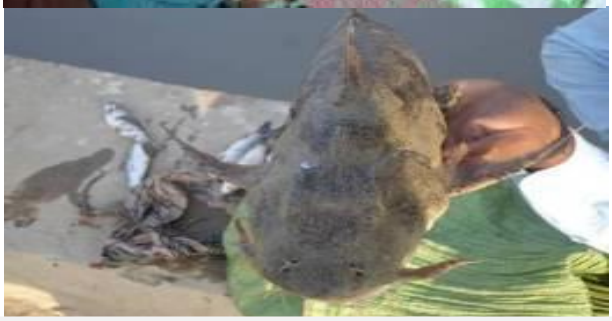
GOVERNMENT OF SINDH
Irrigation Department
PROJECT MANAGEMENT TEAM
SINDH RESILIENCE PROJECT
(IRRIGATION COMPONENT)

CREDIT NO. 5888-PK

ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT (ESIA)

SAGYOON MATIARI (SM BUND) EMBANKMENT OF INDUS RIVER



PROJECT MANAGEMENT TEAM (PMT) SINDH RESILIENCE PROJECT (SRP)

August 2018

SINDH RESILIENCE PROJECT

DOCUMENT ISSUE AND REVISION RECORD

Project:	SINDH RESILIENCE PROJECT (SRP)
Proponent:	GOVERNMENT OF SINDH, IRRIGATION DEPARTMENT
Document Ref:	SRP – ESIA – SM
Document Title:	ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT (ESIA) SAGYOON MATIARI (SM BUND) EMBANKMENT OF INDUS RIVER

Revision	Purpose Description	Originated	Checked	Review	Authorized	Date
0	Draft for World Bank Review	Arshad Hussain Memon Nasir Ali Panhwar	Iqbal Palijo	Zahid Shaikh	Javaid Memon	26-04-18
1	World Bank Comments	Arshad Hussain Memon Nasir Ali Panhwar	Iqbal Palijo	Zahid Shaikh	Javaid Memon	7-8-2018
2	Additional World Bank Comments	Arshad Hussain Memon Nasir Ali Panhwar	Iqbal Palijo	Zahid Shaikh	Javaid Memon	5-9-2018
3	Additional World Bank Comments	Arshad Hussain Memon Nasir Ali Panhwar	Iqbal Palijo	Zahid Shaikh	Javaid Memon	19.10..2018
4	World Bank RSA Comments with conditional Approval	Arshad Hussain Memon Nasir Ali Panhwar	Iqbal Palijo	Zahid Shaikh	Javaid Memon	27.11..2018

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXURES

LIST OF ACRONYMS

ACE	Associated Consulting Engineers (Pvt) Ltd
BP	Bank Policy
BU	Baghar Uchito
BHU	Basic Health Unit
CFT	Cubic Feet
CITES	Convention on International Trade in Endangered Species
CoI	Corridor of Impacts
DACREP	Disaster and Climate Resilience Enhancement Project
DC	Deputy Commissioner
DDT	Dichloro-Diphenyl-Trichloroethane
EC	Electrical Conductivity
ECA	Employment of Child Act
EIA	Environmental Impacts Assessment
EMU	Environment Management Unit
EPA	Environmental Protection Agency
ESA	Environmental and Social Assessment
ESIA	Environmental and Social Impacts Assessment
ESMEC	Environmental/Social Monitoring and Evaluation Consultants
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESMU	Environmental and Social Management Unit
ESU	Environmental and Social Unit
FT	Foot or Feet
GFP	Grievance Focal Point
GoS	Government of Sindh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
IBIS	Indus Basin Irrigation System
IEE	Initial Environmental Examination
ISDS	Integrated Safeguards Data Sheet
IUCN	International Union for Conservation of Nature
LAA	Land Acquisition Act
MEAs	Multilateral Environmental Agreements
NCS	National Conservation Strategy
NEP	National Environmental Policy
NEQS	National Environmental Quality Standards
NGO	Non-Governmental Organization
NGVS	No Guideline Value Set
OP	Operational Policy
P&DD	Planning and Development Department
PAP	Project Affected Person
PCC	Public Complaint Centre
PC-I	Pakistan Planning Commission Form – 1 Appraisal of Development Project

PCRWR	Pakistan Council for Research in Water Resources
PD	Project Director
PDMA	Provincial Disaster Management Authority
PEPC	Pakistan Environmental Protection Council
pH	Power of Hydrogen
PID	Project Information Document
PISSC	Project Implementation, Support and Supervision Consultant
PIU	Project Implementation Unit
PKR	Pakistani Rupee
PMT	Project Management Team
POPs	Persistent Organic Pollutants
PSC	Project Steering Committee
RAP	Resettlement Action Plan
RD	Reduced Distance
RFP	Request for Proposal
RoW	Right of Way
SCOPE	Society for Conservation and Protection of Environment
SDPI	Sustainable Development Policy Institute
SEPA	Sindh Environmental Protection Agency
SEPC	Sindh Environmental Protection Council
SID	Sindh Irrigation Department
SIDA	Sindh Irrigation and Drainage Authority
SM	Sagyoon Matiari
SRP	Sindh Resilience Project
SSSD	Sindh Strategy for Sustainable Development
USDA	United States Department of Agriculture
WAPDA	Water and Power Development Authority
WB	World Bank
WWF	World Wildlife Fund

EXECUTIVE SUMMARY

The Government of Sindh (GoS) is undertaking a World Bank financed Project - the Sindh Resilience Project (SRP) through the Sindh Irrigation Department (SID) and Provincial Disaster Management Authority (PDMA) in various parts of Sindh Province. Physical interventions under SRP Irrigation Component include rehabilitation/improvement of existing earthen embankments along River Indus and construction of small rainwater recharge dams in the water-scarce areas of the province. During the second year of the SRP implementation, GoS is going to rehabilitate and improve Sagyoon Matiari (SM) Bund of Indus River. While the financing of the other 9 bunds is being done by World Bank, the financing of SM Bund works will be done by Government of Sindh.

Applicable Laws and Safeguard Policies:
In compliance with the national/provincial regulatory requirements of Pakistan Environment Protection Act 1997, Sindh Environment Protection Act 2014, and World Bank safeguard policies including OP/BP 4.01, OP/BP 4.12 and OP/BP 7.50.

The impacts anticipated are only during the construction period and for less than one year. The sub-projects have positive impacts in the long run to reduce the probability of Indus River embankment breach and flooding of settlements, inundation of agriculture land, standing crops and other livelihoods. Therefore, an ESIA is prepared in accordance to the WB OP 4.01. Further to this, some of the proposed interventions will be carriedout in accordance with the Waterways OP/BP 7.50 in/along Indus River, which is an international waterway. However; exception of notification would be sought by the task team leader. Major applicable laws are discussed below,

Sindh Environmental Protection Act (2014): The act is applicable to environmental parameters such as air, water, soil, and noise pollution, as well as to the handling of hazardous wastes. The Act provides the framework for protection and conservation of species, wildlife habitats and biodiversity, conservation of renewable resources, establishment of standards for the quality of the ambient air, water and land, establishment of Environmental Tribunals, appointment of Environmental Magistrates, Initial Environmental Examination (IEE) and EIA approval. Penalties have been prescribed for those contravene the Act. The key features of the Act have a direct bearing on the proposed sub-projects because the project requires an initial environmental examination (IEE). As the sub-project covered under this ESMP is located in the district of Matiari, it falls under the jurisdiction of the Sindh Environmental Protection Agency that will accord the approval of the IEE pertaining to the project.

The Land Acquisition Act (LAA) 1894: The Land Acquisition Act (LAA) of 1894 is the key legislation that has direct relevance to resettlement and compensation in Pakistan. The LAA and its implementation rules require that before implementation of any development project the privately owned land and crops are compensated to titled landowners and/or registered tenants/users.

Sindh Irrigation Act (1879) with Amendments in 2011: The Sindh Irrigation Act (1879) is the main enactment relating to irrigation in the Province of Sindh, under this Act the entire task of irrigation has been entrusted to the Provincial Government, Canal Officers the Revenue Department and Judicial Officers.

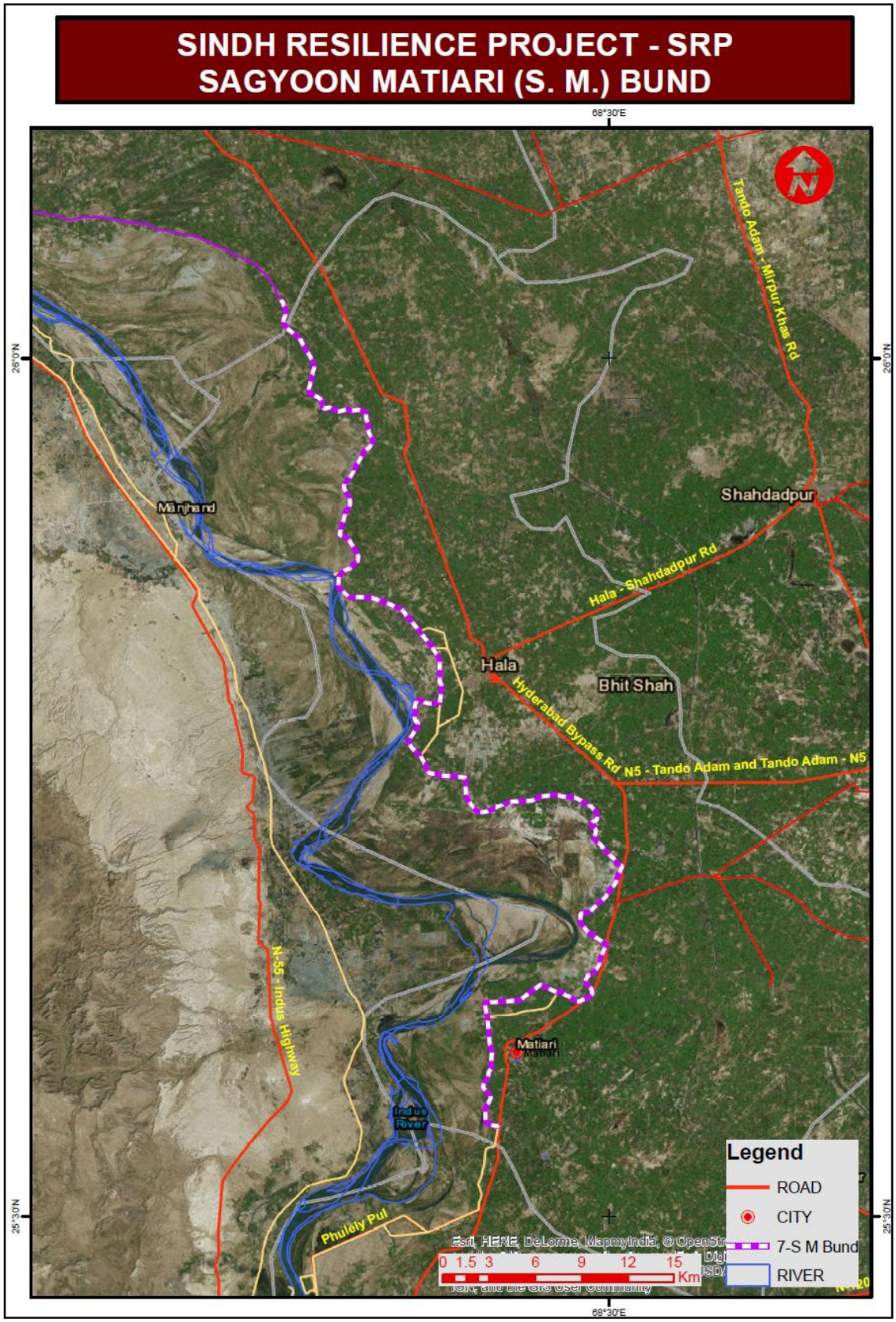
Sindh Wildlife Protection Ordinance (2001): The Sindh Wildlife Protection Ordinance of 1972, as amended in 2001, 2010 provides for the preservation, protection, and conservation of wildlife by the formation and management of protected areas and prohibition of hunting of wildlife species declared protected under the ordinance. The project activities will have to be carried out in accordance with this Act. In particular, no activities of the SRP Project will be carried out inside any protected areas defined under the Act. The ordinance also specifies three broad classifications of the protected areas.

Sindh Forest Act, 1927 (2012): The Act authorizes Provincial Forest Departments to establish forest reserves and protected forests. The Act empowers the department to protect, conserve, and manage sustainable development of forest and biodiversity. The act prohibits any person to set fire in the forest, quarry stone, remove any forest-produce or cause any damage to the forest by cutting trees or clearing up area for out. Most of the forest areas are away more than 1km from the primary impact zone of the sub-project's interventions. However; mitigation measures are devised to restrict the contractor activities in these areas. In addition, the proposed sub-project may cause cultivation or any other purpose. The project activities will have to be carried out in accordance with this Act. No activities will be carried out in any protected forests, and no unauthorized tree cutting will be carried cutting/uprooting of 27 trees out of 111 falling in the potential RoW of the embankments. However; it is planned to plant 5 indigenous trees in place of each cut/uprooted tree.

An environmental and social assessment has been carried out to address the potentially negative impacts of the proposed interventions under SRP. As an outcome of this assessment, the present Environmental and Social Impact Assessment (ESIA) has been prepared for the works to be carried out during the second year of SRP implementation; the ESIA includes an Environmental and Social Management Plan (ESMP). In addition, an Environmental and Social Management Framework and Resettlement Policy Framework (ESMF/ RPF) have been provided for all sub-projects under a separate cover.

Project Description:

The SM bund is located in district Matiari. The main activities involved in the rehabilitation works include obtaining soil from borrow area and transporting it to the embankments, strengthening the existing embankments/ramps with the soil, soil compaction, and stone pitching on slopes. The contractor will also need to establish some temporary facilities including material yard and construction camp for workforce. Map is attached below which is showing the sub- project location.



Document Path: D:\PFF\SRP\GIS\PROJECT LOCATION EMBANKMENT - SM Bund 20-04-2018.mxd

Location of the SM Bund Sub-project

Environmental Baseline

The area along the embankments is mostly comprised of barren land, flood plains, stagnant water and a mixture of reeds, tree thickets and grass/shrub land interrupted by cultivated areas. Tree thickets are present on the outer and inner slopes of the embankments. Most trees have a wide range of economic uses such as timber, fodder and for building and boat making purposes. Important species include Azadiarachta indica, Acacia nilotica, Eucalyptus sp, Magnifera indica, Dalbergia sisoo, Salvadora persica, Cocos nucifera, Ficus religiosa, Albizi lebbeck and Zizyphus jujube, Ficus religiose, Syzygiun, Cumini, Cordia dicotoma, Megnifera indica and Phoenix dectylifere.

Water Resources

River Indus is the major source of water supply in the subproject area. Some hand pumps are installed by the communities along the strip of embankments to get water for drinking purposes. The water results reveal that the pH, Nitrate, Electric Conductivity, Calcium, hardness and Arsenic are within permissible limits while in some cases the Turbidity, Nitrate, TDS, COD, TSS Coliforms and faecal coli are exceeding the permissible limits. The reason for exceeding the limits is due to the untreated domestic and Industrial wastewater is being disposed from various cities located along the River Indus.

Soils

The soil texture in the sub-project area is generally clay loam while loam, and silt loam also exist. The sand is found in riverbed. The test reveals that all the parameters are within permissible limits except SAR is exceeding the standards.

Biological Resources

During the field study, seven (4) large mammal species were observed in which Asiatic Jackal and Indian mongoose are common and can be easily seen. In addition, 8 small mammals, 12 reptile and amphibians and 47 bird species including resident and migratory birds were observed in the study area. Among the birds, common babbler has become very rare, while the population of pheasant crow, Jungle Babbler, Common Myna, Bank Myna, House Sparrow, Common Crow, Indian Roller and Rose ringed Parakeet is quite satisfactory and that of Chestnut-bellied, sand grouse, Pied crested cuckoo, Red wattle Lapwing and turtle dove is declining in the region.

Riverine Forest

Sindh Forest Department controls an area of 241,198 hectares in the riverine tract of the province which is categorized as "Riverine Forests"; locally known as Kacho forests. Total 10 Reserved forests identified in the sub-project area of SM Bund. Out of 10 forests, 9 have been converted in agricultural land while, one existing forest has thin population of trees. All forests areas are located out of the sub-project areas at a distance of 1km to 4km and none of the forest is falling within primary impact zone of the embankment sub-projects covered in this ESIA.

Social Baseline

Surveys and consultations were held in 12 villages on SM Bund. All these villages are within the primary and secondary impact zone. These surveys were conducted in the months of December

2015 and January 2016. While supplementary field survey was carried out in March 2018 in order to establish a social baseline of the project area. According to the results of the survey, total households of these villages are 4,210 with a total population of 30,130. No survey was conducted in the urban areas (Matiari and Hala) town area, however, according to census of 2017, these urban centres had 32,641 households with a total population of 182,590. So total rural and urban households of the sub-project area are 36,851 having a total population of 212,720. (Source: Sindh/district wise census 2017).

There are 10 primary schools for boys, 4 primary schools for girls, 1 middle school for boys, 1 middle school for girls, 1 high school for boys and a high school for girls within radius of 1km on both sides of the sub-project area (SM Bund). In all boys' schools, total enrolment has been recorded 1,345 out of which 630 is in primary schools, 415 in middle schools and 300 in high schools. Girls' total enrolment is 660, out of which 390 are at primary school level, 200 at middle school and 300 are at high school.

At the district level, 926 education institutions (all categories of schools) both for boys and girls show a total enrolment of 84,629. Out of total 926 institutions, 821 are functional while 105 are closed (Source: SEMIS 2014 -2015 Sindh Education Management Information System (SEMIS).

It was found that mostly people have suffered from hepatitis, typhoid, diarrhoea and other hygiene related diseases. Some of women expire during their delivery. Majority of the women are malnourished usually being the last ones to eat their meals in the family. There are three (3) Basic Health Units (BHU) in the project area; one in Bhanote village, one in Jumo Shahuk village and one in Sekhat village of Matiari District. The seriously ill patients are taken for treatment to Matiari or Hyderabad civil/district hospitals.

The socio-economic baseline survey reveals that the major source of the human transport in the project area is van/pickups for the public. Village profile data show that 9 villages (75%) have access to van/pickups facility, 5 villages (42%) have access to bus facility, 5 villages (42%) have cars and 12 villages (100%) have motor cycles. The farm inputs and outputs are transported through trucks, trailers and tractor trolleys. The animals from the project area are transported to Hyderabad and Karachi by Trucks. The Firewood and Furniture wood are also transported through Trucks and Trolleys.

Stakeholder Consultation

Stakeholder consultations were completed in two stages. In the first stage, consultations with a total of 12 villages within the sub-projects were carried out during November 2015 period. During these consultations, the primary stakeholders were briefed on the project components and their concerns and feedback were recorded and incorporated into this ESIA. During the first round, consultations were carried out with Community living in primary impact zone. The Second round consultations were completed in the project and surrounding area in December 2015 January 2016. Consultations were carried out at household level as part of the socio-economic baseline data collection within 12 villages of the project and surrounding area. Moreover, supplementary site survey and public consultations were also carried out in the month of March and July 2018 to

complete this report. This was also imperative as the scope of work has been changed significantly. At the time of initial consultations the scope of work included raising and stone pitching of SM Bund, whereas current scope of work of this sub project includes only construction of village ramps at various locations.

The main findings of the scond consultations with the stakehlders are as follows:

- The community suggested to provide employment oppportunitiions to local communities during construction phase.
- The community appreciated the proposed work on SM Bund and were of the opinion that this would greatly facilitate their movement. They further said that this would provide them easy access from farm to market to sell their agriculture products.
- The community told that with the construction of proper ramps the movemevt of their livestock would also be improved, this would also prevent damge to the Bund structure.

Twelve women consultation events were also held within the project and surrounding area – these were run by the female gender specialist engaged by the consultants for this project. In addition, the gender specialist carried out household level consultations in 12 villages of the project and surrounding area. The second round of consultations in the project and surrounding area included details of the proposed project interventions and sought the views of the project-affected persons on each aspect.

The main findings from consultations with the stakeholders are as follows:

- They have urgent need of rehabilitation of embankment.
- Concerns over construction phase related disturbance, especially with respect to the free mobility of women and children, night time disturbance, conflicts arising from a non-local workforce not respecting local community norms and, or restriction of access to, religious structures were raised by community members.
- Employment opportunities for local communities during construction.
- The need to provide grievance redress procedures.
- Poor access to health and education facilities were noted in the project and surrounding area and provision of such facilities is required.

Resettlement

There is no any resettlement or economic displacement due to limited scope of work i.e. rehabilitation of existing ramps of SM Bund sub-project.

Archaeological Sites

The archaeological survey was conducted by the Culture and Tourism Department, GoS in 1993 and 1996. According to the survey results, there are total 02 archaeological sites situated near the subproject area, i.e. the shrine of Bhitt Shah and Hala Monument located respectively at distance of 20 km and 1 km away from project site.

Potential Impacts during Construction Works

The main engineering interventions proposed to rehabilitate the sub-project are stone pitching and strengthening existing Indus river embankments/ramps. Once complete, the subproject will provide enhanced protection against floods in the River Indus. The potentially negative environmental and social impacts will be associated with development of borrow areas, clearance of vegetation from the existing embankments, earth work and stone pitching to rehabilitate embankments, setting up of contractor's camps, movement of construction machinery and vehicles, material transportation, waste disposal from camps and working areas. The potential impacts of the proposed works include reduced value of the land caused by obtaining soil from borrow areas, loss of natural vegetation and trees, dust and noise generation, traffic congestion on local routes and roads, water contamination caused by slipping of soil and stone in the river and by release of waste effluents from construction camps and work areas, and safety risks for construction workers as well as for the communities.

The clearance beyond the existing toes of embankments is required to prepare the area for formation of the embankments and disposal of material excavated from the embankments. The site clearance shall result in felling of an estimated 27 trees.

Mitigation Measures and Monitoring Plans

As part of the present ESIA, appropriate mitigation measures have been identified. These include: proper disposal of excavated earth; water sprinkling on access paths and construction areas to avoid/minimize dust pollution; use of silencers for the machinery and vehicles; use of ear protection apparatuses and other personal protective equipment by construction workers; provision of septic tanks in camps and offices, treatment of wastewater and other pollution control measures in construction camps; location of borrow pits to be at safe distances from embankments and to be properly restored; not selecting productive land for borrow area or for establishing camps/construction areas, no damage to cultivated areas and agricultural crops; avoiding unnecessary clearing of natural vegetation; avoiding archaeological or culturally important sites; avoiding and controlling toxic materials; implementing erosion control measures, and adhering to safety and occupational health precautions.

Grievance Redressal Mechanism

A Grievance Redressal Mechanism (GRM) has also been prepared in order to address the complaints and grievances received by the project proponent (i.e. Irrigation Department) at the project level. The grievance redress system as proposed for the embankment sub-project covered under this ESIA will primarily (but not exclusively) handle issues that emerge from construction activities of the sub-projects, or can be plausibly described as a consequence of these activities.

GRM is consistent with the requirements of the World Bank safeguard policies will be established to prevent and address community concerns, reduce risks, and assist the project to maximize environmental and social benefits.

GRM will be performed through following steps:

- A Public Complaints Centre (PCC), which will be responsible to receive, log, and resolve complaints;
- A Grievance Redress Committee (GRC), responsible to oversee the functioning of the PCC
- A non-judicial decision-making authority e.g. Project Management Team or Secretary Irrigation Government of Sindh for resolving grievances that cannot be resolved by PCC;
- Grievance Focal Points (GFPs), which will educate people from each community on each sub-project site. The GFPs should be community members who can be easily approached by the community. The GFPs will be provided training by the Environment and Social Section of the PISSC and PMT, SRP.

Safeguard monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be carried out at three levels. (i) At the PMT level, the environment and social safeguard specialists will carry out safeguard monitoring to ensure that the mitigation plans are being effectively implemented, and will conduct field visits on a regular basis. (ii) At the field level, more frequent safeguard monitoring will be carried out by the relevant staff of Project Implementation Support and Supervision Consultants (PISSC). (iii) The PISSC and ESMU of PMT will produce monthly, quarterly and annual reports for ESIA implementation.

ESIA Implementation Arrangements

The overall responsibility for implementing the SRP project as well as the present ESIA rests with the Project Management Team (PMT) headed by the Project Director. PMT has hired the services of M/s Associated Consulting Engineers – ACE (Pvt.) Ltd, Karachi, Pakistan as the Project Implementation Support and Supervision Consultant (PISSC). The PISSC has environmental and social specialists to supervise and monitor ESIA implementation. Finally, the construction contractor will also have environmental and social inspectors/officers to implement mitigation measures and other requirements defined in ESIA. Appropriate clauses will be included in the construction contracts for this purpose. Budgetary Cost of **PKR. 3,473,140** has been estimated for the implementation of mitigation measures.

1. INTRODUCTION

The Government of Sindh (GoS) has undertaken World Bank financed Sindh Resilience Project (SRP) through the Sindh Irrigation Department (SID) and Provincial Disaster Management Authority (PDMA) in various parts of Sindh Province. Physical interventions under its irrigation component include rehabilitation/improvement of existing earthen embankments along River Indus and construction of small rainwater recharge dams in the water-scarce areas of the province. During the second year of the SRP implementation, GoS is going to rehabilitate and improve the Sagyoon Matiari (SM Bund) of River Indus. It will be relevant to note that while financing of works for 9 embankment will be done by World Bank, the financing of SM Bund works will be done by Government of Sindh. In compliance with the national/provincial regulatory requirements and World Bank safeguard policies, an environmental and social assessment has been carried out to address the potentially negative impacts of the proposed interventions under SRP. As an outcome of this assessment, the present Environmental and Social Impact Assessment (ESIA) has been prepared for the works to be carried out during the second year of SRP implementation; the ESIA includes an Environmental and Social Management Plan (ESMP). In addition, an Environmental and Social Management Framework and Resettlement Policy Framework (ESMF/ RPF) have been provided under a separate cover.

The SM embankments is located in district Matiari. The main activities involved in the rehabilitation works include obtaining soil from borrow area and transporting it to the embankments, strengthening the existing embankments/ramps with the soil, soil compaction, and stone pitching on slopes. The contractor will also need to establish some temporary facilities as well including material yard and construction camp for workforce.

1.1 Background

Pakistan is exposed to a number of adverse natural events and has experienced a wide range of disasters over the past 40 years, including floods, earthquakes, droughts, cyclones and tsunamis. Exposure and vulnerability to hazards is further exacerbated by a rapid population growth, growing urbanization, environmental degradation and shifting climatic patterns that can result in the occurrence of increasingly severe natural disasters.[1] Over the past decade, damages and losses resulting from natural disasters in Pakistan have exceeded US$ 18 billion[2]; as the population and assets base of Pakistan increases, so does its economic exposure to natural disasters.

The Government of Sindh has initiated a project to enhance disaster and climate resilience; increase the technical capacity of Government entities to manage natural disasters and climate variability; construction of small dams and support restoration of flood protection infrastructure on Indus River. The project designated as Sindh Resilience Project (SRP) is mainly financed by

[1] Project Appraisal Documents; Report No: PAD 1684.

[2] Project Appraisal Documents; Report No: PAD 1684.

World Bank and will be completed in five year period from 20th June 2016 to 31st August 2021. The location plan of SRP project is shown in Figure-1.

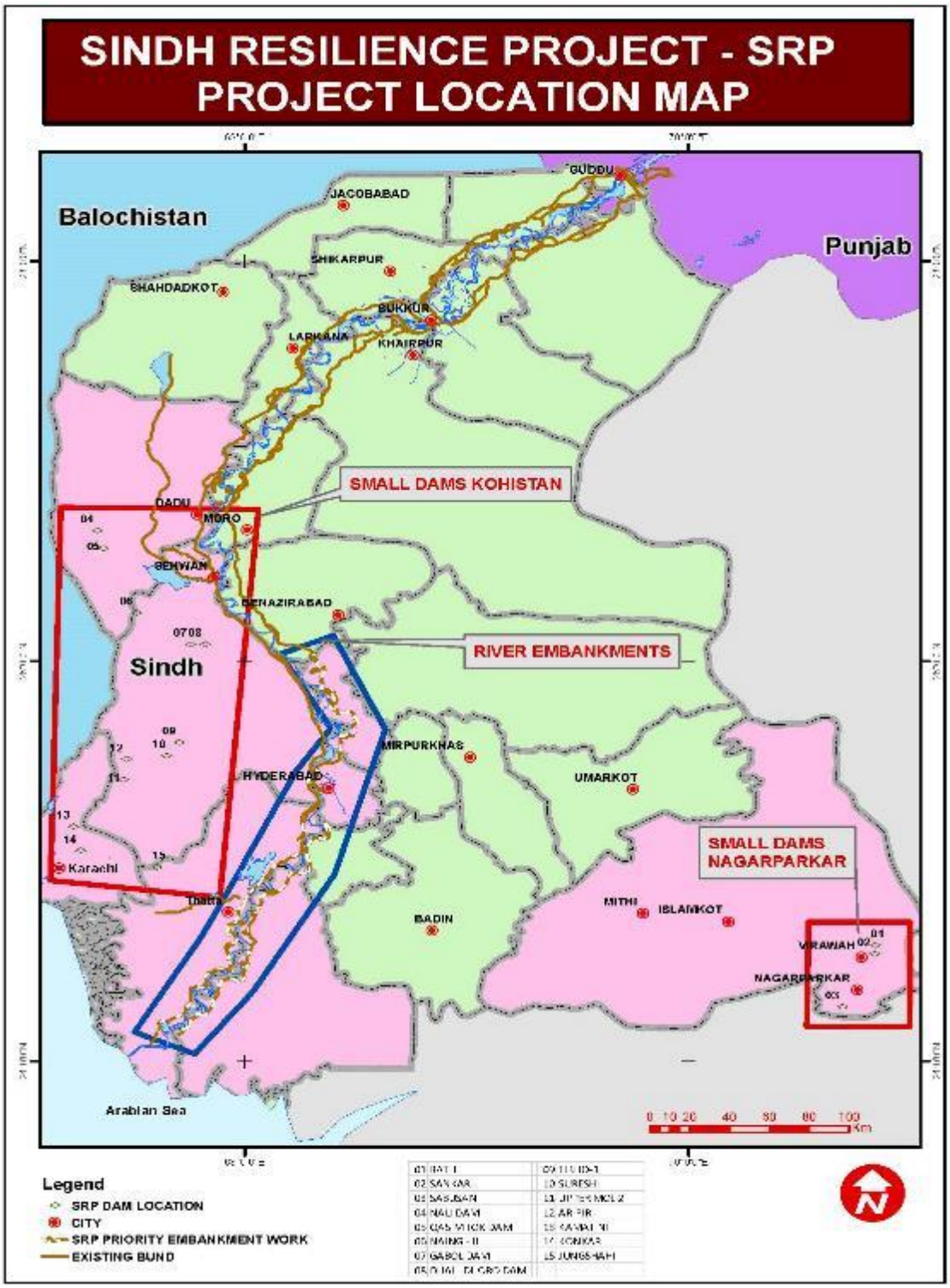


Figure 1: Location of the SRP Project Area

1.2 SRP Components

SRP is being implemented through the Provincial Disaster Management Authority (PDMA) and Sindh Irrigation Department (SID) and have the following components:

Component 1- *Strengthening Institutions and Systems for Resilience*: The component will focus strengthening operational systems and capacities of two key institutions: the PDMA and SID.

Component 2- *Structural Investments*: This component of the project is covering two sub-components i.e. structural investments through flood protection and construction of small dams to address the drought risk. Proposed sub-project of SM Bund comes under this component.

Component 3- *Fiscal Resilience:* The fiscal resilience component would seek to inform the government on strengthening its institutional and financial response capacity in the aftermath of a disaster and reduce the economic and fiscal burdens of such events.

Component 4- *Technical Assistance for Studies and Project Implementation Support:* This component would support the Government in implementing the Project and would include support for the operation of the Project Implementation Units (PIUs) at the implementing agencies, and financing of overall project management, as well as technical assistance in such areas as detailed design / feasibility, contract administration and construction supervision, procurement, financial management, as well as management of social and environmental issues.

Component 5- Contingent Emergency Response Component: This component would allow the government to request the Bank to reallocate financing from other project components to partially cover emergency response and recovery costs. This component could also be used to channel additional funds should they become available for such an emergency.

1.3 Aims and Objectives of the ESIA Study

The main aims and objectives of this ESIA are to:

- Provide information for decision-making on the environmental and social consequences of proposed project interventions;
- Establish an environmental, socioeconomic baseline;
- Determine potential environmental and social impacts and assess these in terms of severity, magnitude and timescale;
- Devise mitigations to reduce the identified environmental and social impacts;
- Promote environmentally and socially sound and sustainable development through the identification of appropriate enhancement and mitigation measures and monitoring programs that will be required to ensure development of the project without significant adverse impacts;
- Meet the provincial, national, international and WB standards;

- Public consultation and information disclosure, including amongst the local community;
- Development of an environmental and social management plan (ESMP) to mitigate the adverse impacts, and
- Determine tentative costs for implementation of the ESMP.

