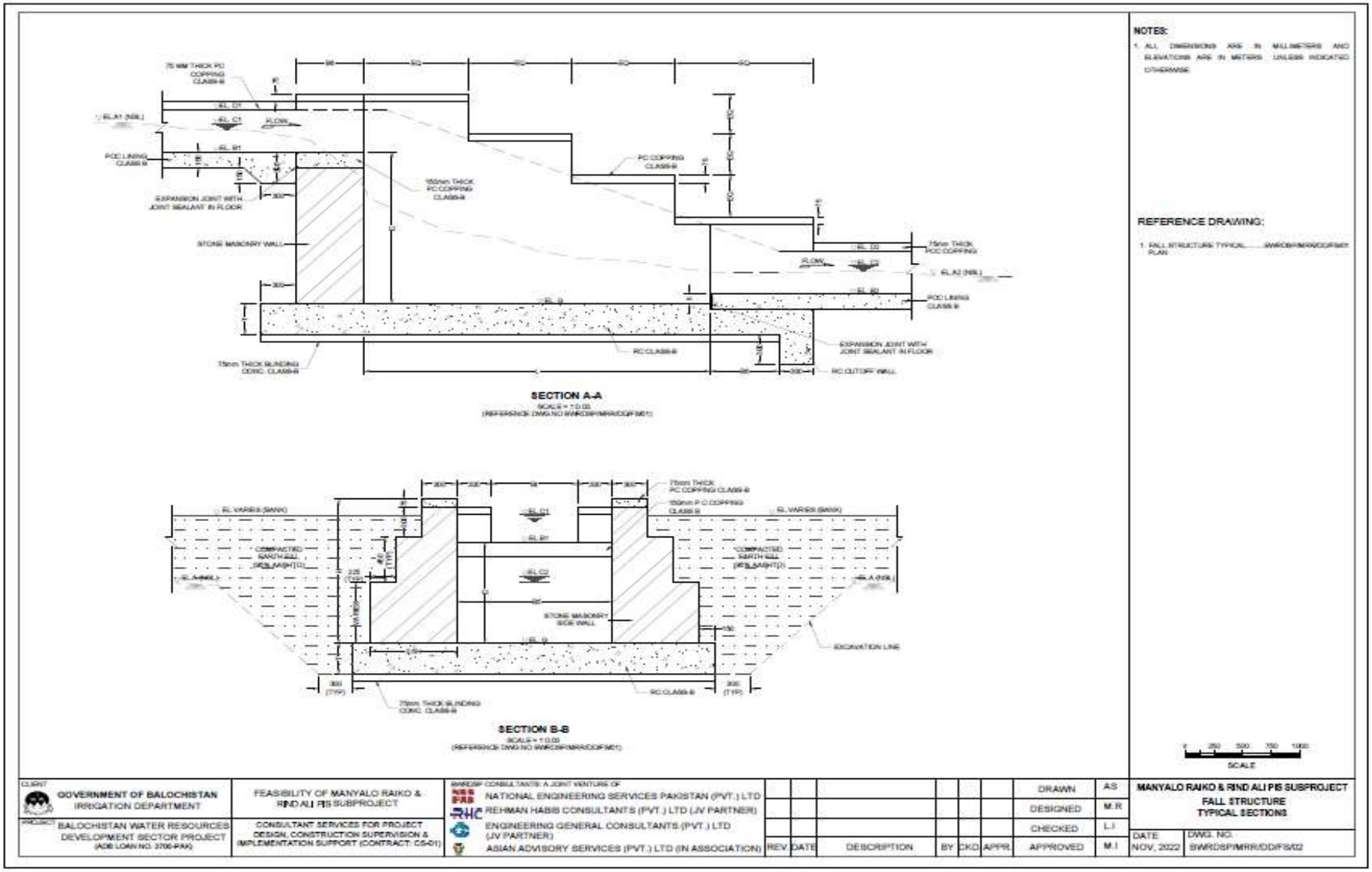


Figure 3-7: Typical Section of Fall Structure

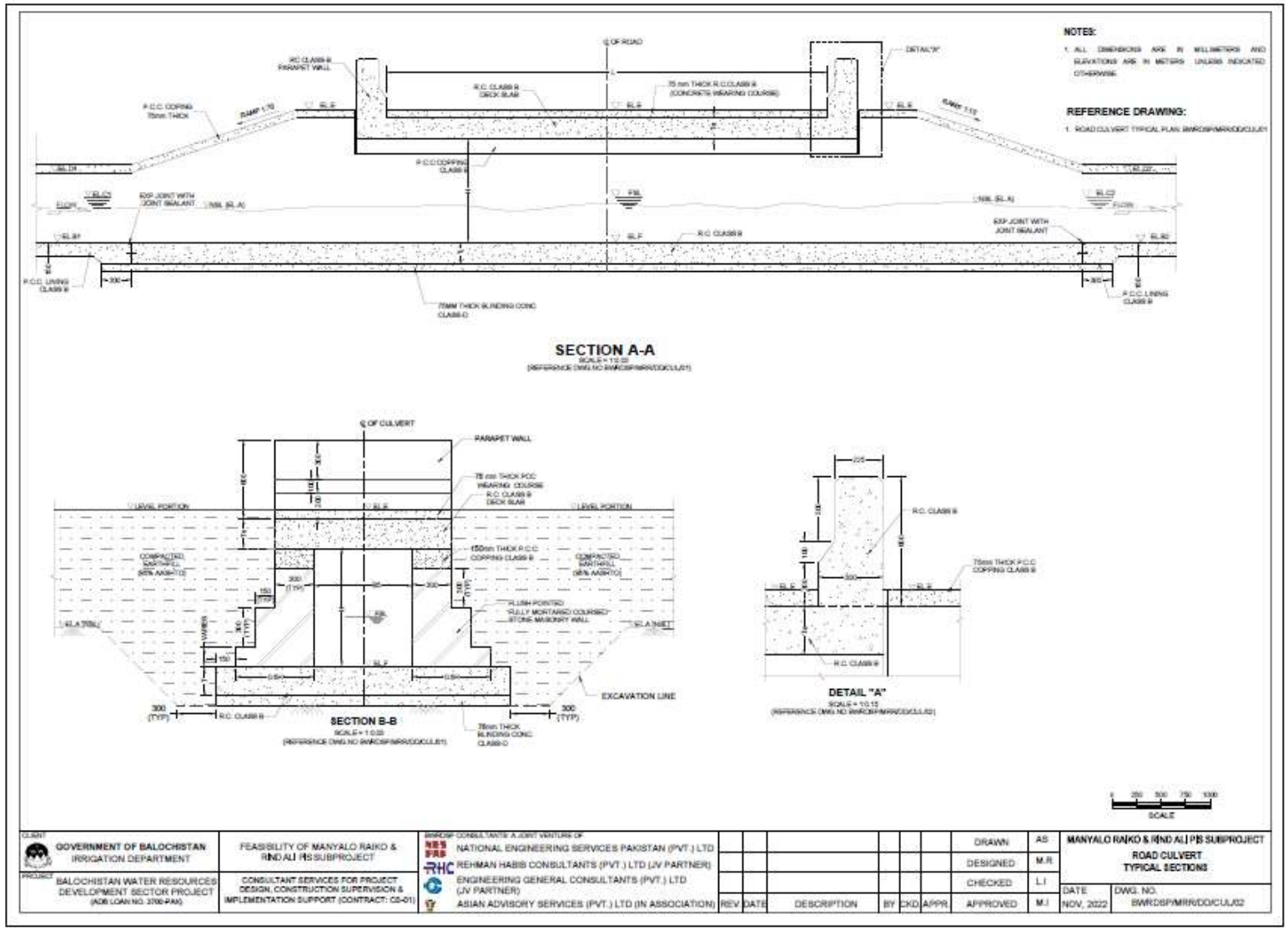


Figure 3-8: Typical Section of Road Culvert

Inverted Syphon

122. Inverted siphons are provided to convey water by pressure flow/gravity under the rivers, roads or other structures. A syphon is a closed conduit designed to flow fully and under pressure. Trash rack has been provided upstream of the syphon to prevent entry of trash into the syphon. Three numbers of syphon has been provided to cross the channel flow under the Anjira River.

123. Syphon has been provided on Manyalo right channel to divert the design discharge to Rind Ali channel. Flow division structure has been provided upstream of syphon to divert required flow from right channel to Rind Ali command area. A 250 mm (10 inch) diameter steel pipe has been designed to carry design discharge below scour level of Mula River to d/s sump of syphon. A fixed trash-rack on both u/s & d/s sumps has been provided to block entry of trash into syphon pipe as to avoid clogging of pipe.

124. Hydraulic design of syphon has been carried including all losses ie. Entrance, exit losses, friction losses and trash-rack losses.

Aqueduct

125. An aqueduct is a cross-drainage structure provided to cross a nullah/ river when the bed level of the canal is clearly above the highest water level in the nullah/ river. At several locations, canals are aligned transverse to river. Therefore, aqueducts are provided. The proposed aqueduct is a rectangular section with concrete trough. The size of aqueducts is adjusted according to incoming flow from canal.

Super Passages

126. Super passages are provided where channel in cut and drainage flow is to pass over the channel. Super passages are provided on perennial channel where the canal is passing around a steep hillside and nullah have to pass over the channel. The alignment of the wing walls and embankment length to be determined as per site condition. Upstream and downstream bed protection are to be provided to ensure that the structure is not undermined by local scour

Social Structures

127. It is important to take care in the alignment of irrigation channel, and in siting of social and other structures, to involve farmers. Farmers are the users of irrigation water, and their views are to be incorporated into the design of the irrigation system. During walk through survey with community (FO) social structure's locations were selected as per their requirements. Washing structure and wuzu structures are provided as per their requirement at appropriate locations.

<u>Wuzu Structure</u>

128. Standard wuzu structure details drawing has been provided. Detail drawings are given in Volume II drawings. In consultation with the community, wuzu structures are provided adjacent to mosque for use in ritual ablutions.

Washing Structure

129. A Standard washing structure details drawing has been provided. Detail drawings are given in Volume II drawings. The structure comprises a number of washing positions where the women can wash their cloths. A foot bridge is provided adjacent to the structure to aid access.

3.4.5 Proposed Mechanical Works

130. Various time division and flow division structures (gates, hoists and their components) have been proposed at Manyalo Raiko & Rind Ali Subproject to release the water for irrigation purposes.

3.5 MAJOR QUANTITIES OF WORKS

131. Quantities of various items of works for the construction of Ahmadzai PIS+FIS sub-project will be worked out from drawings prepared based at detailed design stage. Major dimensions and parameters of works are summarized in Table 3-6.

Table 3-4 Dimensions/Parameter of Works

No.	Project Components	Unit	Dimensions/Parameters
1a	Rehabilitation of weir and silting basin	m	50
1b	Construction of new weir and silting basin	m	20
2a	Rehabilitation of Weir abutment wall	m	40
2b	Construction of new Weir abutment wall	m	161
3	Head regulator	Nos.	2
4	Mechanical works	Nos.	3 gates
5	Lined Channel	m	3,220
6	Earthen channel	m	7,325
7	Aqueduct	m	128
8	Super Passage	Nos.	09
9	Road culvert	Nos.	1
10	Irrigation Outlets	Nos.	14
11	Animal Drinking structure	Nos.	1
12a	Washing Structure	Nos.	1
12b	Wuzu Structure	Nos.	1
13	Bund and river training works	m	470
14	Time division structure	Nos.	10

132. It is estimated that above work can be completed within 24 months from the start of construction work.

3.6 CONSTRUCTION SCHEDULE

133. The non-core sub-project Works are divided into the following two main activities.

Activity – 1: *Preliminary works* which include improvement of existing access road to project site, construction of offices, material testing laboratory, mobilization of construction equipment, etc.

Activity – 2: *Construction/Rehabilitation of weir & irrigation channels* which includes: rehabilitation of weir and stilling basin, rehabilitation of two irrigation channels, stone masonry, weir abutment walls, head regulators, aqueduct, road culvert, super passage, washing and

animal drawing drinking structures, bunds, inspection paths along channel, cross drainage structures along channel length.

3.7 PROJECT COST

Total cost of the civil works of the subproject is estimated and is Rs. 971.417 Million based on market rates.

3.8 PROJECT ADMINISTRATIVE JURISDICTION

134. The proposed project falls under the jurisdiction of the deputy Commissioners of Khuzdar, Balochistan province.

3.9 PROJECT IMPLEMENTATION SCHEDULE

135. Mobilization for this project will include logistics of assembling all necessary plant and construction equipment, providing housing facilities with water sanitary and power utilities, training and organizing work forces and getting construction work underway. It is important that all works discussed under preliminary works including improvement of existing access road are completed prior to start of major civil works. The period for mobilization and preliminary works will extend over first 4 months of the contract period.

3.9.1 Construction of Weir & associated Structures:

136. The meteorological and river flow data showed that best suited period for construction of major civil works is from September to end December. During this period river flows are low and interruptions in construction activities due to rain will be less frequent. Construction work may however continue with some interruptions in January to August each year.

137. Main factors which affect construction program are planning for material utilization (including procurement and transportation of material from other cities to project site). In view of workload involved in construction of weirs and construction of weir abutment wall, stilling basin, mechanical works/gates and construction of flood protection bund as per schedule etc., 10 months have been proposed for completion (beyond preliminary works) involving one main flood period/season.

138. The work on construction of Weir, canal lining, aqueduct, syphon, road culvert, fall structures, super passage, animal drinking structure, washing structure, protection bund and river training works and rip rap will be completed in year – 2 of construction.

139. It is important that main canal structures and miscellaneous works are also completed along with construction of weir structure. These works can be taken up in construction year - 1 and completed in the 2nd year. The construction of drainage crossings may take relatively more time than irrigation canals.

3.10 CONSTRUCTION EQUIPMENT

140. Table 3-5 shows a tentative list of construction equipment required by the Contractor to enable him to undertake this work and meet the prescribed schedule.

Table 3-5: List of Construction Equipment Required by the Contractor

Sr. No.	Description	No. Required
1	Bulldozer D8 with ripper (Blade capacity = 12.9 m^3)	1
2	Motor Grader cat 14G or Equivalent	1
3	Front End Loader Bucket capacity = 6 m^3	2
4	Sheep foot roller for core compaction (10-ton capacity)	2
5	Dump Trucks (capacity = 14 m^3)	4
6	Mobile water tanker 500 Gallons	2
7	Hydraulic Excavator with 14” wide bucket	1
8	Concrete Batching Mixer	4
9	Concrete Vibrators	6
10	Centrifugal pumps ½ cfs	2
11	Hand compactors	3
12	Diesel generator	2
13	Jeeps	2

4. ENVIRONMENTAL AND SOCIAL BASELINE

4.1 GENERAL

141. The purpose of this chapter is to establish the baseline conditions for the physical, biological and the socio-economic aspects of environment of the project area. The data were collected regarding the physical environment, biological environment and social aspects of the study area during stakeholder consultation and technical visits conducted by the environment team.

4.2 AREA OF INFLUENCE(AOI)

142. This chapter describes the environmental, social and biological baseline conditions of the project area. The baseline conditions have been established on the basis of the data collected from the field, and through unstructured interaction with the local communities as well as the officials from various departments. In addition, the published data (secondary data) was also used to provide background information about the project area.

143. In this report, the Area of Influence (AOI) is referred where the potential impacts of the proposed project are anticipated. The AOI includes all those areas in the region within 0.5 km from the project site and which may be affected directly or indirectly by the project activities. This AOI of 500 meters is considered sufficient to assess any potential impacts that might take place on the biological and physical environment, particularly considering the limited and site-specific nature and scope of the proposed scope of works. This chapter describes the environmental setting of the proposed interventions.

4.3 PHYSICAL ENVIRONMENT

4.3.1 Geomorphology

144. All the main streams at the sub-project site show dendritic drainage pattern developed in the rock Formations exposed at the sub-project site which are homogenous in terms of lithology and structural geology.

4.3.2 Topography

145. High mountains surround the area of Manyalo, Raiko and Rind Ali Sub-project. The terrain is generally flat in the sub-project and its command area. The valley slopes of the Project Site are moderate to steep. The average altitude of the Manyalo, Raiko and Rind Ali PIS sub-project site command area is 830~875m above mean sea level. The overall relief at subproject site is 710 m (830~1540m).

4.3.3 Geology of the project area

146. Tectonically the sub-project site is situated in the vicinity of a number of active faults like Kakar Khorasan fault in the north and the Zhob Valley Thrust in the south. Both these faults are trending northeast-southwest. The area is in the near vicinity of subduction zone of Pakistan- India Plate and Eurasian Plate. Due to continuous subduction activity the rocks have undergone immense folding and faulting. A large number of east-west trending folds, existing in the north of the area have been mapped by Geological Survey of Pakistan (GSP) shown in

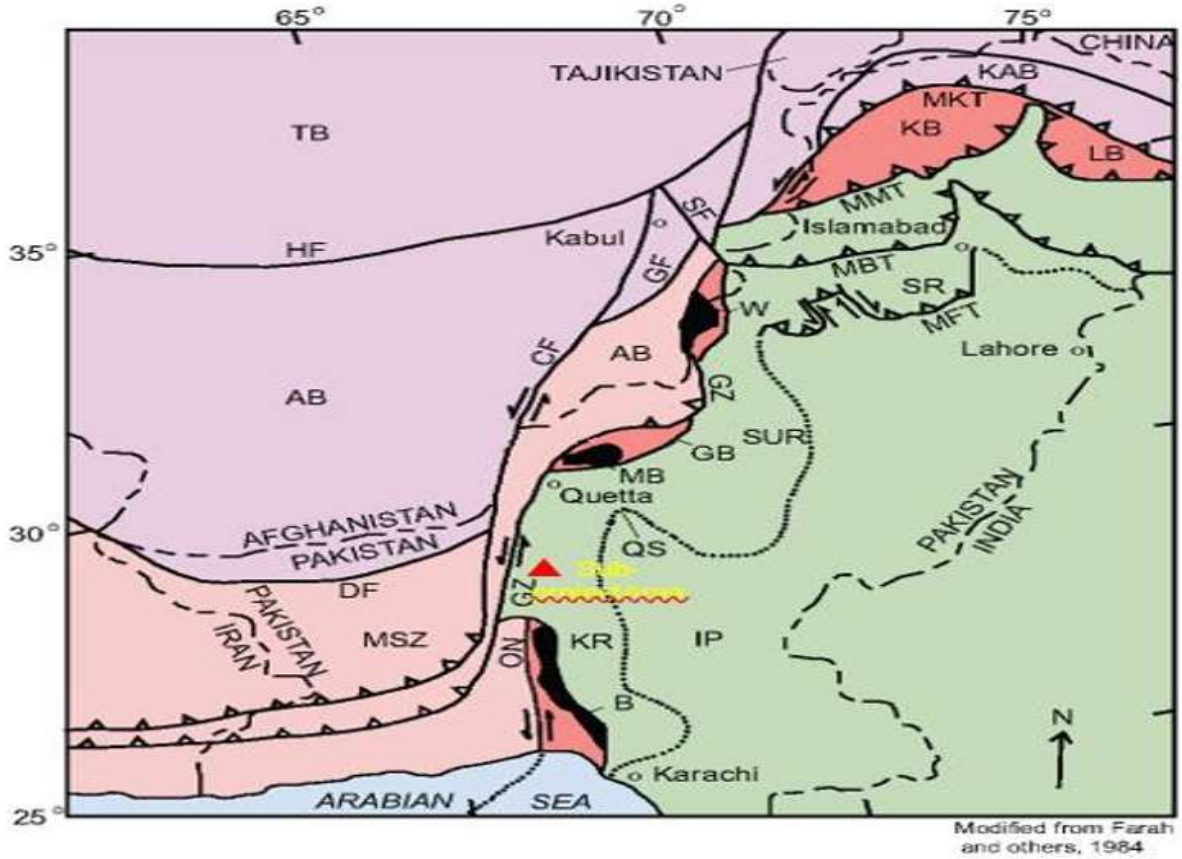


Figure **4-1**.

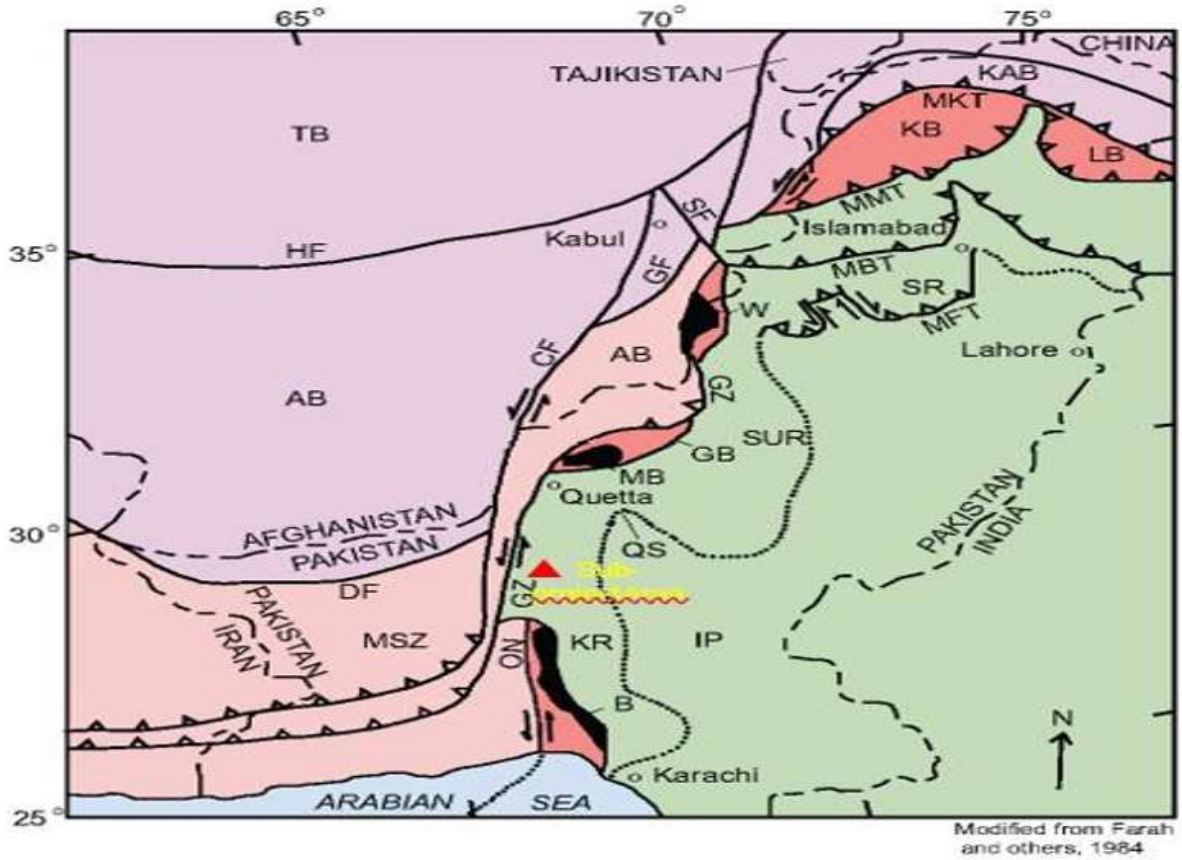


Figure 4-1 Geological map of the Project area

4.3.4 Site Specific Geology

147. The sub-project site is bounded by mountain ranges as Shinkai Ghar in the Noth, Mand Ghar in the South, Nar/Tor Ghar in the East and Rakhpur ghar in the West as shown in the Regional Geological Map prepared by government of Canada for government of Pakistan under Colombo Plan on scale 1: 253,440 (Map No 15, KHUZDAR 35 I.M.).

148. The rocks covered under the alluvium near sub-project site area are mainly Paleocene rocks of sedimentary in nature. Alternate beds of shale, marl, limestone and sandstone belong to Jamburo Group. Rocks are dipping towards the Nala on both sides of slopes due to the syncline running along the Nala. The recent alluvium is present in the river and stream beds consists of angular to sub-angular rounded and sub rounded gravel and boulders with some sand and fine particles.

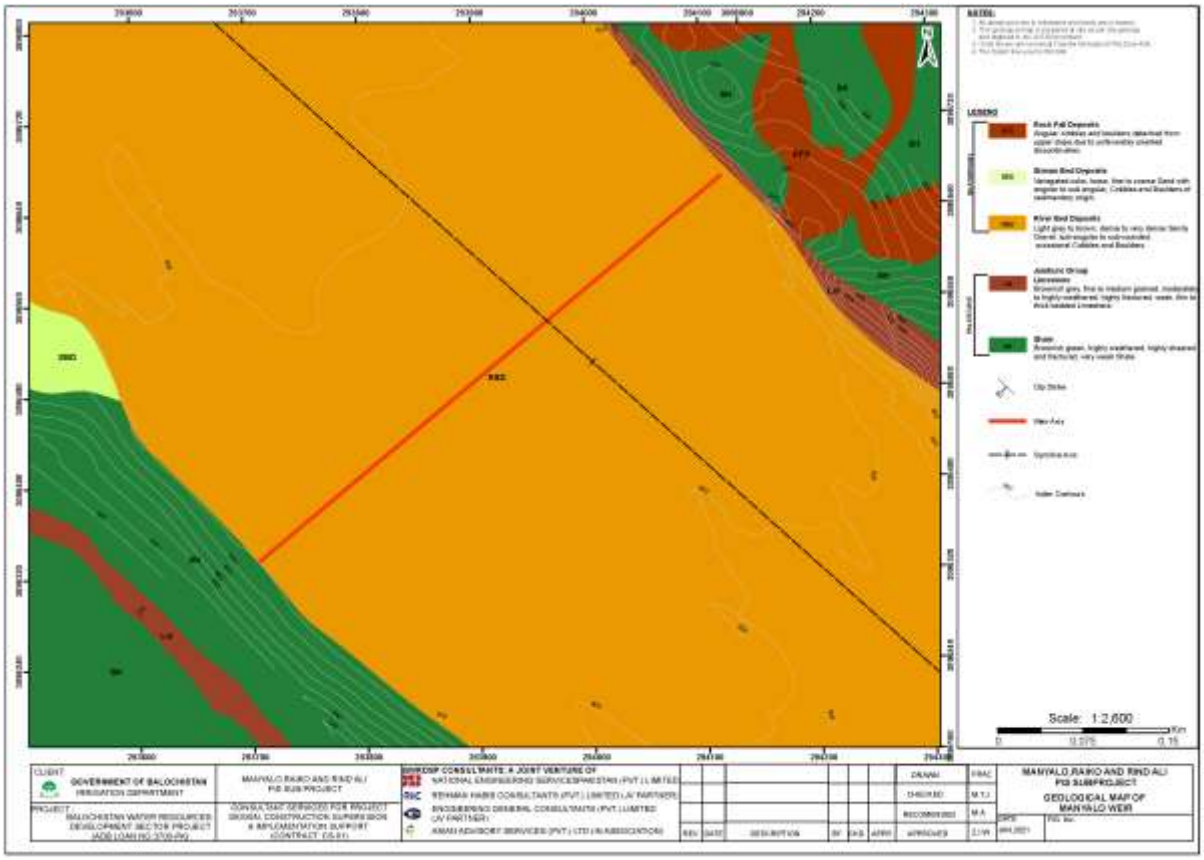


Figure 4-2: Site Specific Geological Map of Manyalo Raiko & Rind Ali PIS sub-Sub-project Area

4.3.5 Soil

149. The soils are deep silt loam, shallow gravelly silt loam, moderately deep to deep silty clay loam and a small area comprises of shallow gravelly soil. The soils were slightly calcareous and are non-saline and non-sodic.

4.3.6 Surface Water Resources

150. Mula river and Nurr Nullah (a tributary of Mula river) are main water resources of the project area. The Mula river is perennial round the year and flows at sub-projects are the exfiltration from the springs. The catchment doesn't receive snow or glacier melt, hence, most

of the flows are produced by rainfall events. In the absence of any such event, the flows in streams are less.

4.3.7 Climate and Meteorology

a) Average Temperatures

151. The mean daily temperature ranges from (June being the hottest month) 27.1°C to 31.1°C in the summer season (May to September) and 10.6°C to 13.0°C in winter season (December to February). Mean monthly temperature in June rises to a highest value of 31.1°C and falls to the lowest value of 10.6°C in January. June, July and August are the hottest months in summer season. December, January and February are the coldest months in winter season. The monthly averages of minimum, maximum and mean daily temperatures are given in Table 4-1 and shown graphically in Figure 4-3.

Table 4-1: Mean Monthly Temperatures in Khuzdar

Month	Temperature (°C)		
	Min	Max	Mean
January	3.7	17.6	10.6
February	6.1	19.7	13.0
March	11.0	24.5	17.8
April	16.4	30.4	23.2
May	21.2	35.3	28.3
June	24.3	38	31.1
July	24.2	37.1	30.5
August	23.1	35.7	30.4
September	20.5	34.5	27.1
October	14.4	30.1	22.2
November	8.9	25.2	17.0
December	5.0	20	12.4

Source (Pakistan Meteorological Department)

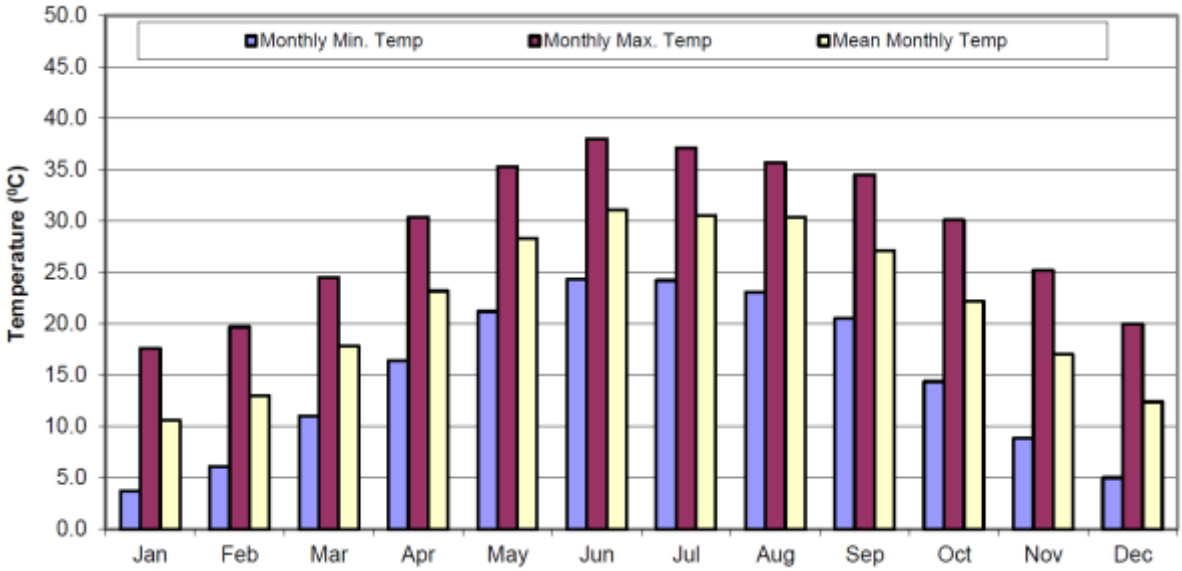


Figure 4-3: Mean Monthly Temperature in Khuzdar

b) Rainfall

152. Mean monthly rainfall data and the number of rainy days recorded at the Khuzdar Met Station are given in Table 4-2. The average annual rainfall of the area is about 267.9 mm

(10.54 inches) (Ref. 1), while on the average the maximum monthly rainfall is 59.9 mm during the month of August and a minimum of 3.7 mm in November. July and august are the months of with maximum rainfall, which is about 45% of the annual rainfall. Winter rains generally occur during the months of January and February, whereas November is normally the month with least precipitation. The distribution of average monthly rainfall is shown in Figure 4-4 below.

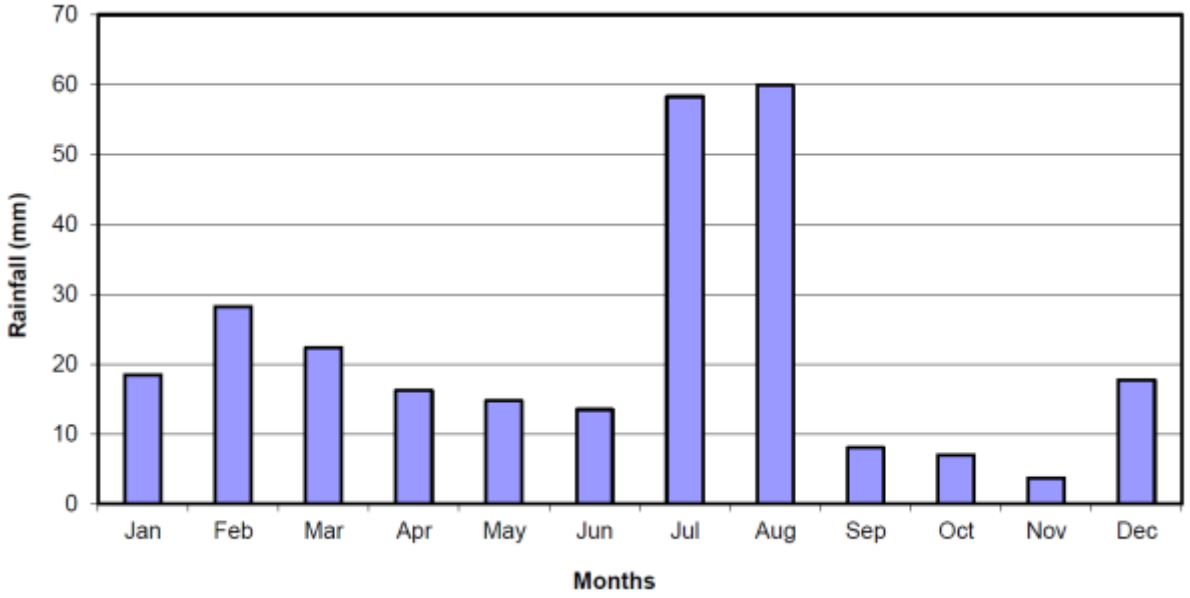


Table 4-2: Mean Monthly Rainfall in Khuzdar

Month	Mean Monthly Rainfall (mm)	Rainy Days (No.)
January	18.4	1.6
February	28.2	2.3
March	22.3	1.9
April	16.2	1.7
May	14.7	1.7
June	13.5	1.5
July	58.3	5.5
August	59.9	3.9
September	8.0	1.5
October	7.0	0.2
November	3.7	0.2
December	17.7	1.4
Annual	267.9	23.4

Source (Pakistan Meteorological Department)

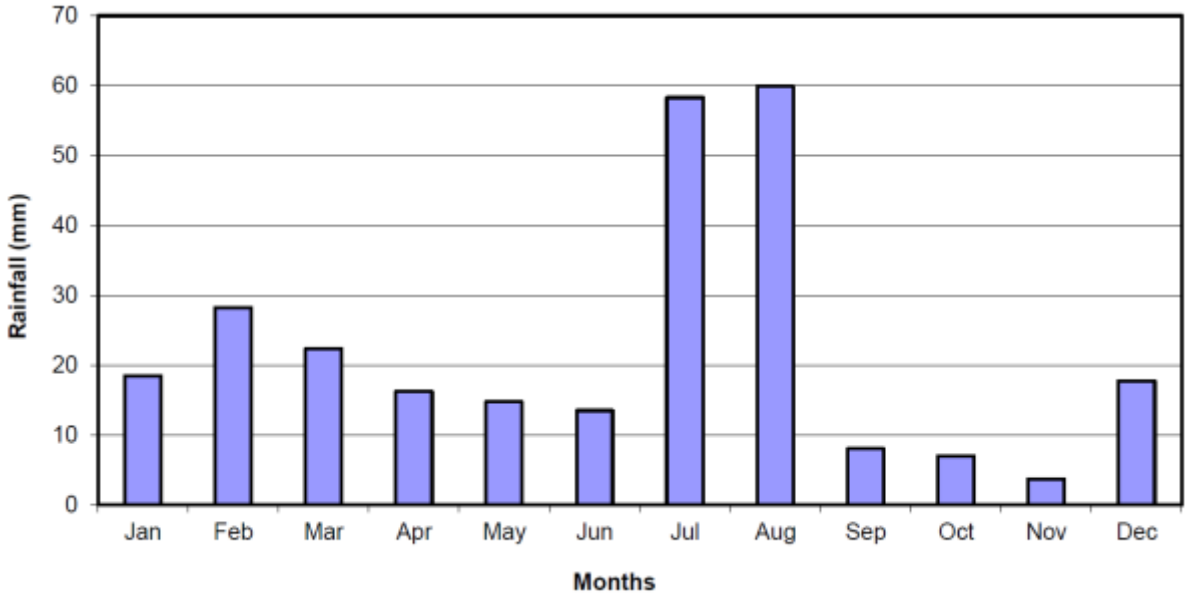


Figure 4-4: Monthly Distribution of Rainfall at Khuzdar

c) Relative Humidity

153. The relative humidity data at 00:00, 03:00 and 12:00 hours was collected from PMD. Mean monthly relative humidity is given in Table 4-3. At 00:00 hr the relative humidity varies from lowest value of 39.7 % in May to highest value of 65.9 % in August. At 12:00 hr the lowest value is 15.6 % in May to highest value of 30.8 % in August.

Table 4-3: Mean Monthly Relative Humidity in Khuzdar

Month	Relative Humidity (%)		
	00:00 hr	03:00 hr	12:00 hr
January	59.6	59.2	27.3
February	57.1	54.5	25.5
March	50.3	47.5	21.9
April	43.3	39.1	17.8
May	39.7	33.8	15.6
June	46.2	41.6	18.5
July	61.9	57.4	28.2
August	65.9	60.7	30.8
September	52.0	46.5	19.5
October	42.3	37.6	17.5
November	49.5	45.7	20.3
December	57.6	54.2	25.4

Source (Pakistan Meteorological Department)

d) Wind Speed

154. The mean monthly wind speed in knots is given in Table 4-4. The data reveals that at 00:00 hours, the wind speeds are generally lower while higher wind speeds are recorded at 03:00 and 12:00 hours. During summers wind speeds are generally higher than wind speeds in winters.

Table 4-4: Mean Wind Speed at Synoptic Hours in Zhob

Month	Mean Wind at Synoptic Hours (Knots)		
	00:00	03:00	12:00
January	1.9	1.6	4.6
February	1.9	1.8	5.3
March	2.1	1.8	5.7
April	2.0	1.8	5.8
May	2.0	2.1	6.6
June	1.9	2.0	6.1
July	2.2	2.1	6.4
August	2.0	1.8	5.4
September	1.6	1.3	4.8
October	1.5	1.0	4.2
November	1.0	0.9	3.6
December	1.4	1.2	3.9

4.3.8 Hydrology and Flood assessment

155. The hydrological assessments covered the estimation of water availability and design flood at the weir site. The catchment area at proposed PIS location is 4411 km^2. The water availability was estimated both from stream flow data and rainfall-runoff modelling using satellite-based data. The study used the average annual rainfall of 196 mm. Rainfall runoff for Manyalo sub-project using Khuzdar and Kalat rainfall data for the period 1971-2018 worked out to be 89.3 MCM (runoff factor 0.1023). In order to estimate the perennial flows in stream, baseflow records of Mula river at Naulang have been transposed to Manyalo sub-project site which are about 34-132 ft^3/s during various months of the year. In order to estimate the base flow volumes on conservative side these flows have been converted to flow volumes which works out to be about 51 MCM at Manyalo, Raiko & Rind Ali sub-project.

156. For estimation of flood flow, one-day annual maximum rainfall data record of Khuzdar and Kalat stations is used. Rainfall Frequency Analysis was carried out using Gumbel's Extreme Value Type-1 Distribution and Log Pearson Type-III. Results by Gumbel Extreme Value Type I best fit. Using the rainfall depth for various return periods, its temporal distribution over the catchment areas and based on Synthetic Unit Hydrograph technique, the estimated peak flood is given in Table 4-5.

Table 4-5: Estimated Peak Floods at Ahmadzai Weir

Return Period (Years)	Estimated Peak Floods	
	(ft^3/s)	(m^3/s)
25	71,270	2,018
50	87,570	2,480
100	104,190	2,950

4.3.9 Climate Change.

157. According to the Global Climate Risk Index 2020, Pakistan was ranked as the 5th most affected nation by extreme weather events (1999-2018). Natural disasters, which already disrupt livelihoods and the economy, are expected to increase in frequency and intensity with climate change. Projected temperature increases are expected to be above global averages, negatively impacting agricultural production, water availability, and human health. This will be

particularly true for large parts of Punjab, Sindh and Balochistan provinces, already considered intense heat zones.

158. Climate change will impact water conservation structures (weir and bund) in myriad ways, depending on the mode and location specific characteristics. All water conservation structures are constructed under design standards that consider very specific temperature and precipitation ranges and return intervals for extreme events, such as floods and extreme heat. Water conservation structures malfunctions if weather conditions diverge from the design range (as was experienced in 2022 flood in District Khuzdar), which could occur more frequently as the climate continues to change. Heat waves are likely to occur with a higher frequency and longer duration in the future. Water conservation structures are particularly vulnerable to precipitation extremes.

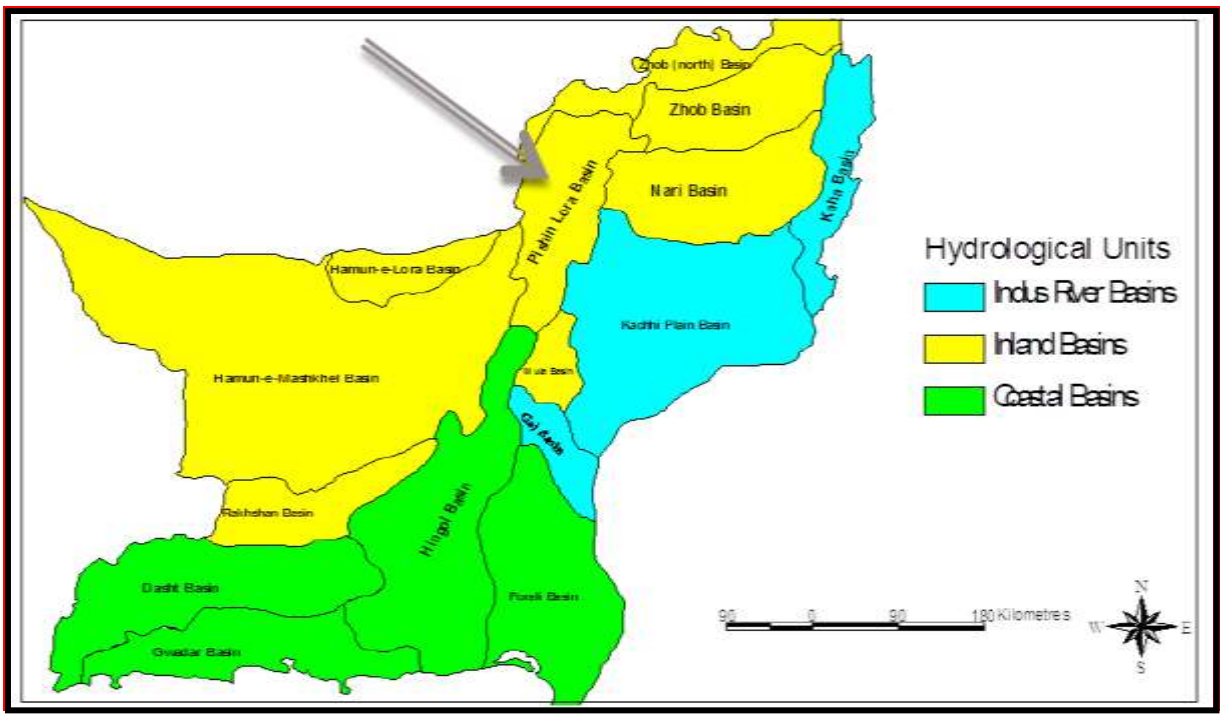


Figure 4-5: Maps showing the study area of Pishin Lora Basin is adjacent to Zhob and Mula River Basins of Balochistan

Climate Risk and Vulnerability Assessment (CRVA)[1]

159. Climate risk and vulnerability analysis of Zhob and Mula river basin was conducted under current ADB funded Balochistan water resources development sector project through using different models i.e. Global Climatic Model (GCM), HEC-RAS and SWAT model.

160. Based on GCM data for Zhob watershed, the highest and the second highest flood years for Zhob Watershed are 2059 and 2031 respectively. While, for Mula River, the highest and the second highest flood years are 2059 and 2027.

161. Data from GCM for 83 years (2017-99) shows that year 2018, 2047, 2031, 2027, 2017, 2059, and 2080 are the highest 7 years for rainfall and ultimately flows for Zhob Watershed.

[1] Climate Risk and Vulnerability Analysis Report (2017). Balochistan Water Resources Development Project Preparatory Technical Assistance (TA 8800-PAK)
https://www.adb.org/sites/default/files/linked-documents/48098-002-sd-04.pdf

Similarly, from the same span of GCM simulations, 2018, 2027, 2031, 2038, 2047, 2059, and 2080 are identified to be the top seven high flow years in Mula River Basin.

162. For vulnerability analysis, flood inundation modelling was done using HEC-RAS and SWAT models. A vulnerability and impact matrix were developed to evaluate the possible climatic effects on both the river basins. It was concluded from the matrix that Zhob river basin is prone to losses associated with increasing temperatures, decreasing rainfall and more frequent droughts. Mula river basin is characterized by a decreasing maximum temperature yet increasing minimum temperatures, decreasing rainfall in winters and summers (two main rainfall seasons) and an increasing trend in frequency and magnitude of floods.

Climate Risks and Vulnerabilities in the Project Area

163. The increasing trend in frequency and magnitude of floods in Mula river basin indicated that flooding may be considered the most important climate risk for the Project. Water flow condition exceeding the systems' design capacity can cause flooding or inundation of water conservation structures. High flood events can also lead to increased deterioration or damage of project structures resulting in more frequent maintenance and rehabilitation.

4.3.10 Seismology

164. The entire province of Balochistan lies in a seismically active region. The province has experienced devastating earthquakes in the past

165. District Khuzdar lies in an active seismic zone. It has faced earthquake jolts measuring the magnitude up to 6.5 on the R/C. The earthquake of 1985 recorded 27 jolts in 36 hours has not been forgotten

166. As per latest seismic zoning map of Balochistan, the Project area lies in zone 2B with PGA value ranging from 0.16g to 0.24g.

167. The updated Seismic Zoning Map of Pakistan is shown below as Figure 4-3.

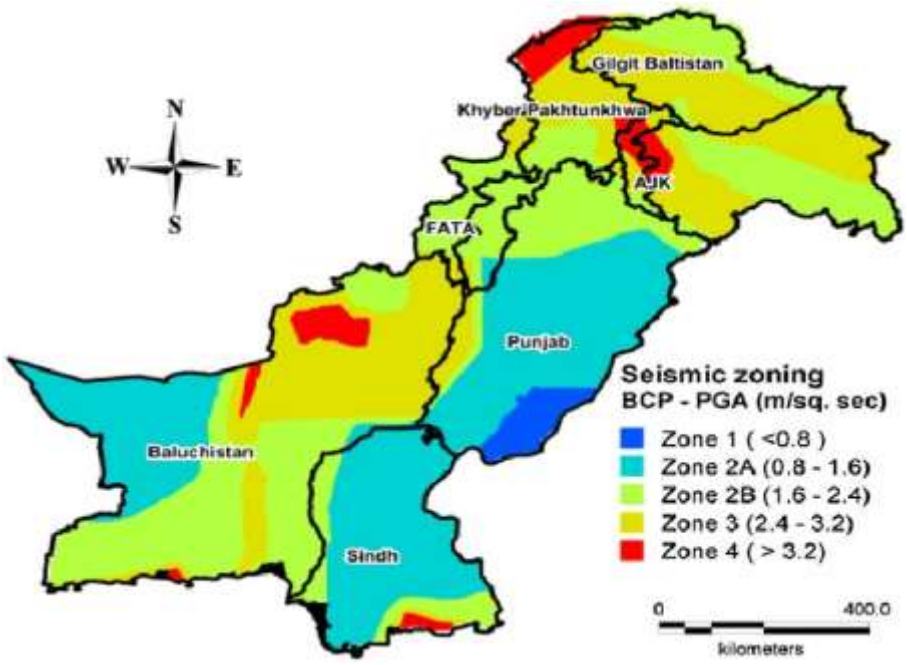


Figure 4-6: **Seismic Zoning Map of Pakistan**

4.3.11 Sensitive Receptors

168. The major construction activities for this project will take place at the weir site. All settlements are located away from it, with the nearest village being Manyalo, situated 3.7 kilometers away. However, major environmentally sensitive receptors, including residential areas, religious places such as mosques and madrassas, and educational institutes, are located near channels as identified through Arc GIS. These findings were further verified through field visits for the proposed project. The identified sensitive receptors, along with their distances from the site, are provided in Tables 4-6 below.

Table 4-6: Sensitive Receptors

Sr.No	Name of Physical Sensitive receptor	Distance from Channel
1	Basic Health Unit (BHU), Manyalo	115 m
2	Masjid of Manyalo Village	110 m
3	Raiko Middle School	270 m
4	Masjid ar Rind Ali Village	218 M

4.3.12 Ambient Air Quality

169. Ambient air quality parameter as per site conditions only includes Suspended Particulate Matters was spot monitored for on Hatachi – Kharzan Site of BWRDSP that is located 18 Km from Manyalo Raiko subproject. Table 18 below shows average 2 hours results. The equipment used for air monitoring is Hazdust EPAM 5000 and test method is USEPA PM10, 2.5 method 201a.Ambient air in general, is apparently clean, because no major industrial activity exists in Mula River Basin. Results have been provided in Table 4-7 below and lab results have been annexed as Annexure 3.

170. Table 4-7 below shows average 2 hours results. The equipment used for air monitoring is Hazdust EPAM 5000 and test method is USEPA PM10, 2.5 method 201a. The results range from 0 to 15 µg/m3 details are presented in Annexure – 7 of this report.

Table 4-7: Ambient Air Quality Results (Suspended Particulate Matters)

S. No.	Location	Test Results (µg/Nm^3)	NEQS/WHO (avg. 24 hrs. µg/m^3)
1	Haatachi Khizran Infiltration Gallery	BDL	500

4.3.13 Ambient Noise

171. Ambient noise level was measured at Mula River, which range between 32-41 dB(A). This range corresponds to a low-level noise atmosphere of the rural areas, associated with some of vehicular traffic. The details of the analysis are presented in Annexure – 3 of this report.

172. Ambient noise levels were measured and the average 2 hours monitoring results are given as following in Table 4-8. Noise monitoring was done with a type 1 noise meter.

Table 4-8: Summarized Results of Noise Monitoring

Sr. No.	Location	Noise Level dB(A)	NEQS / WHO Day Time	NEQS / WHO Nighttime
1	Haatachi Khizran Infiltration Gallery	32	55	45

4.3.14 Surface Water Quality

173. Surface water samples were collected from Mula River and tested. The results show that all the parameters are within permissible level according to National Environmental Quality Standards and WHO guidelines. The river water is fresh in this reach having TDS value less than 500 ppm.

Table 4-9: Mula River Water Analysis

#	Parameter	UoM	Kharzan-Hatachi Infiltration Gallery Surface Water UTM Coordinates 313763.63 E 3104294.59 N	PEQS	WHO/IFC
1	Turbidity	NTU	BDL	<5	<5
2	Total Suspended solids	mg/L	BDL	<1000	<1000
3	Total Dissolved Solids	mg/L	357	<1000	<1000
4	pH		7.99	6.5-8.5	6.5-8.5
5	Aluminum	mg/L	BDL	≤ 0.2	0.2
6	Antimony	mg/L	BDL	≤0.005	0.02
7	Arsenic	mg/L	BDL	≤0.005	0.01
8	Barium	mg/L	BDL	0.7	0.7
9	Boron	mg/L	BDL	0.3	0.3
10	Cadmium	mg/L	BDL	0.01	0.003
11	Chromium	mg/L	BDL	≤ 0.05	0.05
12	Copper	mg/L	BDL	2	2
13	Lead	mg/L	BDL	≤ 0.05	0.01
14	Manganese	mg/L	BDL	≤ 0.5	0.5
15	Nickel	mg/L	BDL	≤ 0.02	0.02
16	Mercury	mg/L	BDL	≤ 0.001	0.001
17	Selenium	mg/L	BDL	0.01	0.01
18	Zinc	mg/L	BDL	5.0	3

4.4 BIOLOGICAL ENVIRONMENT

4.4.1 Flora

174. It has moderately dense forests and a negligible area has been conserved as state forest, overall natural vegetation, including shrubs, bushes and grasses can be aptly termed as rangelands. These rangelands are substantially contributing to the ecological stability of important ecosystems and economic uplift of people in the district.

Table 4-10: Floristic List of District Khuzdar

#	Taxon	Family	Life form	Vernacular name
01	Acacia nilotica	Fabaceae	Tree	Babbur
02	Acacia sengal	Fabaceae	Shrub	Babbur
03	Prosopis cineraria	Fabaceae	Tree	Kandi
04	Prosopis glandulosa	Fabaceae	Shrub	Kandi
05	Prosopis juliflora	Fabaceae	Shrub	Devi
06	Tamarix sultanii	Tamaricaceae	Shrub	Kirri
07	Zizyphus nummularia	Rhamnaceae	Shrub	Ber
08	Aerva javanica	Amarantheaceae	Shrub	Gujo
09	Periploca aphylla	Ascalpidaceae	Shrub	
10	Capparis decidua	Capparidiaceae	Shrub	
11	Haloxylon recurvum	Amarantheaceae	Shrub	
12	Suaeda fruiticosa	Amarantheaceae	Shrub	
13	Suaeda ferinosa	Amarantheaceae	Shrub	
14	Grewia domaine	Malvaceae	Shrub	
15	Alhaji marorum	Fabaceae	Shrub	
16	Salvadora oleoides	Salvadoraceae	Shrub	
17	Salvadora persica	Salvadoraceae	Shrub	
18	Heliotropium sp	Boragenaceae	Shrub	Merin
19	Calligonum polygonoides	Polygonaceae	Shrub	
20	Rhazya stricta,	Apocynaceae	Shrub	
21	Euphorbia caducifolia	Euphorbiaceae	Shrub	
22	Commiphora mukal	Burseraceae	Shrub	Gugul
23	Inula montaine	Asteraceae	Herb	Kulumurak
24	Inula grantoides	Asteraceae	Herb	Kulumurak
25	Grewia tenex	Malvaceae	Shrub	Chill
26	Phoenix dyctylefera	Palmea	Tree	Khajoor
27	Cymbopogon sp	Poaceae	Grass	
28	Cenchrus sp	Poaceae	Grass	
29	Aristida sp	Poaceae	Grass	Nadak
30	Chrysopogon sp	Poaceae	Grass	
31	Sericostoma	Boraginaceae	herb	

175. ***Flora of sub-Project area*** includes Khajoor, Babbur, Kandi, Devi, Kirri, Ber, Gujo, Merin, Gugul, Chill,Kulumurak, Grass: Nadak.

4.4.2 Fauna

176. Wildlife habitat type is Steppe Forest in Intermediate Latitude. There are no historical benchmarks to determine the status of wildlife in the area. However, according to the community the number of wildlife species has declined, which could aptly be attributed to casual attitude for hunting and habitat degradation.