1.4 Scope of the Study

The present ESIA covers the rehabilitation and improvement of SM Bund of Indus River. The scope of the study includes but not limited to:

- Collection of baseline primary and secondary information on physical, biological and socio-economic conditions prevailing in the subproject study area;
- Undertake stakeholder consultations;
- Environmental and social impact assessment of subproject interventions;
- Develop mitigation measures for impacts identified;
- Prepare environmental and social management plan including monitoring program and institutional strengthening program;
- Design and implement public awareness program;
- Prepare cost estimate for implementation of ESMP.

1.5 ESIA Methodology

The initial reconnaissance and detailed environmental and social baseline surveys were carried out by a team comprising environment specialist, ecologist, and resettlement and social expert as well as male and female sociologists during the months of December 2015 and January, 2016 under Disaster and Climate Resilience Enhancement Project (DACREP) preparatory study. The screening criteria for the sub-projects devised in Table 1 of SRP ESMF/RPF (based on the World Bank environmental screening process) have been followed and as a result, the proposed sub-project has been categorized as Category A.

The baseline data has been collected in accordance with the Sindh Environmental Protection Act, 2014 and the Sindh Environmental Assessment Regulations, 2014 as well as applicable WB safeguard policies. The approach and methodology for data collection was a combination of qualitative and quantitative techniques.

This study has been conducted using standard environmental and social impacts assessment methodologies, the assessment process consists of a number of elements based on previous studies and incorporation of additional information gathered during site visits, discussions with officials of government departments and meetings with groups from the communities living in as well as adjacent to the sub-project area. This also formed part of the public information dissemination process.

Focus group discussions and consultative meetings have been conducted at village level. An instrument to collect village level data profiles has been designed very carefully and administrated to sample the target male and female population of the area.

Similarly, the instrument for women data collection has also been prepared and applied during the consultation with the female members of communities.

1.6 Study Team

This report has utilised the data collected for environmental and social impact assessment carried out by ACE Pvt Ltd for DACREP project in 2016. Supplementary field surveys have also been conducted during months of February and March 2018 by PMT with assistance of PISSC team. List of team members is given in Table-1.

Table 1: Study Team

S.NO	Name	Designation	Organisation
1	Arshad Hussain Memon	Environment Safeguard Consultant	SRP
2	Nasir Ali Panhwar	Social Safeguard Consultant	SRP
3	Farooq Ahmed Memon	Environment Specialist	ACE Pvt Ltd.
4	Naimatullah Khan Kakar	Social Safeguard & Resettlement Specialist	ACE Pvt Ltd.
5	Attaullah Pandrani	Ecologist	ACE Pvt Ltd.
6	Abdul Latif	Environment Officer	SRP
7	Himat Kumar	Environment Officer	SRP
8	Taha Tariq Khokhar	Environment Officer	SRP
9	Sajid Memon	Social Safeguard Officer	SRP
10	Marvi Baloch	Social Safeguard Officer	SRP
11	Imran Ali Memon	Asst: Social Safeguard Specialist	ACE Pvt Ltd.

1.7 Environmental Social Management Framework and Resettlement Policy Framework (ESMF/RPF) for Later Years Sub-projects

As mentioned earlier, the SRP project envisages a number of interventions under its Component 2 including improving / rehabilitating the degraded reaches of embankments of Indus River and construction of small detention dams in water scarce districts of the province. The present ESIA has been prepared for the sub-project to be implemented during the second year of SRP implementation.

An Environmental and Social Management Framework (ESMF) along with a Resettlement Policy Framework (RPF) has been prepared to identify the potential but generic adverse environmental and social impacts of the subprojects to be implemented during the later years of SRP implementation, propose mitigation measures to address these potential impacts, and finally, to provide basic screening criteria on the project level for selecting the subprojects to be undertaken during later years. ESMF/RPF has already been developed for entire project and provided under separate cover.

The ESMF/RPF defines that: i) a full EIA/ESA including an ESMP and RAP will be carried out for subprojects requiring new construction or having significant irreversible and widespread impacts or involving significant degradation of forests of sensitive areas, requiring land acquisition or dam height more than 15m; ii) an ESMP (and a RAP if needed) will be prepared for medium-sized sub-projects involving rehabilitation of existing structures, potentially causing low to moderate level of negative but reversible and localized impacts; and iii) Environmental and Social Checklists will be filled for smaller subprojects resulting in low / negligible impact.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This chapter provides an overview of the federal and provincial institutional frameworks, federal and provincial environmental policies and guidelines, applicable laws and the World Bank operational policies.

2.1 Pakistan Institutional Framework

The institutional framework for decision making and policy formulation in environmental and conservation is briefly described below.

2.2 National Disaster Management Authority- Climate Change Division

After the 18th Amendment, the Environment Ministry was devolved to the provinces and a new Ministry of National Disaster Management was created. National Disaster Management Authority that would implement the National Policy on Climate Change with coordination of provincial governments. The Government of Pakistan renamed the Ministry of National Disaster Management in 2012 as the Ministry of Climate Change to deal with the threats posed by global warming and to protect environment in the country. National Policy of Climate Change was also approved in the same year. The policy describes the following measures regarding environmental assessment:

- Take necessary measures to redesign administrative structures and procedures of Federal and Provincial EPAs and Planning and Development Division to integrate climate change concerns into Initial Environmental Examination (IEE) processes;
- Ensure that IEE/EIA and other mechanisms are strictly observed in all development projects, particularly infrastructure projects, by the concerned agencies.

2.3 Non-Governmental Organizations

International environmental and conservation organizations, such as the International Union for the Conservation of Nature (IUCN) and the World Wide Fund for Nature (WWF) are active in Pakistan. Both these Organizations have worked closely with the Government and have played an advisory role with regard to the formulation of environmental and conservation policies. Since the Rio Summit (1992), a number of national environmental Non-Governmental Organizations (NGOs) have also been formed, and have been engaged in advocacy and, in some cases, in research. The other prominent environmental NGOs include Sustainable Development Policy Institute (SDPI), Leadership for Environment and Development (LEAD), Society for Conservation and Protection of Environment (SCOPE), Pakistan Institute for Environmental Development and Research (PIEDAR), and Shirkatgah etc.

As mentioned earlier, environmental NGOs have been particularly active in advocacy and promoting sustainable development approaches. Much of the government's environmental and

conservation policy has been formulated in consultation with leading NGOs, who have also been involved in drafting new legislation on conservation.

2.4 Sindh Environmental Protection Agency (SEPA)

The Sindh Environmental Protection Agency (SEPA) was established under Pakistan Environmental Protection Act 1997. It is headed by a Director General who exercises powers delegated previously to him by the Pakistan Environmental Protection Agency and now the Environmental and Alternate Energy Department, Government of Sindh. Sindh EPA is the relevant agency for the review and approval of the present ESIA.

2.5 Sindh Irrigation Department (SID) and Sindh Irrigation and Drainage Authority (SIDA)

Major tasks performed by the SID are the operation and maintenance of the irrigation and flood protection system and regulation of flows in rivers and canal systems. Execution of development schemes and mega projects is also one of the major responsibilities. The embankment sub-projects under SRP are under the jurisdiction of the Chief Engineer Irrigation, Sukkur Barrage Region, Sukkur.

The Sindh Irrigation and Drainage Authority (SIDA) was established under Sindh Irrigation and Drainage Authority Act 1997.This Act empowers SIDA to have control over all the rivers, canals, drains, streams, hill torrents, public springs, natural lakes, reservoirs (except such reservoirs as are under the control of WAPDA) and underground water resources within the Sindh Province to give effect to schemes to be prepared under this Act in relation to public purposes.

An Environment Management Unit (EMU) was established in SIDA under National Drainage Program in 2004 and further strengthened under WSIP Projector support implementation of Social and EMF/EMPs under the project and also to improve SIDA's capacity in planning, development and operation of water resources management systems with proper consideration to environmental and social issues and participation of stakeholders in order to make water systems sustainable in the long run and generate higher benefits.

2.6 Sindh Wildlife Department

Sindh established the Wildlife Management Board in 1972, and the Sindh Wildlife Protection Ordinance was also promulgated in the same year. A Chairman, who is normally the Chief Executive of the province heads Sindh Wildlife Management Board constituted in 1972, and members as determined by the Government. During the time of "Board", the services of the wildlife staff were non-pensionable within the autonomous body where no bylaws, recruitment and other rules regarding service structure were ever framed. The provincial government in 1994 decided to regularize the services of the employees and Sindh Wildlife Management Board was converted into a regular Sindh Wildlife Department. Sindh Wildlife Department is the main organization responsible for the protection of wildlife in Sindh.

2.7 Provincial Disaster Management Authority

Provincial Disaster Management Authority (PDMA) is responsible for implementing policies and plans for disaster management in the Province. The PDMA is also responsible:

- To formulate the provincial disaster management
- Coordinate and monitor the implementation of the National Policy, National and Provincial Plans
- Examine the vulnerability of different parts of the Province to different disasters and specify prevention or mitigation measures
- Lay down guidelines to be followed for preparation of disaster management plans by the Provincial Departments and District Authorities
- Evaluate preparedness at all governmental or Non-Governmental levels to respond to disaster and to enhance preparedness
- Coordinate response in the event of disaster;
- Give directions to any Provincial department or authority regarding actions to be taken in response to disaster
- Promote general education, awareness and community training in this regard;
- Provide necessary technical assistance or give advice to district authorities and local authorities for carrying out their functions effectively
- Advise the Provincial Government regarding all financial matters in relation to disaster management
- Examine the construction in the area and if it is of the opinion that the standards laid down have not been followed and it may direct the following same to secure compliance of such standards
- Ensure that communication systems are in order and disaster management drills are being carried out regularly; and
- Perform such other functions as may be assigned to it by the National or Provincial Authority.
- PDMA is one of the proponent and implementing agency of SRP.

2.8 Federal Environmental Policies and Guidelines

2.8.1 National Conservation Strategy (1992)

The Pakistan National Conservation Strategy (NCS) is the principal policy document for environmental issues in the country which was developed and approved by the Government of Pakistan on 1st March 1992. The NCS works on a ten-year planning and implementation cycle. It deals with fourteen core areas as follows:

- Maintaining soils in cropland;
- Increasing irrigation efficiency;
- Protecting watersheds;
- Supporting forestry and plantations;

- Restoring rangelands and improving livestock;
- Protecting water bodies and sustaining fisheries;
- Conserving of biodiversity;
- Increasing energy efficiency;
- Developing and deploying material and energy renewable;
- Preventing and abating pollution;
- Managing urban wastes;
- Supporting institutions for common resources;
- Integrating population and environmental programmes;
- Preserving the cultural heritage

2.8.2 National Climate Change Policy (2012)

The National Climate Change Policy is the principal policy document developed and approved by Government of Pakistan in 2012, which provides a framework for addressing the issues that Pakistan faces or will face in future due to the changing climate. In view of Pakistan's high vulnerability to the adverse impacts of climate change, in particular extreme events, adaptation effort is the focus of this policy document. The vulnerabilities of various sectors to climate change have been highlighted and appropriate adaptation measures spelled out. These cover policy measures to address issues in various sectors such as,

- Water Resources
- Agriculture and Livestock
- Human Health
- Forestry
- Biodiversity
- Other Vulnerable Ecosystems
    - Mountain Areas
    - Rangeland and Pastures
    - Arid and Hyper Arid Areas
    - Coastal and Marine Ecosystems
    - Wetlands

This poliy covers mitigation measures regarding the this project is i.e Water Resources sector like water shortage and infrastructure development such as;

- Ensure early rehabilitation, remodeling and up-gradation of the existing irrigation infrastructure in the country to make it resilient to climate change related extreme events;
- Assess and address the needs for additional water storage and distribution Infrastructure.
- Identify new potential dam sites to keep the option open to develop new dams, should they be needed;

- Develop necessary infrastructure to harness the potential of hill torrents;
- Enforce measures to enhance the life of existing storage facilities.

2.8.3 The National Environmental Policy (2005)

The National Environmental Policy (NEP) describes integration of the environment into development planning through the implementation of the EIA process at the scheme level. The NEP is the overarching framework which 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 includes guidelines to Federal, Provincial and Local Governments under the following relevant headings:

- Water supply and management
- Air quality and noise
- Waste management
- Forestry
- Biodiversity and protected areas
- Climate change and ozone depletion
- Energy efficiency and renewable
- Multilateral environmental agreements

Cross-sectorial guidelines are also included which link the environment to poverty, population, gender, health, trade, local governance and natural disaster management.

2.8.4 Guidelines for Sensitive and Critical Areas (1997)

The guidelines identify officially notified protected areas in Pakistan, including critical Ecosystems, archaeological sites, etc., and present checklists for environmental assessment procedures to be carried out within or near to such sites. Environmentally sensitive areas include archaeological sites, game reserves and natural parks, and wildlife sanctuaries, none of which are located within primary impact zones of sub-projects.

2.8.5 The Solid Waste Management Policy (2000)

This policy was promulgated by PEPA, which aims to facilitate control on waste by providing principles of good waste management and reducing waste at source. The Guidelines would be consulted during planning and designing the disposal of solid waste from the Contractor's camp to the construction sites.

2.8.6 Factories Act (1934)

The clauses of the Factories Act relevant to the project are those which concern health, safety and welfare of workers, disposal of solid wastes and effluents, and damage to private and public

property. The Factories Act also provides regulations for handling and disposal of toxic and hazardous materials. As construction activity is classified as 'Industry', these regulations will be applicable to the project construction contractor. This act will be applicable to the Contractor(s) to be engaged for sub-project's construction works covered under this ESIA.

2.8.7 Antiquity Act (1975)

The Antiquity Act ensures the protection of cultural resources in Pakistan. This act is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade and export. Antiquities have been defined in this act as "Ancient products of human activity, historical sites, sites of anthropological or cultural interest and national monuments etc."

Pakistan Antiquities Act of 1975 ensures the protection of physical cultural resources in Pakistan. The Act is designed to protect especially the notified "antiquities" from destruction, theft, negligence, unlawful excavation, trade and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan (Provincial Governments after the introduction of the 18th Amendment to the Constitution of Pakistan) to prohibit excavation in any area which may contain articles of archaeological significance.

The Act describes antiquity as (i) any ancient product of human activity, movable or immovable, illustrative of art, architecture, craft, custom, literature, morals, politics, religion, warfare or science or of any aspect of civilization or culture; (ii) any ancient object or site of historical, ethnographical, anthropological, military or scientific interest; (iii) any national monument; and (iv) any other object or class of such objects declared by the Federal Government, by notification in the official Gazette. The Act also defines 'ancient' as an antiquity which has been in existence for a period of not less than seventy five years.

The Antiquities Act of 1975 further provides about the fate of Chance Finds, officially termed as "Accidental discovery". In such a case the chance find is to be reported to the Director General Provincial Archaeological Department within seven days of its being discovered or found and preserve it for the period thus specified. If, within seven days of his being informed of the discovery of movable antiquity, the Director General decides to take over the antiquity for purpose of custody, preservation and protection, the person discovering or finding it shall hand it over to the Director General or a person authorized by him in writing. It further says that if Director General decides to take over the antiquity he may pay such amount as would be decided by the Advisory Committee.

The act prohibits new construction in the proximity of a protected antiquity and empowers the government of Pakistan to prohibit excavation in any area that may contain articles of archaeological significance.

Under this act, the proponents are obligated to ensure that no activity is under taken in the proximity of a protected antiquity, and during the course of the project if an archaeological discovery is made, it should be reported to the Department of Archaeology accordingly.

This Act will be applicable to the physical interventions such as construction activities to be carried out for the sub-project covered under this ESIA. No protected or unprotected antiquity has been identified in the primary impact zone of the sub-project areas that may be affected by the project interventions. However a chance find procedure has been included in this ESMP in case of any, as yet, unidentified antiquity.

2.8.8 National Environmental Quality Standards (2010)

The National Environmental Quality Standards (NEQS) were first promulgated in 1993 and have been amended in 1995 and 2000 including standards for liquid effluent and gaseous emissions. The standards for ambient air, drinking water quality and noise levels were published on November, 2010 and standards for motor vehicle exhaust, diesel vehicle, and petrol vehicle published on August, 2009. The following standards are specified therein:

- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid Indo trial effluents discharged to inland waters, sewage treatment facilities, and the sea (three separate sets of numbers).
- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from Indo trial sources.
- Maximum allowable concentration of pollutants (8 parameters) in ambient air quality.
- Maximum allowable concentration of pollutants (3 parameters) in motor vehicle exhausts quality.
- Drinking water standards and
- Noise standards.

The above NEQS are available on the ministry website and only a few of these standards will be applicable to the gaseous emissions and liquid effluents discharged to the environment from the activities under the proposed project.

2.8.9 Highway Safety Ordinance (2000)

The Highway Safety Ordinance includes provisions for licensing and registration of vehicles and construction equipment; maintenance of road vehicles; traffic control offences, penalties and procedures; and the establishment of a police force for motorways and national highways to regulate and control the traffic as well as keep the highways clear of encroachments. During transportation of the construction material, the Contractor's vehicles and machinery may need to use the national highways accessing to the sub-project location; therefore; this ordinance is applicable to the sub-projects covered under this ESIA.

2.8.10 Land Acquisition Act (LAA)-1894

The Land Acquisition Act (LAA) of 1894 is the key legislation that has direct relevance to resettlement and compensation in Pakistan. The LAA and its implementation rules require that

before implementation of any development project the privately owned land and crops are compensated to titled landowners and/or registered tenants/users.

Based on the LAA, only legal owners and tenants registered with the Land Revenue Department or those possessing formal lease agreements are eligible for compensation. Under this Act, users of the Rights of Way (RoW) are not considered "affected persons" and thus not entitled to any mitigating measure, compensation, or livelihood support. Also, there is no legal obligation to provide compensation to title-less land users, unregistered tenants, squatters or encroachers for rehabilitation. However, after independence and with the passage of time various deviations to LAA have been practiced.

The exceptions to the rule can be explained by the fact that the law is not rigid and is broadly interpreted depending on operational requirements, local needs, and socio-economic circumstances.

The relevant key sections of the LAA, 1894 are briefly described below.

Section 3:
According to this Section, land means land along with any superstructure, fixtures, etc., thereon and benefits accruing there from. For the purposes of Act, land includes buildings, and also trees and standing crops. Land thus is a sum total of land plus benefits arising out of land plus all objects/things attached to or permanently fastened to anything attached to it.

Section 4:
Section 4 details the first step in the land acquisition process under the LAA. A preliminary notice is served by the government expressing its desire to "enter upon" broadly identified private lands for surveying and soil-testing for the specified public purposes.

Requirements of publication of the notification under LAA are mandatory, and the acquisition proceedings would stand invalid if requirements of this section are not fully satisfied. Notification of LAA is a public pronouncement by appropriate government officer, empowered to publish a notification to that effect in official gazette in order to put those who are affected or likely to be affected on due notice. Purpose of LAA is to carry out preliminary investigation/land survey with a view to find out after necessary survey whether land was suitable for purposes for which it was sought to be acquired. Section 4 puts owners of land on alert that land is going to be acquired.

Section 5:
The initial notification under the LAA is followed and confirmed by way of a second notification under the Act. Under this Section, the marking and measurement of the land and assessment of compensation is carried out. The cash compensation is assessed on the basis of five or three years average registered market rate, and is paid to the landowners for their lands being acquired.

Under section 5, the owners of land or those affected or likely to be affected, may raise objections over the intent of land acquisition or survey report to the competent authority within 30 days of notification under section 5 for the hearing of objections.

Section 6:
Once an area in the locality is fixed to be acquired, it is notified by publishing the notification. The exact purpose of acquisition of land is also mentioned in the notification, and the land may be acquired only for the purpose thus specified. Any proposal for further acquisition in the same locality would have to be followed up by a fresh notification under the LAA.

Section 8:
Affectees are made aware of the exact measurement of their respective lands/structures and the value of land under acquisition through issuance of notification under the LAA.

Section 9:
Stating that the land is intended to be possessed and claims for compensation for all interests in the land may be made to the officer concerned and all persons interested/affected should appear before him at a given place and time not being earlier than 15 days after the publication of said notice.

Sections10, 11 and 12:
According to section 10, the Collector (defined under section 17 of the LAA) publicly declares/announces awards. Generally the award is declared at place where affectees can get together and hear the award. Affectees can either accept the award or reject the award; however, in any case the affectees have to sign the award mentioning whether they accept the award and the compensation offered therein or reject the award and sign under protest.

Section 17:
Under the this section, the Collector is authorized to acquire land on the basis of the situation declared as an "emergency situation" on behalf of the government and can avoid the formalities to be completed and to avoid any delay in proceedings. In such a situation, the Collector under section 17(4) can pass an award without looking into or addressing the objections/complaints of affectees. Proceedings under this section are independent and not subject to any restrictions and conditions.

2.8.11 Possession of Land

When the Collector has made an award under section 11/12, he may take possession of the land which shall thereupon vest absolutely in the government/ or acquiring department free form all encumbrances.

Under this Act, only legal owners and tenants officially registered with the Land Revenue Department or possessing formal lease agreements are considered "eligible" for land compensation.

2.8.12 Employment of Child Act, 1991

Article 11(3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any factory, mines or any other hazardous employment. In accordance with this Article, the Employment of Child Act (ECA) 1991 disallows the child labour in the country. The ECA defines a child to mean a person who has not completed his/her fourteenth year of age. The ECA states that no child shall be employed or permitted to work in any of the occupation set forth in the ECA (such as transport sector, railways, construction, and ports) or in any workshop wherein any of the processes defined in the Act is carried out.

The contractor will be bound by this Act to disallow any child labour at the project sites or camp sites.

2.9 Sindh Provincial Environmental Laws, Policies and Guidelines

2.9.1 Sindh Strategy for Sustainable Development (2007)

The Sindh Strategy for Sustainable Development (SSSD) proposes a ten year sustainable development agenda for Sindh. Its purpose is to highlight the ecological, economic and social issues of the province and to provide recommendations and strategic actions to address them. The strategy promotes the sustainable use of natural resources to achieve the objectives of poverty alleviation and social development through the participation of the people of Sindh.

2.9.2 Sindh Environmental Protection Act (2014)

The key features of the Act have a direct bearing on the proposed sub-projects because the sub-project requires an Environmental Social Impact Assesment (ESIA). As the sub-project covered under this ESIA is located in the district of Matiari, it falls under the jurisdiction of the Sindh Environmental Protection Agency that will accord the approval of the ESIA pertaining to the project.

The following are the key features of the Act that have a direct bearing on the project area.

- Section 11 (Prohibition of Certain Discharges or Emissions) states that “Subject to the provisions of this Act and the rules and regulations made there under, no person shall discharge or emit, or allow the discharge or emission of, any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards (NEQS)”.
- Section 15 (Regulation of Motor Vehicles): Subject to provision of this clause of the Act and the rules and regulations made there under, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the NEQS, or where the applicable standards established under clause (g) of subsection (1) of Section-6 of the Act.

- Section 17-I (Initial Environmental Examination and Environmental Social Impact Assessment) requires that "No proponent of a project shall commence construction or operation unless he has filed with the SEPA an EIA or, where the project is likely to cause an adverse environmental effect, an EIA, and has obtained from the SEPA for approval in respect thereof." This EIA meeting the requirement of ESIA has been prepared for the sub-projects covered under the report to comply with this Section of the Act.
- Section 17-2a and b (Review of IEE and EIA): The Sindh EPA shall review the Environmental Impact Assessment report and accord its approval subject to such conditions as it may deem fit to impose, or require that the ESIA be re-submitted after such modifications as may be stipulated or rejected, the project as being contrary to environmental objectives.

2.9.3 Sindh Irrigation Act (1879) with Amendments in 2011

The Sindh Irrigation Act (1879) is the main enactment relating to irrigation in the Province of Sindh, under this Act the entire task of irrigation has been entrusted to the Provincial Government, Canal Officers the Revenue Department and Judicial Officers. The main features of the Act are as under:

- Important policy aspects of Irrigation, like the appointment of the Canal Officers, acquisition of water for public use, payment of compensation, water rates, drainage schemes, canal crossing and framing the rules, have been entrusted to the Provincial Government.
- Operational functions are entrusted to the Canal Officers but the Act does not specify which Canal Officers are empowered to act under any of its provisions. Therefore, a Canal Officer must by duly authorized by the Provincial Government to act under any provision of the Act.
- The Revenue Administration helps the Irrigation Department to acquire land, determine compensation and collect water dues. Moreover, the Commissioner and Collector have substantial power to settle disputes among irrigators and can decide appeals against the decisions of the Canal Officers. Thus, the Canal Officers are substantially subservient to the Revenue Department.
- The offences under the Act can be tried before the Magistrate.
- As the reaches of Indus River embankment considered for rehabilitation under SRP Project is to be implemented by the Sindh Irrigation Department, therefore; this act is applicable to the sub-projects.

2.9.4 Sindh Local Government Act, 2013

The Sindh Local Government Act, 2013 empowers the Government of Sindh and Districts to establish an elected local government system to devolve political, administrative and financial responsibility and authority to the elected representatives of the local governments; to promote good governance, effective delivery of services and transparent decision making through

institutionalized participation of the people at local level; and, to deal with ancillary matters. The embankment sub-project area is administratively falling under the jurisdiction of Matiari District.

2.9.5 Motor Vehicles (Amendment) Act, 2014

The Provincial Motor Vehicle Act, 2014 deals with the powers of the Motor Vehicle Licensing Authorities and empowers other related agencies to regulate traffic rules, vehicle speed and weight limits, and vehicle use, to erect traffic signs, and to prescribe special duties of drivers in case of accidents. It also prescribes powers of police officers to check and penalize traffic offenders.

2.9.6 Sindh Wildlife Protection Ordinance (2001)

The Sindh Wildlife Protection Ordinance of 1972, as amended in 2001, 2010 provides for the preservation, protection, and conservation of wildlife by the formation and management of protected areas and prohibition of hunting of wildlife species declared protected under the ordinance. The project activities will have to be carried out in accordance with this Act. In particular, no activities of the SRP Project will be carried out inside any protected areas defined under the Act. The ordinance also specifies three broad classifications of the protected areas:

2.9.7 Sindh Forest Act, 1927 (2012)

The Act authorizes Provincial Forest Departments to establish forest reserves and protected forests. The Act empowers the department to protect, conserve, and manage sustainable development of forest and biodiversity. The act prohibits any person to set fire in the forest, quarry stone, remove any forest-produce or cause any damage to the forest by cutting trees or clearing up area for cultivation or any other purpose.

The project activities will have to be carried out in accordance with this Act. No activities will be carried out in any protected forests, and no unauthorized tree cutting will be carried out.

There are 10 riverine protected forest areas in the embankment sub-project area. Out of 10, 09 have been converted into agriculture land and do not exist anymore while 1 of them exist with thin tree population due to cutting of trees by the local people and washing out due to change in the Indus River course. All of the said forest areas are out of the proposed sub-project primary impact zones. The details of the forest areas and its location are given in Chapter-5. No impacts of the sub-project are anticipated. Most of the forest areas are away more than 1km from the primary impact zone of the sub-project's interventions. However, mitigation measures are devised to restrict the contractor activities in these areas. In addition, the proposed sub-project may cause cutting/uprooting of 27 trees out of 111 falling in the potential RoW of the embankments. However, it is planned to plant 5 indigenous trees in place of one cut/uprooted tree.

2.9.8 Sindh Fisheries Ordinance (1980)

The Sindh Fisheries Ordinance of 1980 provides rules and regulations for marketing, handling, and transportation, storage of fish and shrimps for commercial purpose and sale of fish used for the provincial trade in the Province of Sindh. Contravention of this Ordinance leads to imprisonment up to 6 months or a fine of 10,000 rupees or both. No government or local people operated or maintained fish hatchery or production site exist in the primary impact zone of sub-projects, however; the Indus River and some ponds along the embankment is the source of fishing for the local people. Therefore, this act is applicable to the sub-projects.

2.9.9 Sindh Cultural Heritage (Preservation) Act - 1994

The Sindh Cultural Heritage (Preservation) Act 1994 provides rule and regulations to preserve and protect ancient places and objects of agricultural, historical, archaeological, artistic, ethnological, anthropological and national interest in the province of Sindh. Therefore; this act may be applicable in specific situation. The Act however does not cover Chance find explicitly. Hence, the provisions of the Antiquity act 1975 are applicable at the provincial level in the case of Chance find.

2.9.10 Sindh Prohibition of Employment of Children Act 2017

The Sindh prohibition of employment of children Act 2017 provides rule and regulations to prohibit the employment of children and to regulate employment of adolescents in certain occupations and work. This act defines “adolescent” means person who has completed his fourteenth but has not completed eighteenth year of his age. According to the act “child” means a person who has not completed his fourteenth years of age.

2.10 The World Bank Safeguards Policies

The World Bank is the donor of the project. Therefore it is obligatory for Sindh Irrigation Department (SID), Government of Sindh (GoS), to abide by the World Bank Safeguard polices. In the light of the World Bank OP: 4.01, the Sindh Resilience Project (SRP) has been categorized as Category-A project. The triggering statuses of the World Bank Operational Policies on the sub-projects covered in this ESIA are described below in Table-2.

Table 2: Applicable World Bank Safeguard Policies

Sr. Nr.	Description	Law / Policy Reference	Remarks
1	Environmental Assessment	OP/BP/GP 4.01	As per PID/ISDS of the SRP Project, the overall project is categorized as Category-A due to the structural investments under the Component- 2 which will include construction of new and rehabilitation of existing flood protection and river training structures. These activities are likely to cause negative environmental and social impacts of varying degree of intensity, significance, spatial as well as temporal extent, reversibility, and importance. Therefore; in accordance to the WB OP 4.01, the environmental assessment of each sub-project to be covered under the ambit of SRP is required.
2	Natural Habitats	OP/BP 4.04	Some interventions are likely to be carried out within or near important habitats. Therefore; this OP is triggered.

Sr. Nr.	Description	Law / Policy Reference	Remarks
3	Involuntary resettlement	OP/BP 4.12	There is no any involuntary resettlement resulting in relocation or adverse impact on livelihood and/or sources of a livelihood. Because sub-project to be constructed on government own land. Therefore; this OP 4.12 is not applicable on this sub-project Although this policy is triggered on overall project.
4	Project Inter-national water ways	OP/BP 7.50	The proposed interventions will be carried out in/along Indus River which is an international waterway as defined in the OP. However; an exception notification would be sought by the task team.

Environmental Assessment (OP 4.01)

The World Bank requires environmental assessment (EA) of projects proposed for Bank funding and thus to improve decision-making. The OP 4.01 defines the EA process and various types of EA instruments. The present environmental assessment has been carried out in accordance with this OP-4.01, to identify the extent and consequences of these impacts and to develop an ESMP for their mitigation. OP 4.01 defines the requirements for environmental assessments of World Bank funded projects. It describes environmental screening processes in order to define projects as category A, B, or C, where category A projects are likely to have significant impacts, and category C projects have minimal impacts. The OP includes a range of environmental assessment and management tools relevant to different impact category projects and defines the requirements for public consultant and disclosure.

As per PID/ISDS of the SRP Project, the overall project is categorized as Category-A Project due to the structural investments under the Component- 2, which will include construction of new, and rehabilitation of existing flood protection and river training structures. As per ESMF, this is medium sized sub-project, which caters to rehabilitation of existing structures with a potential to cause low to moderate level of impact. As per Table 4.2 of ESMF, this is a category B sub-project requiring ESMP.

Natural Habitat (4.04)

This policy requires the borrower (SID) to apply a precautionary approach to the management of natural resources in order to ensure opportunities for environmentally sustainable development. This policy extends beyond sub-projects designed specifically for the protection, maintenance and rehabilitation of natural habitats, to integrate the conservation of natural habitats into any regional or national development project. As such, this policy is triggered wherever a project may affect upon natural habitats. There are some reserved forest located near or inside secondary COI, some interventions are likely to be carriedout near important habitats. Therefore, this OP is triggered.

Projects on International Waterways (OP 7.50)

OP 7.50 is related to the types of projects falling within the ambit of international waterways. This policy applies to the following types of international waterways:

- (a) any river, canal, lake, or similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states, whether Bank members or not;
- (b) any tributary or other body of surface water that is a component of any waterway described in (a) above; and
- (c) Any bay, gulf, strait, or channel bounded by two or more states or, if within one state, recognized as a necessary channel of communication between the open sea and other states--and any river flowing into such waters.
- This policy applies to the following types of projects:
- Hydroelectric, irrigation, flood control, navigation, drainage, water and sewerage, Industrial facilities, and similar projects that involve the use or potential pollution of international waterways as described in Para. 1 above; and
- Detailed design and engineering studies of projects under Para. 2(a) above, including those to be carried out by the Bank as executing agency or in any other capacity.

Some of the proposed interventions will be carried out in accordance with the Waterways OP/BP 7.50 in/along Indus River which is an international waterway. However; an exception of notification would be sought by the task team.