177. Cumulative faunal list of the Hitachi Area consists mainly of following:

Table 4-11: Faunal List of District Khuzdar

#	Taxon	Common name	Life form	Occurrence	IUCN Red List Conservation status
1.	Vulpes grifithii	Hill fox	Mammals	Occasional	LC
2.	Hysrix indica	Porcupine	Mammals	Common	LC
3.	Vulpes	Desert Fox	Mammals	Occasional	LC
4.	Canis aureus	Asiatic Jackal	Mammals	Occasional	LC
5.	Canis lupus	Wolf	Mammals	Occasional	LC
6.	Hemiechinus auritus megalotis	Hedgehog	Mammals	Common	LC
7.	Goluda ellioti	Bush rat	Mammals	Common	NE
8.	Lepus capensis	Cape hare	Mammals	Common	LC
9.	Ammoperdix griseogularis	See-see Partridge	Bird	Reported	LC
10.	Dupetor flavicollis	Black Bittern	Bird	Reported	LC
11.	Falco peregrinus	Peregrine Falcon	Bird	Reported	LC
12.	Pterocles coronatus	Crowned Sandgrouse	Bird	Migratory	LC
13.	Falco naumanii	Lesser Kestrel	Bird	Reported	LC
14.	Pterocles lichtensteini	Close-barred/ Lichtenstein Sandgrouse	Bird	Reported	LC
15.	Francolinus Pondicerianus	Grey Partridge	Bird	Common	LC
16.	Pseudibis papillosa	Black Ibis	Bird	Reported	LC
17.	Corvus ruficollis	Brown-necked Raven	Bird	Common	LC
18.	Varanus griseus knoiecznyi	Indian desert monitor	Reptile	Common	LC
19.	Naja	Indian Cobra	Reptile	Common	LC
20.	Ablepharus pannonicus	Easter dwarf skink	Reptile	Reported	LC

Fauna of *sub-Project area*:

178. Wildlife of the Project area includes

179. **Mammals:** Asiatic Jackal (*Canis aureus*), Cape hare *(Lepus capensis*), Porcupine (*Hystrix indica*), Hedgehog (*Hemiechinus auritus megalotis*), Bush rat (*Goluda ellioti*) etc.

180. **Birds:** Black Bittern (*Dupetor flavicollis*), Lesser Kestrel (*Falco naumanii*), See-see partridge (*Ammoperdix griseogularis*), Grey Partridge (*Francolinus pondicerianus*), a number of sparrows, Finches, buntings, seasonal/migratory waterfowls, hawks, and sand grouse etc.

Reptiles: Indian Cobra (*Naja oxiana*), Easter dwarf skink (*Ablepharus pannonicus*), Leaf nose viper (*Eristicophis macmahonii*) etc.

4.4.3 Protected and Historical Areas:

181. There were some five areas initially documented in Khuzdar district, however after administrative adjustments, they were left over as follows:

Table 4-12: Protected Area List of District Khuzdar

#	Area	Status	Tehsil	Distance from Manyalo Subproject area
1	Kera Dhori 8,094 hectares	Wildlife Sanctuary	Khuzdar	46 km away
2	Chorani (19,433 hectare)	Notified forest	Khuzdar	89km away

182. In District Khuzdar, Balochistan, there are several notable archaeological sites located at varying distances from Manyalo Raiko and Rind Ali (PIS). The Nausherwani Tombs are approximately 22 kilometers southeast of Manyalo Raiko and 38 kilometers northeast of Rind Ali (PIS). Miri Fort is located around 55 kilometers southwest of Manyalo Raiko and 45 kilometers northwest of Rind Ali (PIS). Moola Chotok, known for its ancient rock carvings, is about 70 kilometers west of Manyalo Raiko and 60 kilometers southwest of Rind Ali (PIS).

4.5 SOCIO-ECONOMIC BASELINE STRUCTURE

4.5.1 Demography

183. The land and water rights mainly belong to different clans of Zehri tribe including Musiani, Jatak and Mengal. About 461 households of 10 killies were reported in sub-project. The detail is being provided in the following Table 4-13.

Table 4-13 : Demography of the Sub-project Area(2021)

S.No.	Name of Killi	Total HHs	Total Population	Male	Female
1	Manyalo	120	1600	750	850
2	Khair	80	640	300	340
3	Raiko	150	1350	650	700
4	Rind	5	40	20	20
5	Siaboz	60	480	180	300
6	Karrecho	30	210	100	110

7	Bhoko	4	28	12	16
8	Jhakkar	4	32	16	16
9	Thatt	2	18	9	9
10	Malki	6	48	24	24
	Total	**461**	**4446**	**2061**	**2385**

4.5.2 Tribes/Caste, Language and Religion

184. Main clans of Zehri tribe including Musiani, Jatak and Mengal. Brohi is spoken as the major language in the area while small number of the people can speak Urdu. The communities belong to Muslim religion group.

4.5.3 Literacy Ratio

185. A person was treated as literate if he or she could read newspaper and write a simple letter in any language. According to the current social survey, the literacy rate of the studied killies was 51 percent. As far as educational level of male is concerned, 43 out of 52 males (82 %) were found primary and middle-class education. Amongst the female, out of 36 respondents, all were illiterate. There is need to establish educational institutions in each killi to improve the educational level of women.

4.5.4 Main Occupation of the Respondents

186. The main occupation of the people of the project areas are agriculture and livestock rearing followed by Govt. services and small businesses. Most of the farmers supplement their income from labor and shop keeping, transporters, private and government jobs etc. For cattle and sheep rearing large tracts of grazing land are still available. The monthly farm income ranged from Rs.8000 to 10000 while Rs.10000- to 15000 from off-farm income was recorded. The community hardly fulfil their domestic needs from their limited resources of income.

187. There is potential to grow all types of fruit plants, but due the shortage of water has hindered the ability to sow. By rehabilitating water channels, the farmers will be able to plant fruit trees, thereby generating income and reducing poverty.

4.5.5 Water Rights

188. The source is Mula river water diverted through kacha traditional diversion bund. Significant perennial flow can be seen in the Mula river but farmers can divert only few cusecs in earthen channels. There is no conflict prevailing in sub-project related to water rights and water distribution. The available water is being diverted to each of farm and water allocation is based on land holding.

4.5.6 Consensus on Water Use

189. The approach of community participation was shared with beneficiaries of each sub-project and no dispute was reported on land and water rights and farmers agreed to participate in development of sub-project. Community demanded separate head regulator for each killi, especially for Khair and Karrecho killies.

4.5.7 Social Facilities & Pressing Needs

190. The situation regarding social facilities is very alarming in the sub-project area. No social and civic facilities were available in the surveyed killies. There was no facility of health in the local villages and residents have no direct access to the metaled road. Facilities of public transport are also very poor. Facilities of drinking water, sanitation and health are also missing. The facilities of primary school for boys and girls were available in all surveyed killies, but local communities were not satisfied because of poor buildings and non-availability of trained teaching staff. The overall facilities in all surveyed killies were recorded as follow in Table 4-14 which indicated very poor condition:

Table 4-14 : Social Amenities Available in the Surveyed Killies

Facilities	Manyalo	Raiko	Siaboz
Hospital/Dispensary	No	No	No
RHU	No	No	No
Primary School	Yes	Yes	Yes
High School/College	No	No	No
Bank	No	No	No
Vet. Dispensary	No	No	No
Shop	Yes	Yes	Yes
Post office	No	No	No
Telephone/Mobile	Mobile	Mobile	Mobile
Drainage/sewerage	No	No	No
Police Check post	Levis	Levis	Levis
Grain Market	No	No	No
Private Dispenser	Yes	No	No

5. ANALYSIS OF ALTERNATIVES

5.1 GENERAL OUTLINE AND SCOPE .

191. The discussion and analysis of alternatives in this IEE study consider pragmatic strategies that will promote the elimination of negative environmental and social impacts. It is imperative to assess different alternatives to reach the most viable possible option. Different alternatives were considered at the design stage of the proposed project and at the time of preparing this IEE study.

5.2 Categorical Analysis of Alternatives

5.3 No Project Alternative

192. The "No Project Option" is characterized by the current state of water diversion in the Manyalo, Raiko & Rind Ali area, which relies on existing makeshift diversion bunds. These bunds are essentially temporary structures made from materials like stone, debris, and bushes. They serve as barriers constructed to redirect water from the Mula River to the local command areas. However, the key issues with this approach become apparent when examining the absence of proper head regulator structures.

193. One of the major shortcomings of this setup is the lack of adequate control over water distribution. In essence, the water flow is unregulated, which means that there is no efficient mechanism for determining how much water goes where. This lack of control can lead to inefficiencies in water allocation, with some farmers potentially receiving too much water while others receive too little. This can create disputes over water rights and allocations, affecting the local communities' ability to consistently access and utilize water resources.

194. Additionally, the unregulated diversion method contributes to high water losses in the earthen channels used for transporting water from the diversion bunds to the command areas. These losses can occur due to seepage, evaporation, and spillage, resulting in a reduced amount of water reaching its intended destination. As a consequence, agricultural productivity may be negatively affected, impacting the livelihoods of local farmers.

5.4 Interventions at Mulla River (Weir)

5.4.1 Alternatives

195. Two alternatives were considered for this subproject:

196. A 400.0 m wide weir is proposed to be constructed across the river to raise water level and supply irrigation water in channels that will be constructed on each side of river.

197. The two separate infiltration galleries one on each side along with irrigation channels, with flood protection for command area with cross drainage structures. However, stream alignment in past 15 years has been changing, therefore, infiltration gallery option is not recommended

198. The objective of sub-project is to provide more irrigation water to existing and available command area on both side of Mula River in three nearby villages along the river. The sub-project will also provide protection bund along some reaches of command area to preserve it from floodwater. Availability of water round the year will increase productivity of area and enhance income generation activities in the area.

199. Table 5.1 provides brief comparison of both alternatives with respect to environment and social viewpoint.

Table 5-1: Comparison of Alternatives

Parameters	Weir	Infiltration Gallery
Cost	• Weirs are generally cost-effective in terms of initial construction. • Maintenance costs for weirs are usually low, as they are well-understood and straightforward to maintain.	• Building infiltration galleries involves higher initial construction costs, particularly due to the filtration and recharge infrastructure required. • Maintenance, including sediment removal and filtration system upkeep, can be more involved and may lead to higher ongoing costs.
Design	• ***Immediate Flow Control:*** Weirs are engineered to control and regulate the flow of water in rivers or streams. By adjusting the weir's design and features, water levels and flow rates can be precisely managed, which is crucial for consistent irrigation. • ***Simplicity in Design and Maintenance:*** Weirs are known for their straightforward design and ease of maintenance. Constructed from concrete or rock structures, they are cost-effective and have well-understood maintenance requirements, making them a practical choice for water management projects.	• ***Limited Surface Water Flow Control:*** Infiltration galleries are less effective at directly controlling surface water flow. They rely on natural percolation and groundwater recharge processes, which are not as easily adjustable for immediate flow control. • ***Complex Design and Construction:*** Infiltration galleries are more complex to design and construct. They require specialized engineering to ensure proper infiltration and groundwater recharge. Maintenance, including sediment removal and filtration system upkeep, can also be more involved.
Perceived Environmental Impacts	• Weirs, with their ability to regulate water levels, can play a pivotal role in mitigating downstream flooding during heavy rainfall events. • The impounded water behind a weir can act as a natural filter, allowing sediment to settle out of the water. This can improve the water quality downstream as the sediment is captured behind the weir.	• Infiltration galleries are more passive in managing surface water, and they lack the flood control benefits that weirs can provide. • While infiltration galleries may not offer the same capacity for water retention as weirs. So might not have the same impact on water quality improvement through natural filtration.
Social	• ***Cultural Compatibility:*** Weirs may be more compatible with local cultural practices related to water use. In some regions, traditional practices may revolve around open water bodies like rivers, making weirs a familiar and culturally acceptable feature.	• ***Limited Cultural Compatibility***: Infiltration galleries does not align with traditional practices related to open water bodies like river that are common in the project area. Communities are deeply rooted cultural and historical connections to surface water sources, which can make the concept of diverting water underground less culturally acceptable.

	• ***Recreational and Social Gatherings:*** Weirs can become community focal points, attracting people for recreational activities and social gatherings. This can strengthen community bonds and improve the social environment.	• ***Limited Recreational and Social Use:*** Infiltration galleries typically do not offer the same recreational and social opportunities as weirs. They are not likely to become community focal points for social gatherings and recreational activities. This lack of community engagement and bonding around the infrastructure can reduce their social appeal.

5.5 Recommended Option .

200. Based on a comprehensive analysis of alternatives between the Weirs and infiltration gallery, recommended option is construction of weir. Weirs tend to be more cost-effective, offer precise flow control, and have a positive impact on flood mitigation and water quality. They also align better with local cultural practices and provide opportunities for recreational and social gatherings. In contrast, infiltration galleries have higher initial construction costs, lack immediate flow control, and may not be culturally compatible or socially engaging.

6. PUBLIC CONSULTATION AND DISCLOSURE

6.1 GENERAL

259. This section describes the outcome of the public consultation sessions held with different stakeholders that may be affected (positive / negative) by the proposed project activities. Public consultation is a mandatory part of the IEE process for development projects. The adequacy of the public consultation and information disclosure is one of the basic criteria used to determine the project compliance with the national laws.

260. The consultation process was carried out in accordance with the requirements of Pakistan environmental procedures and ADB SPS requirements. The objectives of this process were to:

- Informing the public about what is proposed project.
- Identify and involve all stakeholders, especially local residents, in the consultative and participation process;
- Share information with stakeholders on the design and construction of the proposed project and anticipated impacts (positive / negative) on the physical, biological and socio-economic environment of the project area;
- Understand stakeholders' concerns regarding various aspects of the project, including the existing available facilities and problems, construction of the project and the likely impacts of construction and operation related activities;
- Understand the perceptions, assessment of social impacts and concerns of the communities in the vicinity of the proposed project;
- Provide an opportunity to the public in the public consultation session to provide valuable suggestions for the project design in a positive manner; and
- Reduce the chances of conflict through the early identification of controversial issues, and consult them to find acceptable solutions.

6.2 Consultation and Participation Process

261. For ascertaining the perceptions of different stakeholders about the project (during construction/operation), consultation meetings were held with them. Site visits of dam sites were conducted. Consultation meetings were carried out during the site visit with local communities of Killi Manyalol, Killi Raiko and Killi Siaboz etc. Consultation photographs have been provided as Figure 6-1.

6.3 METHODS OF PUBLIC CONSULTATION

262. Public consultations were conducted in order to establish stakeholder’s opinion regarding project implementation. The following methods were used for public consultation with project stakeholders:

- Scoping sessions
- Informal meetings
- Individual interviews

6.4 IDENTIFICATION OF STAKEHOLDERS

263. Stakeholders are those who have a direct or indirect interest in project development, and who will be involved in the consultation process. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. The stakeholders identified during field survey were the local residents, private land owners, shop keepers, farmers, job holders (Govt / pvt), drivers, daily wage labor and students. All the stakeholders had different type of stakes according to their professions which are listed down along with their comments and/or feedback. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders.

6.5 MAJOR STAKEHOLDERS AND THEIR APPREHENSIONS

264. The Table-6.1 contains the list of major stakeholders.

Table 6-1 Stakeholders Contacted in the Project Area

Sr. No.	Stakeholder Category	Number of Respondents
1	Local residents	52
2	Farmers	42
3	Job (Govt / Pvt)	7
4	Drivers	1
5	Students	3

265. No major concerns were raised by the local residents during these consultation meetings conducted on 29-30 May 2021.

266. Further consultation was conducted with the local community on 24-05-2024. The local people requested that water be supplied to the village of Rind Ali by constructing a pacca head for the existing channel instead of constructing a Saifan.

Figure 6-1: Community Consultation in project area during May 2024

267. Participants showed their full support for project implementation. No private land acquisition is involved in the sub projects. The Figure: 6-1 below shows the pictorial view of interviews and consultation meetings held with the stakeholders.

6.6 CONSULTATION MEETINGS AND FORMAL AND INFORMAL GROUP DISCUSSIONS

268. In order to get spontaneous responses, scoping sessions in the proposed project area were held to extract qualitative information about the perception and apprehensions about the project. The views of the locals were formally recorded and effort will be made to make those beneficial for the project.

269. Consultation meetings regarding project impacts, their magnitude and mitigation measures were held with the local residents, private land, shop keepers, farmers, job holders (Govt / pvt), drivers, daily wage labor and students to know their concerns regarding proposed project.

270. Generally, it was found that people were already aware of the proposed project. After the meetings, most of the respondents including all local residents and other stakeholders showed their full support for the proposed project. This project will be beneficial in terms of water resource management and agricultural development, not only for the local residents but also good for the development of the area. Concerns of the local communities and responses are provided in Table 6-2 below.

Table 6-2: Community Concerns and Consultant Responses

S. No.	Concerns and Suggestions	Responses
1	When will the Project be Started?	Project will start after the completion of detail design of this subproject.
2	Is there any Resettlement Involved?	No house / shop is falling within the RoW. Only one encroacher will face loss of income as carrying out agricultural activities in Government owned land.
	The rural women actively participate in outdoor socioeconomic activities such as herding livestock, agricultural activities, picking fuel wood etc. Their privacy should not suffer due to the project activities.	Local norms and customs will be respected.
3	Local residents should be hired for jobs during the construction and operation phase.	Local residents will be given priority while hiring during construction phase of the proposed project.
4	Exposure of noise and dust pollution will cause disturbance and health & safety issues for the local residents and other stakeholders throughout the construction stage due to the movement of construction machinery and transportation of construction materials.	The effects of noise and dust pollution on the local residents will be minimized by making necessary arrangements. Dust pollution will be controlled by water sprinkling on daily basis
5	Due to the movement of loaded trucks during the construction period of proposed project, congestion on the access road will increase.	Traffic Management Plan will be prepared and implemented to reduce the impact of traffic congestion on the local roads.

6	Government should provide basic facilities to project area as part of the project.	Suggestion Noted. Other interventions are not in the mandate of this project.
7	Will there be any arrangement for the Solid Waste produced during construction activities?	Solid waste generated during construction at site will be disposed of safely at approved designated waste disposal sites.
8	On 24-05-2024, the local community requested that water be supplied to Rind Ali by constructing a pacca head for the existing channel rather than a Saifen.	The request will be reviewed and considered in the project design.

Figure 6-2: Pictorial View of Interviews & Public Consultation

Consultation in Killi Manyalo

Consultation in Killi Raiko

Consultation in killi Siaboz

6.7 Departmental Consultation

In the consultation process for IEE, following key stakeholders were consulted:

- Power and Irrigation Department, IUCN Pakistan, Balochistan
- Program office Quetta

- Balochistan Forest and Wildlife Department, Khuzdar
- Agriculture Department

The concerns and their responses are given below in the Table 6-3

Table 6-3: Departmental Consultation Concerns and Responses

Sr. No.	Name of Department	Name & Designation of Official	Points of Discussion /Apprehensions	Consultant Response
1.	Irrigation Department, Government of Balochistan	Syed Perveiz Bukhari, Chief Engineer	• The consultants probed the justification of the project and conditions on the ground. • Has the BIPD engaged in discussions with the community regarding their issues and how the BIPD can facilitate to resolve them?	• The Chief Engineer was very positive that the project would have a positive impact on the community of the subproject areas. • The Chief Engineer informed that he and his department were constantly in contact with the community and the proposed design is based on informal meetings and discussions with the local community.
2.	IUCN- Pakistan, Balochistan Program office Quetta	Mr. Naseeb ullah Khan	• The Project was briefed by the team with the help of maps. IUCN shared its input and endorsed the need of the projects in Balochistan while focusing on improving water efficiency. • Is there any Protected Area or threaten species present in the project area?	• IUCN shared its sensitivities about the protected areas and threaten species. • No protected areas and no threatened species are reported in the Project area.
3.	Balochistan Forest and Wildlife Department, Khuzdar	Mr. Iqbal Zehri, Conservator	• The consultants shared project details with him and benefited with the organizational knowledge of the Conservator. • Mr. Zehri discussed the formations present in and around the project areas. • Are there any protected sites of ecological importance in and around the project areas? • How the proposed project can help conserve the forest and wildlife? .	• There are no protected sites of ecological importance in and around the project areas • If any tree is fallen, 10 additional trees should be planted to compensate its effect. The type and number would be finalized by Balochistan Environmental Protection Agency in consultation with Balochistan Forest

Sr. No.	Name of Department	Name & Designation of Official	Points of Discussion /Apprehensions	Consultant Response
				and Wildlife Department at the time of IEE approval.

6.8 Women Consultations

271. It is believed that an economic growth, poverty reduction, human development, including population planning and sound management of natural resources and the environment cannot be fully achieved without increased investments in women and greater attention in their needs, concerns and contribution. Investing in health and education of females not only results in positive returns to women themselves but return to the society is even larger and last for generations.

272. The project has included women through its gender mainstreaming strategy rather than relying entirely on implementation of gender targeted interventions. Mainstreaming will ensure inclusion of females in the project process, particularly in scheme awareness campaigns and similar activities for implementation of Gender Action Plan (GAP) for all three out puts of the Project.

273. The project provides support to the formation of formal and informal women's groups (WGs) to represent female beneficiaries. WGs will be responsible for: (a) giving input to PMO/PIO BWRDP on infrastructure design particularly location of social structures such as washing points and animal drinking troughs; and (b) acting as an agent for basic health and hygiene training, participation in income generation activities and Grievance Redress Committees GRCs.

i. Objectives of Gender Consultations

274. Provide a brief of Gender Interventions and conduct needs assessment to determine the communities' choices of domestic water supply location, washing facilities, water collection points, and other like facilities.

- Create awareness among the women about gender activities provided in the GAP and ensure their participation;
- Identification of potential female activists in the project catchment areas to harmonize with the project initiatives;
- Assessment of opportunities to develop and implement gender specific intervention in the project;
- Create awareness among women about the subprojects and it components and involvement and role of the local women in the activities related to the women development proposed in the project;
- Conduct needs assessment to determine the communities' choices of domestic water supply location, washing facilities, water collection points and other like facilities;
- Role of women in income generation activities and decision making (Agriculture, Livestock raring and any other);
- Need Assessment related to skill trainings;
- Assessment of gender issues and in the subproject's areas; and

- Gender concerns related to the subprojects and suggestions to get maximum benefits from the project.

ii. Process of Gender Consultation

275. According to Asian Development Bank's policies and procedures, consultation process must be gender inclusive and responsive and tailored to the needs of disadvantageous and vulnerable groups. To explore the gender related issues, female mobilizers from the local areas were included in the team. Formal and informal meetings with the women were held to explore their needs, problems and priorities related to the project execution.

iii. Brief of Consultations and Participants

276. Keeping in view the important role of the female in the project activates, gender consultations were conducted in 3 villages where 36 women participate in the discussions in the project area of Manyalo Riko and Rind Ali PIS sub-project. The summary of participants with locations is provided in Table 6-4. These consultations were conducted in the same villages where the male members of the community were consulted.

277. Women actively participated in the meetings and showed their support for the project with the consent of their male members.

Table 6-4: Summary Location Wise Number of Participants of Gender Consultations

Sr. No.	Location Village	Name of Scheme	River Basin	Participants (No.)
1	Killi Manyalo	Manyalo Riko and Rind Ali PIS	Mula River Basin	14
2	Killi Raiko			7
3	Killi Siaboz			15
Total				**36**

iv. Gender Consultation in Manyalo Riko and Rind Ali PIS Sub-project area

278. Parallel with male community consultations, females of the project area were also consulted on 29-30 May 2021 to achieve the objectives of the field. 36 females participated in the two meetings. The locations, number of participants with age, occupation and educational status is provided in the Table 6-5.

Table 6-5: Consultations with the Female Participants

S.No	Name	Education	Occupation
Killi Manyalo			
1	Noor Bibi	Nil	House wife
2	Samreen	Nil	House wife
3	Samina	Nil	House wife
4	Humaira	Nil	House wife
5	Fazila	Nil	Household work
6	Hakim Zadi	Nil	House wife
7	Rashida	Nil	House wife
8	Asia	Nil	House wife
9	Zahida	Nil	House wife
10	Shazia	Nil	House wife
11	Najma	Nil	House wife

S.No	Name	Education	Occupation
Killi Manyalo			
12	Yasra	Nil	Household work
13	Jamila	Nil	House wife
14	Shakira	Nil	House wife
Killi Raiko			
1	Sadaf Bibi	Nil	House wife
2	Nadia	Nil	House wife
3	Shaista	Nil	Household work
4	Maryam	Nil	House wife
5	Khan Bibi	Nil	House wife
6	Bibi Sabira	Nil	House wife
7	Bibi Samina	Nil	House wife
Killi Siaboz			
1	Razia	Nil	House wife
2	Jamila	Nil	House wife
3	Salma	Nil	House wife
4	Hajira	Nil	House wife
5	Noor bano	Nil	House wife
6	Samrin	Nil	House wife
7	Humera	Nil	House wife
8	Fazila	Nil	House wife
9	Rashida	Nil	House wife
10	Kalsoom	Nil	House wife
11	Sajida	Nil	House wife
12	Hakimzadi	Nil	House wife
13	Sabira	Nil	House wife
14	Samina	Nil	House wife
15	Sabira Bibi(2)	Nil	House wife

279. All participants were briefed about the purpose of meetings their involvement in the project activities. Social structures proposed in the project components for the benefits of the women were explained in detail. All participants were housewives and only one was literate. Low -level of literacy indicates educational facilities in the sub-project area are nominal and there is no trend of sending specially girls to schools. The women are also deprived of the basic facilities.

280. Participants suggested the washing points and water supplies should be constructed near the settlements with the easy access.

v. Current Roles and Responsibilities of Women

281. The gender and social Consultation revealed extreme poverty in the area. Women used to handle all the chores and outside regarding limited agriculture and livestock with their partners. The participants were pleased with the proposed irrigation project. They think that their land will become fertile and valuable with the supply of surface irrigation water. Over all 25 % women were educated as out of total 36 females of Manyalo, Raiko and Rind killies were consulted, 09 were literate having primary education. All were working as housewives. High-priority needs demanded by the community were clean drinking water as it was most distinctive need of the community because they have to fetch water from on every day basis for drinking purpose. The list of consultation with female respondents is provided below in

Table 6-5. The female Participants of surveyed killies did not allow the social team to take photographs. The names are very common/same names in each killi.

282. The study explored the role of rural women in decision making in various family affairs. It has been observed that the role of women in decision making was very low like a marriage of Children, sale and purchase of property, sale and purchase of animals, decisions regarding the schooling of Children and to attend social activities. It was found during the consultations that the head of tribe, a male member of the family has power of decision making. He determines the family interests and makes decisions with regard to the family.

7. ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION MEASURES

7.1 GENERAL

283. This chapter identifies the significant potential environmental and socio-economic impacts which may occur during the project life. The appropriate mitigation measures are also discussed in this and the subsequent chapters of this report. A brief qualitative description of each aspect and the affected environment in the project Area is presented in the following sections.

7.2 METHODOLOGY FOR IMPACT SCREENING

284. Determining the significance of potential environmental impacts and their effects enables the identification of necessary mitigation and benefit enhancement measures as well as an estimation of the related financial costs associated with the impacts of a project. An impact can be either beneficial or adverse and is assessed by comparing the quality of the baseline conditions with the predicted quality once the project is under implementation or in place.

285. The procedure for determining the level of risk associated with each potential impact is described below. The likelihood that the activity will have an effect on the environment, as well as the consequence of the effect occurring, are used to assess risk. It is frequently described as follows:

Risk = Likelihood × Consequence

Table 7-1: Likelihood Scale

Likelihood	Definition	Scale
Certain	Will certainly occur during the activity at a frequency greater than every week if preventative measures are not applied	5
Likely	Will occur more than once or twice during the activity but less than weekly if preventive measures are not applied	3
Unlikely	May occur once or twice during the activity if preventive measures are not applied	2
Rare	Unlikely to occur during the project	1

Table 7-2: Consequence Scale

Consequence	Definition	Score
Catastrophic	The action will cause unprecedented damage or impacts on the environment or surrounding communities	5
Major	The action will cause major adverse damage on the environment or surrounding communities.	3
Moderate	No or minimal adverse environmental or social impacts	2
Minor	No or minimal adverse environmental or social impacts	1

Table 7-3: Risk Score Table

Likelihood	Consequence			
	Catastrophic	Major	Moderate	Minor
Certain	**25**	**15**	**10**	5
Likely	**15**	**9**	6	3
Unlikely	**10**	**6**	4	2
Rare	5	3	2	1

Risk: Significant: 15-25
Medium: 6-10
Low 1-5

286. Any 'Medium' to 'Significant' risk requires an environmental management measure to manage the potential environmental risk. Judgment will be required concerning the application of an environmental management measure to mitigate low risk situations.

287. The impact assessment matrix presenting the potential impacts and expected impacts during the different project development phases are presented in the Table 7-4 below.

Table 7-4: Impact Assessment Matrix

Activity / Impact	Likelihood	Consequence	Impact (Consequence x likelihood)	Residual Impact
Design Phase				
Flooding	Likely	Major	High	Low
Seismic damage	Likely	Moderate	Medium	Low
Land Acquisition	Unlikely	Minor	Low	Low
Construction Phase				
Air Quality	Likely	Moderate	Medium	Low
Noise Pollution	Likely	Moderate	Medium	Low
Vibration impacts	Likely	Minor	Medium	Low
Solid waste generation incl. Spoil material	Likely	Moderate	Medium	Low
Resource Conservation	Likely	Minor	Medium	Low
Soil Contamination	Likely	Moderate	Medium	Low
Soil erosion/ silt run-off	Likely	Moderate	Medium	Low
Community Health and Safety	Likely	Minor	Medium	Low
Occupational Health and Safety	Likely	Moderate	Medium	Low
Traffic management	Likely	Minor	Medium	Low
Communicable diseases	Likely	Minor	Medium	Low
Flora	Likely	Minor	Medium	Low
Fauna	Likely	Moderate	Medium	Low
Use of local water resources	Likely	Moderate	Medium	Low
Contamination of water resources	Likely	Moderate	Medium	Low
Social and Cultural Conflicts	Likely	Minor	Medium	Low
Religious and Cultural Heritage	Unlikely	Minor	Low	Low
Operation Phase				
Adequacy of O&M	Likely	Major	Medium	Low
Waste disposal in Canal	Likely	Major	Medium	Low

7.3 Anticipated Impacts during Pre-Construction/ Design Phase

288. Following is the description of impacts envisaged and the recommended mitigation measures during pre-construction/design phase.

7.3.1 Land acquisition

Potential Impacts

289. The proposed works will be carried out on BID land and will utilize the department's owned Right of Way on all proposed sites. Therefore, there is no requirement for any type of land acquisition, including Voluntary Land Donation, for these sub-projects.

290. Currently, no community is occupying the existing structures for both permanent and temporary shelter and relief from floods, and no community asset has been identified for relocation. Therefore, no mitigation measures are needed.

Mitigation Measures

No measures required.

7.3.2 Seismic Hazard

Potential Impacts

291. As per the seismic zone map of Pakistan, the district Khuzdar is in Zone 2B. This implies the potential for ‘moderate’ to ‘severe’ damage in the event of earthquakes. This indicates the likelihood of experiencing severe damage from earthquakes. In Zone 2B, the design of various structures should be formulated considering the Peak Ground Acceleration (PGA). The occurrence of a highly intense earthquake in the vicinity of the project site could lead to detrimental impacts on its development, constituting a significant negative consequence. The resultant impact is expected to hold ‘moderate’ significance.

Mitigation Measures

292. At the detailed design stage, the safety of the proposed structures against the damages due to seismic activity need to be ensured. As such structural designs of dam body, spillway and other structures need to follow the applicable criteria for the zone 2B recommended in the Building Code of Pakistan, 2021. By adopting the aforementioned measures, the impact would be of low significance.

7.3.3 Flooding

Potential Impacts

293. The valley is under a severe threat of flooding during heavy rains. The rapid floods originating from hill torrents in the surrounding area cause devastation in almost the entire region due to their high velocity and magnitude. The future flooding can breach the dam body and damage spillways and other infrastructure. This impact would be of high significance.

Mitigation Measures

- As per findings of the hydrological study, estimation of the discharge of streams/nullahs of the project area has been calculated against 100 years return period. Hydrological studies have considered peak historical floods to incorporate in dam design to avoid/minimize future flooding impacts.
- A pre-construction visit is recommended to be conducted by a team comprising Route Engineer, Hydrologist and Hydraulic Engineer to validate the crossing locations and design.

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

7.4 Construction Phase

7.4.1 Impact on Air Quality

o **Fugitive Dust Emissions**

Potential Impacts

295. Air quality will be affected by fugitive dust emissions from excavating activities of construction machinery, material stockpiles and material transportation, dust from unpaved surfaces, and the movement of construction vehicles, which can be very harmful for the site worker, local population, and natural vegetation. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of the surrounding air and atmospheric stability. These emissions may also affect the biophysical environment. The list of sensitive receptors is given in **Table 4-6.** This impact would be of medium significance.

Mitigation Measures

296. The measures are as follows:

- 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 windstorm 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.

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

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

Potential Impacts

298. 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

299. The mitigation measures will be as follows:

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

o **Vehicular and Generator Exhaust Emissions**

Potential Impacts

300. Emissions of noxious gases from movement of heavy machinery, batching plant and generators etc. would release emissions which would certainly add to the ambient air levels of the immediate vicinity. Also, the movements of heavy machinery and vehicles of old make and poor engine condition tend to release more than new well-tuned vehicles while the use of low-grade fuels and lubricants also increase pollutant emission levels.

Mitigation Measures

301. The mitigation measures will be as follows:

- 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 / WHO applicable standards 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.

7.4.2 Impact of Noise Pollution

o **Noise from Construction Activities**

Potential Impacts

302. Noise is the most pervasive environmental nuisance. Noise is a by-product of human activity and area of exposure increases as a function of mobility and construction activities. The main sources for noise in the project area may be heavy machinery such as excavators, concrete mixing plant, stone crushers and other equipment. Noise generated by construction

machinery is likely to affect sensitive receptors located within AOI (**Refer Table 4-6**). Health risks associated with exposure to continuous noise levels include high blood pressure, hypertension, annoyance and sleep disturbance, temporary threshold shift etc. This impact would be of medium significance.

Mitigation Measures

303. 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.
- Construction activities that are close to settlements will be stopped during night times if high noise values are observed.
- Consultations 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 / WHO standards and to ensure the effectiveness of mitigation measures.

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

305. .

7.4.3 Solid Waste Generation including Spoil material

Potential Impact

306. Considering the labourers residing in the construction camp and the locally available labour, solid waste generation will take place. The major components of the labour camp waste will be garbage, putrescible waste, rubbish and small portion of ashes and residues. Other type of wastes may include inorganic construction wastes including hazardous waste.

307. Spoils will be generated from the excavation activities. Disposal of spoil / surplus material may cause negative environmental impacts, if not properly mitigated during implementation of the proposed project. Potential impacts from spoils and its disposal are (i) land for disposal of spoil, (ii) conversion of those land areas into a permanent dumping area, (iii) potential erosion from the spoil areas and spoil material reaching the Nullahs/Streams, and (iv) aesthetic impacts. Approximately 210972 m^3 material will be excavated most of which will be reused after approval of quality control engineer.. Not much excavation is involved in this project and excavated material will be used in embankments This impact would be of medium significance.

Mitigation Measures

- 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;
- The contractor must develop a plan of action with the help of concerned solid waste management department for transporting the waste to the disposal site;
- Toxic waste will be handled, stored, transported and disposed separately;
- The waste will be properly sealed in containers with proper labels indicating the nature of the waste; and
- Solid waste will be segregated at source so that it can be re-used or recycled.
- Waste management plan will be developed to implement an efficient and responsive solid waste management system during construction phase. Recyclable wastes e.g. steel bars will be sold to waste vendors;
- Reusable material will be used as a filling material during ground levelling;
- Solid waste generated during construction will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; and
- The site will be restored back to its original condition after construction completion.
- The spoil material from the excavation will be dumped at designated places. The dumping sites must be approved by environment specialist of the Construction Supervision Consultant (CSC).
- The contractor will also ensure that no spoil material is disposed into stream/nullahs and into any other water body along the project site.
- As far as possible barren/waste lands available will be used for disposal of the excavated waste material.
- The spoil material shall be deposited in layers and properly rolled and sprinkled to avoid any negative environmental impacts.
- Contractor will prepare and get the spoil management plan approved by the CSC, prior any disposal of spoil.

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

7.4.4 Resource Conservation

Potential Impact

309. During the construction, overburden on local resources is possible if construction facilities such as workers camp and construction camp built near rural areas and can create problems for local communities. There can be a conflict for resources between workers and local community. This impact would be of medium significance.

Mitigation Measures

- Use potable water bowsers for construction works and mineral water bottles/ ground water for drinking purposes;
- Plan for the provision/purchase of adequate insulation to reduce heat loss through construction plants;

- Reduction of wastage of water through training of workers involved in water use;
- Reuse of construction waste materials may be adopted wherever possible;
- Aggregates will not be sourced from river and stream beds.
- Diesel and fuels with low Sulphur content should be used to operate construction machinery and equipment;
- Efficient and well -maintained equipment and machinery will be used;
- The equipment and machinery will be turned off when not in use;
- A good camp design and an efficient worksite management plan can help the contractor to reduce the water demand, wastewater and solid waste volumes to the lowest levels.

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

7.4.5 Soil Contamination

Potential Impacts

311. Surface soil has the potential to be contaminated by construction material, vehicle movements and various construction activities. Spillage of fuel, lubricants, cement and chemicals has the potential to result in contamination. Possible sources of spillage are:

- During transfer of fuel from one container to another or during refueling;
- Unloading of construction material due to careless handling;
- Maintenance of equipment and vehicles;
- Due to leakages from equipment and containers;
- It is anticipated that a large quantity of excavated material will need to be disposed of. If this waste material is not properly disposed of, it will contaminate the soil and water resources, especially during the rainy season. Improperly managed excavated material, if left exposed or not stored correctly, can easily erode and get washed away by rainwater. During the rainy season, the increased water flow can carry the eroded soil into nearby water bodies, causing sediment runoff.

312. This impact would be of medium significance.

Mitigation Measures

313. The following practices will be adopted to minimize the risk of soil contamination:

- The Contractor will be required to train its workforce in the storage and handling of materials like oils, diesel, petrol, other chemicals, concrete and cement, etc., that can potentially cause soil contamination. The Contractor will be required to prepare a training manual and module for all the construction related activities along with the schedule of training program and submit to the supervising consultants for approval.
- Refueling areas will have impervious concrete bases with appropriate drainage to prevent spills from contaminating the surrounding area.
- During on-site maintenance of construction vehicles and equipment, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil.
- Oils, fuels and hazardous materials will be stored in appropriately bounded areas. Fuel tanks will have to be placed within sealed bunds capable of containing 120% of the total volume of the tank in case of leakage.

- Regular inspections will be carried out to detect leakages from vehicles and construction machinery.
- Vehicles and/or equipment with leakage will not be used, until repaired.
- Solid waste generated during construction and at camp sites will be properly treated and safely disposed of only in demarcated waste disposal sites.
- The construction phase will consume lot of cement additives and oils and the empty containers will contain dangerous amount of chemicals inside, which can impact the humans as cancer producers. All such containers must not be sold to general public and must be destroyed and sent for recycle. This will be contractor's responsibility who must seek consultant's supervision. The people must be warned against use of empty chemical containers through local press and erecting banners in project area.

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

7.4.6 Soil Erosion

Potential Impacts

315. Major considerations are as follows:

- Soil erosion may occur in the workshop areas as a result of improper runoff drawn from the equipment washing-yards and improper management of construction activities. Potential sources of soil erosion (due to wind or rain) include clearing of area for construction, preparation of camp sites, workshop areas, equipment washing-yards access tracks for operations, off road vehicular traffic on unpaved roads during construction.
- The reduction in vegetative cover along sides of project infrastructure will reduce the binding capacity of the soil and susceptibility to erosion by the force of rainfall, resulting in increased soil erosion and removal of plant nutrients. The loss of vegetative cover can increase propensity for landslides.

316. This impact will be of medium significance.

Mitigation Measures

317. Good engineering practices will help controlling soil erosion both at construction sites and in peripheral areas, particularly in haul tracks. Soil erosion remedial measures will be based on geotechnical, geomorphic and hydrological conditions of the project area and these will vary from site to site. However, the following measures will be adopted as per site conditions:

- All the freshly cut surfaces will be restored/stabilized as soon as possible;
- Seeding or plantation of erodible surfaces will be done;
- Construction activities will be planned in such a way so as to avoid cutting of erodible surfaces and earth movement in rainy season;
- Along cross-drainage structures of the access road where embankments are more susceptible to erosion by water runoff stone pitching or a riprap will be provided across the embankment.

- Proper monitoring of the soil erosion prone areas will be carried out during operation phase and soil conservation measures (if needed) will be carried out like provision of physical structures e.g. retaining walls, etc.

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

7.4.7 Community Health and Safety

Potential Impacts

319. The communities residing in the project areas might be at risk from the proposed works since deep excavation works will take place along with movement of heavy machinery and vehicles transporting the raw materials and spoils etc. to and from the work sites. This could potentially result in injury and/or death to community members, particularly women and children if care and precautions are not taken while moving in the project areas. This impact will be of medium significance.

Mitigation Measures

- The Contractor will prepare the site-specific community health and safety plan in compliance with applicable national and international regulations and guidelines.
- The Contractor will clearly barricade work areas to prevent access by the public, while ensuring passage by providing safe pathways for pedestrians around construction zones;
- The Contractor will exclude parking, waiting vehicles and vendors from areas adjacent to the work by means of clearly marked barricades and posted signage;
- The Contractor will remove excavated earth, spoil, rubble, cut vegetation and refuse whether generated by the project or discarded by third parties from areas within the construction zone, where it has potential to interfere with the public or generate dust;
- The Contractor will provide temporary lighting to facilitate construction during night time;
- The Contractor will remove hazardous conditions on construction sites that cannot be controlled effectively with site access restrictions and will barricade any excavations and materials placed near the public place (if applicable);
- The Contractor will promptly reinstate any services and reinstall any physical facilities that are cut, disconnected or damaged during construction, and maintain or provide temporary services that are interrupted by construction. The Supervisory Consultant will inspect and certify the adequacy of all reinstated services and facilities;
- Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas especially near the settlements;
- An Emergency Preparedness and Response Plan (EPRP) in coordination with the local emergency responders to provide timely first aid response in the event of accidents and hazardous materials response in the event of spills;
- Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites;
- Timely public notification on planned construction works;
- Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity and social links;

- Any environmental condition that is disagreeable to the public and causes an avoidable nuisance can be addressed with additional provisions over and above those described above, as determined necessary by the supervisory consultant.
- These requirements will be incorporated into the bidding specification and contract documents, and will be binding on the contractor, at risk of penalty for noncompliance, as charges to be recovered from contractor for unsafe act or condition.

7.4.8 Occupational Health and Safety

Potential Impacts

320. Occupational Health and Safety (OHS) related impacts will arise during construction stage activities including clearing of earth, levelling, compaction, foundations, finishing, testing & commissioning. In a nutshell, occupational health and safety issues associated with the construction of proposed sub-projects will primarily include physical hazards; chemical hazards; and noise.

321. **Noise:** Construction and maintenance personnel may be potentially exposed to high levels of noise from heavy equipment operation and from working in proximity to vehicular traffic. As most of these noise sources can be prevented by using personal hearing protection by exposed personnel and implementation of work rotation programs to reduce cumulative exposure.

322. Lack of Emergency Response Plan (ERP) or an inefficient response plan may lead to an accident or critical injury. This impact would be of medium significance.

323. **Welding and hot work** involved during construction of this subproject can generate intense light and heat, which can pose significant risks to workers' eyesight and health. Potential hazards include severe eye injuries or blindness due to bright welding arcs and inhalation of noxious fumes that may lead to chronic respiratory conditions.

324. **Eye Hazards:** Solid particles from a wide variety of activities i.e. metal cutting etc. and / or a liquid chemical spray may strike a worker in the eye causing an eye injury or permanent blindness.

Mitigation Measures

325. Following mitigation measures shall be adopted by the contractor to control accidents due to deep excavations:

- Proper barricading shall be applied to all excavation deeper than 6 feet.
- Warning taps shall be applied to trenches which are around 3 feet deep.
- Isolation of area must be done during excavation activities to control accidents.
- Damping down of area to control fugitive dust.
- Where necessary, apply green sheet to control fugitive dust, especially during high wind season.
- Material shall be stored at least 3 feet away from the edges of excavations.
- Designated entry and exit points at all deep excavations.
- If any confined space encounters (excavation deeper than 10 feet or any main hole etc.), procedure for confined space entry shall be followed.

326. For further details, framework for Occupational Health and Safety Management plan has been developed to handle any health and safety issue of workers and community. Mitigation measures to prevent and control physical hazards include:

Moving Equipment and Traffic Safety

327. Establishment of work zones to separate workers on foot from traffic and equipment by:

- Routing of traffic to alternative roads when possible;
- Regulation of traffic flow by warning lights, avoiding the use of flaggers if possible;
- Reduction of maximum vehicle speeds in work zones; and
- Training of workers in safety issues related to their activities, such as the hazards of working on foot around equipment and vehicles; and safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination for the work space (while controlling glare so as not to blind workers and passing motorists).
- Provide appropriate PPE in conjunction with training, use, and maintenance of the PPE.
- Furthermore, the noise reduction options that should be considered which include:
- Selecting equipment with lower sound power levels;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing vibration isolation for mechanical equipment;
- Providing noise protection PPEs (ear plugs/ear muffs) to the construction workers;
- Re-locating noise sources to fewer sensitive areas to take advantage of distance and shielding;
- Developing a mechanism to record and respond to complaints; and
- Regular monitoring of noise levels at active sites or near noise producing equipment/machinery and compare it to the available occupational noise standards.

Monitoring of OHS Activities:

328. During the construction phase of proposed project, occupational health and safety monitoring programs of the contractor (s) should verify the effectiveness of prevention and control strategies. The selected indicators should be representative of the most significant occupational, health, and safety hazards at the construction site and camps, and the implementation of prevention and control strategies. The occupational health and safety monitoring program should include:

- Regular inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used;
- Surveillance of the working environment: The contractors should document compliance using an appropriate combination of portable and stationary sampling and monitoring instruments. Monitoring and analyses should be conducted according to internationally recognized methods and standards. Monitoring methodology, locations, frequencies, and parameters should be established individually for each project following a review of the hazards;
- Continuous and efficient surveillance of worker's health during the entire construction phase by the nominated officials of contractors; and

- Training: Training activities for employees (construction contractor & supervision consultant staff) and visitors should be adequately monitored and documented (curriculum, duration, and participants). Emergency exercises, including fire drills, should be documented adequately. Service providers and contractors should be contractually required to submit to the employer adequate training documentation before start of their assignment.
- Contractor(s) shall prepare a comprehensive OHS Plan as part of Site Specific Environmental Management Plan (SSEMP).

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

330. Additionally, below are some other applicable hazards from the IFC's EHS Guidelines, along with their impacts and mitigation measures provided

Welding / Hot Work

- Ensure that all personnel involved in welding operations use proper eye protection, such as welder goggles or full-face shields. Implement barrier screens around welding stations to prevent exposure of nearby workers to welding light.
- Establish and enforce Hot Work Permits for all welding and hot cutting activities. This includes requiring a fire watch during and after the operation, and having fire extinguishers readily available.
- Develop and implement Standard Operating Procedures (SOPs) for hot work, including specific measures for reducing fire risks, such as maintaining clear work areas and conducting regular fire safety inspections.

Eye Hazards

- Provide appropriate eye and face protection for workers, such as safety glasses with side shields, goggles, or full-face shields.
- Install and maintain machine guards and splash shields to protect against flying particles or liquid splashes.
- Develop SOPs for sanding, grinding, and handling chemicals, including guidance on eye protection and safe practices.
- Designate and clearly mark areas where there is a risk of discharges or emissions, such as from metal cutting or pressure relief valves. Implement additional guarding or proximity restrictions to protect workers and visitors from potential hazards.

7.4.9 Traffic Management

Potential Impacts

331. During construction activities, large number of light and heavy vehicles is expected to use the community roads. Similarly, heavy machinery will be stationed in and adjoining areas of the project site. This may create a burden on the capacity of the existing road network and the project-generated traffic may be a nuisance for surrounding communities. This impact would be of medium significance.

Mitigation Measures

- Construction traffic hindrance should be avoided by providing proper diversion and signage.
- Traffic management plan will be prepared by the contractor after consultation with the Resident Engineer (RE) and approval by the CSC for its implementation.
- GRM will be put in place to address community grievances in this regard.

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

7.4.10 Communicable diseases

Potential Impacts

333. The laborers in the Contractor Camp, truck drivers and like personnel who interact with each other have the potential for the spread of HIV/AIDS if the incidence exists. 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 like Cholera, Typhoid and Tuberculosis.

334. This impact is medium adverse in nature.

Mitigation Measures

335. The Contractor shall:

- Arrange to run an active campaign, in the labor camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS;
- Strengthen the existing local health & medical services for the benefit of labor as well as the surrounding villages;
- Ensure cleanliness and hygienic conditions at the labor 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 labor 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

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

7.4.11 Flora

Potential Impacts

337. No tree cutting is expected as this is restoration /rehabilitation project and being executed within its already available ROW. The Contractor’s workers may damage the

vegetation and trees (for use as firewood to fulfil the camps requirements). The cutting of small trees and shrubs will cause degradation of local environment as under:

- It will enhance soil erosion. Without the branches and leaves, to break its fall, heavy storms can quickly wash away the soil from even a gentle slope. Cutting down of trees/shrubs also takes away the roots that would otherwise help in binding the soil.
- During the entire construction period dust, laden polluted air will form a dust film on leaves thus blocking sunshine and stomata consequently hindering photosynthesis processes causing detrimental effect on the plant health.

338. This impact would be of medium significance.

Mitigation Measures

339. 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 labor 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.
- The 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.
- Tree cutting due to project intervention is not expected. However, ten saplings will be replanted in case a tree is cut as per EPA rule.

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

7.4.12 Fauna

o **Mammals and Reptiles**

341. The impact on mammals and reptiles will include the following:

During the construction phase, there will be negative impacts on the mammals and reptiles of the area, due to construction activities involving excavation, movement of labour, carriage of goods and machinery to various sites.

The key terrestrial species in the project area are:

Mammals:

- Asiatic Jackal (Canis aureus),
- Cape hare (Lepus capensis),
- Porcupine (Hystrix indica),
- Hedgehog (Hemiechinus auritus megalotis),
- Bush rat (Goluda ellioti)

Reptiles:

- Indian Cobra (Naja oxiana),
- Easter dwarf skink (Ablepharus pannonicus),
- Leaf nose viper (*Eristicophis macmahonii*)

342. Mammals, such as jackal, porcupine, etc. will avoid these areas for fear of being persecuted. Same will be the case with reptiles; some reptiles might be killed during the digging and dragging operations. Movements of the mammals and reptiles will be restricted during the construction phase.

343. Eatable and refuse goods of the Contractor's camps may attract wildlife that might be hunted by the workers. The accidental striking of all terrestrial fauna by project vehicles on access routes is a considerable risk during the project. This impact would be of medium significance.

o **Birds-Avian Fauna**

344. The presence of migratory and sedentary birds is considered likely throughout the area surrounding the project footprint. Avifauna prefers undisturbed marshy habitats, such as that surrounding the larger steams and away from agricultural land. However, they are also observed within cultivated lands and around settlements of the project area. The presence of avifauna will increase during the winter months, with the arrival of migratory birds. However, there are no landing zones used by migratory birds in the immediate project area.

345. The key avifauna species in the project area are:

- Black Bittern (*Dupetor flavicollis*),
- Lesser Kestrel (*Falco naumanii*),
- See-see partridge (*Ammoperdix griseogularis*),
- Grey Partridge (Francolinus pondicerianus),
- A number of Sparrows,
- Finches,
- Buntings,
- Seasonal/migratory waterfowls,
- Hawks, and
- Sand grouse etc.

346. During construction, avifauna may be disturbed due to sensory disturbance from construction; movement of vehicles and crew personnel; location and operation of camps; operation of large plant; and site restoration. This will be a temporary disturbance within the project area. Following construction, there will be availability of wetland areas in the project area.

347. Birds will try to find shelter and food somewhere else and will tend to move away from the project area due to the activities mentioned above for fear of being hunted/trapped. According to consultations done with Wildlife Offices at Quetta[2] and Khuzdar[3], no endangered or vulnerable species inhabit the project area.

Mitigation Measures

o **Mammals and Reptiles**

- Hunting, poaching and harassing of wild animals will be strictly prohibited and Contractor will warn their labor accordingly.
- Noise generating activities will be avoided during the night.
- The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly, waste from the camps will be properly disposed of to prevent the chances of being eaten by wild animals, which may become hazardous to them.

- Vehicles will be maintained in good condition and provided with mufflers to reduce noise.

348. After adopting the above-mentioned mitigation measures, the residual impact will be of low risk of striking fauna on access routes.

o **Birds-Avian Fauna**

- Special measures will be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding that generally occur from March to August..
- The contractor should be committed to ensuring the conservation and protection of wildlife within the project area. To achieve this goal, a strict "No Hunting" policy shall be implemented and enforced among all workers and personnel involved in the project.
- Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.

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

7.4.13 Use of Local Water Resources

Potential Impacts

350. The water resources of the project area mainly comprised of surface water (seasonal rivers and streams in District Khuzdar etc) and groundwater that is being used by all communities for drinking purpose. There will be ample need of water not only for construction purposes (of concrete side slopes) but also for meeting the consumptive and non-consumptive needs of the campsites, workshop, washing yard, etc. It is obvious that these needs will be

[2]Arz Muhammad (Conservator of Wildlife) consulted at Forest and Wildlife Office opposite to Balochistan University, Sabzal Road, Quetta on 05-07-2024.

[3] Muhammad Arsalan (Conservator of Wildlife) Khuzdar, Balochistan consulted by phone on 07-07-2024

met from the existing resources of the areas in close proximity to the dam. This impact would be of medium significance.

Mitigation Measures

351. Mitigation 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.
- Contractor will ensure that the water availability of the existing local users remains unimpeded by the project interventions. The contractor will make arrangements for the availability of drinking water and construction works on his own. For this purpose, contractor will install hand pumps/tube wells accordingly.
- 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.

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

7.4.14 Contamination of Water Resources

Potential Impacts

353. The water resources [Mula River & seasonal streams(in these areas, precipitation mainly occurs from December to February and occasionally extends into March and April. So seasonal streams experience significant water levels in tee months] 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.

354. This impact would be of medium significance.

Mitigation Measures

355. 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 hill torrents & Mula River, 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. Cost of this item will be made part of Contractor's Bill of Quantities (BOQs). 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.

356. 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 be neutralized before being discharged into the natural streams/Wetlands. Contamination of the springs/nullah with concrete or cement must be avoided.
- Sewage water from the camp will have to be collected and treated in a suitable septic tank before being released into the streams.
- Generally, waste should be reduced, re-used, recycled and the disposal has to be controlled

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

7.4.15 Social and Cultural Conflicts

Potential Impact

358. During the construction phase of the proposed project, conflicts may arise between labor force and local community. Use of local resources and products by the construction workers can generate stress on the local resources. Furthermore, difference in cultural values may also cause discomfort to local residents. This impact would be of medium significance.

Mitigation Measures

- Local labor especially from nearby communities should be given preference for the construction works;

- Careful planning and training of work force to minimize disturbance to the local people;
- Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and
- Adequate training especially for the transitive workforce of the station (involved both in the construction process and in the commissioning) to regard the customs of the area so that the locals do not feel insecure.

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

7.4.16 Religious and Cultural Heritage

Potential Impacts

360. No graveyard will be disrupted due to this project. No historical or archaeological site has been observed or reported along the project area. So, no mitigation measured for graves, cultural and historical sites needed.