2.11 Multilateral Environmental Agreements

Pakistan is signatory of several Multilateral Environmental Agreements (MEAs), including:

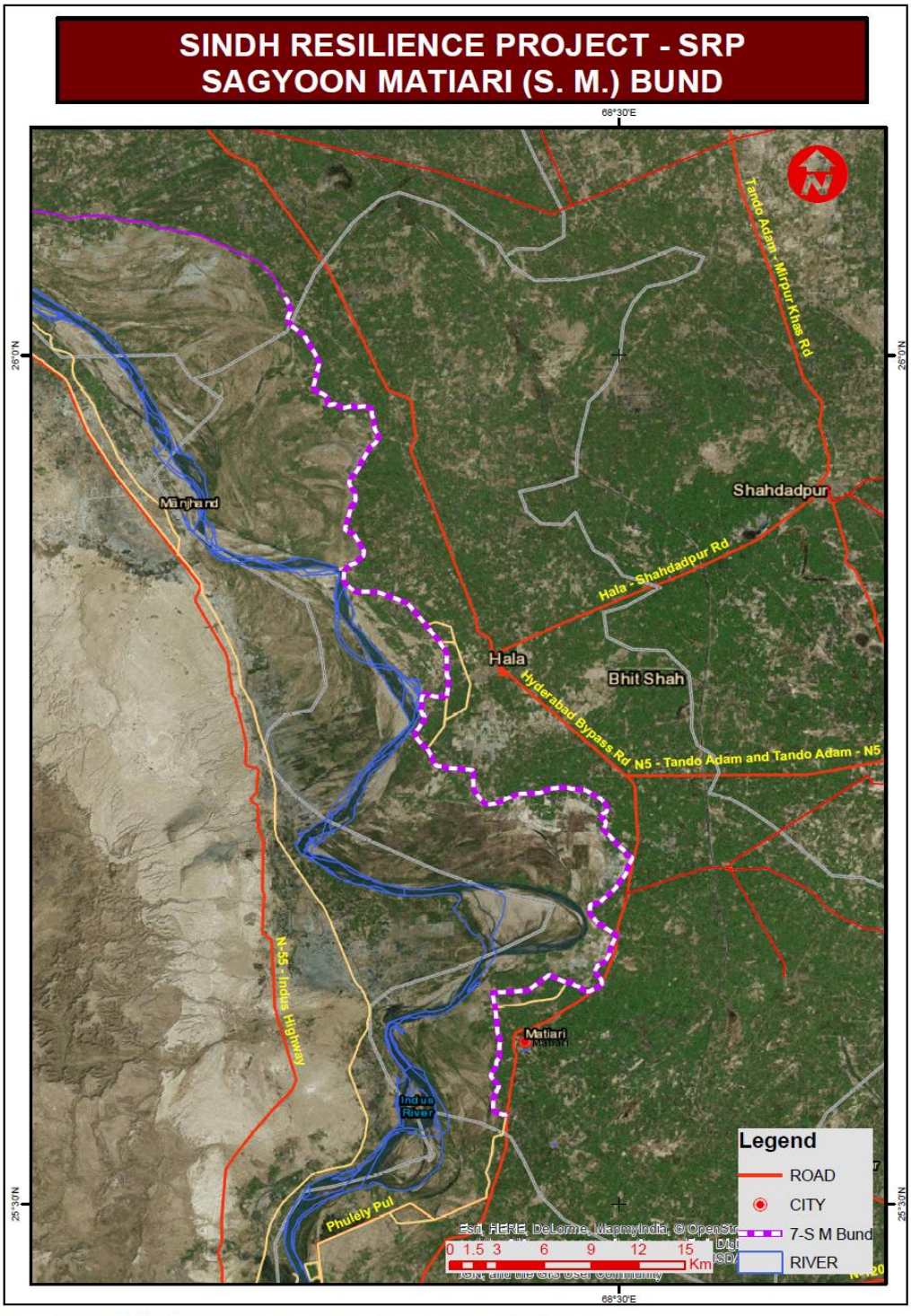
- Basel Convention,
- Convention on Biological Diversity, Convention on Wetlands (Ramsar),
- Convention on International Trade in Endangered Species (CITES),
- UN Framework Convention on Climate Change (UNFCCC),
- Kyoto Protocol,
- Montreal Protocol,
- UN Convention to Combat Desertification,
- Convention for the Prevention of Pollution from Ships (MARPOL),
- UN Convention on the Law of the Seas (UNCLOS),
- Cartina Protocol.
- The Ramsar Convention (the Convention on Wetlands of International Importance)

These MEAs impose requirements and restrictions of varying degrees upon the member countries, in order to meet the objectives of these agreements. However, the implementation mechanism for most of these MEAs is weak in Pakistan and institutional setup mostly non-existent. The MEA most applicable for the Project is the Stockholm Convention on Persistent Organic Pollutants (POPs), under which certain pesticides such as dichloride dichloromethane (commonly known as DDT) cannot be used.

3. DESCRIPTION OF SUB-PROJECT

3.1 Location of the Sub-Project

The location of SM Bund of Indus River to be undertaken under the proposed sub-project is shown in Figures-1 and 2. The SM Bund is located in district Matiari.



Document Path: D:\PFF\SRP\GIS\PROJECT LOCATION EMBANKMENT - SM Bund 20-04-2018.mxd

Figure 2: Location of the SM Bund Sub-projects

3.2 Existing Condition and Problems of the Sub-Projects

The Indus flood protection embankment are designed, constructed and maintained according to Sindh Irrigation Bund Manual and guidelines of Indus River Commission. The bunds are constructed of soils from riverbed, which are mostly sandy silts and clays. The bund crest is kept 20 ft. wide with a freeboard of 4 to 5 ft. above the maximum observed flood level, slopes are kept quite gentle and upstream face is protected with stone pitching. Upstream stone aprons (launching aprons) are provided in the reaches where riverbed erosion is expected. There is no slope protection on the downstream face. The embankment faces sometime get damages during high floods. Animal and human activity is another source of disturbance. The typical cross-section of embankment indicating project works as shown in Figures 3 and 4.

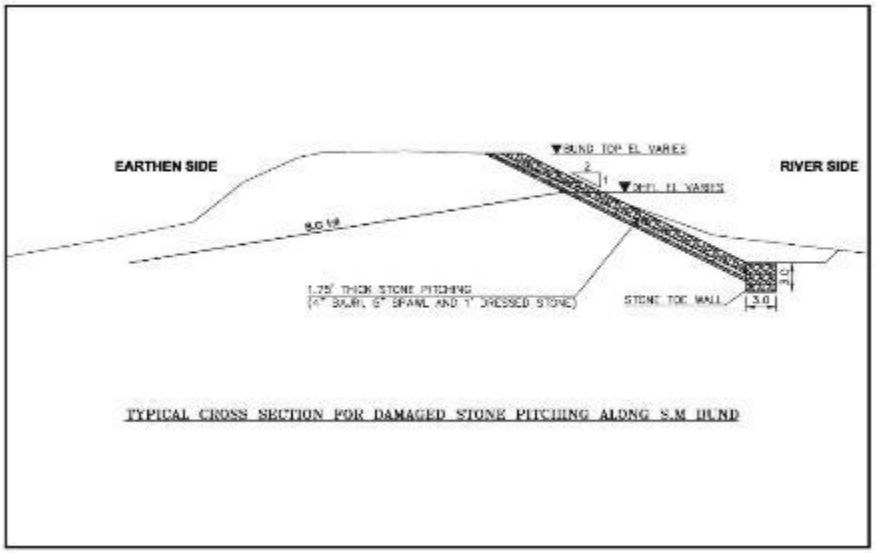


Figure 3: Typical Cross Section of Damaged Stone Pitching along S.M Bund

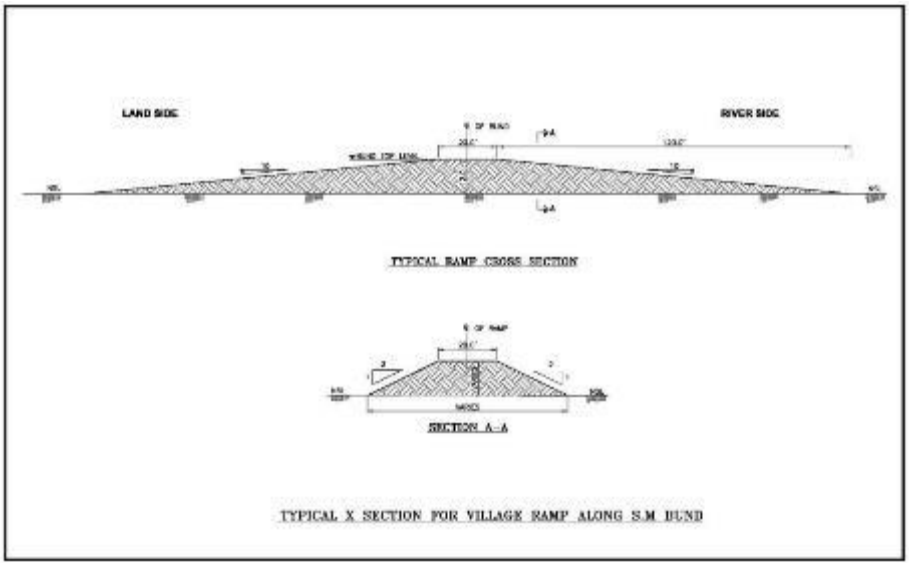


Figure 4: Typical Cross Section of Village Ramp along SM Bund and proposed repair works

The condition of embankments of sub-projects is described below. Some photographs of the embankments are given in **Annex-A.**

3.3 Sagyoon Matiari (S.M) Bund

Sagyoon Matiari Bund (S.M bund) is on left bank river protective bund from Mile 0/0 in Khairpur District and 172/0 end of District Matiari. S.M bund is important as it is directly under the thrust of river water. The water touches the bund all the way during flood. Due to heavy wave wash action along the bund the stone pitching was damaged badly during past floods. It is earnestly required recoupment of the damaged stone pitching and construction of village ramps along Bund from Mile (123/0 to 172/0).

3.4 Proposed Rehabilitation Works

The rehabilitation and strengthening of embankments mostly include following type of works:

- Recoupment of damaged stone pitching
- Reconstruction of existing earthen community ramps on Indus River.

The major proposed activities shall be as under;

i. Contractor's mobilization: After awarding the contract the selected contractor will be mobilized in the field and arrange the camp for their staff and labor. The machinery and other necessary equipment will be shifted.
ii. The borrow areas will be excavated as per specifications. The borrow material will be loaded and transported by tractor-trolleys through approved routes to the bund/ embankment.
iii. Restoration of existing community ramps with the soil obtained from borrow areas. Activities involve unloading the soil on embankment, leveling, and compaction of soil in layers.
iv. The stone shall be loaded and transported from Khanot quarry to the site through trucks and unloaded/stacked at designated places.
v. 1.75' ft. thick stone pitching layer (4" Bajri, 5" spall and 1' dressed stone) will be recouped/reconstructed stored carried out at desired reaches of S.M Bund from Mile 123/0 to 172/0 in Hala irrigation division. Details of village ramps are provided in the Table-3 below.

Table 3: Detail of Ramps

S. No.	Reach in Miles	Land Side	River Side	Sub-Total	S. No.	Reach in Miles	Land Side	River Side	Sub-Total	Total
1	121.00	-	-	-	55	152.00	-	1.00	1.00	1.00
2	124.00	-	1.00	1.00	56	152.00	-	1.00	1.00	2.00
3	125.00	1.00	-	1.00	57	153.00	-	1.00	1.00	2.00
4	125.00		1.00	1.00	58	153.00	1.00	-	1.00	2.00
5	126.00	1.00	1.00	2.00	59	154.00	-	1.00	1.00	3.00
6	128.00	-	1.00	1.00	60	154.00	-	1.00	1.00	2.00
7	128.00	1.00		1.00	61	155.00	-	1.00	1.00	2.00
8	128.00	-	1.00	1.00	62	155.00	-	1.00	1.00	2.00
9	129.00	1.00	1.00	2.00	63	155.00	1.00	-	1.00	3.00
10	130.00	1.00	1.00	2.00	64	156.00	1.00	-	1.00	3.00
11	131.00	1.00	1.00	2.00	65	157.00	1.00	-	1.00	3.00
12	132.00	-	1.00	1.00	66	157.00	1.00	-	1.00	2.00
13	132.00	-	1.00	1.00	67	157.00	-	1.00	1.00	2.00
14	133.00	-	1.00	1.00	68	158.00	-	1.00	1.00	2.00
15	133.00	-	1.00	1.00	69	158.00	-	1.00	1.00	2.00
16	133.00	1.00	-	1.00	70	159.00	-	1.00	1.00	2.00
17	134.00	-	1.00	1.00	71	159.00	-	1.00	1.00	2.00
18	135.00	1.00	-	1.00	72	159.00	-	1.00	1.00	2.00
19	135.00	-	1.00	1.00	73	159.00	-	1.00	1.00	2.00
20	137.00	-	1.00	1.00	74	159.00	1.00	-	1.00	2.00
21	141.00	-	-	-	75	159.00	-	1.00	1.00	1.00
22	143.00	-	1.00	1.00	76	160.00	1.00	1.00	2.00	3.00
23	143.00	-	1.00	1.00	77	160.00	1.00	-	1.00	2.00
24	143.00	-	1.00	1.00	78	160.00	1.00	-	1.00	2.00

S. No.	Reach in Miles	Land Side	River Side	Sub-Total	S. No.	Reach in Miles	Land Side	River Side	Sub-Total	Total
25	143.00	-	1.00	1.00	79	161.00	-	1.00	1.00	2.00
26	144.00	1.00	1.00	2.00	80	161.00	1.00	-	1.00	3.00
27	144.00	-	1.00	1.00	81	161.00	-	1.00	1.00	2.00
28	145.00	-	1.00	1.00	82	162.00	-	1.00	1.00	2.00
29	145.00	1.00	1.00	2.00	83	162.00	-	1.00	1.00	3.00
30	146.00	-	1.00	1.00	84	163.00	1.00	-	1.00	2.00
31	146.00	1.00	-	1.00	85	163.00	-	1.00	1.00	2.00
32	147.00	1.00	1.00	2.00	86	164.00	-	1.00	1.00	3.00
33	147.00	-	1.00	1.00	87	164.00	-	1.00	1.00	2.00
34	147.00	-	1.00	1.00	88	164.00	1.00	1.00	2.00	3.00
35	147.00	1.00	1.00	2.00	89	165.00	1.00	-	1.00	3.00
36	148.00	-	1.00	1.00	90	165.00	-	1.00	1.00	2.00
37	148.00	1.00	1.00	2.00	91	166.00	1.00	1.00	2.00	4.00
38	148.00	1.00	-	1.00	92	167.00	-	1.00	1.00	2.00
39	148.00	-	1.00	1.00	93	167.00	1.00	1.00	2.00	3.00
40	149.00	-	1.00	1.00	94	168.00	-	1.00	1.00	2.00
41	149.00	1.00	-	1.00	95	168.00	-	1.00	1.00	2.00
42	149.00	1.00	-	1.00	96	168.00	-	1.00	1.00	2.00
43	149.00	-	1.00	1.00	97	169.00	-	1.00	1.00	2.00
44	149.00	1.00	1.00	2.00	98	169.00	-	1.00	1.00	3.00
45	150.00	-	1.00	1.00	99	169.00	1.00	-	1.00	2.00
46	150.00	1.00	-	1.00	100	169.00	-	1.00	1.00	2.00
47	150.00	1.00	-	1.00	101	169.00	-	1.00	1.00	2.00
48	150.00	-	1.00	1.00	102	169.00	-	1.00	1.00	2.00

S. No.	Reach in Miles	Land Side	River Side	Sub-Total	S. No.	Reach in Miles	Land Side	River Side	Sub-Total	Total
49	150.00	1.00	1.00	2.00	103	170.00	-	1.00	1.00	3.00
50	151.00	1.00	-	1.00	104	170.00	1.00	1.00	2.00	3.00
51	151.00	-	1.00	1.00	105	170.00	1.00	-	1.00	2.00
52	151.00	-	1.00	1.00	106	170.00	1.00	-	1.00	2.00
53	151.00	-	1.00	1.00	107	170.00	-	-	1.00	2.00
54	151.00	1.00	1.00	2.00	108	171.00	-	1.00	1.00	3.00
DETAIL OF RAMPS N.F BUND										
1	2.00	-	1.00	1.00	5	3.00	1.00	1.00	2.00	3.00
2	2.00	-	1.00	1.00	6	4.00	1.00	1.00	2.00	3.00
3	2.00	-	1.00	1.00	7	4.00	1.00	-	1.00	2.00
4	3.00	-	1.00	1.00	8	4.00		1.00	1.00	2.00
Total								**87.00**	**46.00**	**133.00**

3.5 Construction Materials

The quantities of the main construction materials are given in the Table-4 below. The fill for earthwork will be obtained from uncultivated land from river side which is state owned land/property. Whereas, Contractor shall be restricted to obtain the fill material from private lands, hence no compensation will be required. The sandy and organic soils shall be avoided. Water for compaction of earth work will be obtained from river through water bowsers and ground water will be utilized for domestic purpose.

The stones for pitching and launching aprons shall be obtained from limestone quarries of Khanote that are located at distance of about 90 km from the site respectively. The gabion meshes shall be obtained from Karachi. The stones will be moved directly from the stone quarries.

Table 4: Summary of Major Construction Materials

S.No.	Material	S.M Bund Matiari	
		Quantity (cft)	Source
1	Earth work Excavation	2062.50	
2	Formation dressing and Preparing Sub-base	364275.66	
3	Stone filling	2062.50	Khanote/Jamshoro
4	Stone Pitching including sub-base. 3 chains	637482.41	Khanote
5	Borrow pit Excavation in 100ft	3477018.40	

3.6 Construction Schedule

The works on the sub-project are scheduled to be completed in 12 months as shown in Figure 5. The works in these sub-project will be carried out when flows in river are low, however during flood period which remains 1-2 months i.e July-August, in these months outerside of embankment activities will be carried out. Further, after passing of flood remaining works of stone pitching and ramps rehabilitation will be carriedout.

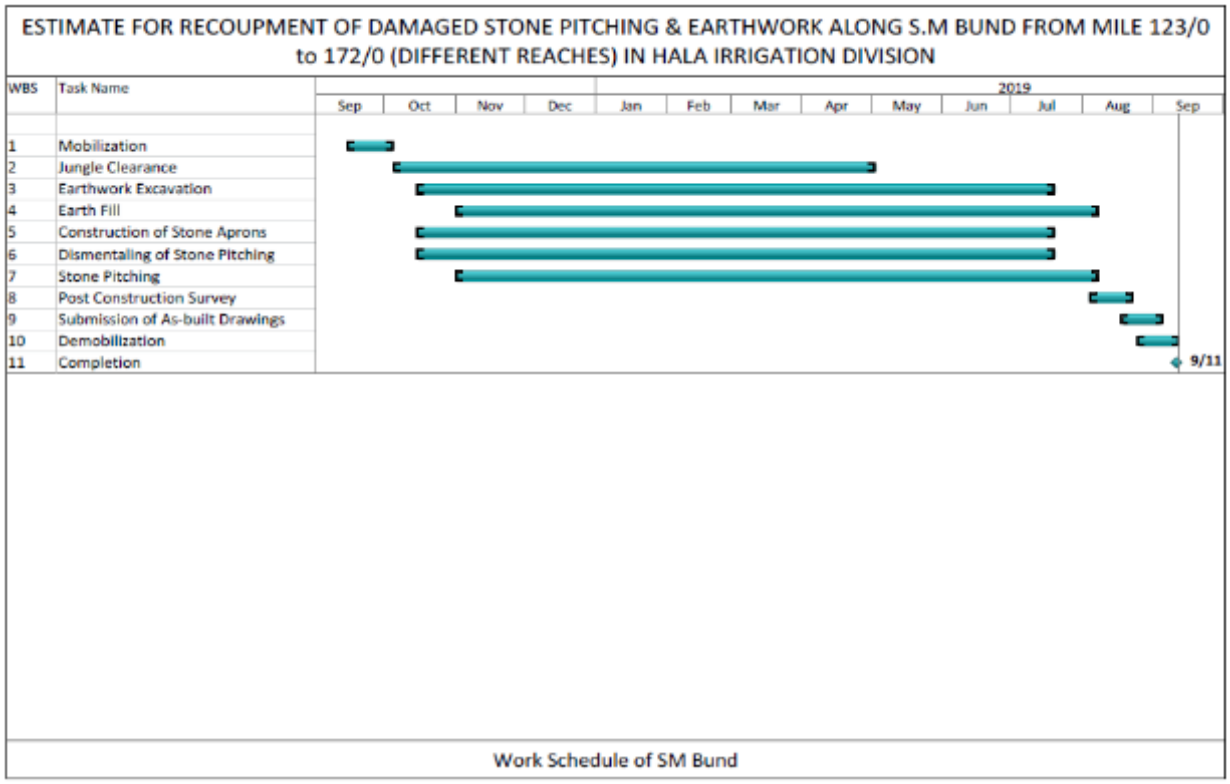


Figure 5: Work Schedule for S.M Bund

3.7 Construction Camps

The main camp shall be located in Matiari city to be in a rented compound for the contract period of twelve months. While two site camps are to be established near the working areas. Each site camp will accommodate 20-30 persons. Site camps shall be established in uncultivated areas within RoW. Tube well will be installed by the contractor for water extraction to be used in labor camp.It will be ensured that constractor shall not rely on community wells. The cutting of trees as well as establishment of camp within agriculture productive land shall be avoided. These camp sites shall be 500m away from the settlements. The site camps will include following facilities.

- Staff accommodation
- Sanitation facilities
- Sewage disposal system
- Parking of vehicles or machinery
- Generators
- Medical facilities
- Dining areas
- Solid / Medical waste storage area
- Tube well

The areas and location wise details of all proposed campsites are provided in following Table-5.

Table 5: Site Camps Location

S. No	Sub-project	Location Mile	Co-ordinates		Approx. Area Sq. ft.	Details
			N	E		
1	S.M Bund	133/7	25.896923	068.343948	100,000	Uncultivated land near village Mari Muhammad Khan 500M away from embankment. Easily accessible through link road from Saeedabad town through N-5 Highway.
2		162/2	25.37403	068.29131	95,000	Government owned uncultivated land near Baodero town, 500 M away from population and easily accessible through N-5 highway.

Locations of all sub-project site camps are given in Figures 6 to 8.

Figure 6: Camp Site Location of S.M Bund near Mari Muhammad Khan village

Figure 7: Current Status of Camp Site Location of S.M Bund near Mari M. Khan village

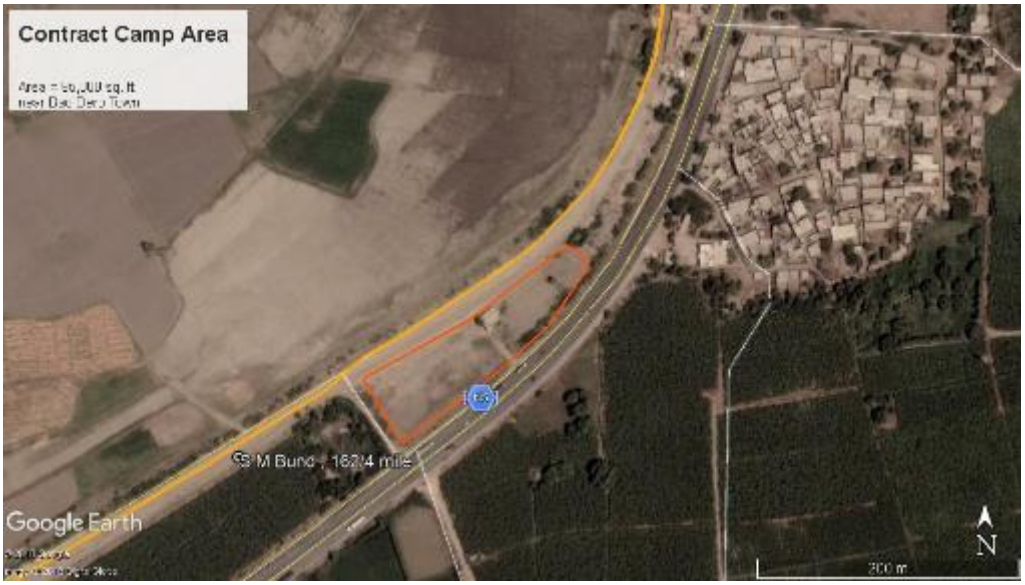


Figure 8: Camp Site Location of S.M Bund near N-5 Highway

3.8 Area of Influence and Corridor of Impact (CoI)

The Corridor of Impact (CoI) for the sub-project covered under this ESIA is considered the area in which there could be a direct impact during construction phase. The CoI covers the footprint of the temporary and permanent works or the working area required to undertake the proposed works. The impacts could be on businesses and livelihood due to removal or relocation of commercial structures, houses, irrigation and drainage structures, impacts on access routes, agriculture land and crops relocation of inhabitants, felling of trees, and disturbance during construction period. The spatial extent of the sub-project area when preparing the ESIA has been focused keeping in view the proposed engineering interventions and broad impacts of the sub-project after completion of the embankments. The CoI shall be classified as described below.

3.9 Primary Impact Zone

The primary impact zone is the direct footprint of the sub-projects (permanent and temporary works) where there will be direct impacts, for example, construction/rehabilitation works will be carried out, borrow areas will be developed, contractor's site camps to be established and access/haulage routes to be developed. The impact receivers such as human habitations and natural resources existing in this area will be directly affected by project actions e.g. construction of access roads, movement of vehicles, pollution, and presence of workers. Schematic diagram for typical primary impact zone is presented in Figure-9.

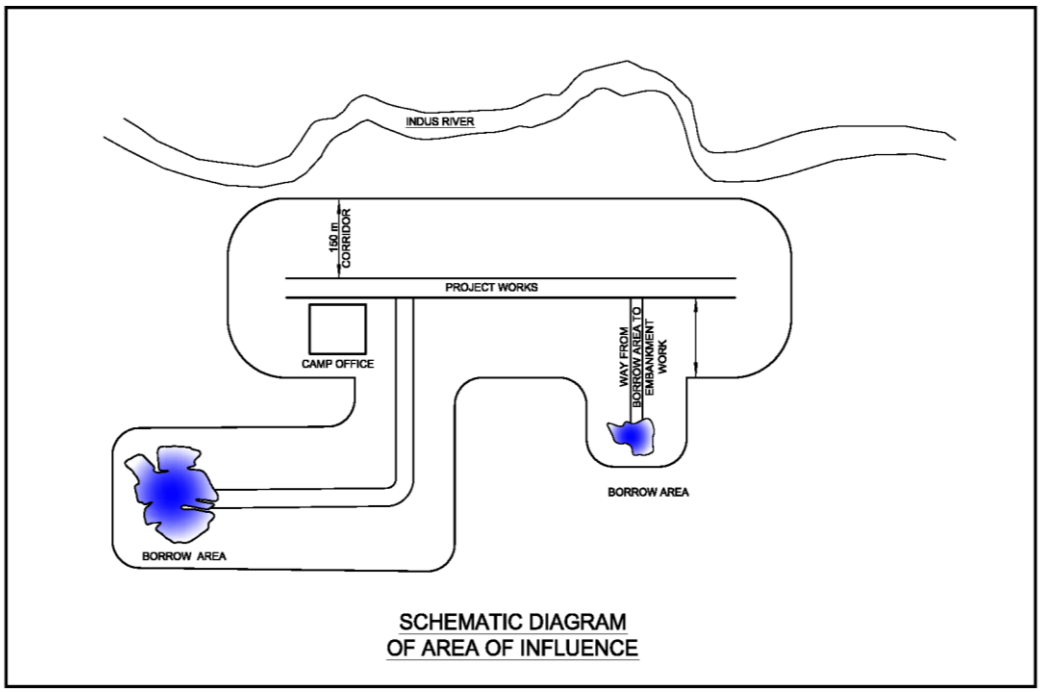


Figure 9: Typical Primary Impact Zone

3.10 Secondary Impact Zone

The secondary impact zone in case of the sub-project will be considered the areas prone to frequent flood damage or experienced damages in the past due to breach in the embankments. This area has been considered within the radius of 1km on each side of the embankment.

4. ANALYSIS OF ALTERNATIVES

4.1 General

An analysis of alternatives has been perform to review and assess different ways of meeting the project objectives that might have fewer environmental or socio-economic impacts.

The consideration of alternatives is a proactive method of environmental and social assessment as it enhances the project design by examining options and ruling out option(s) that are deem to be environment or socially damaging, instead of only focusing on mitigations to reducing adverse impacts of a single design. This calls for a systematic comparison of feasible alternatives for the proposed project site, technology and operational alternatives.

The designs for sub-project works on SM bund of Indus River are a result of an iterative design approach in which alternatives have been review, against for its functionality and socio-environmental impacts. The alternative project activities have been considered and the reasons for their rejection are discussed under the following headings.

This section presents an overview assessment of the impacts of each option under the following categories:

- Economic;
- Environmental; and
- Social

The assessment considers the magnitude and duration of both positive and negative impacts to assign impact significance as given in Table 6.

Table 6: Determination of Impact Significance

Impact Magnitude	Impact Significance	
	Short-term Duration	Long-term Duration
Major Positive	Moderate Positive	Major High positive
Moderate Positive	Minor Positive	Moderate Positive
Minor Positive	Negligible	Minor Positive
Neutral	Negligible	Negligible
Minor Negative	Negligible	Minor Negative
Moderate Negative	Minor Negative	Moderate Negative
Major Negative	Moderate Negative	Major Negative

For the alternatives considered in this chapter, each category is assign an impact significance according to the criteria given in Table 6.

4.2 The Available Alternatives for Sub-projects

The River Indus in its lower part while passing through Sindh flows on a ridge, with river water level higher than the land beyond both banks. In 1940 a system of earthen embankments (levees) was constructed to contain spread of water within river waterway. These embankments are 20 to 50ft higher than the adjacent landside ground levels. The river side slope of these embankments is protected with stone-pitching and stone aprons. The landside slope is made sufficiently flat to avoid seepages emerging on the embankment face. The crest level (top) of embankments was kept to provide ample freeboard against wave overtopping. The following problems have arisen in some reaches of river embankments with passage of time (see Figure 10):

Figure 10: Issues of Existing River Embankment Requiring Rehabilitation

i) Due to climate change the flood peak discharges have increased in River Indus resulting in insufficient freeboards against overtopping
ii) Damages in stone protection works due to factors such as again of stone, poor quality and erosion due to high flood velocities
iii) Local erosion of embankment body have reduced seepage path, which may cause piping failure.

Due to these shortcoming, in past at a number of places breaches of embankments have occurred causing catastrophic loss of human life, property and crops.

To develop resilience against floods intervention is required on river embankments. The following alternatives may be considered.

Option 0: Do nothing
Option 1: Strengthening of existing embankment (The Project)
Option 2: Abandon exiting embankment and construct new embankment
Option 3: Construction of Steel Sheet Pile or Concrete Retaining Wall

These options are shown in Figures 11 to 14 and discussed below.

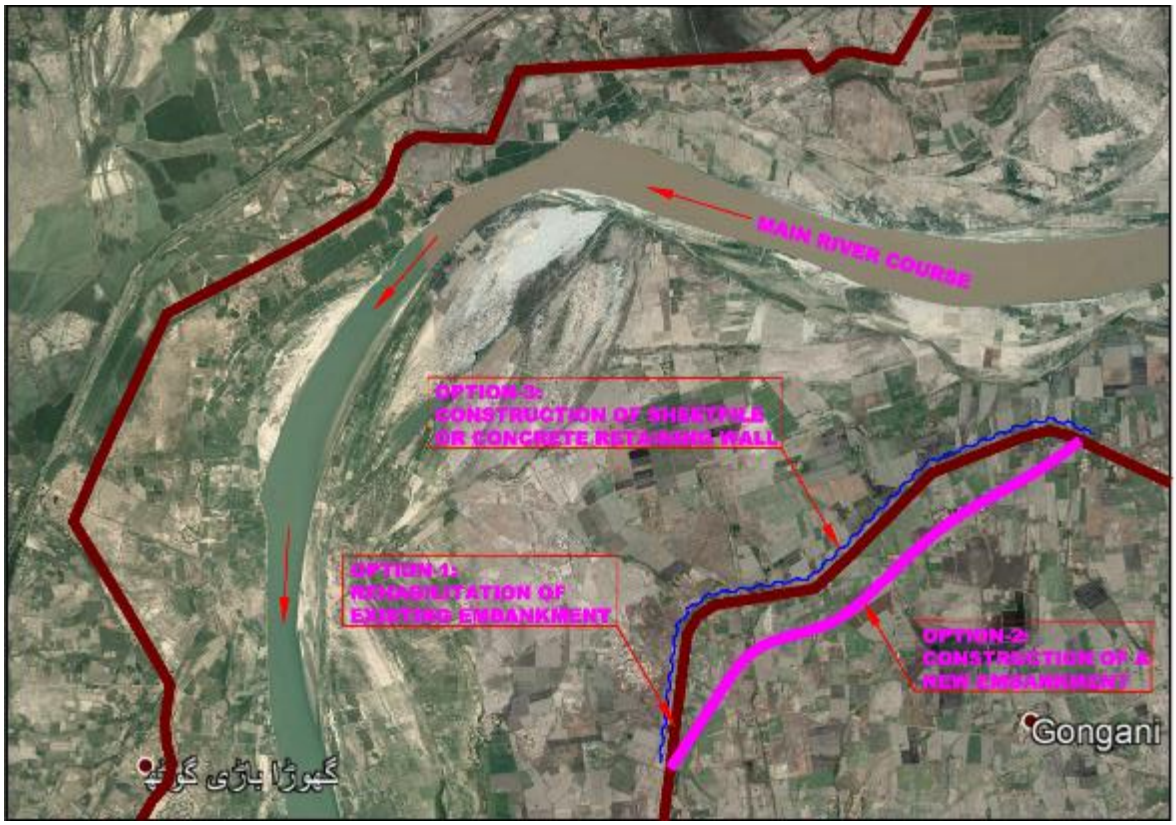


Figure 11: Layout Plan of Miscellaneous Options

4.3 Option 0: No Project Alternative

The no project alternative is assessed on the assumption that in the absence of the project, the Irrigation Department would continue to undertake on-going maintenance of the embankments at the current rate and nature.