Mitigation Measures

361. Currently no graveyard is affected by this project. However, if any graves affected by the project, they would have to be shifted. The proponent will obtain Fatwa from local Mufti before shifting the graves. During such operation the proponent will inform local administration and seek their assistance for security. The request will also be extended to Health Department for deputation of medical and paramedical staff during the operation. As referred earlier, no relocation of historical site is involved, so no mitigation is required except that contractor will follow the prayer timing particularly at prayer of Juma and the workforce will observe the sanctity of religious properties.

362. There are no cultural sites located within the study area and no impacts on archaeological sites are envisaged. However, the Contractor will be required to instruct the construction crews and site supervisors in respect of archaeological site recognition, conservation procedures, and temporary site protection. In case of a chance finding during excavation, the contractor will protect the site and notify the Engineer who will inform Department of Archaeology & Museums through Irrigation Department and hand over such sites to the department if instructed by Engineer / Irrigation Department. The Chance Find Procedure is provided as Annexure 6.

7.5 Operational Phase

7.5.1 Adequacy of operation and maintenance (O & M)

363. No or Inadequate operation and maintenance of canal will be main hindrance to obtain project objectives

Mitigation Measures

- Carrying out repair of damaged canal linings if any bank holes, repairs of cattle and washing ‘ghats’ and carry out extensive annual maintenance programmes on

structures and canal, and insurance of adequate irrigation water supply at the tails in the proposed canal command area.

- The investment made must be maintained in the long term, off-farm O & M will be the responsibility of the project and it should be sustainable.
- Ensure community participation in management and operation of the irrigation system and provide necessary training about it.
- Maintenance of on-farm structures will be the responsibility of the individual landowner.

7.5.2 Disposal waste (connection of waste streams) in the Canal

364. Disposal of waste in the canal will degrade irrigation water quality and cause health issues. This impact will lead to serious health issues and will be of moderate significance

Mitigation Measures

365. Proper monitoring of canal alignment and disconnect all identified waste streams

7.6 Cumulative Impacts

366. There are no cumulative impacts expected from the proposed project activities since there will be no other works going on in parallel while the works proposed in this IEE study are being conducted in the respective project areas.

8. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1.1 General

367. The EMP is a strategic approach towards the effective implementation of the mitigation measures and environmental protection of the project area and its surroundings. This EMP ensures that the undue or reasonably adverse impacts of a project are prevented and the positive benefits of the project are enhanced. According to this plan, all the activities related to various phases of the project are controlled and monitored.

368. This EMP encompasses all the phases of the project and may be used as a quick reference by the personnel(s) of client and contractors for effective implementation of the proposed mitigation measures and tracking the overall environmental performance of the project.

369. This EMP addresses all the significant impacts that are identified during the impact's identification process. It will be amended in consultation with the concerned regulatory authority; if any issue has been overlooked or if any need would arise as the project continues.

8.1.2 Structure of EMP

370. The contents of this chapter are given below:

- Regulatory requirements
- Purpose & need of the EMP
- Objectives of EMP
- Scope of EMP
- Institutional arrangement for implementation of EMP

- Institutional arrangements for implementation of EMP during Construction phase
  - Role and responsibilities of the functionaries involved in EMP implementation
  - Reporting mechanism
  - Non-compliance of the EMP
- Institutional arrangements for implementation of EMP during Operation phase
  - Role and responsibilities of the functionaries involved in EMP implementation
  - Reporting mechanism
  - Environmental mitigation plan
  - Environmental monitoring plan
  - Implementation of EMP
- NOC and other approvals
- Stakeholder coordination
- Trainings
- Communication and documentation
  - Environmental management cost
  - Change management

8.1.3 Regulatory Requirements

371. This EMP refers to the applicable national and international legal framework for the proposed project for the protection of the environment.

8.1.4 Purpose & Need of the EMP

372. Primarily, the purpose of this EMP is to serve as a quick reference for the consultants, contractor as well as BID to implement the proposed mitigation measures effectively and to monitor the overall environmental performance of the project.

373. Furthermore, to house the procedure, which the BID follows to implement and maintain this EMP. The need of the EMP is mentioned as follows:

- Ensure that attention is paid to the actual environmental effects arising from construction and operation of the proposed sub-projects;
- Ensure that anticipated impacts are maintained within the predicted levels;
- Ensure that unanticipated impacts are managed or mitigated before they become a problem; and
- Ensure that environmental management brings about real environmental benefits and achieves environmental sustainability.

8.1.5 Objectives of the EMP

374. The main objectives of the EMP during different phases of the project is to implement mitigation measures and to evaluate the effectiveness of mitigation measures as proposed in the IEE and recommend improvement if any need would arise.

8.1.6 Scope of the EMP

375. The scope of the EMP includes the following phases of the project:

- Design phase
- Construction phase; and
- Operation phase.

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

8.1.7 Institutional Arrangement for Implementation of EMP

377. The following is a broad guideline has been proposed for institutional setup under this project as a reference for BIPD. It is based on the recommendations for PIU of ADB's Sri Toi Irrigation Project. The final organizational structure, working and monitoring of Institutional setup would be proposed by the BIPD and would be finalized in consultation with ADB's Resident Mission in Pakistan.

a) Institutional Arrangements for Implementation of EMP during Construction Phase

378. The successful implementation of the Environmental Management Plan requires the involvement of concerned stakeholders, each fulfilling a different but vital role to ensure sound environmental management and compliance during the construction phase.

379. The key players involved during construction stage of the proposed project are following

- Project Management Unit through SC's Environment Specialist-PMO Support
- Balochistan Environment Protection Agency (BEPA)
- SC's Environmental Engineer/Scientist; and
- Contractor's Environmental Engineer/Scientist.

380. The Construction Contractor will make a bond through contract documents to implement the EMP. The whole EMP will be included as a clause of the contract documents. The organizational setup for implementation of EMP is given below:

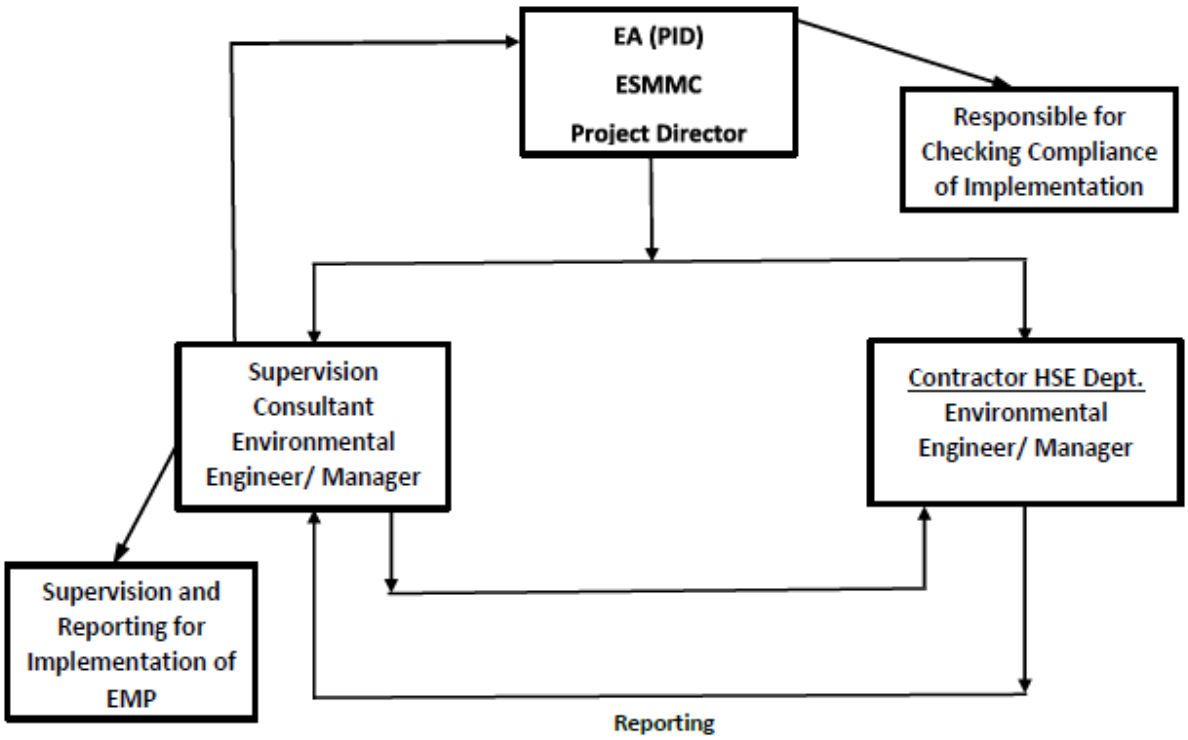


Figure 8-1: Organizational Setup for the Implementation of SSEMP at Construction Phase

❑ Roles and Responsibilities

381. The roles, remits and responsibilities of organizations that will be involved in EMP implementation are outlined below.

a) Project Management Unit through SC's Environment Specialist-PMO Support

382. Project Management Unit is responsible for assuring implementation of SSEMP/EMP through SC's Environment Specialist of PMO Support. This includes the following:

- Ensuring that required environmental training is provided to the concerned staff.
- Carrying out random site visits to the construction site to review the environmental performance of the construction contractors.

- Review monitoring reports for the progress of environmental related activities.
- Make sure that the construction contractor is implementing the additional measures suggested by the supervision consultant in environmental monitoring reports.
- To assist contractor for obtaining necessary approval from the concerned departments.
- Maintaining interference with the other lined departments / stakeholders.
- Reporting to Balochistan EPA on status of EMP Implementation.
- Reporting to ADB on status of EMP implementation.

b) BEPA

383. BEPA is the regulatory authority for issuance of NOC for the proposed sub-projects. As part of its mandate, protection of environment is its responsibility. Therefore, this agency will undertake inspection (as and when required) of project activities with respect to the protocols as defined in the EMP. Environmental Protection Agency (EPA) Balochistan has issued the No Objection Certificate (NOC). The specific roles of key functionaries are described hereafter.

c) Supervisory Consultant: Resident Engineer

384. Resident Engineer (RE) Roles and Responsibilities

- To oversee the performance of construction contractor to make sure that the construction contractor is carrying out the work in accordance with the tender design and follow the specifications;
- Ensuring that the day to day construction activities are carried as per EHS method statement and in safe manner.
- Strong coordination with the construction contractor and PMO.

d) Supervisory Consultant: Environmental Specialist-Field

385. Supervisory consultant (SC)'s Environmental Engineer / Scientist will perform following responsibilities.

- Directly reporting to R.E
- Preparing training materials and implementing programs
- Ensure the implementation of the mitigation measures suggested in the EMP.
- To supervise and monitor environmental activities being performed at site
- To organize periodic Environmental Training programs and workshops for the Consultants and Contractor's staff.
- Periodic reporting as mentioned in the EMP.
- Suggest any additional mitigation measures if required.

e) Construction Contractor: Environmental Engineers / Managers

386. Its contractor contractual obligation to appoint site Environmental Engineer / Manager with relevant educational background and experience. Contractor Environmental Engineer / Manager will carry out the following activities.

- Implementation of mitigation measures and SSEMP recommendations at construction sites.
- Plan, manage, monitor and coordinate the entire construction phase in term of HSE.
- Take account of health and safety risk to everyone effected by the work.
- Liaise with the client and consultant for the duration of the project to ensure that all the risks are effectively managed.
- Maintain and practice good housekeeping and keep everything at work in its proper place.

- Ensure suitable welfare facilities are provided from the start of project and maintained throughout the construction phase.
- Contractor will be bound through contract to take action against all the special and general provision of contract document.
- Ensure the provision of Personal Protective Equipment (PPE), conduct the environmental, health & safety training to the workers / Labour and coordinate with Environmental Engineer of SC.

f) Employees/ Workers Responsibility/ Obligations

387. Employees / workers have obligation to take reasonable care for the health and safety of themselves and of other persons who may be affected by their acts or omissions at work. The other responsibilities are

- To cooperate with employer in assisting them to fulfill their statutory duties.
- Comply with safety instructions and procedures.
- Use all safety equipment properly and do not tamper it.
- Not to interfere with deliberately or misuse anything provided, in accordance with health and safety legislation, to further health and safety at work.

❑ Reporting Mechanism

388. Progress reporting related to environmental activities will be responsibility of Supervision Consultant, Environmental Engineer/Scientist. He will also be responsible for submitting monthly EMP compliance report for the project to the PD. A bi-annual report of environmental activities shall be submitted to ADB by BIPD / Supervision Consultant.

389. PD will in turn add his remarks / comments / feedback and submit the Report to ADB and BEPA in accordance with the frequency defined by them. In case the frequency is not defined and/or communicated, bi-annual monitoring reports based on the monthly monitoring report will be submitted to ADB for disclosure on ADB website.

❑ Non-Compliance of the EMP

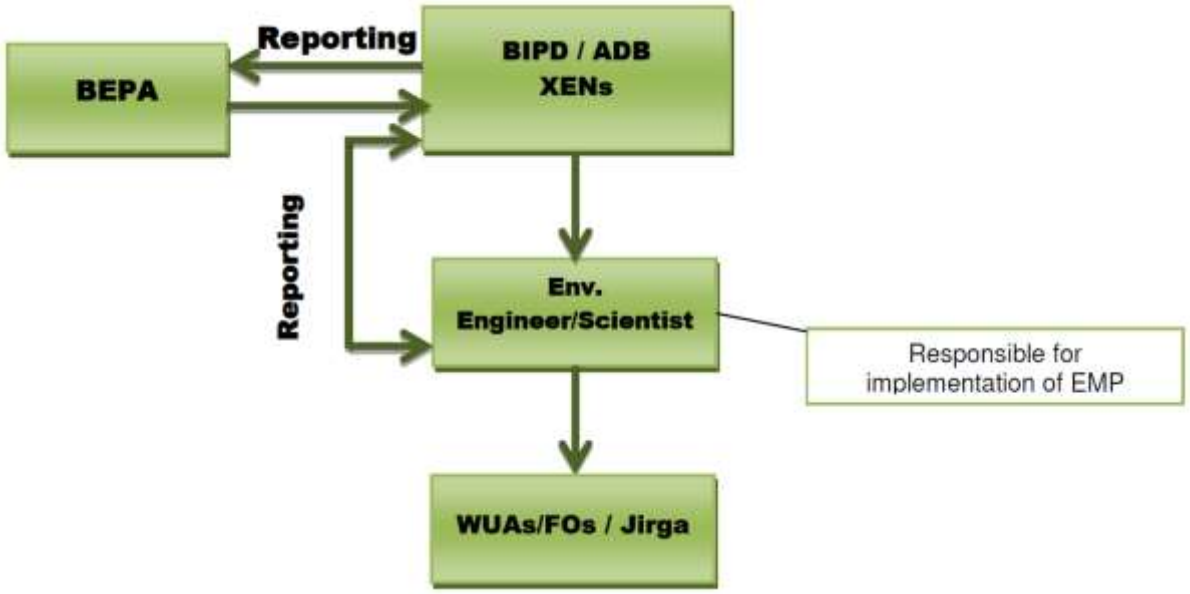
390. The implementation of the proposed EMP involves inputs from various functionaries. Construction Contractor will be primarily responsible for ensuring implementation and reporting of the mitigation measures proposed in the EMP, which will be part of the contract documents. In addition, the Contractor will also need to prepare Site Specific Environmental Management Plan (SSEMP) and get it approved from Consultant / BIPD before start of any construction phase. The SSEMP will provide the risk rating for each construction activity and will provide mitigation measures to reduce activities with higher degree of risk. Various plans, and layout maps (construction camp layout plan) will also form part of SSEMP. The provision of the environmental mitigation cost will be made in the total cost of project, for which Construction Contractor will be paid on the basis of monthly compliance reports. However, if the Construction 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 Construction Contractor claimed under the heads of environmental components.

❑ Institutional Arrangement for Implementation of EMP during Operation Phase

391. The key players involved during operation phase of the proposed project are BIPD, BEPA, Water User Associations (WUA) and Farmer Organizations (FOs) or Jirga. The roles, remits and responsibilities of these organizations are outlined below. The following staff will

be involved in the implementation of EMP. Organizational setup for implementation of EMP is also given below.

- WUA and FOs, or Jirga; and
- BIPD, Environmental Engineer/Scientist.



- **Roles and Responsibilities**

a) **Environmental Engineer/Scientist**

392. Environmental Engineer/Scientist will have responsibility for assuring implementation of EMP. This includes the following:

- Coordinating and planning the overall activities, as per EMP;
- Environmental Engineer/Scientist will randomly check the operation of project and make sure system is in compliance with EMP;
- Make sure that the WUA & FOs are implementing the measures suggested in the EMP and to report in environmental monitoring reports; and
- Bi-annual reporting to BEPA on environmental compliance of the project during operation stage.

b) **Water User Association (WUA) and Farmer Organizations (FOs), Chairman & Vice Chairman / Jirga**

393. WUA and FOs will ensure the implementation of the mitigation measures at operation site and will report to BIPD.

8.2 Environmental Management Plan

394. Potential impacts and their mitigation measures are devised against the project activities to minimize their significance. Responsibilities for the collection and analysis of data as well as the reporting requirements have been outlined in Table 47. Implementation of environmental impact mitigation measures during construction is to avoid and reduce short and long-term potential environmental impacts. Incorporation of environmental impact

mitigation considerations into the tender and contract documents is a fundamental prerequisite for effective implementation of the EMP.

8.2.1 Environmental Management and Monitoring Plan

395. Potential impacts and their mitigation measures are devised against the project activities to minimize their significance. Responsibilities for the collection and analysis of data as well as the reporting requirements have been outlined in Table 8-1. Implementation of environmental impact mitigation measures during construction is to avoid and reduce short- and long-term potential environmental impacts. Incorporation of environmental impact mitigation considerations into the tender and contract documents is a fundamental pre-requisite for effective implementation of the EMP.

Table 8-1: ENVIRONMENT MANAGEMENT AND MONITORING PLAN (EMP)

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
A. Design & Planning Phase					
1.	Seismic Hazard	Failure of design	• At the detailed design stage, the safety of the proposed water conservation structures against the damages due to seismic activity need to be ensured. As such structural designs of dam body, spillway and other structures need to follow the applicable criteria for the zone 2B recommended in the Building Code of Pakistan 2021.	Design Engineer	BID
2.	Flooding	Failure of design	• As per findings of the Hydrological Study, estimation of the discharge of streams/Nullahs of the project area has been calculated against 100 years return period. • A pre-construction visit is recommended to be conducted by a team comprising Route Engineer, Hydrologist and Hydraulic Engineer to validate the crossing locations and design.	Design Engineer	BID
B. Construction Phase					
1.	Impact on Air Quality	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	**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 windstorm emissions. • The contractor will monitor air quality on regular basis near the plant.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		very harmful for the site worker, local population and natural vegetation.	• 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** • Clean and smoke free fuel will be used in the labor 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** • All vehicles during construction activities will be kept in good working condition and be properly		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			tuned and maintained in order to minimize the exhaust emissions; • Proper maintenance and repair of power generators and construction machinery will be ensured to minimize 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 / WHO applicable standards to gaseous emissions generated by construction vehicles, equipment and machinery will be enforced during construction works. • Best quality fuel and lubes will be purchased and where possible, lead free oil and lubes will be used.		
2.	Impact of Noise Pollution	The main sources for noise in the project area may be heavy machinery such as excavators, concrete mixing plant, stone crushers and other equipment.	• 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. • Construction activities that are close to settlements will be stopped during night times if high noise values are observed. • Consultations will be held to discuss appropriate solutions and techniques to control noise (e.g. mud or brick walls, bushes, etc.). Such hearings	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			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 / WHO standards and to ensure the effectiveness of mitigation measures.		
3.			•		
4.	Solid Waste Generation incl. Spoil Material	Waste and Spoils will be generated from the camps and from excavation activities. Disposal of spoil / surplus material may cause negative environmental impacts, if not properly mitigated during implementation of the proposed project.	• 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; • The contractor must develop a plan of action with the help of concerned solid waste management department for transporting the waste to the disposal site; • Toxic waste will be handled, stored, transported and disposed separately; • The waste will be properly sealed in containers with proper labels indicating the nature of the waste; and	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Solid waste will be segregated at source so that it can be re-used or recycled. • Waste management plan will be developed to implement an efficient and responsive solid waste management system during construction phase. Recyclable wastes e.g. steel bars will be sold to waste vendors; • Reusable material will be used as a filling material during ground levelling; • Solid waste generated during construction will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; and • The site will be restored back to its original condition after construction completion. • The spoil material from the excavation will be dumped at designated places. The dumping sites must be approved by environment specialist of the Construction Supervision Consultant (CSC). • The contractor will also ensure that no spoil material is disposed into stream/nullahs and into any other water body along the project site. • As far as possible barren/waste lands available will be used for disposal of the excavated waste material. • The spoil material shall be deposited in layers and properly rolled and sprinkled to avoid any negative environmental impacts.		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Contractor will prepare and approve a spoil management plan, prior any disposal of spoil.		
5.	Resource Conservation	During the construction, overburden on local resources is possible if construction facilities such as workers camp and construction camp built near rural areas and can create problems for local communities.	• Use potable water bowsers for construction works and mineral water bottles/ ground water for drinking purposes; • Plan for the provision/purchase of adequate insulation to reduce heat loss through construction plants; • Reduction of wastage of water through training of workers involved in water use; • Reuse of construction waste materials may be adopted wherever possible; • Aggregates will not be sourced from river and stream beds. • Diesel and fuels with low sulphur content should be used to operate construction machinery and equipment; • Efficient and well-maintained equipment and machinery will be used; • The equipment and machinery will be turned off when not in use; • A good camp design and an efficient worksite management plan can help the contractor to reduce the water demand, wastewater and solid waste volumes to the lowest levels.	CC	SC
6.	Soil Contamination	Surface soil has the potential to be contaminated by construction material, vehicle movements and	• The Contractor will be required to train its workforce in the storage and handling of materials like oils, diesel, petrol, other chemicals, concrete and	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		various construction activities. Spillage of fuel, lubricants, cement and chemicals has the potential to result in contamination.	cement, etc., that can potentially cause soil contamination. The Contractor will be required to prepare a training manual and module for all the construction related activities along with the schedule of training program and submit to the supervising consultants for approval. • Refuelling areas will have impervious concrete bases with appropriate drainage to prevent spills from contaminating the surrounding area. • During on-site maintenance of construction vehicles and equipment, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil. • Oils, fuels and hazardous materials will be stored in appropriately bounded areas. Fuel tanks will have to be placed within sealed bunds capable of containing 120% of the total volume of the tank in case of leakage. • Regular inspections will be carried out to detect leakages from vehicles and construction machinery. • Vehicles and/or equipment with leakage will not be used, until repaired. • Solid waste generated during construction and at camp sites will be properly treated and safely disposed of only in demarcated waste disposal sites. • The construction phase will consume lot of cement additives and oils and the empty containers will contain dangerous amount of chemicals inside,		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			which can impact the humans as cancer producers. All such containers must not be sold to general public and must be destroyed and sent for recycle. This will be contractor's responsibility who must seek consultant's supervision. The people must be warned against use of empty chemical containers through local press and erecting banners in project area.		
7.	Soil erosion/ silt run-off	Phenomenon may pose serious environmental impacts like landslides, slumps, slips and other mass movements.	• All the freshly cut surfaces will be restored/stabilized as soon as possible; • Seeding or plantation of erodible surfaces will be done; • Construction activities will be planned in such a way so as to avoid cutting of erodible surfaces and earth movement in rainy season; • Along cross-drainage structures of the access road where embankments are more susceptible to erosion by water runoff stone pitching or a riprap will be provided across the embankment. • Proper monitoring of the soil erosion prone areas will be carried out during operation phase and soil conservation measures (if needed) will be carried out like provision of physical structures e.g., retaining walls, etc.	CC	SC
8.	Community Health and Safety	The communities residing in the project areas might be at risk from the proposed works since deep excavation works will take place	• The Contractor will prepare the site-specific community health and safety plan in compliance with applicable national and international regulations and guidelines.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		along with movement of heavy machinery and vehicles transporting the raw materials and spoils etc. to and from the work sites.	• The Contractor will clearly barricade work areas to prevent access by the public, while ensuring passage by providing safe pathways for pedestrians around construction zones; • The Contractor will exclude parking, waiting vehicles and vendors from areas adjacent to the work by means of clearly marked barricades and posted signage; • The Contractor will remove excavated earth, spoil, rubble, cut vegetation and refuse whether generated by the project or discarded by third parties from areas within the construction zone, where it has potential to interfere with the public or generate dust; • The Contractor will provide temporary lighting to facilitate construction during night time; • The Contractor will remove hazardous conditions on construction sites that cannot be controlled effectively with site access restrictions and will barricade any excavations and materials placed near the public place (if applicable); • Hard Barricades will be provided at the excavation deeper than 1.5 meter as per “NZS 3845:1999 Road safety barrier systems”; • The Contractor will promptly reinstate any services and reinstall any physical facilities that are cut, disconnected or damaged during construction, and maintain or provide temporary services that are interrupted by construction. The Supervisory		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			Consultant will inspect and certify the adequacy of all reinstated services and facilities; • Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas especially near the settlements; • An Emergency Preparedness and Response Plan (EPRP) in coordination with the local emergency responders to provide timely first aid response in the event of accidents and hazardous materials response in the event of spills; • Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites; • Timely public notification on planned construction works; • Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity and social links; • Any environmental condition that is disagreeable to the public and causes an avoidable nuisance can be addressed with additional provisions over and above those described above, as determined necessary by the supervisory consultant. • These requirements will be incorporated into the bidding specification and contract documents, and will be binding on the contractor, at risk of penalty for noncompliance, as charges to be recovered from contractor for unsafe act or condition.		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
9.	Occupational Health and Safety	Occupational Health and Safety (OHS) related impacts will arise during construction stage activities including clearing of earth, levelling, compaction, foundations, finishing, testing & commissioning.	• All suggested project-specific health and safety plans would include appropriate training and supervision of employees and enforcement of workplace safety policies. • All processes and equipment will be designed and constructed for safe operation. • A process of safety management program will be developed and implemented to identify hazards associated with each applicable chemical. • All project related staff will be provided with the required personal PPE and shall be trained to make sure that they are aware of the usefulness and correct use. • Working at heights and in confined spaces should be done after obtaining approvals from the safety supervisors and should regularly be monitored. • Emergency preparedness and response plan and emergency escape routes shall be identified and all the workers will be made aware of them. • Use of correct signage for better understanding of all the health safety instructions and precautions for the workers. Signage will be in languages appropriate to the workforce employed.	CC	SC
		Welding / Hot Work	• Ensure that all personnel involved in welding operations use proper eye protection, such as welder goggles or full-face shields. Implement barrier screens around welding stations to prevent exposure of nearby workers to welding light.		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		Eye Hazards	• Establish and enforce Hot Work Permits for all welding and hot cutting activities. This includes requiring a fire watch during and after the operation, and having fire extinguishers readily available. • Develop and implement Standard Operating Procedures (SOPs) for hot work, including specific measures for reducing fire risks, such as maintaining clear work areas and conducting regular fire safety inspections. • Provide appropriate eye and face protection for workers, such as safety glasses with side shields, goggles, or full-face shields. • Install and maintain machine guards and splash shields to protect against flying particles or liquid splashes. • Develop SOPs for sanding, grinding, and handling chemicals, including guidance on eye protection and safe practices. • Designate and clearly mark areas where there is a risk of discharges or emissions, such as from metal cutting or pressure relief valves. Implement additional guarding or proximity restrictions to protect workers and visitors from potential hazards.		
10.	Traffic Management	During construction activities, large number of light and heavy vehicles is expected to use the community roads. Similarly, heavy machinery	• Construction traffic hindrance should be avoided by providing proper diversion and signage. • Traffic management plan will be prepared by the contractor after consultation with RE for its implementation.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		will be stationed in and adjoining areas of the project site.	• GRM will be put in place to address community grievances in this regard.		
11.	Communicable diseases	The laborers in the Contractor Camp, truck drivers, and other personnel who interact with each other have the potential for the spread of HIV/AIDS if the incidence exists.	• 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 & 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	SC
12.	Flora	No tree cutting is expected as project is being executed within its already available ROW. The Contractor's workers may damage the vegetation and trees (for use as firewood to fulfil the camps requirements).	• 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	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• 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. • Ten trees will be replanted for each tree cut as per EPA rule.		
13.	Fauna	The accidental striking of all terrestrial fauna by project vehicles or equipment/machinery Avifauna may be disturbed due to sensory disturbance from construction equipment; movement	**Mammals and Reptiles** • Hunting, poaching and harassing of wild animals will be strictly prohibited and Contractor will warn their labor accordingly. • Noise generating activities will be avoided during the night.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		of vehicles and crew personnel; location and operation of camps	• 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. • Vehicles will be maintained in good condition and provided with mufflers to reduce noise. **Birds-Avian Fauna** • Special measures will be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding that generally occur from March to August. • The contractor should be committed to ensuring the conservation and protection of wildlife within the project area. To achieve this goal, a strict "No Hunting" policy shall be implemented and enforced among all workers and personnel involved in the project. • Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.		
14.	Use of local water resources	Burden on local water resources and possible social conflicts.	• 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. • Contractor will ensure that the water availability of the existing local users remains unimpeded by the	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			project interventions. The contractor will make arrangements for the availability of drinking water at site. The contractor will arrange for the water required for construction works on his own. For this purpose, he will install hand pumps/tube wells accordingly. • 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.		
15.	Contamination of Water Resources	The water resources, may get polluted from may get polluted from hazardous construction materials, wastewater effluent, solid waste, silt from construction and soil erosion, etc.	• Camps will be located at least 500 m away from the nearest local settlement to prevent the contamination of 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. Cost will be added in Contractor's BOQs.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• 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 springs/nullah with concrete or cement must be avoided. • Sewage water from the camp will have to be collected and treated in a suitable septic tank before being released into the streams. • Generally, waste should be reduced, re-used, recycled and the disposal has to be controlled. • Contractor will have to get water quality testing of dam sites at the start of construction and biannual basis as per NEQS.		
16.	Social and Cultural Conflicts	During the construction phase of the proposed project, conflicts may	• Local labor especially from nearby communities should be given preference for the construction works;	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		arise between labor force and local community.	• Careful planning and training of work force to minimize disturbance to the local people; • Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and • Adequate training especially for the transitive workforce of the station (involved both in the construction process and in the commissioning) to regard the customs of the area so that the locals do not feel insecure.		
17.	Religious and Cultural Heritage	No graveyard will be disrupted due to this project. No historical or archaeological site has been observed or reported along the project area.	• If any graves affected by the project, they will have to be shifted. The proponent will obtain Fatwa from local Mufti before shifting the graves. During such operation the proponent will inform local administration and seek their assistance for security. The request will also be extended to Health Department for deputation of medical and paramedical staff during the operation. • Contractor will follow the prayer timing particularly at prayer of Juma and the workforce will observe the sanctity of religious properties. • Contractor will be required to instruct the construction crews and site supervisors in respect of archaeological site recognition, conservation procedures, and temporary site protection. • In case of a chance finding during excavation, the contractor will protect the site and notify the Engineer who will inform Department of Archaeology & Museums through Irrigation	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			Department and hand over such sites to the department if instructed by Engineer / Irrigation Department.		