In the No project scenario, the performance of the embankments is considered to be continued as has been recorded since commissioning of the embankment, as such the following issues are expected to continue:

- Catastrophic breaches of the embankments during high floods season.
- Piping (or leaks) through the embankments during high flood events – such leaks may weaken the bunds (levees) and increase the risk of a breach occurring during high floods in the future and the same losses are expected as described above.
- Depressions in embankment crests are developing at local crossing points, and would be expected to continue to lower, reducing the level of freeboard provided and increasing the risk of failure of the bunds due to overtopping during a high flood season.
- Erosion of the embankments due to wave washes during high flood season.

In all the above-mentioned cases, there is a threat of breach of the embankment during high flood in Indus River. As the province of Sindh has already experienced major floods in 1975, 1976, 1992, 1994, 1995, 2003, 2005, 2007, 2010, 2011, 2012, 2013 and 2015. Floods in 2010 displaced

7.2 million people and affected 11,992 villages. The impact on the economy of Sindh was estimated at PKR. 372 billion (US$ 4.4 billion), with agriculture, livestock and housing contributing to major losses. This risk may be further increased due to frequent occurrence of supper floods as a result of climate change and deteriorating condition of embankments. As such, without implementation of this project to provide flood protection, the widespread damage in the region resulting from super floods is expected. Therefore; this option has been dropped.

4.4 Option 1: Recoupment of Damaged Stone Pitching and Reconstruction of Existing Embankment Ramps (The Project)

This alternative involves the recoupment of damaged stone pitching and reconstruction of existing earthen community ramps on existing SM Bund of Indus River.

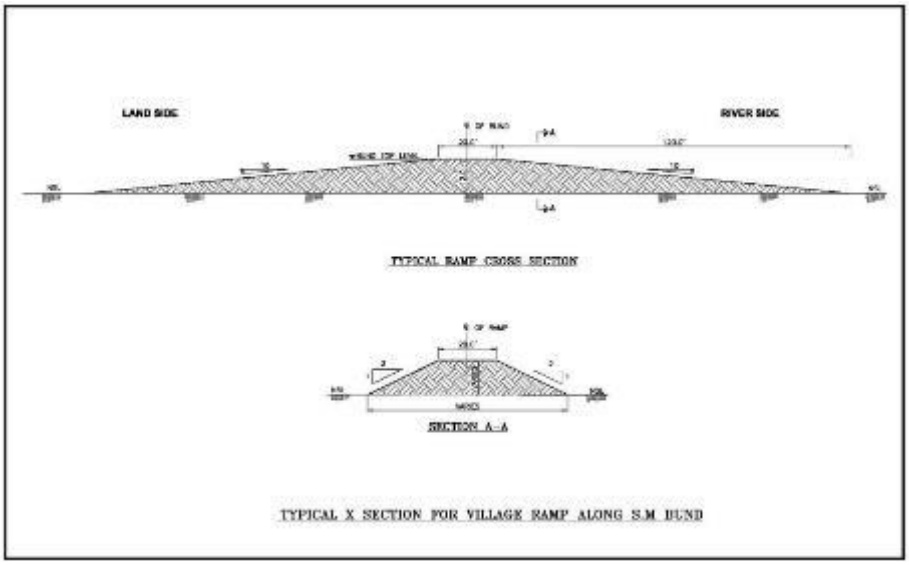


Figure 12: Option 1: Recoupment of Damaged Stone Pitching and Reconstruction of Existing Embankment Ramps

The earthfill material for the formation of existing ramps would be obtain from borrow areas situated within the riverine areas of Indus on government owned land. Stone pitching would be added to the damaged parts of existing stone pitching at riverside face of embankments to protect from becoming undermined by erosion during flood flows. The materials for stone pitching will be acquired from commercial quarries approved by Government of Sindh.

As part of these works, no any housing structure would be affected, only 27 Nos: trees situated on the embankments would be removed/felled.

The existing embankment is generally in good condition expect some local erosion and loss of protective works. Their rehabilitation and replenishing will not only be an economical solution but will have minimum negative environmental and social impacts involving no any resettlement and no land acquisition is required.

4.5 Option 2: Construct New Embankments

This alternative would require the construction of new embankments on the river-side or land-side of the existing embankments to reduce the requirement to resettle those who are currently living on the existing bunds. But a major part of required area, which in most cases is located on landside, is generally used for agriculture and covered with trees and vegetation and there are temporary and permanent villages also.

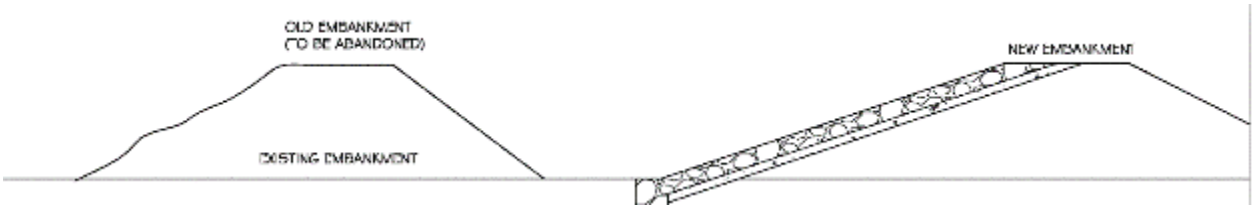


Figure 13: Option 2: Construt New Embankment

The environmental and social impacts associated with the construction of new embankments are clearance of vegetation, removal / uprooting of trees, disturbing water bodies, defacing the landscape, land acquisition and relocating the settlements, requiring additional areas and cost. These impacts are certainly high during construction of new embankments as compared to rehabilitation work.

Also this alternative will involve high costs of construction. Therefore, option of construction of new embankments has been rule out. Forgoing above reason it is preferable to rehabilitate the existing structures rather than replacing of existing embankments.

4.6 Option 3: New Design Configurations other than Embankments

There are some other alternatives for flood protection systems, which are may be adopted in place of embankments, such as flood protection by providing retaining walls, anchored sheet piles, etc. These options are normally utilize in restricted areas where river passes through urban developments, however these options require high costs, specialized technologies and having negative environmental impacts. On the other hand, the embankments are most common way of containing the floods and do not require special technology of construction and supply of special materials. The construction / rehabilitation of embankment can be carried out by using locally available earth and rock. In the given situation, the rehabilitation of embankments is the best option from technical as well as economical, environmental and social point of view.

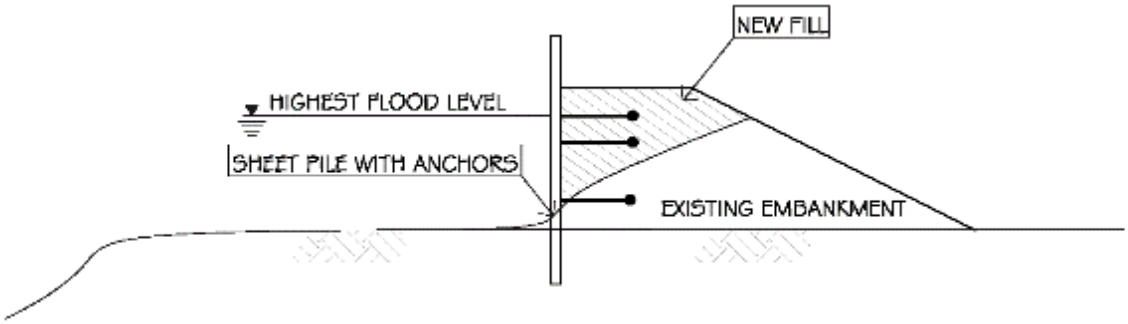


Figure 14: Option 3: Construction of Sheetpile or Concrete retaining Wall

4.7 Alternatives for Sources of Construction Materials

The rehabilitation work requires earth for raising, widening and replenishing of embankment bodies and stones for slope pitching and riverside aprons. The alternate sources of these materials are discussed below.

4.8 Earth Material

The earth material for embankment rehabilitation can be obtained either (i) from riverbed side or (ii) from area beyond river-bank at both sides suitable material is available. The material will be obtain from outside riverbed poses issues of acquiring of land, affecting existing crops and vegetation and development of depression on populated areas. The borrow areas on river side will not require land acquisition as it is property of state and disturbance to vegetation, crops and population will be minimum. Thus, most of the earth material planned to obtain from uncultivated riverine areas.

4.9 Stones

The stones will be obtained from nearby commercial limestone quarries at Khanote and Jamshoro Petaro which are operated by privately owned companies and approved by Government of Sindh. The exploitation of new quarries will require land acquisition, licenses for blasting, disturbance of new areas etc.

4.10 Alternative of Strip Borrow Areas versus Deep Pits

In order to reduce the total acquired land associated with the formation of borrow areas, the option of using only deep borrow pits has been consider. The maximum depth of such borrow pits would be 1.5 m (5ft) due to limitations of the excavators which must operate from ground level and could not operate from within a borrow area (as the high water table would flood any borrow area established). As discussed earlier, these borrow pits shall be established within uncultivated lands along the riverside of the embankment. This option is environmentally and socially preferable as

the proposed borrow areas like (a) these areas are the ownership of the project proponent (b) there is opportunity for natural rehabilitation of the proposed borrow pits during super flood and (c) acquisition of land is not required. In addition, a guideline/mitigation measures relevant to the development and rehabilitation of borrow areas is prepared in the ESIA and ESMP.

In order to reduce haulage costs that shall be incurred in transporting borrow material from borrow areas to the embankments, consideration was given to establishing strip borrow areas within the RoW of the embankment for their entire length. However, this alternative was rule out for the following reasons:

- It would not be possible to establish deep borrow pits within the RoW due to seepage losses which would result from the Indus River into the borrow pits and ultimately jeopardise the structure. In addition, the Bund Manual prepared by SID does not allow any kind of excavation within RoW.
- If the RoW is already dominated by agriculture land, ponds and wetlands there are insufficient suitable area within the RoW to establish the required area of shallow borrow areas.
- As much of the project area beyond the RoW is cultivated, this would result in the permanent loss of productive agricultural land due to flooding of the borrow areas. Due to the high water table in the areas adjacent to the RoW, there is a risk of flooding to even shallow borrow areas. This option was rule out due to its negative socio-economic impacts associated with the loss of agricultural land and the cost of the permanent land acquisition would be require.

Table-7 reviews the alternative interventions considered to improve the protection against flooding of land and communities in vicinity of proposed embankment sub-projects.

Table 7: Analysis of Alternatives: Rehabilitation of Embankments

	Action	Economic Impacts		Environmental Impacts		Social Impacts	
		Positive	Negative	Positive	Negative	Positive	Negative
1	Without project	None	• Cost of recovery from frequent flooding (Moderate long term). • Maintenance of existing embankments (Moderate long term)	• Extension of seasonal wetlands (Minor long term).	Flooding of established dry land habitat (Minor long term).	None	Regular flooding, destruction of structures and infrastructure, loss of life, loss of business and displacement of people (Moderate long term)
2	Recoupment of damaged stone pitching and reconstruction of existing earthen community ramps on existing SM Bund	• Reduced occurrence of flooding (Major long term). • Employment during construction (Moderate short term)	• Moderate capital cost to implement (Moderate short term); • Moderate on-going maintenance costs (Moderate long term)	None	• Felling trees on bunds (Moderate short term); • Quarrying of stone (Minor long term) • Transport of earth material within project area (Minor short term); • Greenhouse gas emissions from heavy machinery during construction (Minor short term)	• Reduced frequency of large scale flooding and associated risks to life and property and loss of business (Major long term) • The construction of ramps will ensure safely movement of the livestock in and out side of the River. • Transportation of agriculture products will be properly managed due to construction of ramps	• **None**
3	Construction of new embankments	As for # 2	• Moderate capital cost to implement – higher than alternative #2 (Moderate short term); • Moderate on-going maintenance costs	None	• Felling trees on new alignment (Moderate short term); • Quarrying of stone (Minor long term) • Transport of earth material (Minor short term);	As for #2	• Moderate loss of land to be acquired and displacement of people due to establishment of borrow areas and

	Action	Economic Impacts		Environmental Impacts		Social Impacts	
		Positive	Negative	Positive	Negative	Positive	Negative
			(Moderate long term)		• Greenhouse gas emissions from heavy machinery during construction (Minor short term)		realignment of embankments (Major long term); • Construction stage disturbance (Moderate short term)
4	New Design Configuration other than embankment	• As for # 2	• High capital cost to implement – higher than alternative #2 (High short term); • High on-going maintenance costs (High long term) • Special technologies are required for construction	• None	• Felling trees on new alignment (Moderate short term); • Quarrying of stone (Minor long term) • Transport of earth material (Minor short term); • Greenhouse gas emissions from heavy machinery during construction (Minor short term)	• As for option #2	• Moderate loss of land to be acquired and displacement of people due to establishment of borrow areas and realignment of embankments (Major long term); • Construction stage disturbance (Moderate short term)
5	Deep borrow areas (River side)	• The land for deep borrow areas are the ownership of the project proponent and therefore; no acquisition	• Need capital cost for transportation (Moderate short term);	• Establishment of temporary wetlands and will rehabilitate naturally after flooding.	• Non	• The land for deep borrow areas are the ownership of the project proponent and therefore; no acquisition of land is required.	• None

	Action	Economic Impacts		Environmental Impacts		Social Impacts	
		Positive	Negative	Positive	Negative	Positive	Negative
		of land is required.					
6	Deep borrow areas (Community side)	• None	• Need capital cost for transportation (Moderate short term);	• None	• Establishment of permanent pits.	• None	• None
7	Strip borrow	• No major capital cost for transportation (Moderate long term);	• None	• None	• Jeopardize the integrity of the structure. • Clearance of trees and flora	• None	• Damage to the standing seasonal crops like (Banana, sugarcane)
8	Stone pitching (from existing commercial quarries)	• No major additional capital cost	•	• None	• None	• None	• None
9	Stone pitching (from new areas)		• Need additional cost for land acquisition ((Moderate short term);	• None	• Change in landscape	• None	• None

5. ENVIRONMENTAL AND SOCIAL BASELINE

This chapter describes the existing environmental conditions of the project area to provide a baseline against which the project impacts can be measured. The chapter also identifies sensitive flora and fauna receptors in the project area. The information provided in this section is both quantitative and qualitative and based on primary and secondary sources, data was collected through specific field surveys conducted for this study and desk studies related to the project area.

5.1 Physical Environment

5.1.1 Topography

Sindh can be divided into four parts topographically: (a) Kirthar range on the west; (b) a central alluvial plain bisected by the Indus River; (c) a desert belt in the east; and (d) the Indus delta in the South. The reported sub-project covered in this ESIA is located in central alluvial plain bisected by the Indus River. Geological map of Sindh is shown in Figure-15.

Basin wise Sindh lies in the lower Indus Basin and its main tectonic features are the platform and fore deep areas. Thick sequences of Pab sandstone is of Upper Cretaceous, Ranikot Group (Khadro, Bara, Lakhra) is of Palaeocene, while Laki, Tiyon, and Khirthar belongs Eocene age, Nari Formation is of Oligocene, Gaj Formation of Lower to Middle Miocene, Manchar is belongs Upper Miocene to Pliocene, Dada Conglomerate is of Pleistocene are present in various areas of Sindh. Limestone and sandstones are the most dominant sedimentary rocks in the area. Structurally Sindh is generally contains gently folded anticlinal features trending in north-south direction.

District Matiari geologically belong to early Eocene Laki formation. The Laki formation is dominantly composed of cream color white fossiliferous limestone of massive and nodular character with subordinate calcareous sandstone, shale and marl. Structurally the region belongs to Karachi Arc zone that comprises a series of about 200km long and 50km wide parallel to sub parallel, small, rounded dome shaped, anticline hills with corresponding wide synclinal valleys and Piedmont plains. The River Indus and its banks are alluvial deposits of fine sands and non-plastic silts.

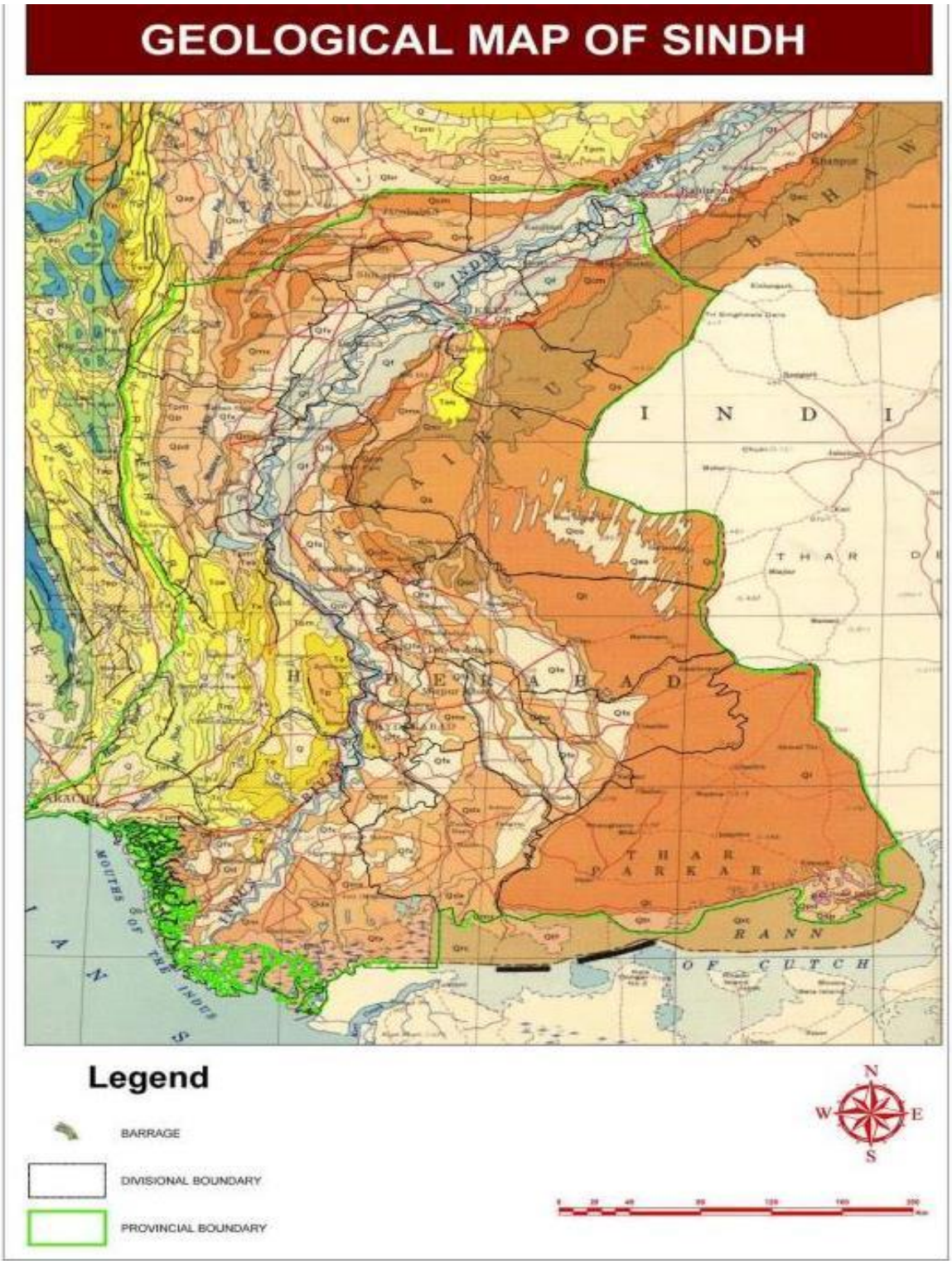


Figure 15: Geological Map of Sindh

5.1.2 Floods

Floods in the Sindh province are common along the River Indus but are very uncommon in the areas away from the river. The 2010 floods in Pakistan began in late July 2010, resulting from heavy monsoon rains in the Khyber Pakhtunkhwa province, affecting the Indus River basin.

Approximately, one-fifth of Pakistan's total land area was flooded affecting about 20 million people, mostly by destruction of property, livelihood, and infrastructure and with a death toll of close to 2,000. The monsoon rainfall of 2010, over the region was highest since 1994 and ranked second highest during last 50 years of period. Most of the damages in the Sindh province were limited to low lying areas along the Indus River.

During August-September 2011 heavy rains in the Sindh province destroyed/damaged 73% of crops and 67% of the food stocks. Crop destruction had wiped out farmer's present and future sources of food and income, 300 people were reported dead and more than 7 million were affected directly and indirectly.

According to different reports, over five hundred thousand houses had been destroyed and millions were damaged. Crops of cotton, banana, dates, chilli and sugarcane over a cultivated area of 2.8 million acres were destroyed or affected. Flood damages details of Matiari District are given in Table-8, below.

Table 8: Extent of damages due to Flood in the villages of Project Area in 2010 and 2011

S.no	Name of Village	Total Estimated Households	Total Estimated Population	Flood Losses (yes = √ no = ×)	Type of Losses
				Yes	
1	Bhanoth	600	5000	√	Standing Crops
2	Keher Colony	60	200	×	0
3	Goth Wazeer Rind	35	250	×	0
4	Delo Keti	400	2500	×	0
5	Goth Badar Lakho	250	1500	×	0
6	Goth Jumo Shahuk	500	4000	√	Standing Crops
7	Goth Haji Yousaf	250	1500	√	Standing Crops
8	Sekhat	800	5000	×	0
9	Goth Abdul Hakeem	80	1000	√	Houses
10	M. Laique Rind	35	180	√	Houses
11	Goth M. Ali Sangrasi	400	3000	×	0
12	Goth Dural Khan Khosa	800	6000	×	0
		4210	30130		

5.1.3 Land use

Indus River occupies most of the project area of activities. It consists of active channels and other creeks in which water flows during high flow periods.

Land use in the sub-project area can be broadly categorized as:

- Existing Indus River embankments;
- Indus River (active channels and creeks);

- Riverine scrublands;
- Agriculture land;
- River Banks;
- Stagnant water bodies;
- Settlements including villages and associated structures such as agricultural sheds, places of worship, graveyard, government schools and other community buildings;
- Irrigation and drainage network
- Roads (unsealed tracks and paved road);
- Uncultivated/Wasteland that includes areas, which have been rendered unusable for agriculture due to water logging, salinity, or due to other causes.

The detailed land use map of subproject area prepared through ArcGIS, Google Earth and Filed inspection are shown in Figures 16 to 25.

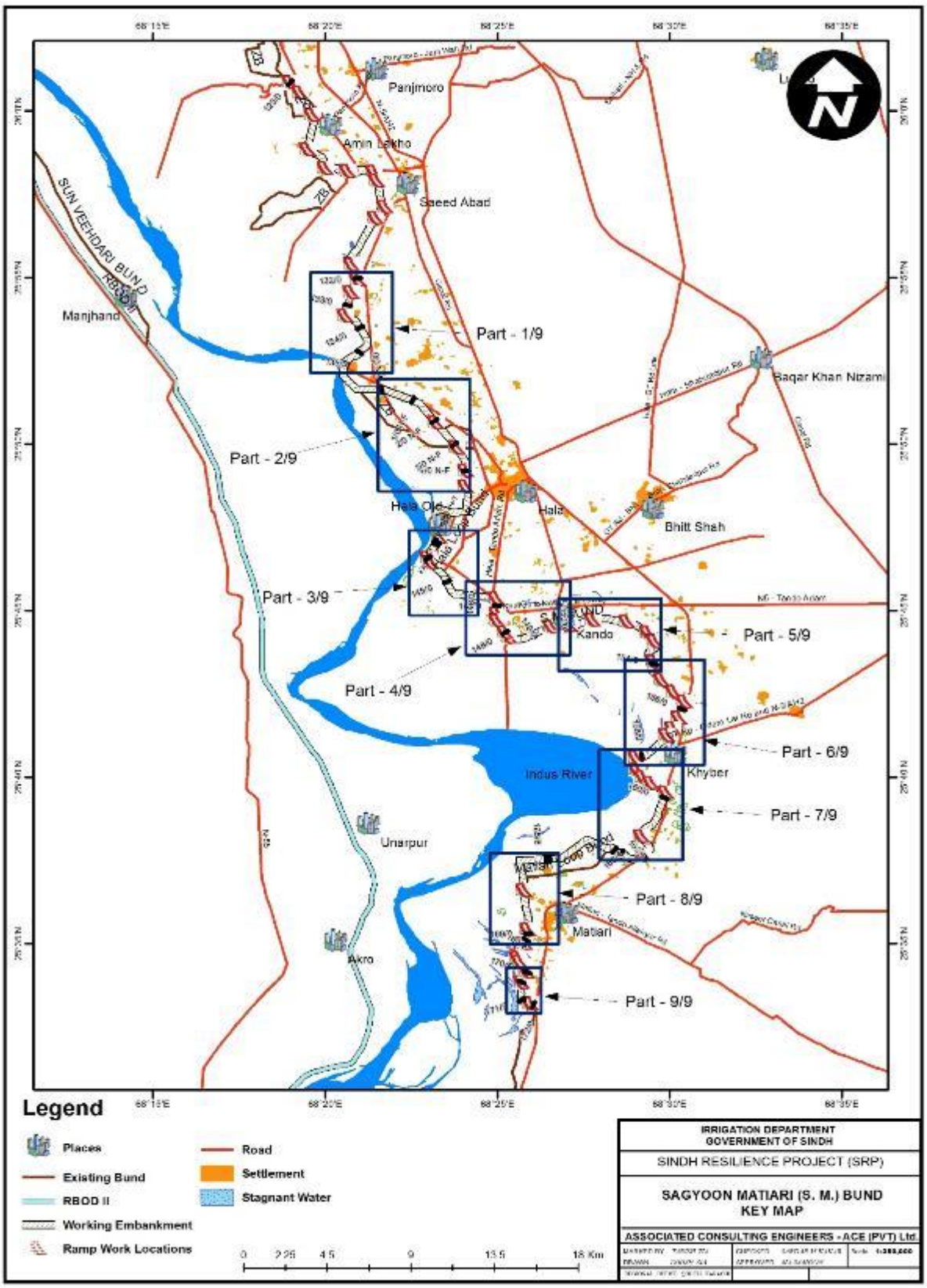


Figure 16: Land Use Map of S.M Bund (Key Map)