Table 8-2: Environmental Management Plan (Operation Phase)

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility
C. Operation Phase				
1.	Adequacy of operation and maintenance (O & M)	No or Inadequate operation and maintenance of canal will be main hindrance to obtain project objectives	• Carrying out repair of damaged canal linings if any bank holes, repairs of cattle and washing 'ghats' and carry out extensive annual maintenance programmes on structures and canal, and insurance of adequate irrigation water supply at the tails in the proposed canal command area. • The investment made must be maintained in the long term, off-farm O & M will be the responsibility of the project and it should be sustainable. • Ensure community participation in management and operation of the irrigation system and provide necessary training about it.	EA Staff

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility
			• Maintenance of on-farm structures will be the responsibility of the individual landowner.	
2.	Disposal waste (Connection of waste streams) in the Canal	Degradation of irrigation water and Health issues	• Proper monitoring of canal alignment and disconnect all identified waste streams	EA Staff

Key: CC=Construction Contractor, DC=Design Consultant, EA=Executing Agency, SC=Supervision Consultant, PD = Project Director

8.3 Monitoring Parameters

396. A monitoring plan for the pre-construction/design and construction phases of the project, indicating environmental parameters, mitigation measures of the negative environmental impacts, responsible authority and frequency is provided below as Table 8-3 and Table 8-4 below.

397. During the procurement/pre-construction period, the monitoring activities will focus on (i) checking the contractor's bidding documents particularly to ensure that all necessary environmental requirements have been included; and (ii) checking that the contract documents' references to environmental mitigation measures requirements have been incorporated as part of contractor's assignment and making sure that any advance works are carried out in good time.

398. During the construction period, the monitoring activities will focus on ensuring that any required environmental mitigation measures are implemented to address possible impacts.

399. In general, the construction impacts will be manageable, and no insurmountable impacts are predicted, provided that the EMP is implemented to its full extent as required in the Contract documents. However, experience suggests that some Contractors may not be familiar with this approach or may be reluctant to carry out some measures. For the proposed project, in order that the Contractor is fully aware of the implications of the EMP and to ensure compliance, environmental measures must be costed separately in the tender documentation and listed as BOQ items, and that payment milestones must be linked to environmental performance, vis a vis the carrying out of the EMP.

400. The effective implementation of the EMP will be inspected as part of the loan conditions by both NDRMF and ADB, and as part of regulatory/NOC compliance by BEPA. In this regard, the PMU/CSC will guide the design engineers and Contractors on the environmental aspects and necessary EMP documentation.

Table 8-3: 'Pre-Construction' Environmental Monitoring Plan for Baseline Development

Parameter to be measured	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility	
						Implementation	Monitoring
Ambient Air Quality	To establish baseline air quality levels	CO, NO2 & PM10 (particulate matter smaller than 10 microns) concentration at receptor level, PM2.5	1-hr and 24-hr concentration levels	At three random receptors locations at the sub-project sites.	Once	Contractor	CSC
Ambient Noise	To establish baseline noise levels	Ambient noise level near receptors in project area	A-weighted noise levels 24 hours, readings taken at 15 s intervals over 15 min. every hour, and then averaged	At three random receptors locations at the sub-project sites.	Once	Contractor	CSC
Water quality in the project area	Establish a baseline for water quality in the project area.	Water quality in project area	Water samples for comparison against NEQS parameters	At three of the sub-project locations.	Once	Contractor	CSC

Table 8-4: Construction Phase Monitoring Requirements

Project Activity and Potential Impact	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Noise Disturbance due to noise from construction activity	To determine the effectiveness of noise abatement measures on sound pressure levels	Ambient noise level at different locations in project area	A-weighted noise levels 24 hours, readings taken at 15 s intervals over 15 min. every hour at 15 m from receptors, and then averaged	At three random sensitive receptor locations in project area	Quarterly basis on a typical working day	Contractor's Environmental officer, CSC
Air Quality Dust emissions from construction vehicles and equipment	To determine the effectiveness of dust control program on dust at receptor level	CO, NO2 & PM10 (particulate matter smaller than 10 microns), PM2.5 concentration at receptor level	1-hr and 24-hr concentration levels	At three random sensitive receptor locations in project area	Quarterly basis on a typical working day	Contractor's Environmental officer, CSC
		Visible dust	Visual observation of size of dust clouds, their dispersion and the direction of dispersion	Construction site	Once daily during peak construction period	Contractor's Environmental officer, CSC
Water quality monitoring for drinking water and wastewater	To determine the effectiveness of mitigation measures	As per WHO/NEQS	Water samples for comparison against NEQS parameters	Worker's camp and active construction site	Quarterly basis on a typical working day	Contractor's Environmental officer, CSC
Safety precautions by Safety workers	To prevent accidents for workers and general public	Number of near miss events and accidents taking place	Visual inspections	Construction site	Once Daily	Contractor's Environmental officer, CSC

Soil Contamination	To prevent contamination of soil from oil and toxic chemical spills and leakages	Incidents of oil and toxic chemical spills	Visual inspections	At construction site and at vehicle and machinery refueling & maintenance areas	Once a month	Contractor's Environmental officer, CSC
Solid Waste & Effluent disposal Insufficient procedures for waste collection, storage, transportation and disposal	To check the availability of waste management system and implementation	Inspection of solid and liquid effluent generation, collection, segregation, storage, recycling and disposal will be undertaken at all work sites in project area	Visual inspections	At work sites in project area	Once daily	Contractor's Environmental officer, CSC

8.4 Environmental Training

8.4.1 Capacity Building and Training

401. Capacity building and training programs are necessary for the project staff to increase awareness, improve compliance, enhance resource efficiency, and control the negative impacts resulting from the project's construction and operation phases, including biodiversity impacts. The staff will also need training on monitoring and inspecting a project for environmental impacts and implementing mitigation measures.

402. The details of capacity building and training program are presented in the Table 8-5.

Table 8-5: Capacity Development and Training Programme

Provided by	Organized by	Contents	Target Audience	Venue	Duration
Pre-construction Phase PMC offering specialized services in environmental management and monitoring	CSC & PMU	Short seminars and courses on: Environmental Management Plan and Environmental Monitoring Plan Group exercise and participatory workshop to measure effectiveness of program	Contractor staff	BID Office	One day long training seminar including group exercise/workshop
Construction Phase PMC offering specialized services in social management and monitoring	CSC & PMU	Short seminar on Environmental risks associated with construction phase. Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues Group exercise and participatory workshop to measure effectiveness of program	Contractor staff	BID Office	One day long training seminar including group exercise/workshop

8.5 Environmental Management Costs

403. The Table 8-66 provides cost estimates for 'Construction phase' monitoring of key environmental parameters.

404. The costs associated with implementation of the EMP and the necessary mitigation measures are provided as Table 8-7**Error! Reference source not found.** The Table 8-88 below provides the cost for capacity development and training programme for project contractors for the proposed sub-projects.

Table 8-6: Annual Cost Estimates for 'Construction Phase' Environmental Monitoring

Monitoring Component	Parameters	Quantity	Amount PKR	Details
Surface water Quality	NEQS / WHO	24 (Quarterly basis at 3 locations)	480,000	24 readings @ PKR 20,000 per sample
Ground water quality	NEQS / WHO	24 (Quarterly basis at 3 locations)	384,000	24 readings @ PKR 16,000 per sample
Air Quality	CO, NO2, PM10, PM2.5	24 (Quarterly basis at 3 locations)	720,000	24 readings @ PKR 30,000 per sample
Noise Levels	dB(A)	24 (Quarterly basis at 3 locations)	720,000	24 readings @ PKR 30,000 per reading
Total				**2,304,000**
Contingencies			115,200	5% of monitoring cost
Total			**PKR 2,419,200 or 8,684 USD****	

*Subject to monitoring requirements of EPAs as per conditions of Environmental Approval for construction phase. **where1 USD = 287.57 PKR

Table 8-7: Estimated Costs for EMP Implementation

Item	Sub-Item	Estimated Total Cost (PKR)
Contractor Environment Specialist	1 persons for 24 months (@ 100,000 per month)	**2,400,000**
Monitoring Activities	Provided separately in Tables 8.6 and 8.7.	-
Mitigation Measures		
(i) Water sprinkling	To suppress dust emissions	700,000
(ii) Solid waste collection & disposal (including hazardous waste)	From construction sites (based on initial estimates)	20,000,00
(iii) Cost of Hard Barricades	Provision of hard barricades in case the trench is 1.5 meter deep	1,000,000
(iv) HSE (including First Aid cost)	For Workers safety	2,500,000
Total		**8,600,000**
Contingencies	5% of EMP implementation cost	430,000
Total Estimated Cost		**PKR 9.030,000 or 32,416 USD**

Table 8-8: Cost of Capacity Development and Training Programme for Project Contractor(s)

Provided by	Organized by	Contents	No. of training events	Duration	Cost (PKR)
Pre-construction Phase Monitoring Consultants / Organizations offering specialized services in environmental management and monitoring	CSC & PMU	Short seminars and courses on: Environmental Management Plan and Environmental Monitoring Plan	Four seminars for Contractor management staff and project staff	1 day	200,000
Construction Phase Monitoring Consultants / Organizations offering specialized services in environmental management and monitoring	CSC & PMU	Short seminars on Environmental risks associated with construction phase. Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues	Four seminars for Contractor management staff and project staff dealing in environment and social issues	1 day	200,000
Total			**PKR 400,000 or USD 1,391**		

8.6 Performance Indicators

405. For evaluating the performance of the environmental management and monitoring plan, performance indicators are identified for the efficient and timely implementation of measures/actions proposed in EMP. The indicators are defined both for the implementation phase and for the operation phase. QA/QC Consultant will be responsible for compiling the information on these indicators and report to PMU.

406. To measure the overall environmental performance of the project, a list of performance indicators is given below:

- The number of inspections carried out by environmental team of CSC per month.
- The number of non-compliances observed by CSC.
- Availability of environmental, and OHS specialists in CSC .
- Availability of environmental, and OHS specialists with Contractors.
- Timely reporting of documents (as defined in EMMP and monitoring plan).
- Number of training imparted to stakeholders/other capacity building initiatives.
- Number of grievances received.
- Number of grievances resolved.
- Number of constructions related accidents.

9. GRIEVANCE REDRESSAL MECHANISM

9.1 General

407. This section deals with the Grievance Redressal Mechanism (GRM) to be developed for proposed sub-projects. The proposed project, at stage of construction may involve some disturbance to local community and thus this GRM is necessary for the successful resolution of potential disputes.

408. The ADB Policy (SPS 2009) requires establishment of a local grievance redress mechanism to receive and facilitate resolution of concerns and grievances regarding the project's social and environment performance. The measures have been identified to mitigate any potential environmental and social impacts to be caused due to implementation of the project works.

409. However, despite of best efforts, there is chance that the individuals / households affected by the project or other stakeholders are dissatisfied with measures adopted to address adverse social impacts of the project. To address, such situation an effective GRM will be established at the time of award of contracts to ensure timely and successful implementation of the project. It will also provide a public forum to the aggrieved to raise their objections and the GRM would address such issues adequately. It will receive, evaluate and facilitate the resolution of complaints and grievances about the social and environmental performance at the level of the project.

410. The GRM will aim to investigate charges of irregularities and complaints received from any displaced persons and provide a time-bound early, transparent and fair resolution to voice and resolve social and environmental concerns link to the project.

411. The PMU shall make the public aware of the GRM through public awareness campaigns. The name of contact person(s) and his/her phone number, PMU contact numbers will serve as a hotline for complaints and shall be publicized through the media and placed on notice boards outside their offices, construction camps of contractors, and at accessible and visible locations in the project area. The project information brochure will include information on the GRM and shall be widely disseminated throughout the project area. Grievances can be filed in writing, via web-based provision or by phone with any member of the PMU.

412. **First tier of GRM**: The PMU is the first tier of GRM which offers the fastest and most accessible mechanism for resolution of grievances. The PMU staff for environment and social safeguards will be designated as the key officers for grievance redressal. Resolution of complaints will be completed within seven (7) working days. Investigation of grievances will involve site visits and consultations with relevant parties (e.g., affected persons, contractors, traffic police, etc.). Grievances will be documented and personal details (name, address, date of complaint, etc.) will be included, unless anonymity is requested. A tracking number will be assigned for each grievance, including the following elements:

413. Initial grievance sheet (including the description of the grievance), with an acknowledgement of receipt handed back to the complainant when the complaint is registered;

414. Grievance monitoring sheet, mentioning actions taken (investigation, corrective measures);

415. Closure sheet, one copy of which will be handed to the complainant after he/she has agreed to the resolution and signed-off.

416. The updated register of grievances and complaints will be available to the public at the PMU office, construction sites and other key public offices in the project area. Should the grievance remain unresolved, it will be escalated to the second tier.

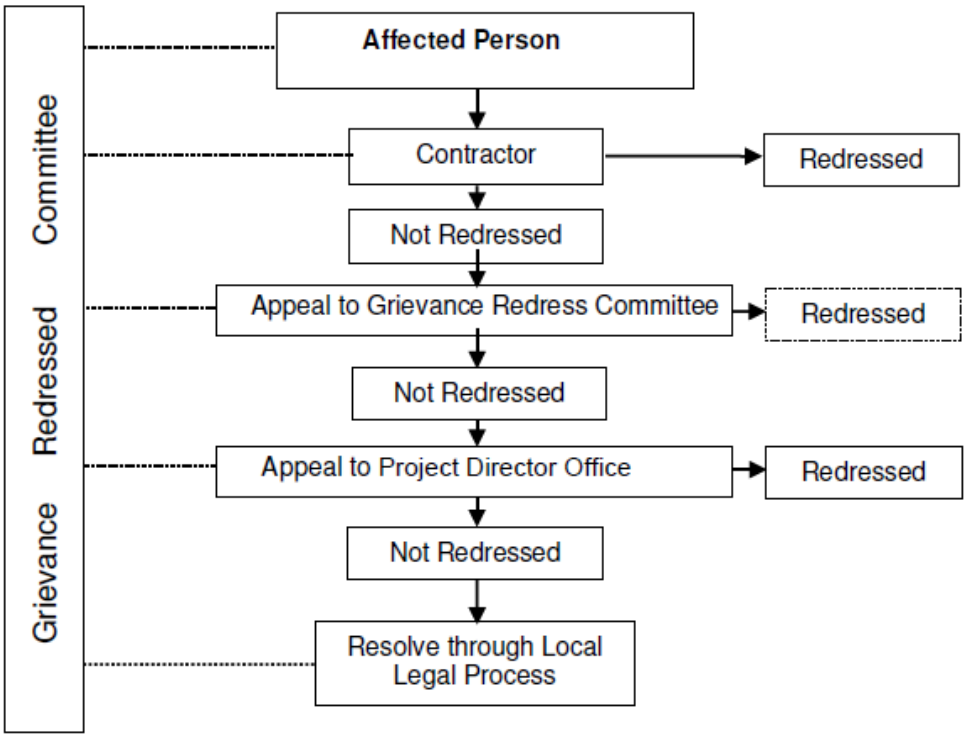
417. **Second Tier of GRM**: The PMU will activate the second tier of GRM by referring the unresolved issue (with written documentation) to the PMU, who will pass unresolved complaints upward to the Grievance Redress Committee (GRC). The GRC will be established by PMU before start of site works. The GRC will consist of the following persons: (i) Project Director; (ii) representative of district government; (iii) representative of the affected person(s); (iv) representative of the local deputy Commissioners office (land); and (v) representative of the BEPA (for environmental-related grievances). A hearing will be called with the GRC, if necessary, where the affected person can present his/her concerns/issues. The process will facilitate resolution through mediation. The local GRC will meet as necessary when there are grievances to be addressed. The local GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within fifteen (15) working days. The Contractor will have observer status on the committee. If unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the Government's judicial or administrative remedies.

418. The functions of the local GRC are as follows: (i) resolve problems and provide support to affected persons arising from various environmental issues and including dust, noise, utilities, power and water supply, waste disposal, traffic interference and public safety as well as social issues and land acquisition (temporary or permanent if any); asset acquisition; and eligibility for entitlements, compensation and assistance; (ii) reconfirm grievances of displaced persons (if any at any stage of project), categorize and prioritize them and aim to provide solutions within a month; and (iii) report to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

419. The PMU officers will be responsible for processing and placing all papers before the GRC, maintaining a database of complaints, recording decisions, issuing minutes of the meetings and monitoring to see that formal orders are issued and the decisions carried out.

420. **Third tier of GRM**: In the event that a grievance cannot be resolved directly by the PMU (first tier) or GRC (second tier), the affected person can seek alternative redressal through the district or sub-district committees, as appropriate. The PMU or GRC will be kept informed by the district, municipal or national authority. The grievance redress mechanism Process Flow Diagram (PFD) is provided in the **Figure 9-1** below. The monitoring reports of the EMP implementation will include the following aspects pertaining to progress on grievances: (i) Number of cases registered with the GRC, level of jurisdiction (first, second and third tiers), number of hearings held, decisions made, and the status of pending cases; and (ii) lists of cases in process and already decided upon may be prepared with details such as Name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e. open, closed, pending). In order to provide greater clarity, the pictorial description of the GRM is provided in **Figure 9-1** below.

Figure 9-1 Process Flow Diagram of Grievance Redressal Mechanism



10. CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusion

421. The proposed sub-projects are of high significance considering the urgent need for construction of weir, Flood Protection Bund and Command Area Development. Primary and secondary data has been collected and used to assess the environmental impacts of the project. This IEE report highlights the potential environmental impacts associated with the project and recommends mitigation measures accordingly. Any environmental impacts associated with the project need to be properly mitigated, through the existing institutional arrangements described in this report.

422. Most of the environmental impacts are associated with the construction phase of the proposed project and majority of these impacts are short term and reversible.

423. Major impacts during construction phase will be related to deep excavations, occupational and community health and safety issues along with ensuring debris and spoils are disposed in an effective and efficient manner during the sub-project works.

424. The implementation of mitigation measures during construction period will be the responsibility of the Contractor. Therefore, the required environmental mitigation measures will have to be clearly defined in the bidding and contract documents, and appropriately qualified environmental staff retained by the Construction Supervision Consultant (CSC) to supervise the implementation process. The EMP includes measures to minimize project impacts due to traffic, noise, air pollution, waste generation etc.

425. The Integrated Environmental and Occupational Health and Safety (OHS) approach outlined in the IEE report addresses various hazards such as noise, traffic, including welding and hot work, and eye hazards through comprehensive mitigation strategies. These include implementing safety protocols, providing adequate training and personal protective equipment, conducting regular monitoring, and ensuring compliance with international standards, thereby promoting a safe and secure environment for construction personnel and minimizing potential health impacts.

426. The EMP prepared for the proposed project under this IEE document is considered sufficient for issuance as part of the contracts to the successful bidder(s) and for subsequent use during the project works.

427. It should be mentioned that prior to the commencement of works, this EMP must be further updated by the Contractor into site specific EMPs (SSEMPs) for review and approval of ADB. In these SSEMPs, aspects such as a detailed traffic management plan, identification of locations for disposal of debris and spoil and any other details which shall become available later must be included for efficient implementation of all proposed mitigation measures and the subsequent monitoring of these measures.

428. NOC from BEPA for construction phase of this project has been obtained. NOC from concerned department for disposal of mucking material, spoil and municipal solid waste from worker camps will be taken which will be the responsibility of the Contractor.

429. Based on the above, this report concludes that there are no potential adverse environmental impacts from the proposed sub-project activities. Impacts of less significance can be mitigated to an acceptable level by adequate implementation of the mitigation measures

identified and suggested in the EMP, hence, no significant or unacceptable change in the baseline environmental conditions will occur.

430. Furthermore, BID will ensure that the selected construction Contractor has contractual obligations with respect to EMP implementation and will ensure appropriate staffing and budgeting for effective implementation and monitoring of project EMP.

431. Based on the findings of the IEE, the project is unlikely to cause any significant, irreversible or unprecedented environmental impacts. The potential impacts are localized, temporary in nature and can be addressed through proven mitigation measures. Hence, the classification of the project as "Category B" as per ADB SPS, 2009 is confirmed and this IEE study has been conducted. No further study or assessment is required at this stage.

10.2 Recommendations

432. Based on the findings of this IEE report, the following recommendations have been formulated to ensure the smooth operation of the proposed project:

- Upon contractor mobilization, BID will provide a safeguards orientation as per the IEE and the project administration manual;
- Contractor to appoint environmental and social safeguards, responsible for environmental compliance, occupational health and safety, and core labor standards.
- The templates for different management plans are attached as annexures. However, detailed plans shall be developed by the contractor before mobilization of the construction teams.
- SSEMPs shall be developed by the contractor before the commencement of construction.During construction phase contractor will implement SSEMP and BID will supervise the implementation status through CSC.
- Prior approval for setting up of construction camps shall be obtained by the Contractor from BID.
- Employment opportunities shall be given to local community as per plans discussed in the IEE report.

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ANNEXURES

Annexure 1: Rapid Environmental Assessment Checklist

The projects are screened through Rapid Environmental Assessment (REA) checklist to determine environmental categorization. The environmental and social rapid screening depicts that:

(i) the subproject will not require any land acquisition;
(ii) the subproject will not involve any involuntary resettlement
(iii) the subproject does not fall in any protected area.

Screening Questions	Yes	No	Remarks
A. Project Site Is the project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Protected Area		×	
▪ Wetland		×	
▪ Mangrove		×	
▪ Estuarine		×	
▪ Buffer zone of protected area		×	
▪ Special area for protecting biodiversity		×	
B. Potential Environmental Impacts Will the proposed project cause…….			
▪ Loss of precious ecological values (e.g. result of encroachment into forest/swampland or historical/cultural buildings/area, disruption of hydrology of natural waterways, regional flooding and drainage hazards)?		×	
▪ Conflicts in water supply rights and related social conflicts?		×	
▪ Impediments to movements of people and animals?		×	
▪ Potential ecological problems due to increased soil erosion and siltation, leading to decreased stream capacity?		×	
▪ Insufficient drainage leading to salinity intrusion		×	
▪ Over pumping of groundwater, leading to salinization and ground subsidence?		×	Limited use of water for project activities which will not be significant
▪ Impairment of downstream water quality and therefore, impairment of downstream beneficial uses of water?		×	
▪ Dislocation or involuntary resettlement of people?		×	No dislocation or involuntary resettlement of people will occur
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups		×	
▪ Potential social conflicts arising from land tenure and land use issues?		×	No land acquisition will be required
▪ Soil erosion before compaction and lining of canals?			N/A

Screening Questions	Yes	No	Remarks
▪ Noise from construction equipment?	×		It will be managed through mitigation measures and will be documented in EMP
▪ Dust during construction?	×		It has moderate Impact for labors during construction, but It will be managed by water sprinkling. Dust generated will be managed through sound planning and good management practices with implementation of EMP
▪ Waterlogging and soil salinization due to inadequate drainage and farm management?		×	
▪ Leaching of soil nutrients and changes in soil characteristics due to excessive application of irrigation water?		×	
▪ Reduction of downstream water supply during peak seasons?		×	
▪ Soil pollution, polluted farm runoff and groundwater, and public health risks due to excessive application of fertilizers and pesticides?		×	
▪ Soil erosion (furrow, surface)?		×	
▪ Scouring of canals?		×	
▪ Clogging of canals by sediments?		×	
▪ Clogging of canals by weeds?		×	
▪ Seawater intrusion into downstream freshwater systems?		×	
▪ Introduction of increase in incidence of waterborne or water related diseases?		×	
▪ Dangers to a safe and healthy working environment due to physical, chemical and biological hazards during project construction and operation?	×		The subproject does not have usage of any hazardous chemicals during construction. However, health and safety measures for laborers will be taken to implement HSE Plan that will be developed and documented in EMP
▪ Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	×		Local people will be employed as much as possible from close by villages/ towns and the same will be documented in EMP
▪ Social conflicts if workers from other regions or countries are hired?	×		Priority will be given to local for employment and the same will be documented in EMP

Screening Questions	Yes	No	Remarks
▪ Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	×		Earth work will not lead to any risk for community during construction time, however, Health and safety Plan and Emergency response procedures will be prepared and implemented. The same will be documented in EMP.
▪ Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g., irrigation dams) are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	×		Safety measures for community will be taken to avoid any risk and consequence. It will be documented in EMP. However, it has major positive impact, because the construction of the new dam will save community/infrastructure from flood threat if any.
Climate Change and Disaster Risk Questions	**Yes**	**No**	**Remarks**
▪ The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.			
▪ Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes?	×		Project area is prone to floods and earthquakes. Appropriate engineering measures to minimize negative impacts, such as designing water diversion structures on the basis of calculating 500 years return period of Nullahs to maintain downstream flows and considering seismic resilience in construction.
▪ Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., increased glacial melt affect delivery volumes of irrigated water; sea level rise increases salinity gradient such that source water cannot be used for some or all of the year)?	×		climate resilience considerations will be incorporated into the project design and Restoration and rehabilitation of water conservation structures will be done
▪ Are there any demographic or socio-economic aspects of the Project area that		×	

Screening Questions	Yes	No	Remarks
are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?			
▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by diverting water in rivers that further increases salinity upstream, or encouraging settlement in earthquake zones)?		×	

Annexure 2: NOC from Balochistan EPA

BALOCHISTAN ENVIRONMENTAL PROTECTION AGENCY

"Environment is a commonality we all equally share and Its protection is a commonality we all must equally strive for"

NO.DG/EPA/2020/7685-88/ Dated: Quetta 27th November, 2020

ENVIRONMENTAL APPROVAL

To

The Project Director
Balochistan Water Resource Development Sector Project
Government of Balochistan
Irrigation Department

Project Description:	**Construction of Sub-Projects proposed under BWRDS Project for Mula River Basin**
Location of Project:	District Khuzdar
Date of filling of EIA:	08-10-2020

After comprehensive assessment of subject Environmental Impact Assessment (EIA) Report, the Balochistan Environmental Protection Agency has decided to accord Environmental Approval in favor of the Project Director BWRDS Project for construction of sub-projects proposed under BWRDS project for Zhob River Basin subject to following terms and conditions laid down in Section 17 & 18 of EIA/IEE Regulations 2000 :-

1. The Proponent shall ensure compliance of the National Environmental Quality Standards (NEQS) for ambient air, noise, liquid and waste generated during construction and operation activities of the project.
2. Mitigation Measures suggested in the EIA Report and Environmental Management Plan (EMP) shall be strictly adhered to minimize any negative impacts on soil, ground water, air and biological resources of the Project area.
3. Complete code of Health, Safety and Environment (HSE) shall be developed which should include efficient parameters at specific work place. For this purpose HSE setup should be established and supervised by designated HSE officer at senior level with sufficient administrative and technical authority to perform the assigned function properly. The proponent shall ensure that the operating instructions and emergency response actions are made available to every worker/laborer/commuter at site.
4. Natural flow of water should not be disturbed and the project be executed/carried out within the time frame prescribed as per schedule. The schedule shall be submitted to this office prior to the commencement of the activities.
5. Watershed management practices should be adopted in the catchment areas.
6. Monitoring shall be carried out during the entire period of the Project activities. Monitoring Reports shall be submitted to EPA Balochistan on monthly basis.
7. Compensation shall be provided to the inhabitants in case of loss of agricultural land, crop, property etc. in accordance with the rates prescribed in the Provincial Land Acquisition Act. All conflicting issues regarding compensation, etc, should be settled amicably before the start of the project activities. A Resettlement Action Plan shall be submitted to this office in due course of time.