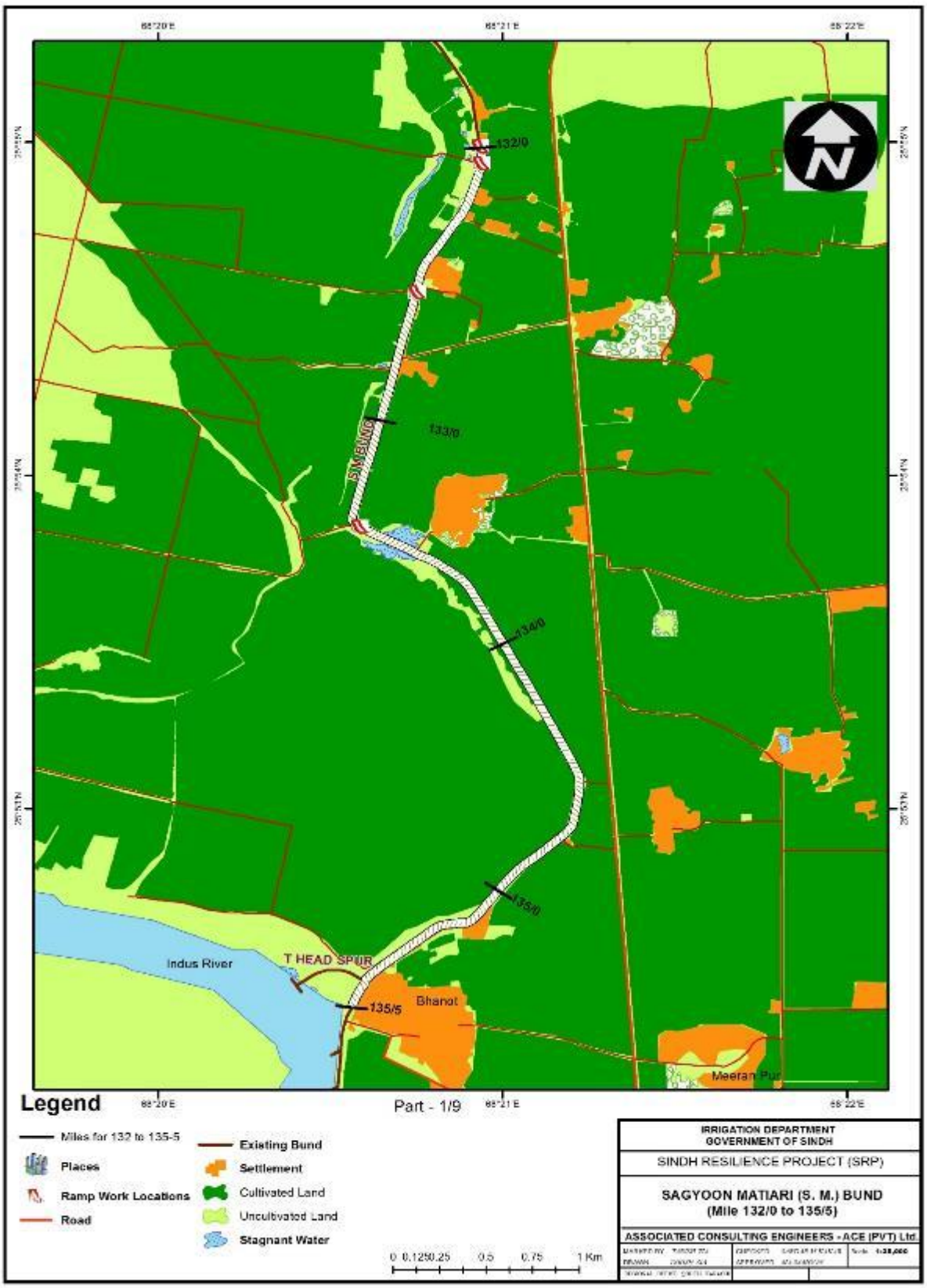


Figure 17: Land Use Map of S.M Bund Part 1/9

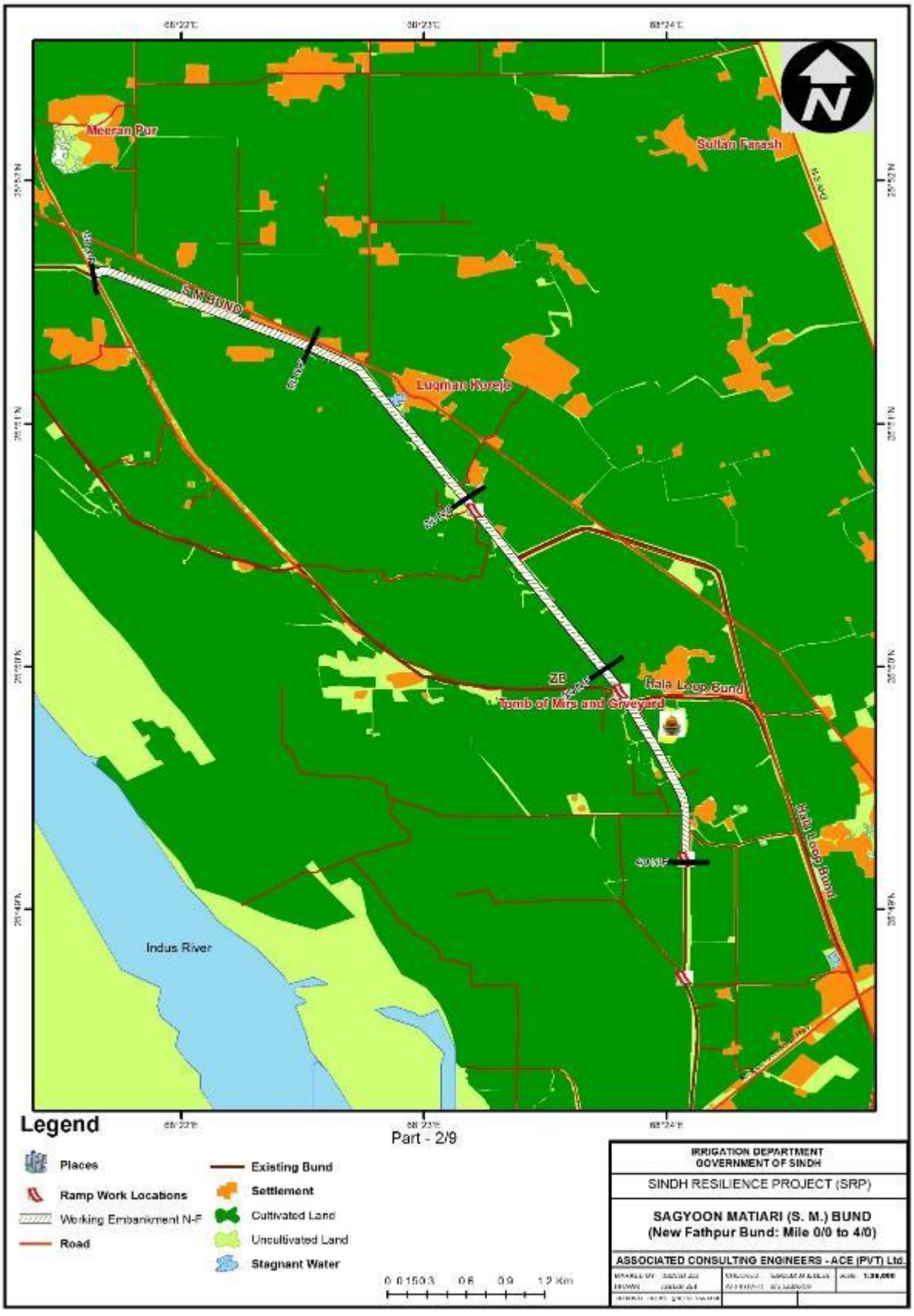


Figure 18: Land Use Map of S.M Bund Part 2/9

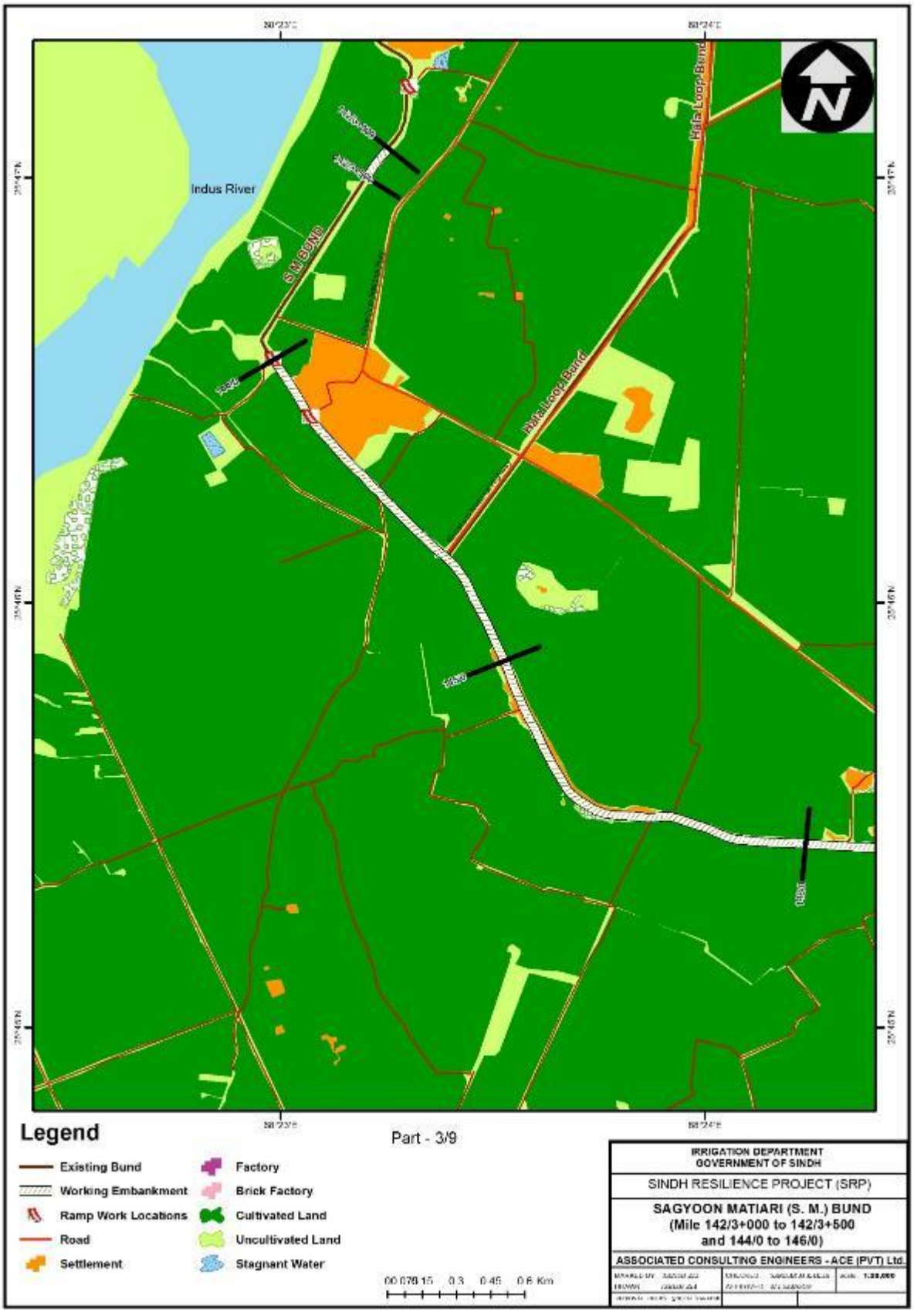


Figure 19: Land Use Map of S.M Bund Part 3/9

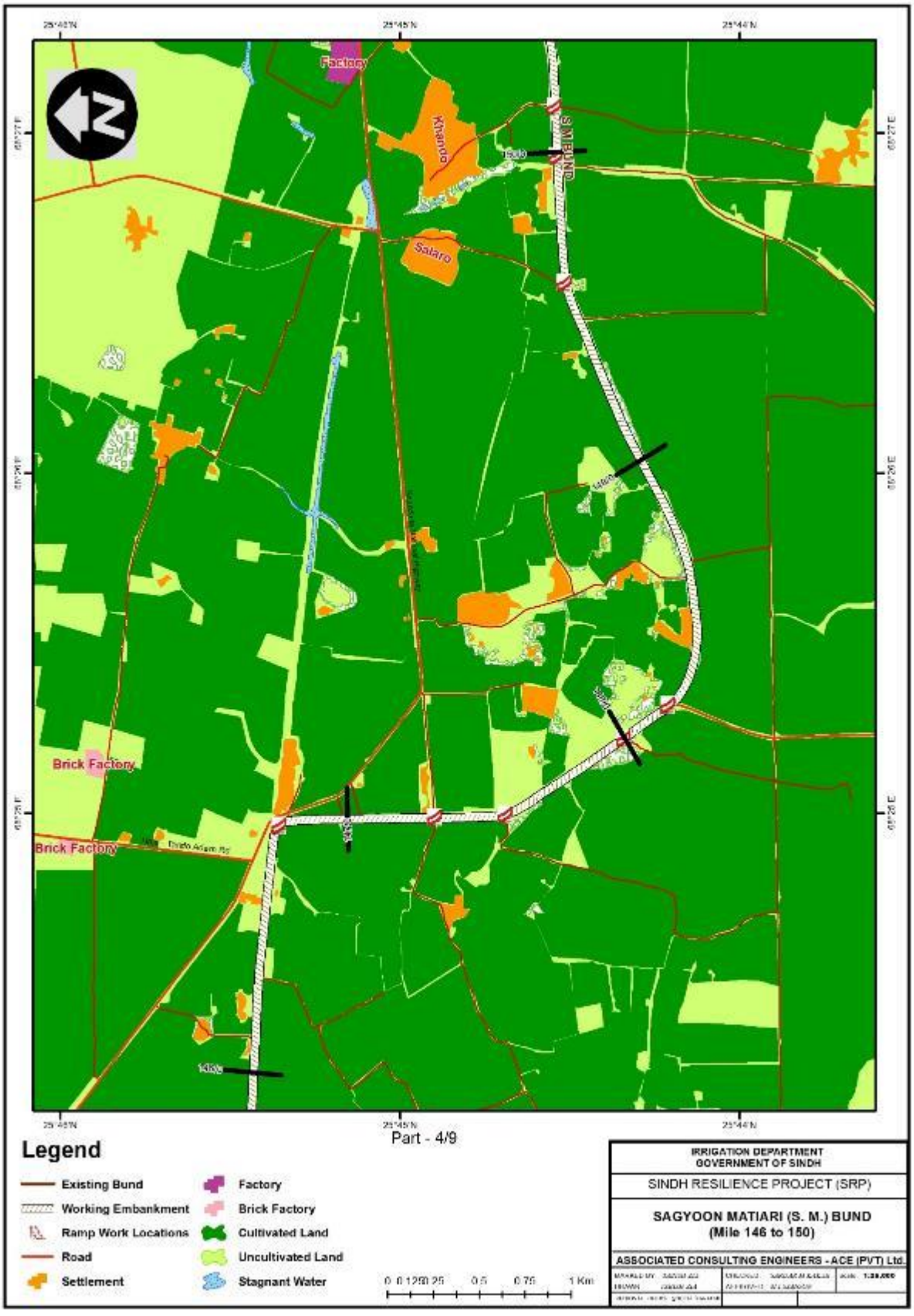


Figure 20: Land Use Map of S.M Bund Part 4/9

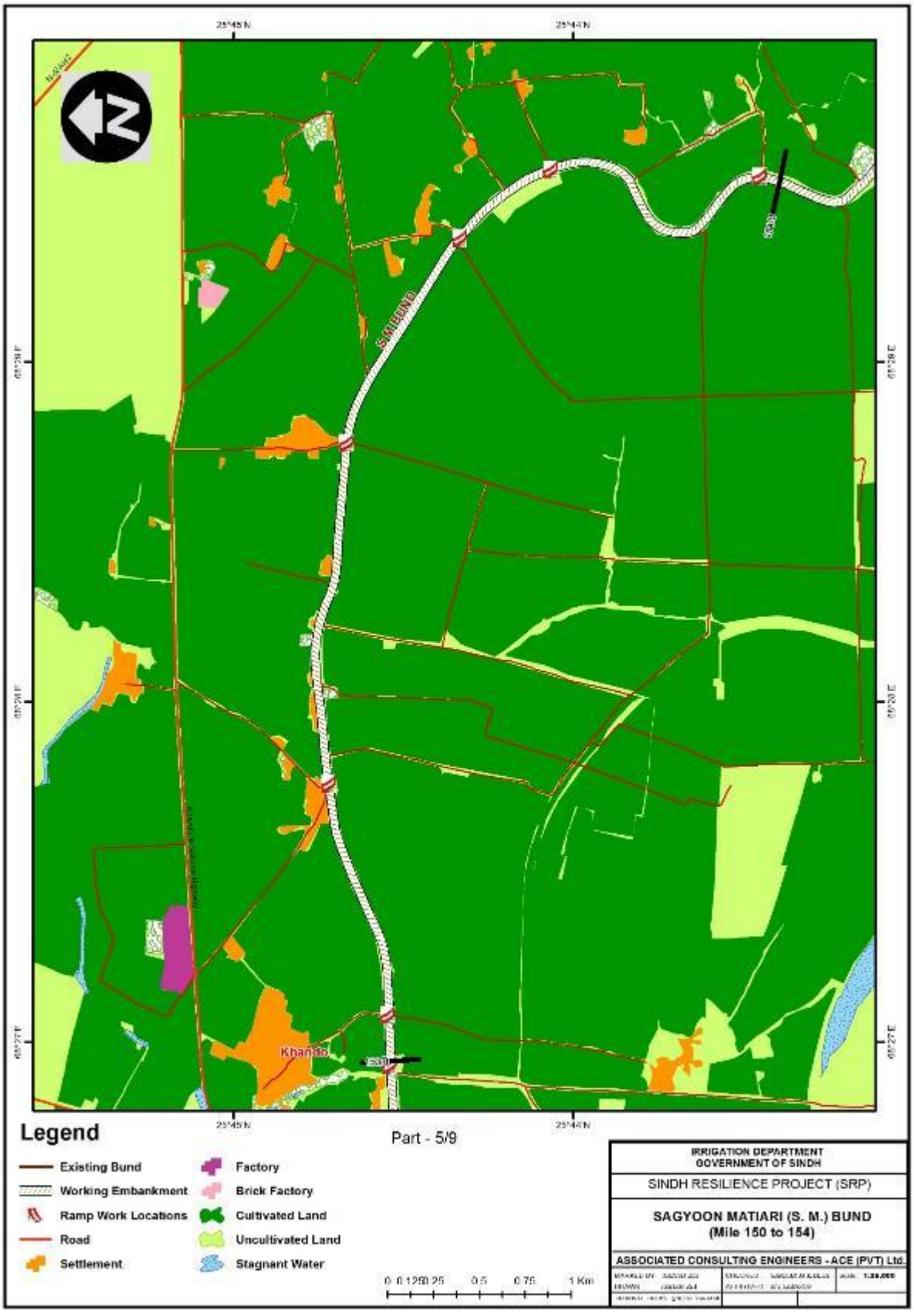


Figure 21: Land Use Map of S.M Bund Part 5/9

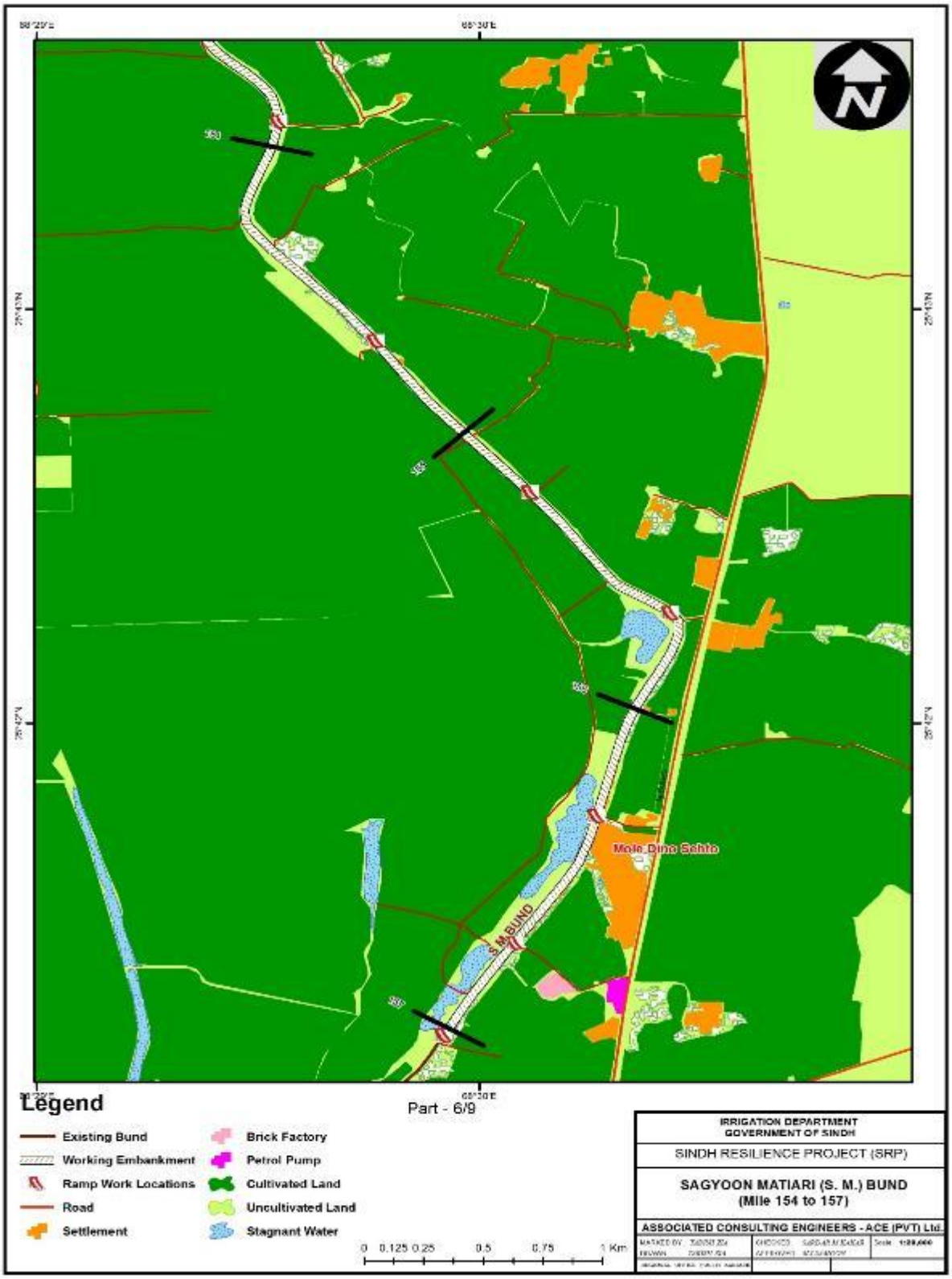


Figure 22: Land Use Map of S.M Bund Part 6/9

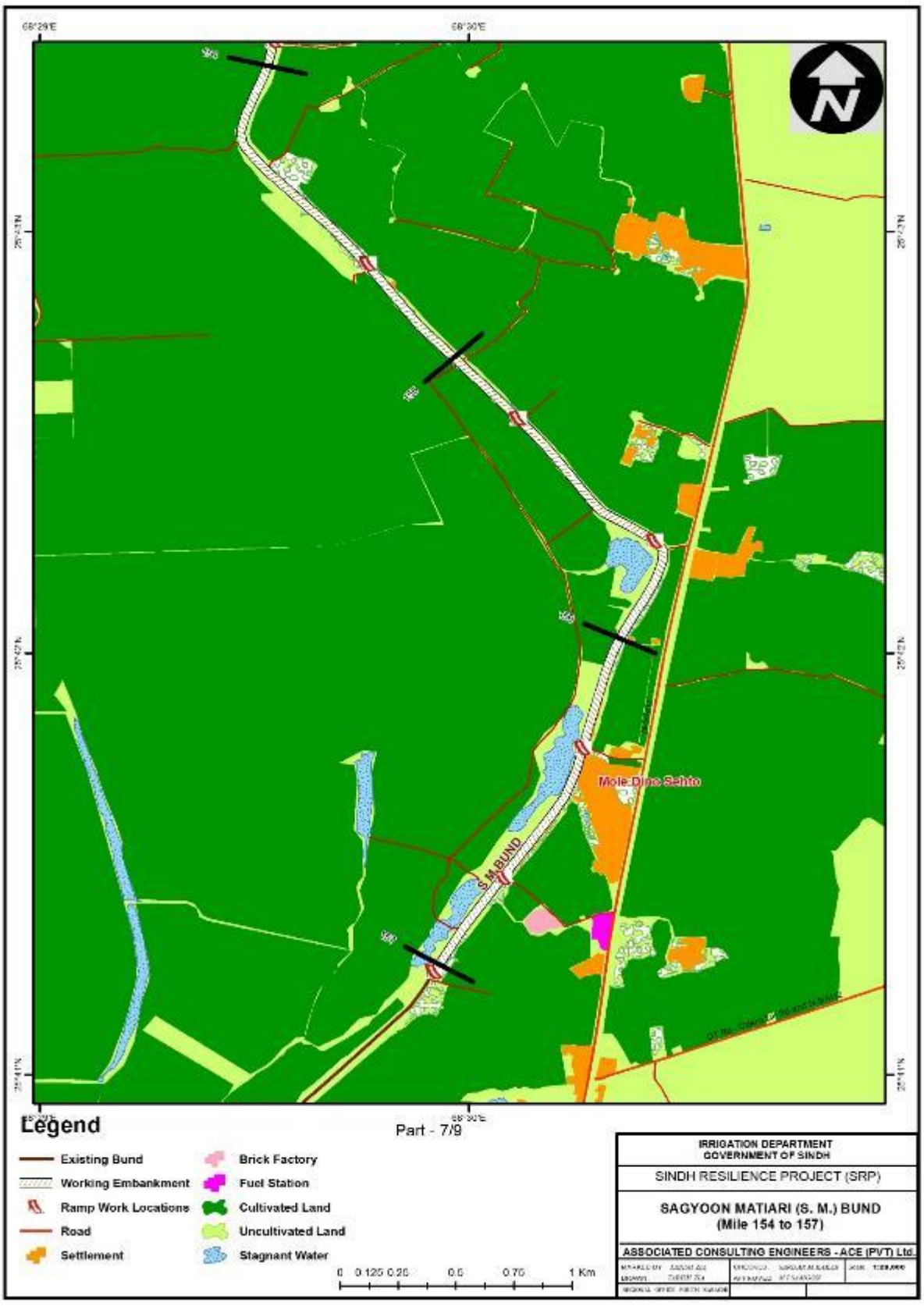


Figure 23: Land Use Map of S.M Bund Part 7/9

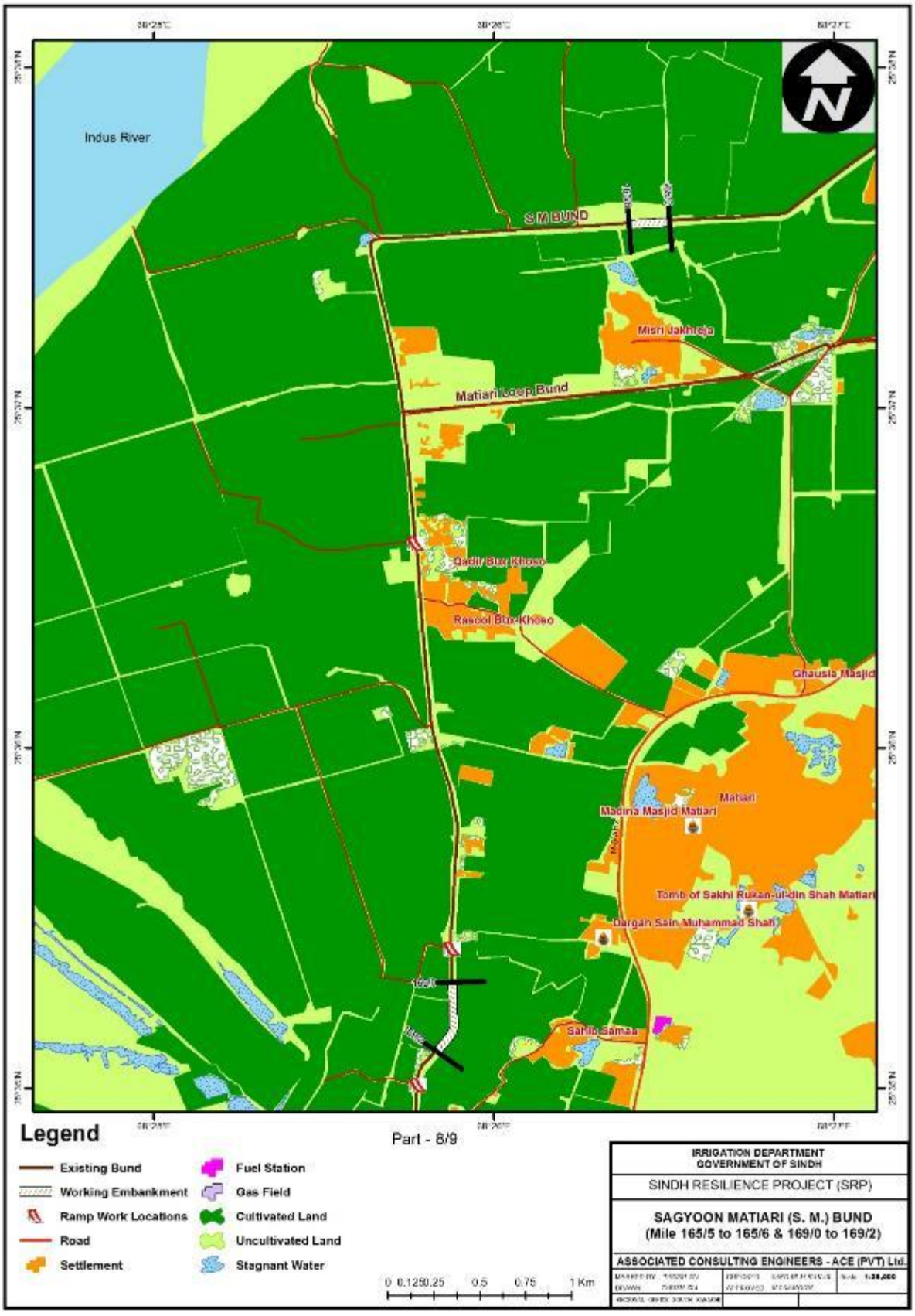


Figure 24: Land Use Map of S.M Bund Part 8/9

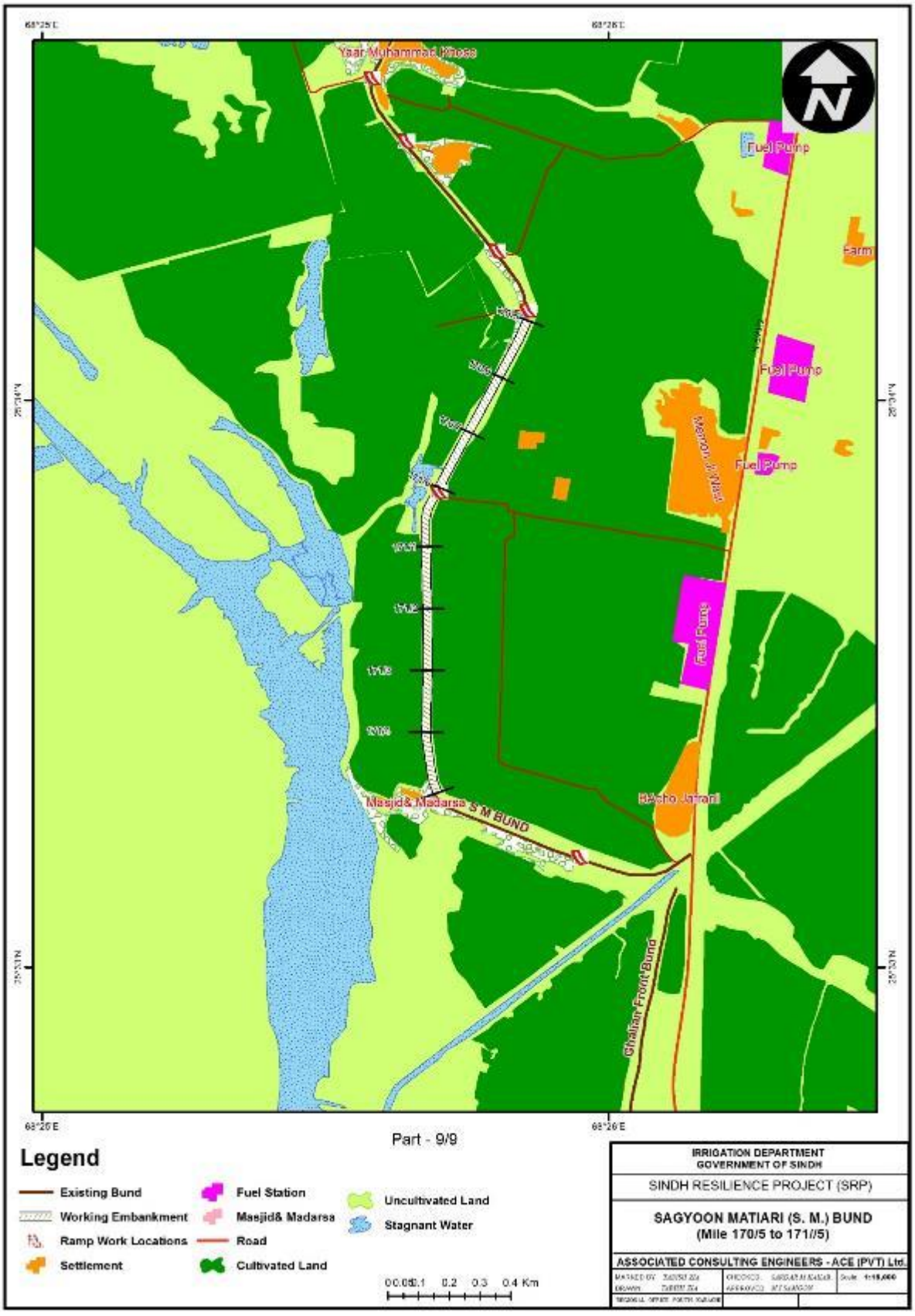


Figure 25: Land Use Map of S.M Bund Part 9/9

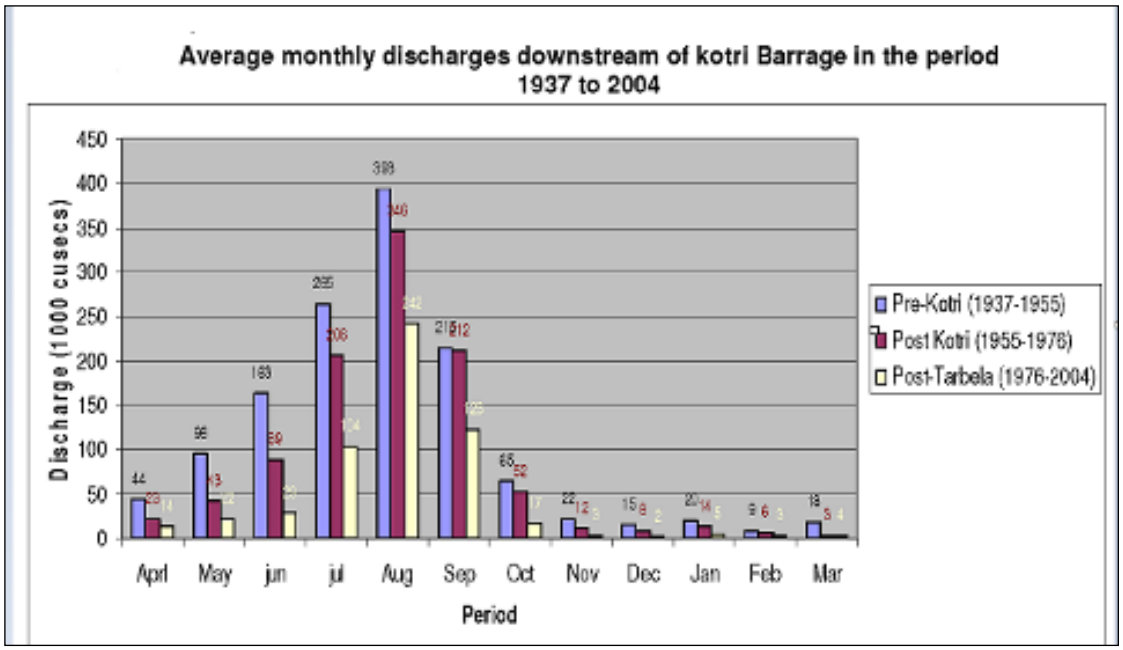
5.1.4 Water Resources

a) Surface Water

Indus River and its tributaries are the only source of surface water in the subproject area. The Sukkur Barrage constructed in 1932 diverts flows to canals in this part of the province. Seven feeder canals, four on the left and three on the right bank of River Indus off-take from this Barrage and delivers assured Irrigation water supplies for an area of more than 7.63 million acres. The feeder on the left, namely, Rohri Canal is 350 Km long, which irrigates around 2.6 million acres of agricultural land in nine districts of Sindh. Matiari district is located at the tail end of Rohri Canal which is only source of surface water in the sub-project area.

Furthermore, peak flows at Kotri Barrage which is close to the Matiari Bund is showing maximum, minimum and average flows given in Figure-26.

Figure 26: Monthly Discharges Downstream of Kotri Barrage



The surface water samples were collected, from the point where the sub-project embankment is aligning close to the river. The physical and chemical parameters were analysed by the Pakistan Council of Research in Water Resources (PCRWR) Karachi laboratory. The results reveal that the pH, Nitrate, Conductivity, Calcium, hardness and Arsenic are within permissible limits while at some cases the Turbidity, Nitrate, TDS and COD are exceeding the permissible limits. The reason for exceeding the limits is due to the untreated domestic and Industrial wastewater is being disposed from various cities located along the River Indus. The detailed lab results are given in the Table-9.

Table 9: Surface Water Quality Analysis (Physical and Chemical Parameters)

S. No	Location	Physical Paramters						Chemical Parameters									
		Color	Odor	Taste	Conductivity System	Turbidity (NTU)	pH	Bicarbonate	Carbonate	Calcium	Hardness $CaCO_3$ (mg/l)	Potassium (mg/l)	TDS (mg/l)	Nitrate	Nitrite (mg/l)	Phosphate (mg/l)	Arsenic (ppb)
	Permissible limit	Colorless	Un-objectionable	Un-objectionable	NGVS	5 (WHO)	6.5-8.5 (WHO)	NGVS	NGVS	75 (PSI)	500 (WHO)	12(EC)	1000 (WHO)	10 (WHO)	0.020 (PSQCA)	NGVS	50 (PSQCA)
1	Surface water, S.M Bund(Mile 135/5)	Turbid	Un-objectionable	Un-objectionable	542	55.6	7.35	170	nil	44	210	11	347	2.096	0.053	0.26	0
2	Surface water, S.M Bund(Mile 159/6)	Colorless	Un-objectionable	Un-objectionable	507	10.5	7.63	140	nil	44	180	4.0	324	2.171	0.027	1.02	0
3	Surface water, S.M Bund(Mile 162/0)	Turbid	Un-objectionable	Un-objectionable	526	30.1	7.45	200	nil	44	210	10	337	1.617	0.029	3.8	0

WHO World Health Organization, **APHA** American Public Health Association, **EC** European Community, **PSQCA** Pakistan Standards & Quality Control Authority, PSI Pakistan Standards Institutuion, **and NGVS** No Guideline Value Set.

b) Groundwater

More than 80% of land in Sindh is underlain by saline groundwater unfit for irrigation, which is a major constraint in irrigated agriculture.

Fresh groundwater found mostly in a strip parallel to the banks of Indus River and some pockets in other areas. Ground water samples were collected during field survey and were analysed from PCRWR Karachi in January 2016. The laboratory tests reveal that the pH, Carbonate, EC, phosphate, potassium, and Arsenic were within permissible limit of NEQS and WHO standards while Hardness, Calcium, TDS, and Turbidity and in some cases TSS, Nitrate were exceeding the permissible limits in both surface and ground water samples. Similarly, the microbiological parameters were also exceeding the limit. Water temperature varies seasonally. During the summer season, the temperature ranges from 10 °C to 20 °C and during the winter season, the temperature ranges from 04 °C to 08 °C. Summary of analysis is given in the Tables 10 and 11.

Sindh Environmental Quality Standards (SEQS) for Drinking Water Quality has been refered for this study and available on the website of the Sindh Environmental Protection Agency[3]**.**

5.1.5 Waterlogging and Salinity

Waterlogging refers to a situation when the water table fluctuates within the root zone depth of crops (cereals, cotton, and sugarcane) fruits, and vegetables for a period long enough to affect plant germination, establishment and growth adversely (DMC 2002). As per WAPDA's criterion, the land having depth to water table of less than 3m is classified as waterlogged and further categorized into two classes:

- Severely waterlogged area: Area having water table depth ranging from 0 to 1.5 m is called severely waterlogged.
- Less severely waterlogged area: Area having water table depth of 1.5 to 3 m is called less severely waterlogged.

Currently, almost 43% of the area in the IBIS[4] is classified as waterlogged having depth to water table of <3 m. The province of Sindh is having largest percentage of the IBIS's area (81%) classified as waterlogged. In the last few decades the waterlogged area has increased in the province of Sindh, whereas the province of Punjab has experienced considerable reduction in the waterlogged area mainly attributed to the abstraction of large amount of groundwater both from public and private tube wells (WAPDA 2005).

[3] http://epasindh.gov.pk/Rules/SEQS%202016.pdf

[4]*Salinity and Waterlogging in the Indus Basin of Pakistan: Economic Loss to Agricultural Economy by Sumia Bint Zaman and Dr. Shahid Ahmad.*

Table 10: Physical and Chemical Parameters of Groundwater Quality Analysis

GROUND WATER QUALITY RESULTS																
		Physical Parameters			Chemical Parameters											
Serial No	Location	Color	Odor	Taste	Conductivity System	pH	Bicarbonate	Carbonate	Calcium	Hardness caco3 mg^	Potassium (mg^)	TDS (mg^)	Nitrate	Nitrite mg^	Phosphate (mg^)	Arsenic (ppb)
	Permissible limit	colorless	un-objectionable	un-objectionable	NGVS	6.5-8.5 (WHO)	NGVS	NGVS	75 (PSI)	500 (WHO)	12(EC)	1000 (WHO)	10 (WHO)	0.02 (PSQSA	NGVS	50 PSQSA
1	Ground water S.M Bund 25ft (Mile 162/2)	colorless	un-objectionable	un-objectionable	2430	6.83	390	Nil	132	660	8.4	1555	8.492	0.526	0.31	5
2	Ground water S.M Bund 80ft (Mile 150/2)	colorless	un-objectionable	un-objectionable	1142	6.90	440	Nil	140	530	8.0	731	1.588	0.034	0.32	0
3	Ground water S.M Bund 45ft (Mile 135/5)	colorless	un-objectionable	un-objectionable	2350	6.82	550	Nil	136	800	6.0	1504	2.225	0.042	1.36	0

WHO World Health Organization, **APHA** American Public Health Association, **EC** European Community, **PSQCA** Pakistan Standards & Quality Control Authority, **PSI** Pakistan Standards Institutuion, **and NGVS** No Guideline Value Set.

Table 11: Summary of Micro Organisms in Water Quality Analysis

WATER QUALITY ANALYSIS RESULTS							
S#	Location	Water quality parameters			Microbiological Parameters		
		Dissolved Oxygen (mg/L)	COD (mg/L)	TSS (mg/L)	Presumptive Coliforms/ 100mL	Fecal Coliforms/ 100mL	E-coli
	Permissible limit	**NGVS**	**15**	**200**	**0/100**	**0/100**	**cfu/100**
1	Surface water, S.M Bund(Mile 162/0)	4.3	4	150	0	0	0
2	Surface water, S.M Bund(Mile 159/6)	4.5	0	140	0	0	0
3	Surface water, S.M Bund(Mile 135/5)	5.4	08	240	0	0	0
4	Ground water S.M Bund 25ft (Mile 162/2)	4.9	0	11.4	33	0	0
5	Ground water S.M Bund 80ft (Mile 150/2)	5.3	0	32	280	50	0
6	Ground water S.M Bund 45ft (Mile 135/5)	5.1	0	118	110	26	0

Sindh has arid climate with very high evaporation and little or no rainfall. The natural slopes are extremely mild, and thus natural drainage is very limited. In addition, natural drainage is also obstructed by public infrastructure, such as canals, roads, and railways. Network of manmade drains is inadequate. As a result, water seepage from the extensive system of irrigation network (main and branch canals, distributaries, minors, watercourses, and farmers' fields) result in shallow groundwater levels, which gives rise to waterlogging conditions. Waterlogging condition combined with high evaporation due to arid climate accentuates salt accumulation in the root zone - salinity - by mobilizing the salt in the ground to the root zone through a capillary rise. To dilute and leach down the salts, farmers usually apply large quantities of water, which turns into a vicious cycle of higher water application - higher losses - waterlogging - salinity that can only be broken by better drainage and improved water management at all levels in the system.

Morover, the ground water table of Matiari district including sub-project area ranges between 4 – 31 feet, which is shown in Figure-27, whereas ground water quality available data shows the high levels of TDS ranges between 2000 – 5000 ppm as shown in Figure-28, which makes it unsuitable for irrigation purpose. Sub-project area is being irrigated through surface irrigation network available in the area.

Further to this, it is concluded that 84.034 sq-km of sub-project area (Matiari district) is severely affected by waterlogging, while 356.05 sq-km are moderately affected by waterlogging. The range of the severely waterlogged area is 0-1.5 meter (0-5 ft) while, range of the moderate level is from 1.5 meter (5 ft) onwards.

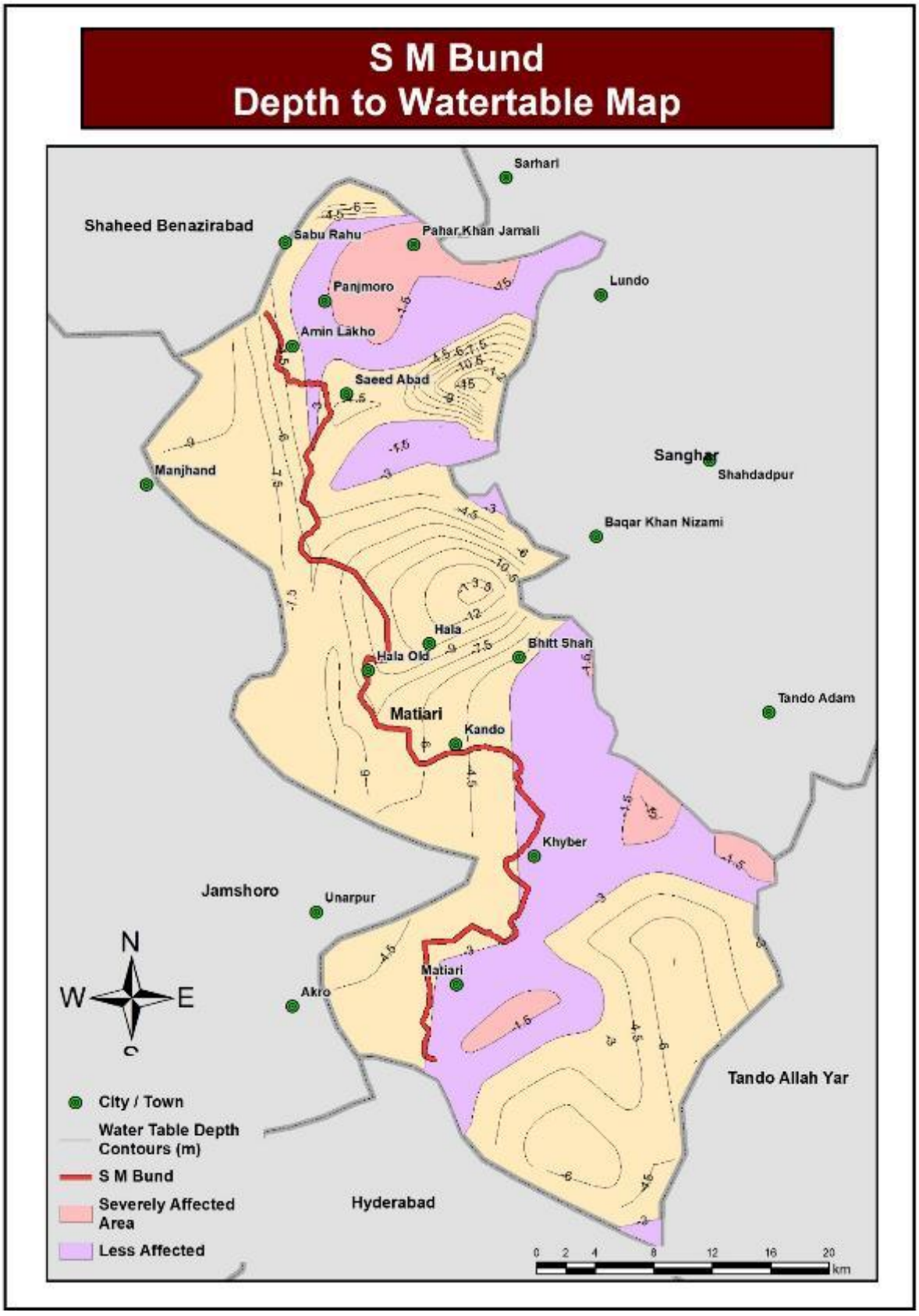


Figure 27: Depth of Ground Water in S.M Bund Sub-project Area

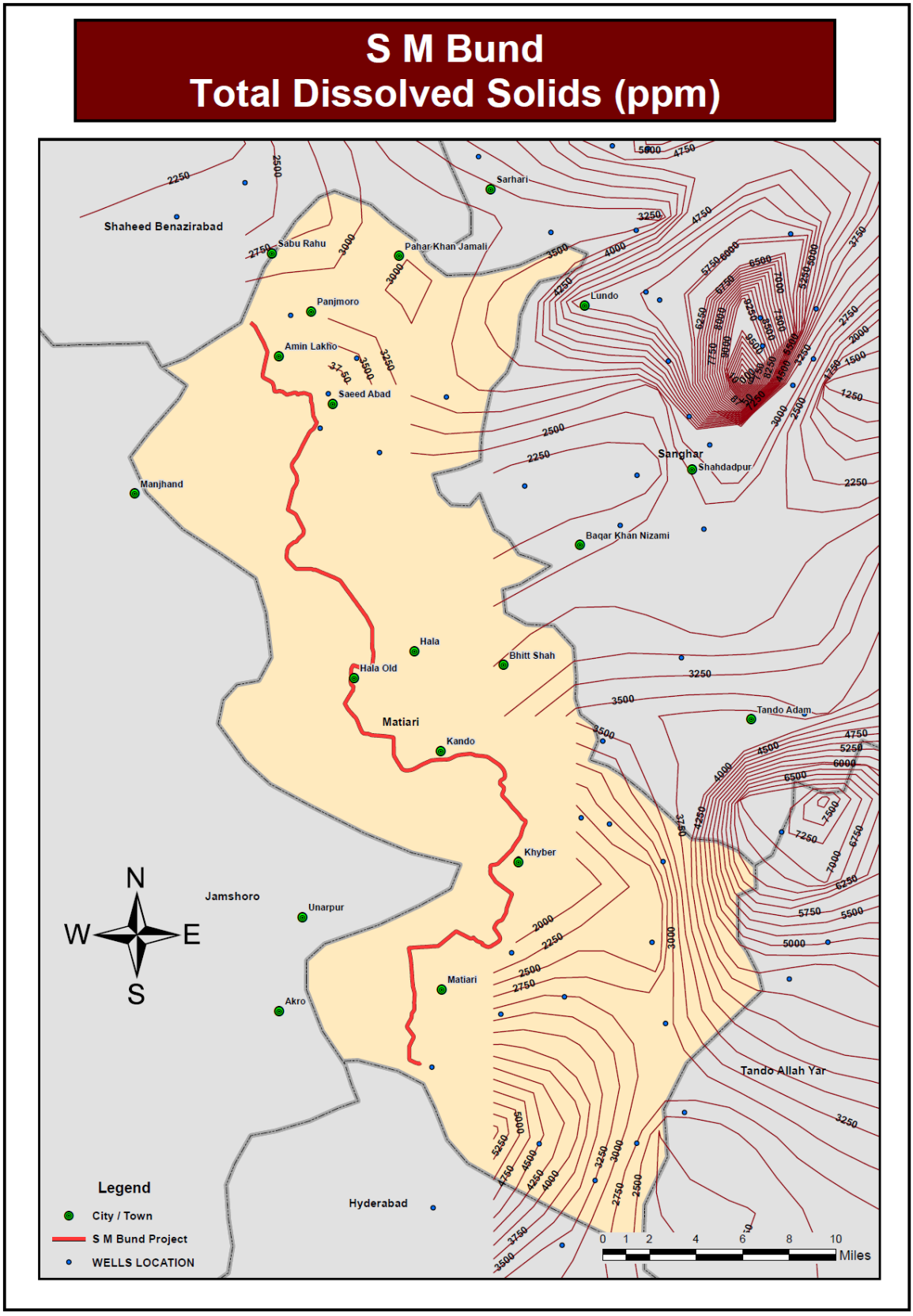


Figure 28: Ground Water Salinity Map of the Sub-Project Area

5.1.6 Air quality

The project area consists of a Bund of wetland parallel to the Indus River embankment surrounded by a very large area cultivated area in the east and west. The existing embankments do not pass through any large built-up or major industrial area and there is no major road network nearby. The only problem is the occasional summer dust storms which increase the concentration of dust particles in the air; as a result the air quality is exceptionally high by any international standards. The ambient air quality tests were carriedout on 19th July 2018 by SRP through Environmental Research Center Bahria University Karachi for S.M Bund. The analysis were carried out on head, mid and tail sections of the sub-project area.Table-12. Results reveals that all parameters are within permissible limits of SEQS ambiant air quality.

Table 12: Ambient Air Quality Results for Sub-projects (District Matiari)

S. No	Parameters/ Analysis	SEQS A.A Limits	WHO Limits of A.A	Units	Results								
					Head 123/0 Mile			Mid 151/0 Mile			Tail 172/0 Mile		
					Min	Max	Avr	Min	Max	Avr	Min	Max	Avr
1	Sulphur Dioxide (SO2)	120.0	125.0 µg/Nm^3	µg/m^3/ 24 hrs	10.5	21.8	**16.2**	4.8	13.5	**9.15**	15.7	45.6	**31.5**
2	Oxides of Nitrogen (NO2)	80.0	200 mg/Nm^3	µg/m^3/ 24 hrs	11.0	22.0	**17.2**	9.0	16.0	**12.8**	12.0	39.0	**24.3**
3	Carbon Monoxide (CO)	10.0	10.0 µg/Nm^3 8 hrs	µg/m^3/ 18hrs	0.197	0.864	**0.531**	0.138	0.756	**0.447**	0.325	2.084	**1.204**
4	Particulate Matter (PM10)	150.0	150.0 µg/Nm^3	µg/m^3/ 24 hrs	51.0	142.0	**94.7**	68.0	137.0	**101.8**	102.0	182.0	**139.7**

5.1.7 Noise

Environmental noise is unwanted or harmful outdoor sound created by anthropogenic activities, including noise emitted by means of transport-road traffic, rail traffic, and air traffic and from construction site machinery, or industrial activities. Proposed sub-project areas are in sparsely populated areas where traffic is less and no presence of other sources. The noise level were recorded at different miles of S.M bund of Indus River in Jan 2016, found within permissible limit of SEQS and WHO standards. The details are given in Table-13.

Table 13: Ambient Noise Levels in the Sub-project Area

Name of Bund	Location-I		Location-II		Location-III		Date	Time
	GPS Coordinates	Noise Level (dB)	GPS Coordinates	Noise Level (dB)	GPS Coordinates	Noise Level (dB)		
Permisible Limits		55 (SEQS)		55 (SEQS)		55 (SEQS)		
S.M Bund	N 25 50 53.2 E 068 23 12.8	51	N25.896923 E 068.343948	50	N 25 33 56.1 E 068 25 45 12.8	53	26th Jan 2016	Day time

5.1.8 Soils

Large quantitative of sediments are brought by Indus River and is deposited along the Indus River banks and especially in the deltaic zone. Further hill torrents also bring silt and clay deposits in the lower reaches. These silts provide a highly fertile layer of soil to the region. The soil textures in the sub-project areas are generally clay loam while loam and silt loam also exist. The soil samples were collected from some of the sub-projects and were analysed by Pakistan Council for Research in Water Resources (PCRWR) Karachi. The soil samples were analysed by considering the following sub-parameters, Soil texture; pH; EC; Phosphorous; Potassium; Soluble and Exch Na; Soluble Ca+Mg; and Sodium Adsorption Ratio (SAR).The test results reveals that all the parameters are within permissible limit except SAR, Chloride and Sodium are exceeding the standards. Details are summarized in Table-14 given below.

Table 14: Summary of Soil Analysis in sub-project Area

S. No	Location	Parameters									Soil Texture			
		E.C (ds/m)	pH	Bicarbonate (HCO_3)Meq/l	Chloride Meq/l	Sulfate Meq/l	Calcium +Magnesium Meq/l	Sodium Meq/l	SAR	ESP	Sand (%)	Slit (%)	Clay (%)	Texture Class (USDA)
Permissible Limits (USDA)		NGVS	6.5-8.5	NGVS	250 Meq/l	250 Meq/l	150 Meq/l	200 Meq/l	0-10=U* 10-18=M* Above 18=H*	NGVS				
1	S M Bund (Head)	50.10	7.3	8.50	372.1	120.38	140.0	358.5	42.84	38.26	36.80	36.40	26.80	Clay Loam
2	S M Bund (Mid)	44.50	7.7	6.0	340.5	97.97	100.0	343.3	48.55	41.30	30.80	44.40	22.80	Loam
3	S M Bund (Tail)	19.54	7.7	6.0	99.8	89.50	30.50	163.2	41.79	37.67	24.80	44.40	30.80	Clay Loam

**U= Useable, M=Marginal and H= Hazardous (Ref: United States Department of Agriculture) USDA, NGVS (No guideline value set)*

5.2 Biological Environment

5.2.1 Flora

Through environmental assessment of the sub-project area, it was recorded that, Acacia nilotica, Prosopis cineraria and Ziziphus nummularia, Tamarix indica, Tamarix sp while bushes and grasses including Capparis spinose, Saccharum griffithii, Saccharum munja, Alhaji, Glinus lotoides, Paspalum vaginatum, Kohautia retrorsa, Salvadora oleoides, Typha dominghensis, Phyla nodiflora and Capparis decidua are the dominant trees species. While during baseline surevy no any flora species with ecological importance found in the sub-project area.

Table-15 provides a review of the key species identified through environmental assessment and the habitat types found in the sub project area, which represent their preferred habitats:

Table 15: List of Plant Species Identified in Sub-project Area.

S.No	Family	Plant species	Habit
1	Vachelliea	Accea nilotica	Tree
2	Fabaceae	Prosopis cineraria	Tree
3	Rhamnaceae	Ziziphus Jujuba	Tree
4	Asclepiadaceae	Leptadenia pyrotechnica	Shrub
5	Asparagaceae	Asparagus dumosus	Shrub
6	Asteraceae	Grangea maderaspatana	Herb
7	Asteraceae	Pluchea wallichiana	Shrub
8	Asteraceae	Vernonia cinerascens	Shrub
9	Asteraceae	Xanthium strumarium	Shrub
10	Capparidaceae	Capparis decidua	Large Shrub
11	Capparidaceae	Capparis spinosa	Sub-shrub
12	Capparidaceae	Cleome brachycarpa	Herb
13	Capparidaceae	Cleome scaposa	Herb
14	Capparidaceae	Cleome viscosa	Herb
15	Chenopodiaceae	Salsola imbricata	Shrub
16	Chenopodiaceae	Suaeda fruticosa	Shrub
17	Euphorbiaceae	Euphorbia	Herb
18	Fabaceae	Alhagi maurorum	Sub-shrub
19	Fabaceae	Alysicarpus ovalifolius	Herb
20	Fabaceae	Crotalaria medicaginea	Herb
21	Fabaceae	Cyamopsis tetragonoloba	Shrub
22	Fabaceae	Indigofera cordifolia	Herb
23	Fabaceae	Melilotus indica	Herb
24	Tamaricaceae	Tamarix alii	Shrub
25	Tamaricaceae	Tamarix indica	Shrub
26	Tamaricaceae	Tamarix sp	Shrub
27	Typhaceae	Typha dominghensis	Reed
28	Verbenaceae	Phyla nodiflora	Herb
29	Violaceae	Viola stocksii	Herb
30	Poaceae	Saccharum benghalense	Large Grass
31	Poaceae	Saccharum griffithii	Large Grass

Figure 29: Typical Vegetation in Sub-project Area

Ziziphus tree of SM Bund

Typha plants SM Bund

Alhaji maurorum along HP Bund

Tamatix bush found inside SM bund area

Saccharum benghalense

Accea Tree (Hori) at SM Bund

5.2.2 Tree Cover

Table-16 provides an inventory of all trees present within the working area giving species and locations with reference to miles. Tree cover is common along the embankment, either side of the embankment crest and on their outer slopes of both. Much of the denser tree cover occurs/exists at 129/4 near Irrigation Landhi.

The species found on embankment include Acacia Nilotica, Mengifera Indica, Azadirachta indica Mengifera Indica, and eucalyptus. Most trees have a wide range of economic uses such as:

Timber, fodder and for building and boat making purposes. Important species include Sindhi Babur (Acacia nilotica), Nim (Azadirachta indica) and Sufedo (Populus euphratica). The majority of the existing trees are on the berms and embankments where stone pitching or construction work of community ramps are going to be undertaken will be lost during the construction works and site clearance. The contractors will have to replant five times as many trees as lost during construction and it will be a part of the Contracts to be awarded for these works. An inventory of cut trees shall be maintained by the Contractor and PISSC on site during execution of the Works in order to enforce this.

Table 16: Tree Inventory of S.M Bund

Tree Inventory S.M Bund						
Miles	Common Name	Scientific Name	Existing Trees		Trees Likely to be cut	
			Landside	Riverside	Landside	Riverside
123/0	Sindhi Babur	Acacia Nilotica	0	3	0	3
123/3	Sindhi Babur	Acacia Nilotica	0	2	0	2
124/2	Sindhi Babur	Acacia Nilotica	0	4	0	2
126/4	Sindhi Babur	Acacia Nilotica	0	1	0	0
129/4	Nim	Azadirachta indica	0	6	0	0
	Sirhan		0	7	0	0
	Babur	Acacia Nilotica	0	20	0	0
143/0	Sindhi Babur	Acacia Nilotica	0	3	0	0
146/3	Sindhi Babur	Acacia Nilotica	0	2	0	0
148/6	Sindhi Babur	Acacia Nilotica	0	3	0	1
150/0	Sindhi Babur	Acacia Nilotica	0	3	0	1
150/2	Sindhi Babur	Acacia Nilotica	0	8	0	2
152/2	Sindhi Babur	Acacia Nilotica	0	12	0	4
159/6	Sindhi Babur	Acacia Nilotica	0	10	0	2
160/3	Sindhi Babur	Acacia Nilotica	0	3	0	0
167/5	Sindhi Babur	Acacia Nilotica	0	4	0	1
169/6	Sindhi Babur	Acacia Nilotica	0	2	0	0
170/1	Nim	Azadirachta indica	0	2	0	0
	Sindhi Babur	Acacia Nilotica	0	1	0	0
170/2	Sufedo	Eucalyptus	0	1	0	0
	Sindhi Babur	Acacia Nilotica	0	3	0	0
171/1	Nim	Azadirachta indica	0	1	0	1
171/7	Nim	Azadirachta indica	0	0	0	0
	Sindhi Babur	Acacia Nilotica	0	10	0	8
Total			**0**	**111**	**0**	**27**

5.2.3 Fauna

Natural habitat of the area is potential for wildlife species. Crop fields provide feeding and roosting ground for rodents and birds while water logged sites are proving alternate habitat to aquatic fauna including fish breeding. River lagoon (Kori) is potential hotspot of water fowls and other migratory bird species. Fallow land around SM bund is providing refuge to various bird species and mammals like Jackal, Wild boar and rodents.

During the field study 4 large mammal species recorded from the site. According to IUCN red list category most of the species are to be considered as least concern (LC), however Indian Civet cat is rarely found is reported in the area. Indian Hog deer is endangered species found in Khasai forest near Matiari, which is located at distance of 3.8 kilometers from the S.M Bund area Wildlife department and local community is more vigilant for the protection of Hog dear.
Moreover, 8 small mammals from different micro habitats were recorded. As well 47 bird species among 4 migratory and 6 partially migrants and rest 37 local species were identified. In addition to this, 12 reptile and amphibians species were also recorded from study site.

Large Mammmals: Large mammal recorded from sub-project area are common and Least concern by IUCN red list category, however Indian hog deer is Endangered ungulate species found riverine forest, Khasai reserve forest is only forest patch located in Matiari district where wildlife species are found. There is no reserve forest close to sub-project (SM Band). During our study along band site, 4 large mammal species recorded including Indian wild boar *Sus scrofa*, Jungle cat *Felis chaus*, Small Indian mongoose *Herpestes javanicus* and Asiatic Jackal *Canis aureus* observed. Details are given in the following Table-17.

Table 17: Large Mammals Recorded in the Area

S/N	English Name	Scientific Name	Conservation status by IUCN 2017-3
Large Mammals			
1	Small Indian mongoose	*Herpestes javanicus*	LC
2	Asiatic Jackal	*Canis aureus*	LC
3	Wild cat	*Felis silvestris*	LC
4	Wild boar	*Sus sacrofa*	LC

Note: (+) means species recorded and (–) means not recorded.
LC = Least concern, EN = Endangered

Small Mammals: Field expedition carried out along SM Band in Hala irrigation division. Spine and droppings of Indian Porcupine found at different locations of study area. Hedgehog observed bushy areas near Bachal Shah village. Physical marks of field Mouse and Porcupine identified on three different locations of SM bund. Group of Common bat observed flying near Abdul Rahman village in evening time. Palm Squirrel observed on trees throughout the field survey time. Most of the species were recorded from bushy areas and agriculture field areas near to SM band. A dead specimen of House shrew found near old Hala. All recorded small mammals are common and Least Concerned (LC) by IUCN. Details are given in the following Table-18.

Table 18: Small Mammals Species Recorded in the Sub-project Area

S/N	English Name	Scientific Name	Conservation status by IUCN 2017-3
Small Mammals			
1.	Palm squirrel	*Funambulus pennantii*	LC
2.	Indian crested porcupine	*Hystrix indica*	LC
3.	Kull's bat	*Pipistrellus kuhlii*	LC
4.	Indian Field mouse	*Mus booduga*	LC
5.	Indian Hedgehog	*Paraechinus micropus*	LC
6	Indian gerbil	*Tatera indica*	LC
7.	House shrew	*Suncus murinus*	LC
8	Indian Gerbil	*Tatera indica*	LC

Note: (+) means species recorded and (–) means not recorded.

Reptiles and Amphibians: Reptile are terrestrial animals they normally occurred in warm and dry area. Marshy areas are favourable for Monitor lizard and water channels are potential sites for spotted pond turtle. During survey of the subproject area two Gecko species observed sleeping on the roof of the shop near the Hala spur. Furthermore 3 amphibian and one fresh-water turtle recorded in study site. Indian Monitor Lizard and House Gecko found near bund site. Details are given in the following Table-19.

Table 19: Reptiles & Amphibians Recorded in subproject area

S/N	English Name	Scientific Name	Conservation status by IUCN 2017
Reptiles & Amphibians			
1	Skittering frog	*Euphlyctis cyanophlyctis*	LC
2	Marble toad	*Bufo stomaticus*	LC
3	Bull Frog	*Hoplobatrachus tigerinus*	LC
4	Yellow-bellied house gecko	*Hemidactylus flaviviridis*	NL
5	Keeled Back Gacko	*Hemidactylus brookii*	NL
6	Bengal monitor	Varanus bengalensis	LC
7	Spotted gecko	*Hemidactylus maculatus*	LC
8	Indian garden lizard	*Clotes versicolor*	NL
9	Indian cobra	Naja	DD
10	Indian flapshell turtle	Lissemys punctate	NL
11	Grass skink	*Eutropis macularia*	NL
12	Saw-scale viper	*Echis carinatus*	
EN= endangered, LC = least concern, NL= not listed in IUCN red list, DD = data deficient			

Birds: The River Indus and its riverine forest is providing excellent feeding roosting and breeding ground for local resident and migratory avian species. During the baseline survey of subproject

area through interviewing and personal observation it was recorded that, total 35 bird species were recorded includes, Common babbler has become very rare from the region, while pheasant crow, Jungle Babbler, Common Myna, Bank Myna, House Sparrow, Common Crow, Indian Roller and Rose ringed Parakeet population are quite satisfactory in Indus eco-region. Chestnut-bellied sand grouse, Pied crested cuckoo, Red-vented bulbul and Red turtle dove population is declining in the region. Migratory water birds especially the water fowl visiting in lagoons of Indus River. During the field study our team cannot observed water fowls however local community members reported presence of these birds on River Kohri (Khosa Kohri). Local resident waders and other water birds like greenshank, redshank, plovers, common coot, little Grebe, common More hen, Grey Heron, Glossy Ibis were observed in water bodies along band.

The common avian species in the project area are shown in the Table-20 (also see Figure-30 for some photographs of key species).

Table 20: Avian Species of Study Area

S/No	Common Name	Scientific Name	Stationary status
Birds			
1.	Hoopoe	Upupa epops	Resident
2.	Indian house crow	Corvus splendens	Resident
3.	Indian House Sparrow	Passer domesticus	Resident
4.	Indian Roller	Coracias benghalensis	Resident
5.	Jungle Babbler	Turdoides striata	Resident
6.	Grey Shrike	Colluricincla harmonica	Resident
7.	Night Jar	Caprimulgus asiaticus	Resident
8.	Red wattle Lapwing	Vanellus indicus	Resident
9.	Sun Bird	Cinnyris asiaticus	Resident
10.	Flycatcher	Muscicapa striata	Resident
11.	Blue-throat	Luscinia svecica	Resident
12.	Green Bee-eater	Merops orientalis	Resident
13.	White cheeked bulbul	Pycnonotus leucotis	Resident
14.	Black Redstart	Phoenicurus ochruros	Resident
15.	Yellow wagtail	Motacilla flava	Resident
16.	White wagtail	Motacilla alba	Resident
17.	Grey Fantail	Rhipidura albiscapa	Resident
18.	Crested Lark	Galerida cristata)	Resident

S/No	Common Name	Scientific Name	Stationary status
19.	Common Babbler	Turdoides caudate	Resident
20.	Eastern Pied Wheatear	*Oenanthe pleschanka*	Resident
21.	Little Owl	Athene noctua	Resident
22.	Black sholder Kite	Elanus axillaris	Resident
23.	Eurasian sparrow hawk	Accipiter nisus	Partially migrant
24.	Indian Pond Heron	Ardeola grayii	partially migrant
25.	Little Egret	Egretta garzetta	Resident
26.	Bank Myna	Acridotheres ginginianus	Resident
27.	Black winged Stilt	Himantopus	Partially migrant
28.	Blue Rock Pigeon	*Columba livia domestica*	Resident
29.	Common Crow Pheasant	Centropus sinensis	Resident
30.	Common Kingfisher	Alcedo atthis	Resident
31.	Pied kingfisher	Ceryle rudis	Resident
32.	Rose ringed parakeet	Psittacula krameri	Resident
33.	Common coot	Fulica atra	Partially migrant
34.	Common moorhen	Gallinula chloropus	Migratory
35.	Tufted duck	Aythya fuligula	Migratory
36.	Common teal	Anas crecca	Migratory
37.	Grey heron	Ardea cinerea	Partially migrant
38.	Tree pie	Dendrocitta vagabunda	Resident
39.	Green shank	Tringa nebularia	Migratory
40.	Indian cuckoo	Cuculus micropterus	Resident
41.	Black Drongo	*Dicrurus macrocercus*	Resident
42.	Collared Dove	Streptopelia decaocto	Resident
43.	Common Myna	Acridotheres tristis	Resident
44.	Common/Barn Swallow	Hirundo rustica	Resident
45.	Black partridge	Melanoperdix niger	Resident
46.	Grey partridge	Perdix perdix	Resident
47.	Barhamni kite	Haliastur indus	Partially migrant

Note: (+) means species recorded and (–) means not recorded.

Black winged stilt

Common Myna near SM Band

Bank Myna near S.M Bund

White Cheek Bulbul at SM Bund

Collared Dove found on SM Band

Tree pie found on SM Band

Figure 30: Some Avian Species of the Study Area

5.2.4 Habitat

Potential wildlife hotspots either forest patches along SM Band are, Sekhat reserved, Matiari reserved forest, Khasai reserved forest, Rano reserved forest forests and Rais Mureed reserved forest, but most of them were converted into agriculture land and no one forest patch existed close to SM Band site. Dominant trees in these habitats are Acacia Nilotica, Mengifera Indica, Azadirachta indica Mengifera Indica, and eucalyptus.