8. Any change in the approved project shall be communicated to Balochistan Environmental Protection Agency and approval of the same shall be obtained from this Agency.

9. An emergency Response Plan should be established to address the natural and DDMA anthropogenic hazards/catastrophe in coordination with Provincial Disaster Management Authority (PDMA).

10. The proponent shall ensure to take effective measures (installation of protection walls, Gabion walls etc.) for land stabilization and prepare a comprehensive plantation plan at pre-identified dumping sites after land leveling by consulting with relevant authorities.

11. The proponent / Contractor shall make sure the safety and security of wild animals and their habitats at the project site and its environs with the prior consultation and strictly adhering to the guidelines of concerned wildlife authorities.

12. The proponent shall ensure that emission level of machinery Are within permissible limits and ensure that work shall not be carried out at night hours.

13. The proponent shall plant 500,000 indigenous forest tress in consultation with Forest Department. The Forest Department shall also take measures for protection and maintenance of these trees and maintain their proper record.

The proponent shall ensure that the farmers of tail shall not be affected due to the project oration. Proper share of the water should be made available without any deviation.

The proponent shall redress the objection / concerns of neighbors/ stakeholder on priority basis (if any at any stage).

16. Maximum skilled and unskilled jobs after fulfilling the eligibility criteria shall be given to the local community.

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27/11/20

17. The proponent shall ensure availability of downstream E-Flow during construction and operational phases of the project as per design and maintain record thereof.

18. Given to the geology, topography, terrain and demography of the project areas, pre-identified sites shall be utilized for quarrying purpose so that the issues like land degradation, soil erosion, sedimentation of water bodies and potential threats to the human life & properties and public infrastructure could be avoided.

19. The proponent will install standby power generators (if required) adopting sound proofing techniques and it shall be equipped with chimney with proper height to discharge the hot gases / smoke.

20. After completion of project, project area (camp site, workshops, batching plant and stockpile sites) should be restored to its regional condition. For this purpose documentation in terms of videos and photographs should be kept in record.

21. The proponent shall, before commencing construction of the Project, acknowledge acceptance of the stipulated conditions by executing an Undertaking in the form prescribed in Schedule VII of Review of IEE/EIA Regulations 2000.

22. The proponent should ensure the compliance of COVID-19 SOPs for laborers/workers at camp site and construction site.

23. The proponent shall be liable for correctness and validity of information supplied to this Department by the Environmental Consultant.

24. The proponent shall be liable for compliance of Regulations 13, 14 and 19 of IEE / EIA Regulations, 2000, regarding approval, confirmation of compliance, entry, inspections and monitoring.

25. The Proponent shall facilitate BEPA's team during inspection and monitoring project activities.

26. This approval shall be treated as null and void if or any of the conditions mentioned in the approval, BEPA, 2012, Rules and Regulations, Guidelines and instructions is / are not complied with or committed by the proponent or his/her agent or employee.

27. This approval shall be valid (for commencement of construction) for the period of Three Years from the date of issue under the Regulation 17 of IEE/EIA Regulation, 2000.

28. This approval can be withdrawn at anytime without any prior notice if deemed necessary in the Public / National interest.

29. EPA reserves the right to impose any other condition based on its monitoring.

30. This approval does not absolve the proponent of the duty to obtain any other approval or consent that may be required under any law in force.

7685-88
27/11/20

DIRECTOR GENERAL

Copy forwarded for information to:-

1. The Secretary Climate Change & Environment Department, Government of Balochistan, Quetta.
2. The Secretary Irrigation Department, Government of Balochistan, Quetta.
3. The Assistant Director EPA, district Khuzdar.
4. Office / Master file.

DIRECTOR GENERAL

Annexure 3: Secondary Environmental Monitoring Data

Ambient Air Quality Monitoring Results

PERAC RESEARCH & DEVELOPMENT FOUNDATION

TEST REPORT Page 12 of 12

Customer's Name	M/s NEC Consultant (Pvt) Ltd	**Test Report No**	2421K/2016-2017
Customer's Ref	E-mail	**Reporting Date**	08-06-2017
Date	05-05-2017	**Sample Code**	7020-7029
Sample Description	SPM, µg/Nm³ Analysis	**Sampling Date**	16-05-2017

Code #	LOCATION	TEST RESULTS
7020	Chutta	12
7021	Wandari	14
7022	Khadri	15
7023	Jhakaro	11
7024	Acharwand	Nil
7025	Sinjori	4
7026	Hatachi Khizras Infiltration Gallery	Nil

Prepared by | Section In charge (E) | Head R&ASD

The analyses based on Sample (s) provided to us by the Client. The interpretation or opinions expressed represent the first judgment (E.& O.E.). We have no responsibility and warranty or representation in connection with which such report is used.

Rev. No: 0 | Dated: 21.01.2000 | F-30-05

7-B, Korangi Industrial Area, Adjacent NRL, Karachi-74900
Ph: +(92-21) 35121857, 35121905, 35054669-72, Fax: +(92-21) 35054745
Website : www.prdlab.com E-mail: info@prdlab.com, prd@cyber.net.pk

Noise Level Results

PERAC RESEARCH & DEVELOPMENT FOUNDATION

TEST REPORT

Page 11 of 12

Customer's Name	M/s NEC Consultant (Pvt) Ltd	Test Report No	2421/2016-2017
Customer's Ref	E-mail	Reporting Date	08-06-2017
Date	05-05-2017	Sample Code	7010-7019
Sample Description	Noise Analysis	Sampling Date	16-05-2017

TEST RESULTS

Code #	LOCATION	Noise dB (A) By Analyzer
7010	Chutta	38
7011	Wandari	41
7012	Khadri	35
7013	Jhalaro	36.2
7014	Acharwand	37
7015	Sinjori	36
7016	Hatachi Khizran Infiltration Gallery	32
	NEQS Limits	85

Prepared by | Section In charge (E) | Head R&ASD

The analyses based on Sample (s) provided to us by the Client. The interpretation or opinions expressed represent the best judgment (E.& O.E.). We have no responsibility and warranty or representation in connection with which such report is used.

Rev. No. 0 | Dated: 21-01-2010 | F-10-05

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Surface Water Tests Results

PERAC RESEARCH & DEVELOPMENT FOUNDATION

TEST REPORT — Page 07 of 12

Customer's Name	M/s NEC Consultant (Pvt) Ltd	Test Report No	2421F/2016-2017
Customer's Ref	E-mail	Reporting Date	08-06-2017
Date	06-05-2017	Sample Code	7006
Sample Description	Surface Water (Hatachi-Khizran Infiltration gallery)	Sampling Date	16-05-2017

TEST METHOD	METHOD TITLE	TEST RESULTS
HACH-8237	Turbidity, NTU	Nil
APHA-209C	Total Suspended Solids, mg/L	Nil
APHA-209B	Total Dissolved Solids (TDS), mg/L	357
D-1293	pH @ 25 °C	7.99
	Chemical	
By AA	Aluminum (Al) , mg/L	Nil
By AA	Antimony (Sb), mg/L	Nil
By AA	Arsenic (As), mg/L	Nil
By AA	Barium (Ba), mg/L	Nil
By AA	Boron (B), mg/L	Nil
By AA	Cadmium (Cd), mg/L	Nil
By AA	Chromium (Cr), mg/L	Nil
By AA	Copper (Cu), mg/L	Nil
By AA	Lead (Pb), mg/L	Nil
By AA	Manganese (Mn), mg/L	Nil
By AA	Nickel (Ni), mg/L	Nil
APHA-320	Mercury (Hg), mg/L	Nil
By AA	Selenium (Se), mg/L	Nil
By AA	Zinc (Zn), mg/L	Nil

Prepared by | Section In charge (E) | Head R&ASD

The analyses based on sample (s) provided to us by the Client. The interpretation of opinions expressed represent the best judgment (E & O.E.). We have no responsibility and warranty or representation in connection with which such report is used.

Rev. No. 0 | Dated: 21-01-2000 | F-10-05

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Annexure 4:Occupational Health and Safety Plan

General

Occupational Health and Safety covers all personnel working under the project and will be in line with the World Bank/IFC 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 sites associated with the various project construction activities. Other risks associated with the project construction phase include 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.

a. 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 HIV, STDs, and hepatitis and take necessary steps as mandated by the Contractual agreement between the Contractor and the Worker(s).

b. Minimizing hazards and risks at the workplace.

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

i. Installation of signboards and symbols in risky and hazardous areas, to inform workers to be careful.
ii. Construction of barricades around construction sites and deep excavated pits, to cordon off and deter entry of unauthorized personnel and workers into these areas.
iii. Providing a safe storage site/area for large equipment such as power tools and chains, to prevent misuse and loss.
iv. 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.
v. Removing all scrap timber, waste material and rubbish from the immediate work area as the work progresses.

vi. 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;
vii. 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 horizontals.
viii. 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.
ix. Constructing support systems, such as bracing to adjoining structures that may be endangered by excavation works nearby.
x. Only a trained electrician to construct, install and repair all electrical equipment to prevent risks of electrical shocks and electrocution.
xi. Install fire extinguishers and/or other fire-fighting equipment at every work site to prepare for any accidental fire hazards.

c. 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:

i. High visibility clothing for all personnel during road works must be mandatory.
ii. 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.
iii. Safety belt shall be provided to workers working at heights (more than 20 ft) such as roofing, painting, and plastering.
iv. Safety boots shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.
v. Ear protecting devices shall be provided to all workers and will be used during the occurrence of extensive noise.
vi. Eye and face protection equipment shall be provided to all welders to protect against sparks.
vii. Respiratory protection devices shall be provided to all workers during occurrence of fumes, dusts, or toxic gas/vapor.
viii. Safety nets shall be provided when worPunjablaces are more than 25 feet (7.5 m) above the ground or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors or safety belts is impractical.
The specific PPE requirements for each type of work are summarized below.

Table 6.1 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.

d. 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:

i. Provision of dispensaries by the individual EPC contractor.
ii. 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.
iii. 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.
iv. Communication arrangements, such a provision of radios or mobile communication for all work sites, for efficient handling of emergencies, will be made.

e. 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.

f. Compensation for Injuries and Death

Any casualty or injury resulting from occupational activities should be compensated as per the local labor laws. 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.

g. Awareness Programs

The Project management will undertake awareness programs through posters, talks, and meetings with the contractors to undertake the following activities:

i. Dissemination sessions will clarify the rights and responsibilities of the workers regarding interactions with local people (including communicable disease risks, such as HIV/AIDS), work site health and safety, waste management (waste separation, recycling, and composting), and the illegality of poaching.
ii. Make workers aware of procedures to be followed in case of emergencies such as informing the focal health person who in turn will arrange the necessary emergency transportation or treatment.

h. 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:

i. Function as the focal person/representative for all health and safety matters at the workplace;
ii. Responsible for maintaining records of all accidents and all health and safety issues at each site, the number of accidents and its cause, actions taken and remedial measures undertaken in case of safety issues;
iii. 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;
iv. 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.

Annexure 5:Emergency Response Plan

PURPOSE

The purpose of this Emergency Response Procedure is to provide measures and guidance for the establishment and implementation of emergency preparedness plans for the project. The aim of the Emergency Response Procedure is to:

(i) Ensure all personnel and visitors to the office/job sites are given the maximum protection from unforeseen events.
(ii) Ensure all personnel are aware of the importance of this procedure to protection of life and property.

EMERGENCY PREPARATION AND RESPONSE MEASURE SCOPE

The emergency management program is applied to all Project elements and intended for use throughout the Project life cycle. The following are some emergencies that may require coordinated response.

(i) Construction Accident
(ii) Road & Traffic Accident
(iii) Hazardous material spills
(iv) Structure collapse or failure
(v) Trauma or serious illness
(vi) Sabotage
(vii) Fire
(viii) Environmental Pollution
(ix) Loss of person
(x) Community Accident

RESPONSIBILITIES

The detailed roles and responsibilities of certain key members of the Emergency Response team available to assist in emergency are provided in **Table 7.1** below.

Table 7.1 Emergency Response Team

Action Group	Responsibility
Emergency Coordinator	Overall control of personnel and resources. The Emergency Coordinator will support and advise the Site Safety Supervision as necessary. Serves as public relations spokes persons, or delegates to some staff member the responsibility for working with news media regarding any disaster or emergency. Also assure proper coordination of news release with appropriate corporate staff or other designated people.
Site Safety Supervision (Emergency Commander)	Overall responsibility for activating emergency plan and for terminating emergency actions. Be alternative of emergency response chairpersons. Disseminates warnings and information as required to ensure all people in the immediate area have been warned and evacuated either by alarms or by word of mouth. Supervise the actions of the Emergency Response Team to ensure all persons are safe from the danger. Notify outside authorities if assistance is required. Carries the responsibility for coordinating actions including other organizations in accordance with the needs of the situation. Ensure maximum co-operation and assistance is provided to any outside groups called to respond to an emergency. Establish and appoint all emergency organization structure and team. Assures adequate delegation of responsibilities for all key positions of assistants on the Project to assist with any foreseeable emergency. Ensure resources available to purchase needed emergency response equipment and supplies. Assures that all persons on the Emergency Response Team aware and fully understand their individual responsibilities for implementing and supporting the emergency plan. Establish the emergency drill schedule of all identified emergency scenarios, track the status and evaluate the emergency. The Emergency Commander shall ensure that senior management personnel have been reported of the emergency as soon as practical after the event.
Security Team	Ensure that the exit route is regularly tested and maintained in good working order. Maintain station at the security gate or most suitable location to secure the area during any emergency such that only authorized personnel and equipment may enter, prevent access to the site of unauthorized personnel. Assist with strong/activation of services during an emergency. Ensure vehicles and obstructions are moved to give incoming emergency vehicles access to the scene, if ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct any incoming emergency service to the site of emergency.
	Protect the injured from further danger and weather.

Action Group	Responsibility
Rescue & Medical Team	Provide treatment to the victim(s) to the best of their ability by first aid and then transfer to hospital. Remain familiar with the rescue activities and rescue apparatus. Assist outside medical services personnel when they arrive
General Administration Team	Response to support any requested general facilities for assisting Emergency Response Team in their work.
Government Relation Team	Coordinate with local government on a matter of concerned in the emergency response plan to liaise with local officers in their affair for support Emergency Response Team. Coordinate emergency plan with the government authorities, local community.
Environment Team	In case of emergency related to the environmental pollution such as the chemical spill, oil spill into the ambient, the environment team will support the technical advice to control and mitigate the pollution until return to the normal situation.
Department Heads	Call up of personnel into the safe location for protective life and property. Take immediate and appropriate action while Emergency Response Team is being mobilized. Keep in touch with the Emergency Commander Control and supervise operators and contractors on the implementation of this procedure, with consultation with Safety Team as necessary. Provide and maintain emergency equipment of their responsible areas.
Other Staff and Employees	All other staff and employees will remain at their workstations or assembly point unless directed otherwise from Emergency Response Team. Each supervisor will ensure that all members of his work group are accounted for and keep in touch with each of their Department Head.

PROCEDURE

Emergency situation and injuries to person can occur at any time or place either on Project site or elsewhere. The most two common types of emergencies on site are fire and serious accident.

Figure 7.2. Emergency Procedure for Fire

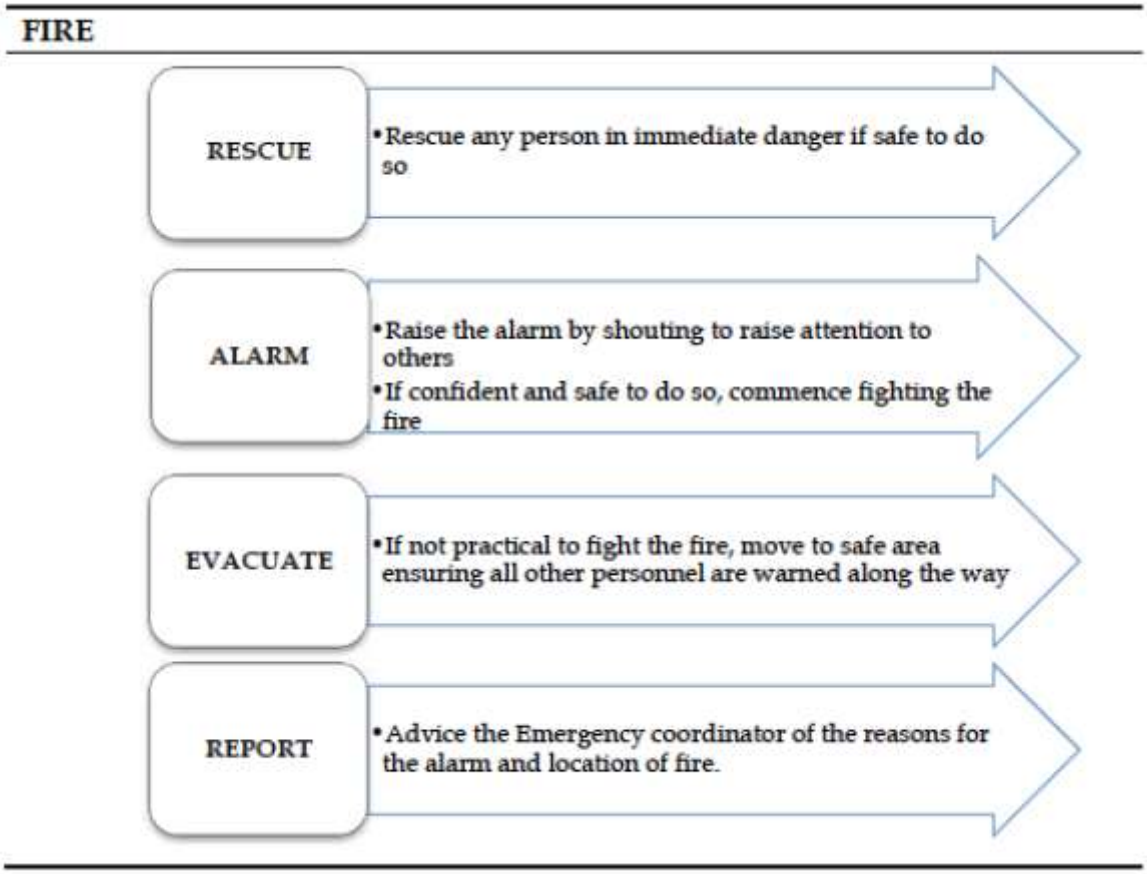
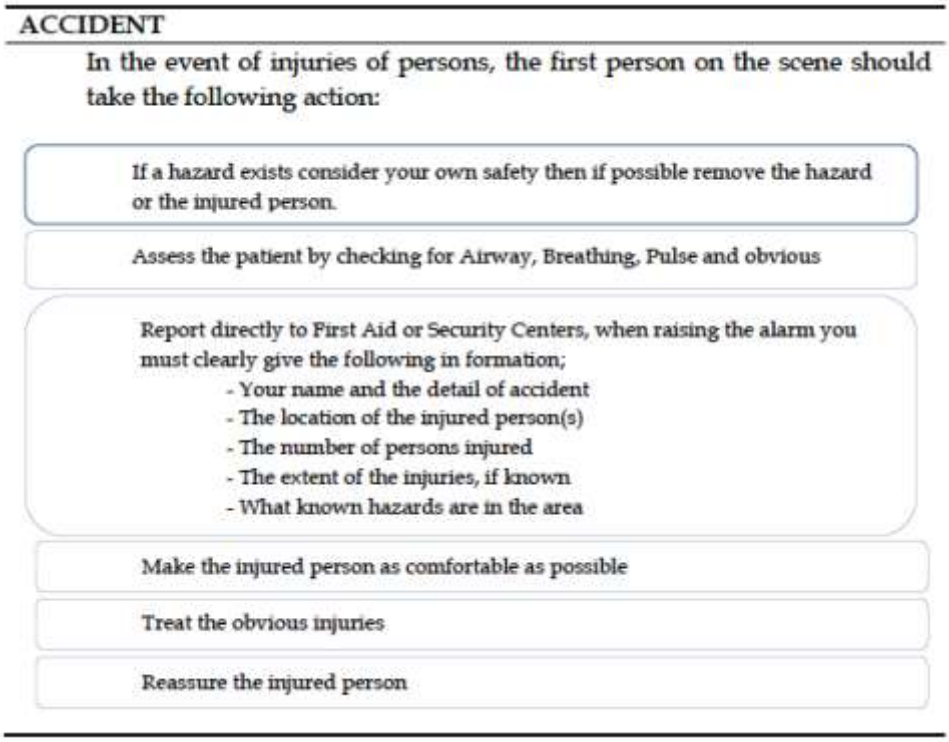


Figure 7.3 Emergency Procedure for Serious



COMMUNICATION WITH AUTHORITIES / PRESS AT SITE

In the event of an accident or incident, only senior staff is permitted to give factual information to the authorities for resource of liability exposure. The press must be avoiding politely, at all costs, with the terse comment that “the matter is under investigation and relevant information when available will be provided by our Head Office” Do not ever give your opinion or story.

First Aid Persons

- Upon advice of medical emergency, make immediate assessment to response required and if necessary, advise security to summon ambulance or medical assistance, the qualified first aid attendant should also,
- Provide treatment to the victim(s) to the best of his/her ability.
- Ensure the safety of victims by ceasing any work activity in the area.
- Protect the injured from further danger and weather.
- Assist medical services personnel when they arrive.

General Administration Team

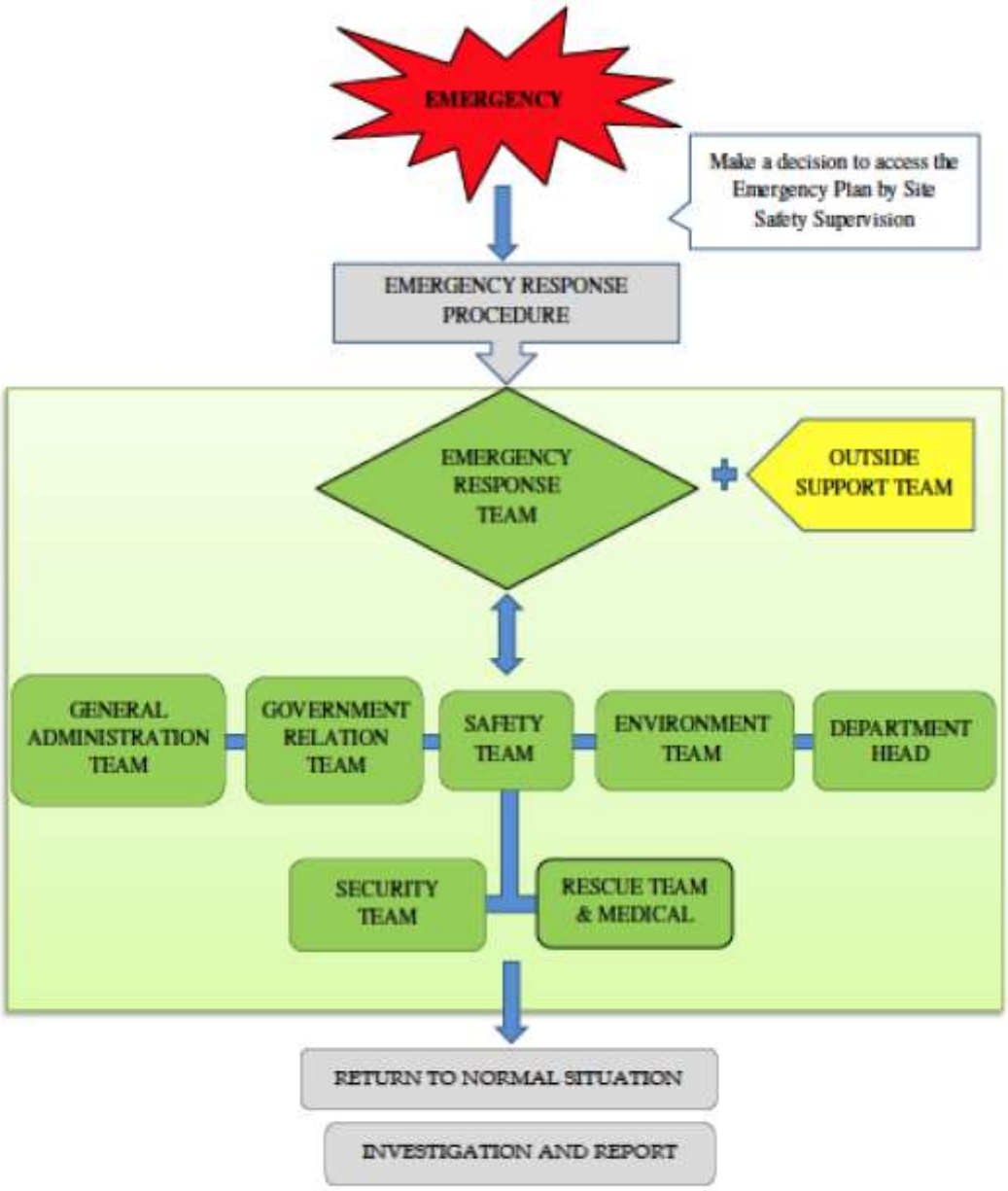
- Upon advice of medical emergency, maintain contact with first aid personnel and summon ambulance if required.

Security Team

- If ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct vehicle closest to the scene.
- Prevent access to the site of unauthorized personnel (press, etc.).