5.2.5 Lakes

During field survey of sub-project area no any lake observed near the sub-project of SM Bund of Indus river.

5.2.6 Riverine Forest

Sindh Forest Department controls an area of 241,198 hectares in the Riverine tract of the province which is categorized as "Riverine Forests"; locally known as Kacho forests. These forests are located along both the banks of River Indus in Thatta, Hyderabad, Dadu, Larkana, Naushahero Feroze, Benazeerabad, Khairpur, Sukkur, Shikarpur, Ghotki and Jacobabad Districts and have been declared as “Reserved Forests” under Forests Act, 1927.

The Riverine forests in the past were only developed through the annual regeneration at the time of monsoon floods. Recently, under annual development program, some areas were developed and planted on the pattern of irrigated plantations by lift irrigation through installation of electric/diesel operated tube wells and diesel operated lift pumps on the river banks and depressions .The underground water in the riverine tract is sweet, available in abundance in the aquifer and is suitable for raising trees and agriculture crops.

Following are the main factors responsible for degradation of riverine forests:

- Severe reduction in flow of fresh water in Indus through floods.
- Population pressure for meeting the local needs of the people.
- Increase in the high lying areas due to low floods.

A summary of reserve forests in the area is presented in Table-21 below.

Table 21: Reserved Forest, Current Status, and Distance from Sub-project Area

S. No	Name of Forest	Distance from sub-project	Current Status
1	Sekhat Reserved Forest	Left side of river, 3 km away from S.M Bund	No forest exist, Flood Plan
2	Matiari Reserved Forest	Left Side of River, 2.5 km away S.M Bund	River Land
3	Rais Mureed Reserved Forest	Left Side of River, 3 km away S.M Bund	Forest has been converted into cultivated Land
4	Pako Bhanoth	Left Side of River, 2.5 Km away from SM Bund	Forest has been converted into cultivated Land
5	Salaro Glotana Reserved Forest	Left Side of River, 1.2 Km away from SM Bund	Forest has been converted into cultivated Land
6	Darbo Reserved Forest	Left Side of River, 1.2 Km away from SM Bund	Forest has been converted into cultivated Land
7	Rano Reserved Forest	Left Side of River, 2.6 Km away from SM Bund	Forest has been converted into cultivated Land
8	Muralabad reserved Forest	Left Side of River, 4.5 Km away from SM Bund	Forest has been converted into Barren Land
9	Rajri Reserved Forest	Left Side of River, 2.2 Km away from SM Bund	Forest has been converted into Barren Land
10	Khasai Reserved Forest	Right Side of River, 3.8 Km away from SM Bund	Thin forest

All forest areas are beyond the primary impact zone of the embankment sub-project covered in this ESIA. The location of the forest areas adjacent to the sub-project area is shown in Figure-31.

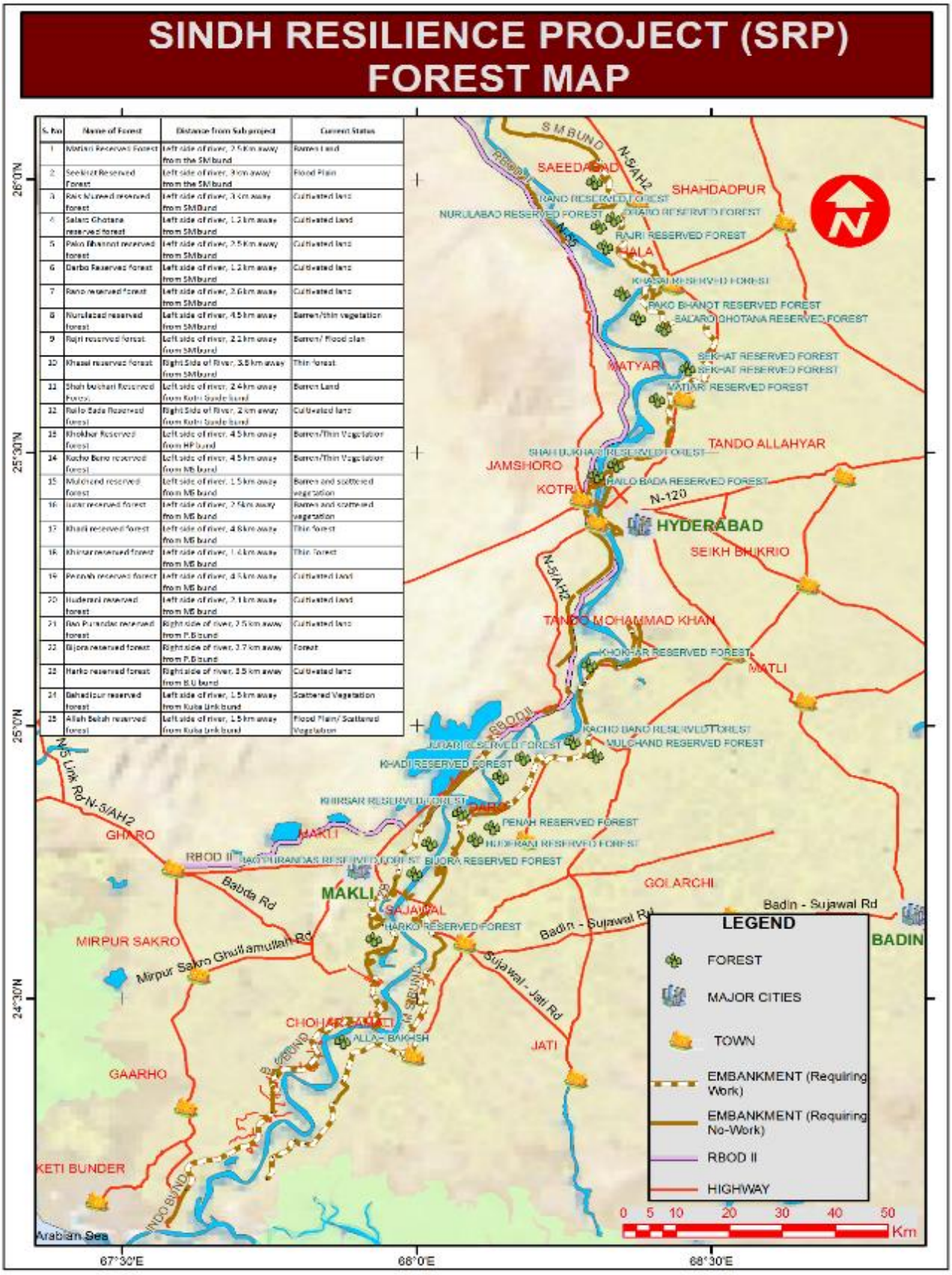


Figure 31: Forest Area of Embankment Sub-project

5.2.7 Fish

The volume of water flowing in the Indus River area supports a complete ecosystem, the fish being the main component of the fresh water ecosystem. The commercial fish species occurring in the project area are presented in Table-22.

Table 22: Fish Species of Commercial Value in the Project Area

Local Name	Scientific Name
Palo	Tenualosa ilisha
Morakho	Cirrhinus reba
Sunni	Cirrhinus reba
Gulfam	Cyprinus carpio
Dahi	Labeo calbasu
Rohu	Labeo rohita
Fauji Khagga	Bagarius
Gundan	Chitala
Bachwa	Clupisoma garua
Thaili	Gibelion catla
Singhari	Sperata sarwari
Malli	Wallago attu
Luhur	Heteropneustes fossilis
Jerko	
Popri	Puntius ticto

5.3 Socio–economic Baseline

In the floods of 2010 and 2011, the SM bund along the Matiari district did not breach, however, the heavy rains of 2011 had a devastating effect on Matiari district as all its union councils were affected. Most of the sources of livelihood were destroyed for the population, particularly for those whose livelihood was dependent on agriculture and related sectors. As reported by Director Cotton Research Institute Sakrand district Shaeed Benazeer Abad, about 803 hectares of cotton out of 15,716 hectares (5%) were damaged in Matiari district. Moreover, 100% of sugarcane, banana and fodder crops sown in kacha area of the Indus River were also badly affected.

Similarly, other sources of livelihood were also severely affected due to floods in 2011. It was reported that 115 houses were damaged in two villages i.e. Goth Abdul Hakeem and Goth Mohammad Laique Rind of Matiari district.

In order to establish a social baseline of the project area, surveys and consultations were carried out in 12 villages lying within the primary and secondary impact zone of CoI of SM bund in Matiari

district during the month of November and December 2015 and supplementary field survey carried out in March 2018 and July 2018.

2nd Round consultation with community

2nd round consultation with community

1st Round Consultation with community

1st Round Consultation with community

1st Round Consultation with community

According to the survey results, households and standing crops were damaged only in 5 villages of due to flood. List of flood damages in villages of sub-project area is provided in Table-8.

The questionnaires were used during the study are provided in Annex-B. The information collected will assist in the measurement and determination of the impacts (positive and negative) on social services, livelihood and cultural pattern of the population under study. To make the analysis more compelling, qualitative data through focus group discussions (FGDs) were also collected which are produced in Table 23.

Table 23: Qualitative Data of the Villages included in Socio-Economic Baseline Survey of SM Bund District Matiari

Sr. Nr.	Name of Village	Location	Tribe and Religion		Occupation		Main language Spoken
			Tribes/ Clan	Religion	Primary	Secondary	
1	Bhanoth	Out side	Solangi, Khoso, Kohli, Malah	Islam/ Hindu	Agriculture	labor/ Jobs	Sindhi
2	Keher Colony	Out side	Balal	Islam	Labor	Agriculture	Sindhi
3	Goth Wazeer Rind	Out side	Rind	Islam	Labor	Nil	Sindhi
4	Delo Keti	Out side	Solangi Kohli, Pathan	Islam/ Hindu	Agriculture	labor	Sindhi
5	Goth Badar Lakho	Out side	Machhi, Jatoi, Detha	Islam	Tenant	Labor	Sindhi
6	Goth Jumo Shahuk	Out side	Shahuk	Islam	Agriculture	labour	Sindhi
7	Goth Haji Yousaf	Out side	Marri, Khoso, Domki	Islam	Labor	Tenancy	Sindhi

Sr. Nr.	Name of Village	Location	Tribe and Religion		Occupation		Main language Spoken
			Tribes/ Clan	Religion	Primary	Secondary	
8	Sekhat	Out side	Machhi, Malah, Bhagri, Chohan	Islam/ Hindu	Labor	Tenancy	Sindhi
9	Goth Abdul Hakeem	In side	Khosa	Islam	Agriculture	labour	Sindhi
10	M. Laique Rind	Out side	Rind	Islam	Labor	Tenancy	Sindhi
11	Goth M. Ali Sangrasi	Out side	Sangrasi, Bheel, Khaskhely	Islam/ Hindu	Agriculture	labour	Sindhi
12	Goth Dural Khan Khosa	Out side	Khoso	Islam	Labor	Agriculture	Sindhi

5.3.1 Population

As may be seen from Table 19, total dwelling of the Project area represents various caste groups such as Khaskhely, Malah, Solangi, Khoso, Jatoi, Pashtun, Machhi, Rind, Sangrasi, Chohan, Shahuk, Bheel, Marri, Domki and Kohli. Sindhi is the main language in the Sub-Project area, whereas most of the people particularly male can also speak Urdu and Saraiki. The dominant ethnic group in the project area are the Khaskhely and Khoso.

Primary Data

SM bund is in district Matiari of Sindh Provence. According to the results of the primary data survey, total households of sub-projects SM bund rural area are 4,210 with a total population of 30,130.Village wise detail is given in Table 24.

Table 24: Rural Population and Households on SM Bund

S.No	Name of Village	Population and Housing	
		Estimated population of the village (No.)	No of Household
1	Bhanoth	5000	600
2	Keher Colony	200	60
3	Goth Wazeer Rind	250	35
4	Delo Keti	2500	400
5	Goth Badar Lakho	1500	250
6	Goth Jumo Shahuk	4000	500
7	Goth Haji Yousaf	1500	250
8	Sekhat	5000	800
9	Goth Abdul Hakeem	1000	80
10	M. Laique Rind	180	35
11	Goth M. Ali Sangrasi	3000	400
12	Goth Dural Khan Khosa	6000	800
	TOTAL	**30,130**	**4,210**

***Source**: Socio-Economic and Social Impacts Assessment Survey of SRP, 2015-16.*

Secondary Data

Matiari and Hala towns are in urban area where the detail survey was not carried out. According to CENSUS of 2017 there were 32,641 households with a total population of 182,590. Total rural and urban households are 36,851 and total population 212,720 both male and female. The detail is given in Table-25.

Table 25: Urban Population and Households Beneficiaries of SM Bund

Towns	No. of Households	Male	Female	Total	1998 - 2017 Average Annual Growth Rate
Matiari and Hala	32,641	94,541	88,049	182,590	2.54

Source: *District wise census result of Pakistan 2017*

5.3.2 Languages

Sindhi is the dominant language spoken by all the people in the project area. In 95% villages Urdu is also spoken and understood.

5.3.3 Family system

The majority (89%) of those in the study area live together with their extended families (parents living with married children and their families). Families believe this is a more economical way of living as they often work together on the same land and are able to share their joint incomes to support the entire family, including elderly relatives who are unable to work. It is also thought to be more efficient to share basic amenities such as water, electricity, housing and food rather than for their own individual families.

5.3.4 Religious Affiliations

During the socio-economic field survey it was observed that about 90 per cent of the population is Muslim whereas 10 per cent consist of Hindu.

5.3.5 Social Cohesion and Conflict

Social organization in all villages is strongly based on Biradari (tribal) system, where each tribe has a tribal head. The tribe heads are mostly landlords and political leaders. All families belonging to the same tribe have strong interactions with one another but mostly remain separate from other tribes. This particularly applies to marriages, where it is preferred for young tribal members to marry the member of the same tribe.

Interactions between different tribes are not common. There are a large number of villages in the area. Separate villages have been established as tribes and families have grown and the land owned by one family becomes sub-divided between the brothers of successive generations.

During the survey it was found that most communities had built their own mosques, while maintenance of these mosques is the joint responsibility of the residents.

5.3.6 Conflict Resolution within Tribes and Villages

According to the socio-economic survey, there is no major inter or intra tribal disputes among the people in the project area. The conflict resolution pattern in the project area is mainly about the right of vote, marriage settlements and other matters which are usually resolved by the village head, i.e., the head of a tribe shall resolve major disputes. It was found during survey that 90 per cent of the conflicts were resolved at village level. Those living within communities of the project area feel obliged to accept the decision of the village heads or tribal leaders.

In case of serious matters, local influential politicians (who are often also tribal leaders) intervene to settle the dispute. Occasionally, when parties do not agree on the decision of village head or tribal leader, matters may go to the police and ultimately to the court of law. The police and the court of law are the last options and these are rarely exercised.

5.3.7 Housing

The project area consists of rural population living comparatively in isolation. Majority of the population live in settlements of about 350 houses compact all over the project area. Mud houses or huts are built without layout or plan. Most of the houses usually have a boundary wall enclosing enough space for cattle and storage of goods or grains. The roof of a mud house consists of wooden beams of all shapes and sizes, cover of thick date-palm mats and a layer of mud with clay plaster at the top. It was observed that all the people were living in self-owned houses.

5.3.8 Literacy

A person who can read and write statements with an understanding, in any language prevalent in Pakistan, is considered as literate. Pakistan Bureau of Statistics (PBS) carried out the survey from August 2014 to June 2015. The report reveals that in Sindh the percentage of educated people dropped by 4% to 56% in 2014-15. Just over about 5% of those living in project area have received education to any level.

5.3.9 Educational Facilities

There are 10 boys and 4 girls Primary schools, 1 middle schools for boys, 1 middle school for girls, 1 high school for boys and a high school for girls exist within radius of 1km on both sides of the sub-project area. Education facilities in the Project Area are given in Table-26.

Table 26: Education Facilities in the Project Area

	Boys Primary School	Girls Primary School	Boys Middle School	Girls Middle School	Boys High School	Girls High School
No of Schools	10	4	2	1	1	1
Enrolment's	630	390	415	200	300	70

District level education facilities are given in Table-27 while details of village wise educational and other facilities are given in Annex-C 5.

Table 27: Education Facilities in Districts Matiari

Taluka/Tehsil wise Summary: Schools, Enrolment, Teachers and Status in District Matiari												
Taluka/ Tehsil Name	**No. of Schools**				**Enrolments**			**Teachers**			**Schools Status**	
	Boys	**Girls**	**Mixed**	**Total**	**Boys**	**Girls**	**Total**	**Male**	**Female**	**Total**	**Functional**	**Closed**
Hala	22	23	175	220	17,281	10,511	27,792	1,015	293	1,308	215	5
Matiari	43	49	303	395	23,049	11,093	34,142	915	189	1,104	345	50
Saeed Abad	33	62	216	311	13,988	8,707	22,695	778	178	956	261	50
Total District	**98**	**134**	**694**	**926**	**54,318**	**30,311**	84,629	**2,708**	**660**	3,368	**821**	**105**

Source: SEMIS 2014 -2015 *Sindh Education Management Information System (SEMIS)*

5.3.10 Health

It was found that most of the people have suffered from hepatitis, typhoid, diarrhoea and other hygiene related diseases. Details may be seen in Annex E1. Some of women expire during their delivery due to non-availability of maternal health facilities. Majority of the women are malnourished usually being the last ones to eat their meals in the family. There are three Basic Health Units (BHU) in the project area; one in Bhanote village, one in Jumo Shahuk village and one exist in Sekhat village of Matiari District. The seriously ill patients are taken for treatment to Matiari or Hyderabad civil/district hospitals.

5.3.11 Transport

Most of surveyed villages have village tracks or black top (Pucca) tracks that are in bad condition except of some villages. Construction and maintenance of village roads is the responsibility of local government. One national motorway/highway Karachi-Sukkur also passes along the project area and connect with Karachi, Hyderabad, Sukkur and other provinces of the country.

The socio-economic baseline survey reveals that the major source of the human transport in the project area is Van/Pickups for the general public. Village profile data show that 75% villages (9 in number) have access to Van/Pickups facility, 42% villages (5 in number) have access to Bus facility, 42% villages (5 in number) have cars and all the 12 villages have motor cycles. The farm inputs and outputs are transported through Trucks, Trailers and Tractor Trolleys. The animals from the project area are transported to Hyderabad and Karachi by Trucks. The Firewood and Furniture wood is also transported through Trucks and Trolleys.

5.3.12 Telecommunication

During the field survey the respondents reported that there is no landline facility available in the CoI. Mobile phone communication is widely spread in the CoI and the project area, the frequent use of mobile phone was observed during the project field visits. Landline facilities are available outside the CoI of the project area.

5.3.13 Energy Source

The Electricity is available in 9 (75%) villages as may be seen in Annex E6. This energy source is being utilized mainly for lighting of the houses and operation of tube wells for drinking water supplies and irrigation etc. In addition to it, people also collect the firewood from the surrounding area and some people purchase firewood from nearby town. During the field survey the respondents reported the consumption of fire wood is on average 10 maunds (one maund=40kg) in winter and 6 maund in summer per household, while price of fire wood is Rs 300 PKR/maund.

5.3.14 Drinking water and sanitation

It was observed that women and children are responsible for fetching of water for drinking and domestic use. The underground water is mostly sweet and suitable for drinking purpose in the project area. Survey results showed that 2,848 hand pumps exist in the project area and overall average ground water depth in sample area was 35 to 60 feet. In 2 villages out of 12 there are 21 tube-wells for irrigation purposes and 8 villages have access to canal water for both irrigation and drinking purpose. The other two villages have hand pumps only for drinking puposes. Within the project area people drain out used water in open places and dump solid waste in the open. Detail may be seen in Annex C 6.

5.3.15 Women in sub-project area

This section provides baseline information and description of the socio-economic and cultural background pertinent to female in the project area. The purpose of this socio-economic survey was to gather first-hand information about the generic characteristics of nearby female communities, their socio-economic status, cultural conditions and social issues. The Female Sociologist carried out the study of socio-economic and cultural environment with reference to femininity of the project area. The approach and methodologies used during data gathering were

interviews, focus group discussions and rapid rural appraisal techniques to qualitative data collection. Socio-economic and cultural data were collected through semi structured questionnaire and focus group interviews with female cluster at village level. This survey was carried out in 12 villages. Table-28 gives detailed results/description of woman profile.

Table 28: Location of conducted cluster meetings with females on SM bund

Name of Villages	No of Participan	skills	Education level	Women Rights	Health and hygiene	WAS (yes/no)	Income source
Village Bhanote	24	Embroidery	8%	poor	poor	No	Embroidery agriculture
Keher Colony	9	Embroidery	0%	poor	fair	No	Embroidery agriculture
Goth Wazeer Rind	13	Embroidery	0%	poor	fair	No	Embroidery agriculture
Delo Keti	23	Embroidery	0%	poor	poor	No	Embroidery agriculture
Goth Jumo Shahuk	25	Embroidery	5%	poor	fair	No	Embroidery agriculture
Goth Haji Yousaf	10	Embroidery	0%	poor	fair	No	Embroidery agriculture
Sekhat	14	Embroidery	5%	poor	poor	No	Embroidery agriculture
Goth Abdul Hakeem	12	Embroidery	0%	poor	fair	No	Embroidery agriculture
Village Badar Lakho	34	Embroidery	0%	poor	fair	No	Embroidery agriculture
Goth Laique Rind	15	Embroidery	0%	poor	fair	No	embroidery, agriculture
Goth Mohammad Ali Sangrasi	29	Net Making	0%	poor	poor	No	net making, agriculture
Village Rais Dural Khan Khosa	14	Embroidery	5%	poor	poor	No	Embroidery agriculture

The status of women in the project area is classified as low. Female Sociologist visited the villages and interviewed the women in a group form. Details of the villages visited are included in the following sections. The result of the surveys revealed that women of the project area are fully responsible for household activities and also take an active part in the field and livestock activities, and thus support the household income generation.

Women within the project area are infrequently consulted and men commonly have the deciding power. Men usually make purchases on behalf of the female members of their family. Rural women mostly remain inside the home or work in the field. In many cases, a husband will not share his plans with his wife. Neither the survey nor the consultations identified any women who owned property.

The result of the surveys revealed that the household and farming activities were carried out by the women in the project area as under:

Women in the area are skilled at embroidery. Many women spend their free time in embroidering. There is the opportunity for women to use these skills as source of income for the family.

Housing Pattern in the Subproject Area

Housing Pattern in the Subproject Area

Figure 32: Housing Pattern in the Subproject Area

Majority of women living within the corridor of impact were found to be illiterate. Only about 5% of the women in 4 villages out of 12 in the project area were found to be educated, and of these none had attended school beyond middle level. Of the total educated population of the project area, only 1.3% are the females.

The health and hygiene condition of females and children is very poor. Many diseases are identified within the CoI, i.e. skin diseases, diarrhoea, hepatitis, typhoid, and flue. Many women suffer from endemic diseases and expire during delivery due to non-availability of maternal health facilities.

5.3.16 NGOs

During the field survey it was observed that only two NGOs: HANDS and NRSP were reported working in the project area. The NGOs working in the area along with their area of interest are detailed in Annex-C 6.

5.3.17 Priority Needs of Male Community

During consultation meeting with the male groups they prioritized their needs. The ranking of prioritized needs is derived from the individual rankings of priorities generated from the discussion with the separate groups in each village. During the male consultation meetings in the target villages, different types of problems were identified and the priorities for each village are summarized as follows;

- Expressed need of male and female primary to middle level schools in the project area.
- Demanded for Link roads construction.
- Demanded for the provision of health facilities in the project area.
- Electricity connections for houses.
- Employment for the jobless and educated youths.
- It was observed that the education facilities was the key requirement during consultation.

The village wise needs are given in the following Table-29

Table 29: Priority Needs of the Male Community Members

Sr. no	Name of Village	Drinking Water	Education facilities	Link road	Health	Electricity	Gas	Employment
1	Bhanoth	×	×	×	×	√	×	×
2	Keher Colony	√	√	√	×	×	×	×
3	Goth Wazeer Rind	√	×	√	×	√	×	×

Sr. no	Name of Village	Drinking Water	Education facilities	Link road	Health	Electricity	Gas	Employment
4	Delo Keti	×	√	×	×	×	×	×
5	Goth Badar Lakho	×	×	√	×	√	×	√
6	Goth Jumo Shahuk	×	×	×	×	√	×	×
7	Goth Haji Yousaf	×	√	×	√	√	×	×
8	Sekhat	×	√	×	×	√	×	×
9	Goth Abdul Hakeem	×	√	√	√	×	×	×
10	M. Laique Rind	×	√	×	×	×	×	√
11	Goth M. Ali Sangrasi	×	√	×	√	×	√	√
12	Goth Dural Khan Khosa	×	√	×	√	×	√	×
Percentage		**17**	**58**	**42**	**33**	**50**	**17**	**25**

5.3.18 Priority Needs of Female Community

During consultation meeting with the women groups they prioritized their needs. The ranking of prioritized needs are derived from the individual rankings of priorities generated from the discussions with the separate groups in each village, the comprehensive priorities for the overall project area is summarized as follows;

- The female community members demanded for the provision of basic living facilities including (health, education and drinking water)
- Demanded for water supply and sanitation facilities in the villages.
- Demanded for hand pumps in the villages
- Requested for provision of separate school for girls where girls school is not available
- Female community members demanded for provision of proper inclined path on embankment for livestock.
- The female community members requested that engage male members as daily labour during project work.

The village wise needs are given in the following Table-30

Table 30: Priority Needs of the Female Community Members

Sr. No	Name of Village	Priority Needs
1	Village Bhanote	1) Provide school to village 2) Install hand pumps in houses 3) Provide pit latrine in houses
2	Village Keher Colony	1) Villagers fetching water from few hand pumps installed in the village, provide hand pumps to villagers 2) Provide health facility. 3) Women's have handicraft skill, they demand to provide marketing support for their local products
3	Village Wazeer Rind	1) Repairs their damaged latrines and shelter homes Villagers fetching water from few hand pumps installed in the village, they need more hand pumps
4	Village Delo Keti	1) Villagers fetching water from few hand pumps installed in the village, they need more hand pumps 2) Female using outdoor latrine, provide latrine to household level
5	Village Jumo Shahuk	1) Villagers fetching water from few hand pumps installed in the village, they need more hand pumps. 2) Female participatory demanded to school teacher. 3) Project will not excavate our land for sediment dumping on Band
6	Village Haji Yousaf	1) Provide WES and basic health especially women heath facility 2) Provide hand pumps to households 3) And opportunity to work during construction work. 4) Female demanded to lady doctor
7	Village Sekhat	1) Females going outdoor for latrine use, they need latrines at household level 2) Villagers fetching water from few hand pumps installed in the village, they need more hand pumps 3) Provide jobs to male members during construction work
8	Village Abdul Hakeem	1) Provide WES and basic health (maternity home) 2) Provide hand pumps to households 3) Provide jobs to male members during construction work
9	Village Badar Lakho	1) Provide WES and basic health especially women heath facility 2) Provide hand pumps to households 3) And opportunity to work during construction work
10	Village Laique Rind	1) Project will provide job opportunity to male members. 2) Some hand pumps will installed in the village. 3) Provide girls primary and boy middle school to villagers 4) Install some hand pumps in the village 5) Provide link road communication. 6) Participatory demanded to grant boundary wall in the village.
11	Village Mohammad Ali Sangrasi	1) Install hand pumps in the village. 2) Provide school and health center to villagers. 3) Pathways leave for villager movement. 4) Female demanded to provide boundary wall. 5) Latrine facility is not available in the village female going outside the village for use latrine, during the project activity they will face problem to go out for latrine need they are demanded Latrine facilities.
12	Village Rais Dural Khan Khosa	1) Provide school and health center to villagers.

5.3.19 Archaeological and Cultural Heritage

The archaeological survey was conducted by the Culture and Tourism Department, GoS in 1993 and 1996. According to the survey results, there are total 02 archaeological sites situated near the subproject area. The current condition of both archeological sites is intact. Details of the archaeological sites are given in the Table-31. The archaeological map of the subproject area is provided in Figure-33.

Tomb of Hazrat Shah Abdul Latif Bhittai near Hala.

Tomb of Mir's near Khudabad, Matiari

Table 31: Number of Archaeological Sites in the Project Area

S. No	Name/Description	Location	District	Estimated Distance (km) from the Sub-Project Area
1	Hala Monuments (Mir's Tombs)	Fateh Pur, Hala	Matiari	01 km from S.M Bund
2	Shrine of Shah Abdul Latif Bhittai	Bhitt Shah Hala	Matiari	20 Km from S.M Bund.

Source: http://antiquities.sindhculture.gov.pk

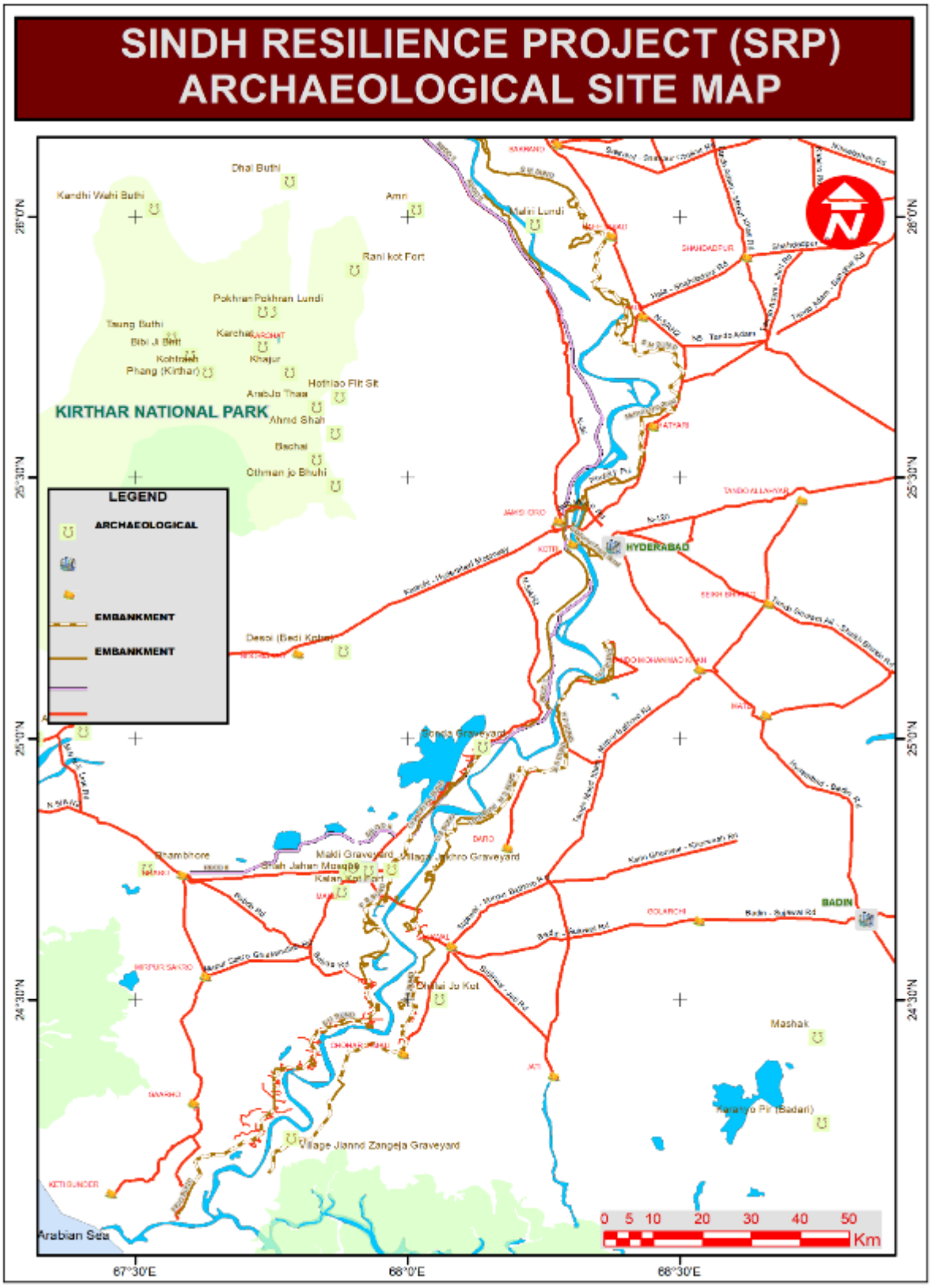


Figure 33: Archaeological Map of the Sub-project Area

6. ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATIONS

The environmental impacts of the Indus River embankment sub-project principally relate to loss of habitat on and beside the Indus River embankments resulting from vegetation clearance and tree felling on the berms (outer and inner slopes) during stone pitching and embankment raising/strengthening. There could also be impacts to the communities within project area, due to disturbance resulting from the movement of contractor machinery, establishment of borrow areas in the agriculture or wetlands having ecological significance. All potential negative impacts along with mitigation measures are set out in this Chapter.

6.1 Air Quality

Impacts: The major dust generation would be during construction phase in undertaking the earthworks, transportation of borrow and other construction materials along the embankments. As contracts/works are estimated to last between six months and the dust raising potential is high, the impact magnitude is judged to be major during this period.