Emergency Coordinator

- The Emergency Coordinator shall assist emergency personnel at the scene as required through allocation of company resources.
- The Emergency Coordinator shall ensure next-of-kin are properly notified as soon as possible and give whatever company support and assistance is necessary to assist them bundle the situation
- The Emergency Coordinator shall ensure that senior management personnel are advised of the emergency as soon as practical after the event.



Note: Name of contact person and call number from Owner/Contractor to be determined.

Details of the actual Job Being done at the time:

Details of Accident / Incident / What actually happened?

Section F: Accident Cause (Basic cause mark X / Contributing cause, if any mark O)

UNSAFE CONDITIONS		UNSAFE ACTS	
1	☐ Inadequately Guarded	1	☐ Operating Without Authority / Training
2	☐ Unguarded	2	☐ Operating at Unsafe Speed
3	☐ Defective Tools, Equipment, or Substance	3	☐ Marking SHE Device Inoperative
4	☐ Unsafe Design or Construction	4	☐ Using Unsafe Equipment or Equipment Unsafely
5	☐ Hazardous Arrangement	5	☐ Unsafe Loading, Placing, Mixing
6	☐ Unsafe Illumination	6	☐ Taking Unsafe Position
7	☐ Unsafe Ventilation	7	☐ Working on Moving or Dangerous Equipment
8	☐ Unsafe Clothing	8	☐ Distraction, Teasing, Horse Play
9	☐ Insufficient Instruction	9	☐ Failure to use Personal Protective Devices
10	☐ Lack of system of work	10	☐ Lack of effective instruction or supervision

Why was the unsafe act committed? _____ Why did the unsafe condition exist? _____

Section G: Guide to Corrective Action (Base on the cause checked above, I am taking the following corrective action)

UNSAFE ACT	UNSAFE CONDITION	If Supervisor can't handle, then recommend to
☐ Stop the Behaviour	☐ Remove	☐ Site Engineer, or
☐ Study the job	☐ Guard	☐ Site Manager, or
☐ Instruct (tell-show-try-check)	☐ Warn	☐ Project Manager, or
☐ Follow Up	☐ Supervisory Training	☐ Safety Committee
☐ Enforce		

Detail below any immediate remedial actions that have been taken:

Detail below any corrective and preventative actions that could be taken to prevent future re-occurrence:	Responsible	Completion Date

Annexure 6: Archaeological 'Chance Find' procedure

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.

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.

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.

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:

(i) Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance.
(ii) Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area.
(iii) 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.
(iv) Work will not re-commence in this location until agreement has been reached between DoA and proponent as to any required mitigation measures, which may include excavation and recovery of the item.
(v) A precautionary approach will be adopted in the application of these procedures.

Detailed Procedural Steps

If the Director, department of Archaeology receives any information or otherwise has the 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 discovering or 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.

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 damage in 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 as for a public purpose.

Annexure 7: Dust Management Plan

General

The purpose of this plan is to describe the measures that the project shall take to ensure that the risk of emissions from dust generated by site operations during construction are minimized and that best practice measures are implemented.

Dust emissions from construction can cause ill health effects to Contractor staff along with nuisance and annoyance to members of the local community. Dust will be controlled through:

- Elimination
- Reduction/Minimisation
- Control

This dust management plan shall be implemented based on the measures already provided in the Environmental Management Plan (EMP) relating to controlling dust emissions.

Methodology

The following methodology will be undertaken for each project section:

Step 1 – Identify the dust generating activities

Construction activities that are likely to produce dust will be identified. The activities that will be taken into account are:

- Haulage Routes, Vehicles and Asphalt/Concrete Batching Plant
- Roads, surfaces and public highways
- Static and mobile combustion plant emissions
- Tarmac laying, bitumen surfacing and coating
- Materials Handling, Storage, Spillage and Disposal
- Storage of material
- Stockpiles
- Spillages
- Storage of Waste
- Site Preparation and Restoration after Completion
- Earthworks, excavation and digging
- Storage of spoil and topsoil
- Demolition
- Construction and Fabrication Processes

Step 2 – Identify e Receptors

e receptors have already been identified. The nature and location of the sensitive receptors will be taken into account when implementing control measures.

Step 3 – Implement Best Practice Measures to Control

Based on the nature of the activity producing the dust, the likelihood of dust being produced and the possible consequence of dust based on the sensitive receptors, the most effective control measure will be identified and implemented.

Step 4 – Monitor effectiveness of control

Construction Supervision Staff (CSC) will have the responsibility to ensure that dust control measures are being implemented and are effective.

Step 5 – Record and report result of monitoring

All inspections, audits and results of monitoring will be recorded and kept as part of the site filing system.

Method Statements and Risk Assessments

- The Contractor's Risk Assessments and Method Statements will be required to be approved by the CSC prior to commencing work and will be required to contain environmental aspects of the task, including dust control measures where required.
- Where dust has been identified within the risk assessment as a significant issue, the method statement will be required to cover the following:
- Methods and materials that will be used to ensure that dust generation is minimized.
- The use of pre-fabricated materials where possible.
- Optimum site layout:
- Dust generating activities to be conducted away from sensitive receptors
- Supply of water for damping down.
- Good housekeeping and management
- All employees will be briefed on the Risk Assessment and Method Statement before starting work.

Training

All Contractor staff will be required to attend training seminars as already mentioned in the EMP document. A site-specific induction will also be required before being allowed to work on site. These will include site-specific sensitive receptors and details regarding dust control measures to be taken.

Toolbox talks on air pollution and minimizing dust emissions will be provided on a regular basis to Contractor staff.

Identification of Dust Generating Sources and Control Methods Haulage Routes, Vehicles and Asphalt/Concrete Batching Plant

Dust Source	Dust Control Methods
Major haul roads and traffic routes	Haul roads will be dampened down via a mobile bowser, as required.
Public Roads	Road sweeper will be used to clean public roads as required.
Site traffic management	Site traffic will be restricted to constructed access roads as far as possible. Site speed limit will be set at 10 mph as this will minimize the production of dust.
Road Cleaning	A mechanical road sweeper will be readily available and used.
Handling, Storage, Stockpiling and Spillage of Dusty materials	
Material handling operations	The number of times a material will have to be handled will be kept to a minimum to prevent double handling and ensure dusty materials are not handled unnecessarily.
Transport of fine dusty materials and aggregates.	Closed tankers will be used or sheeted vehicles.
Vehicle loading/unloading materials on to vehicles and conveyors.	Dusty materials will be dampened down Drop heights will be kept to a minimum and enclosed where possible.
Storage of Materials	
Bulk cement, bentonite etc.	Bentonite will be delivered in tankers and stored in dedicated enclosed areas. Bulk cement will be transported through tractor trollies or trailers.
Fine dry materials	These will be protected from the weather and by storing in appropriate containers and indoors, where necessary.
Storage location	Material will be stored in dedicated lay-down areas.
Storage of Stockpiles	
Stockpile location	Stockpiles will be placed so as to minimize double handling and facilitate the site restoration.
Building stockpiles	Stockpiles, tips and mounds will not be stored at an angle greater than an angle of repose of the material.
Small and temporary stockpiles	Where possible, stockpiles will be placed under sheeting. Dusty material will be damped down. Wind barriers (protective fences) of a similar height to the stockpiles will be erected, if required.
Large and long term stockpiles	Long-term stockpiles will be vegetated and stabilized as soon as possible. Stock plies will be dampened down until stabilized, where necessary. Wind barriers (protective fences) of a similar height to the stockpile will be erected, if required.
Waste Material from Construction	
Disposal method	A dedicated lay-down area will be available for waste. Waste will not be allowed to build up and will be disposed off at the designated locations as per EMP.
Site Preparation and Restoration	

Dust Source	Dust Control Methods
Earthworks, excavation and digging	These activity areas will be kept damp where required and if possible, will be avoided during dry and windy periods.
Completed earthworks	Surfaces will be stabilized by re-vegetation as soon as possible, where applicable.
Construction and Fabrication Process	
Crushing of material for reuse, transportation and disposal	Authorization will be obtained from PMU and ADB before using any mobile plant on site for activities such as crushing and screening. Any crushing or screening activities will be located away from sensitive receptors.
Cutting, grinding, drilling, sawing, trimming, planning, sanding	These activities will be avoided wherever possible. Equipment and techniques that minimize dust will be implemented. Water will be used to minimize dust.
Cutting roadways, pavements, blocks	Water sprinkling to be used.
Angle grinders and disk cutters	Best practice measures will be used such as dust extraction

Monitoring Arrangements

Monitoring will be conducted at sensitive receptor locations in the project area as provided in the EMP. Furthermore, at locations where PM levels are exceeding applicable guidelines, additional stringent measures will be implemented at the respective location(s) in the project area to ensure dust levels are controlled as far as possible.

Annexure 8: Site Specific EMP (SSEMP) Guide & Template for Guidance to Contractor

Guide for Development of SSEMP
Step 1: Define Boundaries
Step 2: Identify Sensitive Receptors
Step 3: Specify construction activities
Step 4: Conduct Risk Assessment
Step 5: Assign Environment Management measures
Step 6: Prepare Site Plans
Step 7: Prepare Environment Work Plans (if required)
Step 8: Monitoring

Step 1: The project area needs to be clearly defined.
Step 2: The mapping of sensitive receptors has already been conducted and needs to be presented clearly in a map.
Step 3: The tentative construction activities to be conducted are as follows:
Site Surveying and Vegetation (Trees and plants) Clearance
Establishment of Work Camp, Batching and Asphalt plant and access roads
Dismantling of Asphalt and existing structures including Utilities
Preparation of ground for Asphalting
Asphalting
Landscaping
Step 4: The Risk Assessment matrix template is provided in the table below.
Risk is assessed as the likelihood that the activity will have an effect on the environment as well as the consequence of the effect occurring. It is often described like this:

Risk = Likelihood × Consequence
Likelihood Scale

Likelihood	Definition	Scale
Certain	Will certainly occur during the activity at a frequency greater than every week if preventative measures are not applied	5
Likely	Will occur more than once or twice during the activity but less than weekly if preventative measures are not applied	3
Unlikely	May occur once or twice during the activity if preventative measures are not applied	2
Rare	Unlikely to occur during the project	1

Consequence Scale

Consequence	Definition	Score
Catastrophic	The action will cause unprecedented damage or impacts on the environment or surrounding community e.g. extreme loss of soil and water resources and quality from stormwater runoff extreme pollution of soil and water resources including major contamination from hazardous materials widespread effects on ecosystems with deaths of fauna/flora widespread community impacts resulting in illness, injury or inconvenience loss or destruction of archaeological or historical sites Occurrence will almost certainly result in the work being halted and a significant fine.	5

Major	The action will cause major adverse damage on the environment or surrounding communities' e.g. major loss of soil and water resources and quality from stormwater runoff major pollution of soil and water resources including contamination from hazardous materials significant effects on ecosystems with isolated deaths of non-vulnerable flora and fauna significant annoyance or nuisance to communities major damage to or movement required to archaeological or historical sites Occurrence may result in work being halted and a fine	3
Moderate	No or minimal adverse environmental or social impacts e.g. no measurable or noticeable changes in stormwater quality. Water quality remains within tolerable limits little noticeable effect on ecosystems no or isolated community complaints no or unlikely damage to archaeological or historical sites no likelihood of being fined	2
Minor	No or minimal adverse environmental or social impacts e.g. no measurable or noticeable changes in stormwater quality. Water quality remains within tolerable limits little noticeable effect on ecosystems no or isolated community complaints no or unlikely damage to archaeological or historical sites no likelihood of being fined	1

Risk Score Table

	Consequence				
		Catastrophic	Major	Moderate	Minor
Likelihood	Certain	25	15	10	5
	Likely	15	9	6	3
	Unlikely	10	6	4	2
	Rare	5	3	2	1

Risk: Significant: 15-25
Medium: 6-10
Low 1-5

Any Medium to Significant risk requires an environmental management measure to manage the potential environmental risk. Judgement will be required concerning the application of an environmental management measure to mitigate low risk situations.

The higher the risk the more intensive the required mitigation measure will need to be; e.g. where site sedimentation is deemed to be low risk, then silt fences may be needed but as the risk increases, then sediment traps may be required. The selection of the appropriate mitigation measure will require judgement based on the level of risk and the specific site parameters.

Step 5: The Environmental Management measures are to be extracted from the IEE study for the project and should be added in the last column of the table below.

No.	Construction Activity	Hazards to Consider	Likelihood that the site or sensitive receptors will be affected?	Consequence of the site or sensitive receptors being affected?	Risk Score (consequence x likelihood)	Environmental Management Measures
i	Site Surveying & vegetation clearance	Damage to vegetation beyond project footprint				These can be taken from the EMP provided in the IEE report (If Risk Score is 6 or more)
		Erosion of exposed areas and sediment				
		Loss of topsoil				
		Dust generation				
		Noise				
ii	Establishment of Work Camp, Batching plant etc.	Soil deposited onto roads from tires				
		Stock Pile erosion				
		Noise & Vibration				
		Traffic congestion				
		Fuel spills				
iii	Dismantling of Asphalt and existing structures including Utilities	Noise and vibration				
		Dust generation				
		Community safety				

		Worker safety				
		Traffic Congestion				
iv	Preparation of Sub-Base	Noise and vibration				
		Dust generation				
		Traffic Congestion				
vi	Landscaping	Dust generation				
		Sediment runoff				
		Failure of vegetation to take root				

Step 6: The Site plans are a critical part of the SSEMP and will need to be prepared, otherwise the ADB will consider the document as incomplete.
The site plan will need to provide the following:

- Indication of North and scale
- Existing and planned supporting infrastructure (e.g. access roads, water supplies and electricity supplies)
- Location of planned work
- Contours
- Drainage systems
- Locations of sensitive receptors

Step 7 (if required)[4]: The completed SSEMP provides details of all the environmental management requirements for all stages of the construction process. For individual work teams who are responsible for only a small part of the overall construction works it can be confusing as to what is required for their particular work component. For example, the work team responsible for stripping soil for the construction areas are not going to be interested in the requirements for pouring concrete for footings and foundations. However, it is essential that the soil stripping team knows exactly what to clear and what to leave, as well as where to put stockpiles of soil for later use.
In situations where different work activities are required at different times or at different locations, environmental work plans can be prepared. These are similar to the work method statements that are often produced for major construction projects.
Step 8: A detailed monitoring plan will be provided along with frequency and responsibilities to ensure all key environmental parameters are monitored to ensure compliance with both national and ADB requirements.

Template for SSEMP

- Introduction
- Project Overview
- Scope of SSEMP
- Objectives of SSEMP
- Map of Sensitive Receptors
- Construction Activities
- Risk Assessment
- Risk Assessment Matrix & Mitigation Measures
- Site Plan(s)
- Environmental Monitoring Plan
- Instrumental Monitoring of Environmental Parameters by Contractor as per EMP
- In-house monitoring
- Third Party environmental monitoring
- Visual monitoring of Environmental Parameters by Contractor as per EMP
- Responsibilities
- Organizational Responsibilities and Communication
- Responsibility of EA
- Responsibility of Construction Supervision Consultant (CSC)
- Responsibility of Contractor
- Responsibility of EPA

[4] ADB, Safeguards Unit for Central & West Asia Department, *Environmental Management for Construction Handbook*.

Annexure 9: Accident and Incident Investigation Procedure

INCIDENT / NEAR MISS REPORT	QUALITY RECORDS / FORMS	
	Doc. Level:	Doc. Version:1
	Doc. No	

HS.T.02	INCIDENT / NEAR MISS REPORT	
Title of Project:		
Location:		Date:

Objective(s)

To implement immediate and effective process in order to provide immediate treatment against any fatality, Injuries, Casualty.

SECTION A: TO BE COMPLETED BY PERSON INVOLVED (OR BY SUPERVISOR OR HEALTH AND SAFETY REPRESENTATIVE IF WORKER IS INCAPACITATED) AND BY THEIR SUPERVISOR

Details of the person involved in the incident/near miss

Employee #: ..... **Site Address** ..... **Work phone:** .....

Name: ..... **Father Name:** .....

Position: ..... **Date of birth:** ..... ☐ **Male** ☐ **Female**

Please select one: ☐ Member ☐ Client Member ☐ Sub Contractor ☐ Visitor/Other

Details of the: ☐ Incident ☐ Near miss ☐ Medical

Date: ..... **Time:** ..... A.M /P.M

City: ..... **Location:** .....

Was the incident/near miss reported to your supervisor, immediately: ☐ Yes ☐ No

Part of the body injured

Head	Trunk	Internal	Arm	Hand	Leg	Foot eye
☐ neck	☐ heart	☐ left	☐ left	☐ left	☐ left	☐ ear
☐ hip	☐ lungs	☐ right	☐ right	☐ right	☐ right	☐
☐ nose	☐ chest	☐ systemic	☐ shoulder	☐ thumb	☐ knee	☐ great toe
☐ mouth	☐ stomach		☐ upper arm	☐ fingers	☐ lower leg	☐ other toes
☐ teeth	☐ groin		☐ elbow	☐ palm	☐ ankle	
☐ face	☐ back		☐ forearm		☐ thigh	
☐ skull	☐ multiple		☐ wrist		☐ upper leg	☐ psychosocial

Nature of injury

☐ abrasion	☐ puncture	☐ heart attack	☐ sprain	☐ burn	☐ traumatic shock
☐ bruise	☐ laceration	☐ hearing loss	☐ strain	☐ scald	☐ electric shock
☐ fracture	☐ amputation	☐ foreign body	☐ hernia	☐ rash	☐ psychosocial
☐ concussion	☐ bite	☐ minor cuts		☐ allergy	☐ chemical

☐ aggravation of previous injury or medical condition *(please describe)*: .....

Type of incident which caused injury

☐ striking against	☐ stumbling	☐ lifting	☐ pushing	☐ ingestion
☐ struck by	☐ slipping	☐ bending	☐ pulling	☐ absorption
☐ caught in/on	☐ tripping	☐ twisting	☐ jumping	☐ inhalation
☐ stepping on	☐ falling	☐ stress	☐ vehicle	☐ needlestick
☐ other *(please describe)*:				

Annexure 10: Traffic Management Plan

Need for Plan

The construction of the Landfill will take over 24 months and, in this period, huge vehicular movement carrying large amount 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 residents in terms of noise, dust, congestion and inconvenience.

The plan

The Objective of Traffic Management Plan (TMP) is to define the requirements that should be implemented 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 and wash-out areas. It is intended to compliment and work alongside relevant ESMMP. The TMP will be classed as “live” and therefore be subjected to updates as required.
- Contractor, at the time of the execution of the project will prepare a comprehensive TMP in coordination with local traffic police department, PMU, emergency services and local administrative department. The PMU and CSC will review and approve contractors 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 construction.
- 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 a result of the Project.
- Spoil dumpsites located close to Project site to minimize journey distance and limit movements to site access roads.
- Concrete mixing plant located at Project site limiting traffic movements associated with concrete delivery 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 times of day when traffic is at its greatest.
- Schedule deliveries and road movements to avoid peak periods
- Road maintenance fund to leave a useful asset for communities after the construction phase.
- 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 Traffic Management Authority)
- 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.
- Run a pedestrian awareness programme
- Temporary signage
- The traffic management plan is provided below.

- 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 project site would be annoyed by the emissions, noise and visual intrusion of queuing vehicles. Some important factors involved in access routes and site traffic are as follows:

- 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 these issues and to effectively manage them before the beginning of the construction.

Site Workers Traffic

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

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.

Contractor's Obligation

The traffic management plan of the Contractor should be safe enough and widening of access roads and construction of the detours must be completed before start of project construction activities so that heavy vehicular transportation for construction activities do not hinder the normal course of traffic lanes. While widening the access roads, the safe movement of the vehicles, people, animals and wildlife must be ensured. It will be sole responsibility of Contractor. The roads widening should be designed on the basis of the traffic survey, summarized and estimated site traffic. 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, PMU, emergency services and Traffic Police, and also publish weekly programme in local newspapers.

Annexure 11: Solid Waste Management Framework

INTRODUCTION

Construction contractors may use this framework as guiding document for preparation of site specific solid waste management plan. The purpose of this Framework Solid Waste Management Plan is to ensure that wastes arising from the proposed construction works are managed, reused, recovered or disposed of by a method that ensures the provisions of the BEPA rules and ADB SPS, 2009. It also ensures that the optimum levels of waste reduction, re-use and recycling are achieved.

Waste management priorities for project are based following waste management hierarchy.

- Prevent material wastage
- Minimise the quantity of waste
- Reuse of site materials
- Recycling of waste
- Energy recovery
- Disposal
-

WASTE MANAGEMENT AT Balochistan Project sites
National Level
Waste management of the project will be carried as per national rules including:

- Solid Waste Management Policy, 2000
- Requirements of Balochistan Environmental Protection Act
- Draft Guidelines on Solid Waste Management, 2005.
- Section 11 of PEPA, 1997 prohibits discharge of waste in amount that violates the NEQS.
- Draft Hazardous Substances rule of 1999
- Section 132 of Cantonment Act, 1942
- Provision Contains in the Local Government Ordinance, 2001

Regional Level

- Asian Development Bank (ADB) SPS, 2009
- IFC guidelines for Solid Waste Management
- Best practices of waste management on construction sites

Details of the wastes to be produced
During construction/civil works, potential sources of waste will include spoils generated during excavation, concrete and construction waste, domestic wastes (solid & wastewater), fuel or oil leakages or spills, onsite effluents from vehicle wash & cleaning, and cement spills. It is the responsibility of all personnel on site including Contractors, Sub-Contractors and their Employees to ensure compliance with this Waste Management Plan.

Main Waste Categories
Contractors are required to develop inventory of main waste categories that will be generated during construction phase of the project. Anticipated main waste categories include construction debris, concrete waste, scrap wood, bricks, concrete, asphalt, plumping fixtures, piping, insulation (asbestos and non-asbestos), metal scraps, oil, electrical wiring and components, chemicals, paints, solvents.

Anticipated Hazardous Waste Arising

Fuels stored on site that will be used during the construction phase are classed as hazardous. There will be fuel stored on site for machinery and construction vehicles. All fuel tanks and

draw off points will be bunded. If the fuel is correctly contained and bunded, it is not expected that there will be any fuel wastage at the site. Other sources of hazardous waste include used paints, used oil/lubricants, electrical waste and chemicals. Project contractors are required to develop SOPs for handling, storage and disposal of hazardous waste arising from the project.

ESTIMATED WASTE GENERATION

Construction Waste Generation

Project contractors are required to develop and maintain waste inventory clearly showing the type, amount and location of waste generated from different activities at the site. Waste record keeping is key to successful implementation of waste management plan.

Proposed Waste Management Options

Waste will be segregated on site. Contractor will ensure that sufficient number of waste drums are placed at site with appropriate color coding. All recyclable waste will be handed over to recycling contractor. The appointed waste contractor will collect and transfer the recyclable wastes as receptacles are filled. The non-recyclable waste will be transferred by an authorized waste collector to an appropriate facility. Project contractors will identify both recycling and non-recycling contractor working in the project area. Contractors through bidding documents will be bound to hire such waste contractors for efficient waste management at project sites.

A successful Waste Management Plan is largely dependent on how readily it can be changed into normal site operations by the person responsible. It is recognized that the plan should not be obstructive to site operations and the construction program by placing the responsibility of construction waste management with the Manager, all reuse, recycling, wastage and necessary disposal can be monitored as close to the source as possible. An Environmental Representative from each Works Sub-Contractor will also be nominated responsible for all waste management in their own operations. In this way, it is possible to identify where the greatest material wastage occurs, with a view to implementing better management.

The site Construction Manager will be designated as the Responsible Person and have overall responsibility for the implementation of the on-site Waste Management Plan. The Responsible Person will be assigned the authority to instruct all site personnel to comply with the specific provisions of the plan. At the operational level, a nominated Environmental Representative from each sub-contractor company on the site shall be assigned the direct responsibility to ensure that the discrete operations stated in this framework for solid waste management are performed on an on-going basis.

Tracking and documentation procedures for off-site waste

The site construction Manager will maintain a copy of all waste collection permits. If waste (soil & stone) is being accepted on-site, a waste docket must be issued to the collector. If the waste is being transported to another site, a copy of the waste permit for that site must be provided to the manager. Record of waste collection docket, a receipt from the final destination of the material will be kept as part of the on-site waste management records. All information will be entered in a waste management system to be maintained on-site.

Disposal Waste

Contractors are required to develop SOP for disposal of recyclable, non-recyclable and hazardous waste generated at site. Food waste will be disposed at food waste pit which will be fenced. Recycling waste will be handed over to recycling waste contractor. Hazardous waste will be disposed through incineration facility available in close proximity of the project area. Workers on the site will be encouraged to recycle as much municipal waste as possible i.e. cardboard, plastic, metals and glass. Prior to removal, the municipal waste will be examined to determine if recyclable materials have been placed in other containers. If this is

the case, effort will be made to determine the cause of the waste not being segregated correctly.

ESTIMATED COST OF WASTE MANAGEMENT

Contractors are required to estimate and budget cost for waste management through BOQ items. Such waste management cost should include cost of waste drums, cost of waste handling crew, cost of waste transportation, cost of EPA approved waste contractor services and associated incineration costs if any. By reusing materials on site, there will be reduction in transport and disposal costs for a waste contractor taking the material away.

TRAINING PROVISIONS FOR WASTE MANAGER AND SITE CREW

A waste manager will be appointed or designated by construction contractors to ensure commitment, operational efficiency and accountability during the project execution.

Site Manager Training and Responsibility

The waste manager will be given responsibility and authority to select a waste team if required i.e. members of the site crew that will aid him in the organization, operation and recording the waste management system implemented on-site. The waste manager will have overall responsibility to oversee record and provide feedback to the CSC on everyday waste management at the site. Authority will be given to the waste manager to delegate responsibility to sub-contractors where necessary and to co-ordinate with suppliers, service providers and sub-contractors to prioritize waste prevention and salvage. The waste manager will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on-site. He will also be trained in the best method for segregation and storage of recyclable materials, have information on the materials that can be reused on-site and know how to implement this Framework for Solid Waste Management.

Site Crew Waste Management Training

Training of the site crew is the responsibility of the waste manager and as such, a waste training program should be organized. A basic awareness course will be held for all crew to outline the construction waste management plan and to detail the segregation of waste at source. This may be incorporated with other training needs (e.g. general site induction, safety training etc.). This basic course will describe the materials to be segregated, the storage methods and the location of the waste storage areas. A subsection on hazardous wastes will be incorporated and the particular dangers of each hazardous waste will be explained.

RECORD KEEPING

Records will be kept for each waste material which leaves the site, either for reuse on another site, recovery, recycling or disposal. A system will be put in place to record the construction waste arising on-site. The waste manager or delegate will record the following:

- Waste taken off-site for reuse
- Waste taken off-site for recovery
- Waste taken off-site for recycling
- Waste taken off-site for disposal
- Waste (soil & stone) accepted on-site for recovery

For each movement of waste off-site, a signed waste collection docket will be obtained by the waste manager (or delegate) from the contractor. This will be carried out for each material type. This system will also be linked with the delivery records. A signed waste acceptance docket will be issued for each movement of waste on-site.

OUTLINE WASTE AUDIT PROCEDURE

Contractors are required to develop SOP for waste auditing at the construction sites. Such SOP should reflect frequency and types of waste audits, audit criteria and way forward to close non-compliances.

Responsibility for Waste Audit
The appointed waste manager will be responsible for conducting a waste audit at the site during project execution.

Review of Records and Identification of Corrective Actions
A review of all the records for the waste generated and transported off-site, as well as waste accepted, should be undertaken. If waste movements are not accounted for, the reasons for this should be established in order to see if and why the record keeping system has not been maintained. Each material type will be examined in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved. Waste management costs will also be reviewed. Upon completion of the construction phase a final report will be prepared summarizing the outcomes of waste management processes adopted and the total recycling/reuse/recovery figures for the development.

CONSULTATION WITH RELEVANT BODIES

Local Authority
Project contractors are required to maintain close coordination with focal government departments/agencies to ensure that all available waste reduction, re-use and recycling opportunities are identified and utilized.