Mitigation: Water sprinkling will be carried out to suppress the dust in work areas and on the access routes, on the top of the embankments of SM Bund where sizeable number of settlements exists. Water sprinkling will particularly be carried out near the villages. Moreover, frequency of water sprinkling would vary as per requirement and would be adjusted to accommodate suppression of dust. Also under traffic management plan, speed limit would be enforced. Community liaison will be maintained and grievance redress mechanism (GRM) (discussed later in the document) will be established to address complaints related to air quality.

The Contractor will prepare and submit a traffic management plan before commencement of the physical works. The movement of the Contractor machinery shall be restricted beyond the routes identified in the traffic management plan of the contractor.

In addition, delivered materials such as sand or aggregates (if required) should be bagged or sheeted on arrival and during storage. No construction should take place during dust storms. No vehicles emitting black smoke from their exhaust should be permitted on site (this shall be linked to the NEQS for the Contract and burning should generally be avoided wherever possible.

6.2 Water Quality

Impacts: As discussed in the chapter 5 about surface water, tested parameters of surface water are under acceptable limits except Calcium and nitrate. During stone pitching and earth works activities (raising and widening) of embankments the Indus River flows may be impacted or disturbed wherever on the reaches to be rehabilitated aligning close to the river flow. During the embankments rehabilitation, the dissolved solids and sediment load in the river flow will

increase and is likely to affect local people who extract water from the river. However this is temporary impact and the effect shall be reversed naturally following construction. Therefore the magnitude of the impact from planned works is minor adverse.

A secondary adverse impact is potential spillage of chemicals, hydro-carbons and other pollutants as part of the construction process as well as contamination arising from the improper disposal of wastes (organic and inorganic) at the camp and work sites. Such wastes are detailed in Table-32.

Table 32: Site Wastes

Type of Waste	Description
Campsite or domestic waste	Biodegradable: Foodstuffs, fruits and vegetables, wood, Campsite or domestic waste bones, grass etc.
	Non-Biodegradable: Paper, metals, glass, plastic bottles, scrap metal, textile and shoes, bottles and jars, fluorescent tubes.
Sewage and grey water	Kitchen and washing areas sewage
Workshop waste including solid and Fluid	Used oil, ferrous /nonferrous materials, batteries etc.
Medical waste	Syringes, glass bottles, Bandages, blood sampling tubes, expired drugs, dressing etc.
Packing waste material	Paper, plastic, textiles, cardboard, rubber, wood, glass, tin cans etc.
Excavated and Demolition waste	Rocks, sand, silt/clay, concrete, bricks and other building materials
Excess construction material	Sand, aggregate, stones and other construction materials

Above types of waste may contaminate surface water and surrounding eco system through improper disposal. Contaminated surface water also holds potential health hazards if the contaminated is exploited for drinking purpose.

Tested parameters of ground water are within acceptable limits of SEQS and WHO except hardness, calcium, nitrate, TDS, TSS and turbidity. The groundwater which is a source of drinking in some areas may be potentially contaminated by the release of untreated sewage from construction camps and offices.

Mitigation: The most important mitigation is to ensure that local drinking water supplies are not in any way worsened during the life of the contract. The local villages get their drinking water from multiple sources such as hand pumps, river creeks, canal and ponds etc. However, hand pumps are the main source for drinking water in the project area, so it should not be affected by an increased sediment load in the Indus River. The Contractor shall also make his own arrangements for supply of water for the purposes of Works.

The contractor must provide the following facilities at each camp site: Latrines; Lined washing areas; and Septic tanks and soaking pits for toilet waste.
Key mitigation measures are listed below.

- Septic systems are to be used at the Contractor's camp for treatment using septic systems. Contractor will submit a plan of camp location in which location of septic tank will be showed for the approval of Engineer.
- A sewerage system will be constructed for disposal of the waste water from Contractor's camps; the quality of the sewage water shall be monitored on quarterly basis against NEQS.
- Camps site shall be provided with all necessary drainage of storm water away from the camp & construction areas and community settlements.
- Vehicles will only be washed in designated areas within camp site.
- All hydro-carbons and other potential pollutants should be properly bunded.
- Regular monitoring of water quality shall be carried out by the PISSC and ESMU of PMT.
- Appropriate arrangements will be made to stop stones and soil to slip in the river water.
- Community liaison will be maintained and GRM will be established to address complaints related to waste disposal.

6.3 Cultural Heritage

There is little likelihood of buried archaeological sites or artefacts since the Indus River embankments system is a relatively recent construction dating back to the British colonial period.

According to the baseline survey results, there are total 02 archaeological sites situated near the subproject area. Tomb of Shah Abdul Latif Bhittai is located at approx. 20 km distance, while Mir's Tomb (Hala Monument) is located at outer side of the river Indus approx. 1 km away from sub-project area. The current condition of both archeological sites is intact. As the sub-project interventions are very limited, which includes revamping of exiting community ramps for easy acces. During construction activity machinery like excavator and rollers are involved, while most of the activites will be carriedout manually by labors. The machinery involved does not produce any vibration which can transmit upto 1km which has no impacts on monuments.

Mitigation: To protect the PCRs identified and marked in the Figures all works (including haulage) shall be excluded from the areas. Contractor will prepare maps showing these areas and display them in the construction office/camps. In the event of a discovery of an unidentified PCR (i.e., Chance Find), the Contractor shall notify the Engineer who will report to PMT-SRP for intimation to Archeologically Department. The Contractor activities shall be restricted from the monuments identified about approx 500 m away from the working areas situated at New Fateh Pur (N.F Bund) on 4/0 Mile.

Community liaison will be maintained during construction stage and GRM will be established to address complaints related to any damage to PCRs (e.g., graves).

6.4 Chance Find Strategy

The sites or items of heritage significance could be found in the course of development work. The "chance finds" procedure covers the actions to be taken from the discovery of a heritage site or item, to its investigation and assessment for siting and designing a project to avoid significant adverse impacts to cultural the client is responsible heritage.

It would be ensured that any chance find further is not disturbed until an assessment by competent professionals is made and actions consistent with the requirements of this Performance Standard are identified.

1. In the case of the chance find, the contractor will secure site and report immediately to PISSC. Works may not recommence until approval is given by the Engineer
2. PISSC will report to PMT for intimation to Archeologically Department.
3. Meanwhile the contractor will cease their operations and due caution will be ensured for archaeological remains.
4. Archaeology department to inspect, identify, advice management, and recover remains.
5. Site visit of Archaeological Department will be facilitated. Further works will be carried out on such sites only after obtaining clearance from the Archeologically Department.

6.5 Biodiversity

Impacts

Habitats

The primary impact to the existing habitat will be during the implementation of the proposed works. The most notable impact shall be due to the establishment of borrow areas, involving the clearance of vegetation prior to excavation of the land – this shall result in a permanent change in the habitat of vegetated areas.

Moreover riverine forests given in the Table-19 exists no more, all riverine forest near the sub-projects area have been converted into agricultural land.

Flora

Specie like Prosopis juliflora is present in uncultivated land, along the embankment and around the settlements in the sub-project area. This specie is fast spreading and covering most of the bare land of the area. The potentially negative environmental will be associated with the clearance of vegetation beyond the existing toes of embankments, it is required to prepare the area for formation of the embankments. About 27 trees of *Acacia nilotica, Azadirachta indica*, *and Eucalyptus camaldulensis to* be felled during execution of the work. Details are mentioned in table 33: given below.

Table 33: Trees to be felled on S.M Bund

Trees to be felled on S.M Bund				
Miles	Common Name	Scientific Name	Riverside	
			Young	Mature
123/0	Sindhi Babur	Acacia Nilotica	2	1
123/3	Sindhi Babur	Acacia Nilotica	0	2
124/2	Sindhi Babur	Acacia Nilotica	0	2
148/6	Sindhi Babur	Acacia Nilotica	0	1
150/0	Sindhi Babur	Acacia Nilotica	1	0
150/2	Sindhi Babur	Acacia Nilotica	0	2
152/2	Sindhi Babur	Acacia Nilotica	2	2
159/6	Sindhi Babur	Acacia Nilotica	0	2
167/5	Sindhi Babur	Acacia Nilotica	0	1
171/1	Nim	Azadirachta indica	0	1
171/7	Nim	Azadirachta indica	0	0
	Sindhi Babur	Acacia Nilotica	3	5
Sub-Total			**8**	**19**
Total			**27**	

Fauna

Fauna of the sub-projects area will be disturbed due to project activities like dumping and moving of heavy materials, human movement, cutting of trees and removing of vegetation from embankment site and barrow area. Wildlife is highly sensitive to human disturbance especially during breeding period; these activities may cause to influence the rate of breeding particularly nesting activity of birds. Excavation and dumping activities may destroy habitats of Rodents and jackals. In addition, Illegal hunting and shooting of birds and mammals by working staff be possible. However, adverse impacts related to operation phase are mostly of temporary nature but some of them are may be significant.

Indian Hog deer is endangered species found in Khasai forest near Matiari, which is located at distance of 3.8 kilometers from the S.M Bund area, and between S.M Bund area and forest there are agriculture Lands and communities living, so there is no chance that Indian Hog deer travel

to S M Bund area. Moreover, Wildlife department and local community is more vigilant for the protection of Hog dear.

There are heavy fines / penalties / impressment on hunting of Hog dear through Sindh Wildlife Act. Contractor staff will not be allowed to involve in such activities of hunting or poaching of wildlife. It may be inferred that there will be no impact on Hog dear due to project activities.

Mitigation:

The following mitigations shall be proposed during the establishment of borrow areas and embankments works. The mitigation measures for impacts from borrow pits which may cause negative impacts on biodiversity are discussed below.

- The area required for the campsite, borrow sites, and dumping sites will be kept to the minimum required.
- The establishment of any borrow areas and camps in agricultural land shall be strictly prohibited in the Contract documents. Approval from Engineer shall be required before clearance of vegetation.
- Dumping of construction materials should be avoided where large number of terrestrial trees, shrubs, herbs, grasses observed.
- Night travelling will be strictly prohibited within the protected areas to reduce the risk of striking fauna on access routes.
- The speed of project vehicles shall be limited to 30km/hr. as per Traffic management plan.
- The construction camp site(s) should be avoided in wildlife sensitive area to minimize Impacts on wildlife during construction stage.
- Wildlife department and local community is more vigilant for the protection of Hog dear.
- There are heavy fines / penalties / impressment on hunting of Hog dear through Sindh Wildlife Act.
- Contractor staff will not be allowed to involve in such activities of hunting or poaching of wildlife, same will be ensured through supervison and monitroing Consultants
- The contractor shall ensure a 3 m (10 ft.) wide strip shall remain unexcavated at 300 m (1,000 ft.) intervals in order to maintain access across the borrow areas.

Flora

About 27 trees to be felled during execution of the works, inventory has been prepared. Tree inventory of the trees felling shall be maintained during construction period. For each tree felled, five saplings of approved tree species will be planted. Total 135 trees of different local species will be planted by contractor in the begning of the contract. The felling of trees for the establishment of borrow areas shall not be allowed.

Fauna

Contractor shall be prohibited from felling any tree which houses an active nest. Following identification and marking of trees to be cut, a member of PISSC's environment team shall complete an inspection of those trees to be cut and identify any trees housing an active nest, if any nest found during inspection will be shifted to near by existing tree.

There shall be a ban on hunting, poaching or trapping built into each contract with specific instructions for avoiding the clearance of nesting areas of mammals, reptiles and amphibians. The contractor's staff shall be required to sign a code of conduct prohibiting hunting, poaching or trapping.

6.6 Borrowing and Quarrying of Materials

Impacts: About 3477018.40 c.ft earth material for construction of Ramps under the proposed sub-project and about 136603.40cft stones will be required for slope pitching.

The stones will be obtained from commercial limestone quarries at Khanote and Jamshoro Petaro located in hilly areas in Jamshoro districts. These commercial quarries are source of stone and gravel for projects in Sindh and do not create any specific impacts for SRP sub-project.

However, the borrowing of earth material if not done properly may create problems of deep permanent ponds, potentially with stagnant water, that may generate negative health effects. If borrow pits are very close to embankments, these may create structural problems for structures. Similarly if cultivated areas are used as borrow areas; the value of the land may be reduced.

Mitigation: The borrow pits would be located in the existing uncultivated land and shall not be in the areas which are permanently flooded. The borrow material shall be obtained from the riverine/flood plain (owned by SID) areas which are currently uncultivable due to salinity and waterlogging. As the area is flood prone, therefore; there are few settlements in the area. The borrow areas will not be selected within or in the immediate vicinity of any settlements.

The location of borrow areas will be at least 150 m away from the existing embankments and will not jeopardize the stability of the embankments, any other structures, settlements, civil works or natural habitats. As the borrow areas will only be 0.6 m (2 ft.) deep, the areas will become vegetated and of value in particular for fish, invertebrates and water birds. This will increase the biodiversity of the area.

The formation of borrow areas adjacent to existing ponds along the Indus River embankments in a manner which removes an existing vegetated margin of a pond shall not be allowed.
The borrow areas shall not be close to the settlement and wherever the settlement exist and the establishment of borrow pit is unavoidable, the Contractor will be responsible to backfill the borrow pit with rejected /surplus excavated/cut material and will be given a vegetative cover.

While quarrying the stones, the existing blacktop roads will be used during transportation. In addition, the contractor will submit and implement a traffic management plan.

Community consultations will be carried out while selecting the borrow areas particularly near the settlements. GRM will be established to address any related complaints.

6.7 Resettlement Impacts

Impacts: The proposed activities will not require any land to be permanently acquired because all works will be carried out on the land that is already owned by the government. However, work is limited to Community ramps and damaged stone pitching therefor no any impacts identified related to relocation or displacement of people.

6.8 Loss of Agricultural Land

Impacts: As the establishment of borrow areas within agricultural land is prohibited, therefore; there shall be no loss of agricultural land outside the RoW due to the establishment of borrow areas.

However, during rough movement (if not regulated) of the Contractor machinery, the cultivated land and standing crops may be slightly damaged and there is no permanent loss of land. As a result of the works, the magnitude of the impact is judged to be minor adverse.

Mitigation: The main mitigation will be the prohibition of additional access routes development and following the existing available access routes in accordance to the traffic management plan to be prepared by the Contractor. In case, due to the contractor's movement into the standing crops, the Contractor will compensate the affectees without invoicing it from the project or as part of the contract.

6.9 Loss of Habitats due to New Haul Routes

Impacts: As new haul routes will be established for access of material. With the movement of the Contractor machinery some native shrubbery and vegetation may be disturbed.

Mitigation: Preference will be given to use of existing tracks within the routes. Construction of haul routes through the forest is prohibited (if any in the area). Traffic management plan will be prepared by Contractor detailing proposed routes to access the site.

Community liaison will be maintained during construction stage and GRM will be established to address complaints related to any damage to crops or cultivated lands.

6.10 Fish Production Ponds

Impacts: During baseline survey, it was observed that the local women were fishing in the ponds along the Indus River embankments, which exist within or close to the CoI of the works shall not be effected by the Works. Moreover no any commercial fish pond observed in the impact zone of the sub-project.

Mitigation: The Contractor shall be prohibited for disposal of wastes; excavated material and interference in the ponds exist along the Indus River embankments. Fishing by the contractor crew shall be strictly prohibited. Regular monitoring shall be carried out by the PISSC and PMT of the stagnant water bodies located along the embankments. In addition, the Contractor will prepare a code of conduct, signed by his crew and get approval from the PISSC engineer.
Community liaison will be maintained during construction stage and GRM will be established to address complaints related to any damage to fishing or fish ponds.

6.11 Community Disturbance

Impacts: On some reaches, the CoI outside and inside of the RoW of embankments is inhabited. Villages and settlements also exist adjacent to the CoI. The nature of construction works in the proximity of settlements will have obvious impacts on the community (noise, potential air pollution etc.) and agriculture. Some impacts will arise due to migration of the workforce to the area and their interaction with the community.

In addition, local communities rely on groundwater for their drinking water needs, and excessive use of these resources by the contractor shall adversely impact upon the availability of local drinking water. Where ground water testing identifies that groundwater quality is suitable for drinking purposes. it is expected that the contractor shall fulfil his domestic water requirements (drinking water only) for labour camps through groundwater extraction by installing motor operated pumps for extraction of groundwater, for other uses water should be extracted from rivers.

As well as impacts in the form of noise and air pollution etc., construction works within the proximity of settlements also give rise to a risk of an accidents resulting in injury to members of the public, such as collision with vehicles or machinery. There shall also be a risk to community health from HIV/AIDS or other transmitted infections as a result of the presence of a migrant construction labour.

Moreover, the Gender Based Violence is pervasive across class, religion, ethnicity and the urban -rural divide in Pakistan and has its roots in patriarchal social structure in which women are subservient to men and are viewed as property. There could be risk of gender based violence from the migrant labour, who often remain away from home on the site. This may lead to inappropriate behaviour including sexual harassment of women girls and boys of the local community.

Mitigation: The contractors shall locate/ construct camps for their staff at least 500 meter away from communities in order to avoid social conflict in using the natural resources such as water and local labors shall be preferred to avoid the possible adverse impacts of the construction camps on the surrounding communities. The contractor shall submit detailed layout plan to PISSC for approval of development of construction camps showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management, septic tank and drainage facilities, prior to the development of the construction camps.

The use of community water pumps shall not be permitted by the Contractor and the use of groundwater for construction works shall be strictly prohibited. Contractor shall fulfil his domestic water requirements for labour camps through groundwater extraction by installing motor operated pumps.

The Contractor's Health and Safety Plan should include plans for the emergency transfer of members of the public to suitable medical facilities in the event of a serious accident resulting from the construction works.

Details of transport and medical treatment route are to be included. The contractor shall include information about HIV/AIDS and the spread of sexually transmitted diseases within the workers code of conduct. The contractor shall also include proposals for awareness on HIV/AIDS and the spread of sexually transmitted diseases in the Contractor's training plan, to be undertaken in a culturally sensitive manner.

Community liaison will be maintained during construction stage and GRM will be established to address complaints related to any disturbance caused by the construction works. Contractor will prepare and implement a code of conduct of its workers.

The contractor will train the workers regarding (Gender Based Violence GBV) and also train workers about sexual harassment, child abuse, human trafficking for reducing the risk of GBV. The contractor will also raise awareness among workers regarding coordination with local law enforcement and code of conduct.

6.12 Health and Safety of Community and Construction Staff/Workers

Impacts: As a result of the works there shall be impacts to the health and safety of both the workforce and the local community. The potential impacts to the local communities shall be direct, such as being struck by moving plant or vehicles within and outside the project area, and indirect through the decrease in air quality surrounding the project area. Air quality will reduce as a result of increased dust generated from construction and on transport routes, as well as due to emissions from plant and vehicles. The impact will continue for the duration of the works (6 months) and can be mitigated by using water bowsers to prevent the creation of dust and by keeping plant and vehicles to a high standard through regular servicing to ensure they meet the

NEQS. Due to the proximity of houses and farm land within the CoI and the risk from moving plant within the borrow areas, the magnitude of this impact is judged to be major adverse.

Mitigation: All works (including construction of new access routes) shall be excluded from within 20m (65ft) of any residential or commercial structure which has not been identified in the Chapter-4 of this ESIA.

The following steps are suggested for proper management of traffic on routes to be used for material transport within the project area:

- The contractor will prepare an Occupational Health and Safety plan in line with the Environmental Code of Practices (ECoPs) (discussed later in the document); submit to the PISSC and PMT for review and approval. When approved, the contractor will implement the OHS plan during construction period. This plan will need to describe all jobs, their risks, and the controls that will reduce risks; these controls may include PPE, restrictions on activities or locations, and other measures. The plan also needs to describe what training will be given to what workers. Those who work near water, at heights, with heavy equipment will need special training so those hazards can be managed.
- The contactor will ensure the use of Personal Protective Equipment (PPE) for his labours during construction period;
- The contractor will hire only licenced and trained operators for his machinery and vehicles.
- The contractor will train his crews on the aspects covered in the above described OHS Plan;
- The contractor shall fence the working area and unauthorized shall not be allowed to enter in the area;
- The Contractor will display sign boards and banners about traffic diversion at places on detour routes;
- He will provide a traffic man at appropriate places particularly near settlements to control traffic;
- Provision of speed breakers at appropriate places in consultation with/approval of the Engineer which should be removed after completion of the project;
- Obey speed limits;
- The Contractor will arrange a rescue team and first-aid facility in case of any accident;
- No private property without permission of the owner will be used for transportation;
- Drivers will fix net on containers while transporting stones and soil etc.
- Community liaison will be maintained during construction stage and GRM will be established to address complaints related to safety hazards.
- Contractor will prepare an emergency response plan to address events such as fire, floods, earthquakes, injury/death, and accidents

6.13 Road Congestions

Impacts: As a result of an increased volume of traffic that should be expected within the each sub-project area, resulting in congestion within transport routes causing delay of local traffic. It is roughly estimated that about 15-20 number of vehicles and machinery would move on construction sites and haulage routes on daily basis. The Contractor shall utilize existing routes which are all used as transportation/communication links by the local communities. The main impact will arise from the use of existing roads which pass through major settlements and the Contractor shall implement a traffic plan which bypasses these settlements where bypass routes exist and which minimized disturbance to local communities. Traffic accessing the Contractor's camp (to be identified at the implementation phase) shall be disallowed from using the reaches where settlement exists close to or over the embankments.

Mitigation: The Contractors shall produce a traffic management plan for the approval of the Engineer and the Client to reduce stress on the transport system. Speed limit of contractor's vehicles will not be more than 30km/hour. Regular water sprinkling will be carried out by the contractor on haulage routes and construction sites. GRM will be established to address complaints related to the traffic management issues. Community Liaison officer will be engaged by the contractor to address the community concerns.

6.14 Noise

Impacts: Noise will be created as a result of the works. The main impact will be from traffic along haulage routes and the operation of construction machinery like (Excavators, dozers, Compactors and Graders) and Generators placed in the site camps. All machinery shall only be permitted to operate six days a week between the hours of 8am and 6pm except generators and unless authorized by the Engineer. The most significant impact shall be to the settlements within or close to the embankments.

Due to the limited number of settlements present within the vicinity of work areas where noise levels shall be elevated, the magnitude of this impact is judged to be minor adverse.

Mitigation: The mitigations shall be to limit working hours to between 8am and 6pm, six days a week. The camp sites shall be situated at least 500m from any settlement. On-demand noise monitoring will be carried out in case of any complaint or request by the affected communities. Additional mitigation measures will be identified and implemented in case the noise levels exceed the permissible limits. Community liaison will be maintained to ensure that complaints and grievances are addressed as soon as possible. Community liaison will be maintained during construction stage and GRM will be established to address complaints related to noise generation.

6.15 Damage to Physical Infrastructure

Impacts: The construction works can potentially damage existing infrastructure such as roads, culverts, and electricity lines. Some of this infrastructure may need to be relocated to allow the proposed works to be carried out.

Mitigation: Electricity transmission line would be shifted to the outer toe of the embankment where line comes under impact. Currently no any transmission line observed which creates hindrances in the execution of the work. All damaged/removed infrastructures will be repaired/ restored to original or better condition. Liaison with the community will be maintained and GRM will be established to address any related complaint.

6.16 Employment Opportunities

It is expected that the sizeable number of the workforce will be engaged in a range of activities. Employment opportunities shall be offered to the local population to be sourced from the surrounding communities. The majority of the personnel shall be unskilled labours, semi-skilled, drivers, equipment operators and secondary support staff and it shall be possible to draw this labour force from communities within the sub-project area.

There is a target for approximately 75% (60 Person) of the workforce (semi-skilled and unskilled) to be from the local areas.

The staffs are considered to be a social receptor of high sensitivity since the employment is only temporary and will not address their long term existing vulnerability. The local staff are of high sensitivity and the magnitude of impact on the local workforce is considered to be moderate beneficial (not major beneficial as the jobs cannot be guaranteed to extend beyond the construction phase).Temporary employment within the area has the potential to contribute to a reduction in the local poverty level, especially if vulnerable groups (such as landless farmers, encroachers living in the CoI and those living below the poverty line) are engaged.

6.17 Reduction of Flood Damages

The proposed rehabilitation works which are to be carried out as part of this Contract will improve the strength of the Indus Rive embankments and effectiveness is passing the super flood during monsoon without any breach will protect the communities settled along both sides of the Indus River, their agriculture land, standing crops, livestock and other livelihoods, public infrastructures and available water resources in the area. These benefits will ultimately manifest in protection of the earlier mentioned receptors and contribute to improvement in the lives of vulnerable people.

Agriculture is an important source of employment and exports (two thirds of employment and 80% of exports). As such this Contract shall also have a positive economic impact.

The magnitude of this impact is considered to be major beneficial as those benefiting extend outside the project area.

6.18 Soil Erosion

During cleared of work areas and slopes are susceptible for erosion of top soils that affects the growth of vegetation which causes ecological imbalance. Further, during construction and material stock piles increased run off and sedimentation causing a greater flood hazard to the downstream and destruction of aquatic environment in nearby lakes, streams, and reservoirs caused by erosion and/or deposition of sediment damaging the spawning grounds of fish, and destruction of vegetation by burying or gullying.

Mitigations:

The Contractor shall;

- Reinstate and protect cleared areas as soon as possible.
- Mulch to protect batter slopes before planting
- Cover unused area of disturbed or exposed surfaces immediately with mulch/grass turfings/tree plantations
- Locate stockpiles away from drainage lines
- Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds
- Remove debris from drainage paths and sediment control structures
- Cover the loose sediments and water them if required
- Divert natural runoff around construction areas prior to any site disturbance
- Install protective measures on site prior to construction, for example, sediment traps
- Control drainage through a site in protected channels or slope drains
- Install ‘cut off drains’ on large cut/fill batter slopes to control water runoff speed and hence erosion
- Observe the performance of drainage structures and erosion controls during rain and modify as required

7. STAKEHOLDERS CONSULTATIONS

Public consultation is one of the key tools employed to improve transparency, efficiency and effectiveness of regulations for a development project. It involves actively seeking the opinions of those interested or affected by a project. It is a two-way flow of information, which may occur at any stage of development from project identification through planning, design, construction and operation. It may be a process or a continuing dialogue between project implementation authority and the affectees. Consultations are increasingly concerned with the objective of gathering information and find the acceptable solution.

For new projects that have environmental and social impacts on the local communities, public consultation will not be a single conversation but a series of opportunities to create understanding about the project. As the sub-projects covered in this ESIA are of Category-A sub-projects therefore; one round of public consultation is carried out during preparing the ESIA.

The purpose of consultation process was/will be to carry out and assemble feedback by means of:

- Meetings with irrigation Department.
- Structured open group meetings in communities adjacent to the visited sub-project sites of embankments.
- Views and photographs of stakeholder consultations are provided in Annex-E.

7.1 Objectives

Participation mechanisms facilitate the consultative process and include: information sharing and dissemination; disclosure; and participation of all stakeholders in the project related activities so that their views and concerns shall be addressed properly and ensure them that they are actual beneficiaries of the project. It is of basic importance to involve representatives of local communities' right from the start. The institutional arrangements should also be in place for continuous consultation throughout the process of planning to implementation of the project.

The consultation with various stakeholders was carried out in accordance with the World Bank Operational Policy (OP4.01).

7.2 Identification of Stakeholders

Stakeholder analysis/identification is a way of determining who among stakeholders can have the most positive or negative influence on an effort, who is likely to be most affected by the effort, and how you should work with stakeholders with different levels of interest and influence. In the case of the embankment sub-projects, the stakeholders are people settled adjacent to the embankments of the Indus River and institutions that may be affected by, can significantly

influence, or are important to the achievement of the stated purpose of a proposed intervention. Generally, stakeholders can be classified into three groups as described below.

7.3 Primary Stakeholders

The Primary stakeholders are the people or groups that stand to be directly affected, either positively or negatively, by an effort or the actions of an agency, institution, or organization. In case of the embankment sub-projects covered under this ESIA Primary stakeholders are;

- Potential PAPs i.e. squatters located within Corridor of Influence (Col).
- The general population / residents, as well as any institutions, Government departments, within primary impact zone who may be subject to direct or indirect impact on their residences or access to their workplaces during the construction period, or by any kind of project action, or who may have other interests in the project.

7.4 Secondary Stakeholders

Secondary stakeholders are people or groups that are indirectly affected, either positively or negatively, by an effort or the actions of an agency, institution, or organization. Secondary Stakeholders identified for the embankment sub-projects are:

- People settled in the area frequently damaged due to breach of the embankments in the past or the people prone to flooding in future due to degradation of the existing embankments. These people will be potentially impacted by this project, positively in the long term through protection of their houses, livelihood, agriculture land, crops and livestock.
- The Project Proponent i.e. Irrigation Department, Government of Sindh
- WWF, NRSP, VISWA, HANDS.
- Sindh and Forest and Wildlife Department Government of Sindh.

7.5 Key stakeholders

Key stakeholders, who might belong to either or neither of the first two groups, are those who can have a positive or negative effect on an effort, or who are important within or to an organization, agency, or institution engaged in an effort. The key stakeholders in case embankment sub-projects are political leaders, influential community members and other local representatives including Imams, and teachers of local schools.

7.6 Primary Stakeholder Consultations

In order to get spontaneous, blunt and truthful responses, scoping sessions were held in all the villages located on both sides of the existing Indus River embankment. The purposes of the meetings with stakeholders were to:

- Inform the officials of the existence, nature of the sub-project and the scope of work involved in the execution of the sub-project
- Provide a forum for the initial definition of critical environmental and social issues
- Establish their interpretation, as official stakeholders, of the key sector development issues and links to the local and regional environment and social development.
- Confirmation of the suitability of the initial list of communities selected for consultation.
- Facilitation of Field Work.

7.7 Community Consultations

The Conduct of the community consultations involved a program of structured discussion in communities in the vicinity of primary impact as well as secondary zone (the villages settled in the radius of 1km on both sides) of the embankment sub-projects was carried out.

The second round of consultations were carried out in the month of February 2018 to complete this report. This was also imperative as the scope of work has been changed significantly. At the time of initial consultations the scope of work included raising and stone pitching of SM Bund, whereas current scope of work of this sub project includes only construction of village ramps at various locations along the SM Bund.

The main findings of the scond consultations with the stakehlders are as follows:

- The community suggested to provide employment oppportunitiions to local communities during construction phase.
- The community appreciated the proposed work on SM Bund and were of the opinion that this would greatly facilitate their movement. They further said that this would provide them easy access from farm to market to sell their agriculture products.
- The community told that with the construction of proper ramps the movemevt of their livestock would also be improved, this would also prevent damge to the Bund structure.

Table-34 showing summary of stakeholder 1st and 2nd round consultations with male community members.

Table 34: Summary of Stakeholder 1st and 2nd Round Consultations with Male Community Members

S#	Name of village	Date	No: of Participants
First Round Consultation on S.M Bund			
1	Bhanoth	05/01/2016	10
2	Keher Colony	05/01/2016	11
3	Goth Wazeer Rind	05/01/2016	9
4	Delo Keti	05/01/2016	7
5	Goth Badar Lakho	21/01/2016	9
6	Goth Jumo Shahuk	26/01/2016	24
7	Goth Haji Yousaf	26/01/2016	14
8	Sekhat	21/01/2016	10
9	Goth Abdul Hakeem	20/01/2016	5
10	M. Laique Rind	24/01/2016	11
11	Goth M. Ali Sangrasi	20/01/2016	13
12	Goth Dural Khan Khosa	24/01/2016	11
Second Round Consultation on S.M Bund			
1	Bhanoth	19/02/2018	4
2	Keher Colony	19/02/2018	5
3	Goth Wazeer Rind	19/02/2018	3
4	Delo Keti	19/02/2018	4
5	Goth Badar Lakho	20/02/2018	6
6	Goth Jumo Shahuk	20/02/2018	9
7	Goth Haji Yousaf	20/02/2018	7
8	Sekhat	20/02/2018	5
9	Goth Abdul Hakeem	20/02/2018	3
10	M. Laique Rind	20/02/2018	5
11	Goth M. Ali Sangrasi	21/02/2018	5
12	Goth Dural Khan Khosa	21/02/2018	4

7.8 Findings of Public Consultation with Male Community Members

Key findings of consultation with male community members on sub-projects are summarized below which have also been given in Annex F along with participant's lists and photographs.

Village Bhanote:

Villagers were told that this project will leave positive impacts on the communities. Project will provide safety to their village. They also expect some development and social work for their village under this project fund. The villagers expect that the project will protect their village roads, schools and other assets from flood in future. They demanded for employment during construction period.

Keher Colony:
The villagers were happy about the project and they expected that the project will protect their village roads, schools and other assets from flood in future.

Goth Wazeer Rind:
The project is protection for village. During consultative meeting, project activities were discussed with the villagers on which villagers shared their views that they are very happy about the project and these types of projects should start before the flood season. Furthermore; they requested for preference to be given to the villagers in hiring unskilled labours.

Goth Dhelo Keti:
People of the Goth Dhelo Keti shared their concerns that in each flood season they feel themselves unsafe. They requested for urgent repair works or stone pitching works along the bund so that they can live with peace during flood time in their village.

Goth Badar Lakho:
The villagers expressed willingness and pleasure about the project, that the project is not only beneficial for their village but for the entire area.

Goth Jumo Shahuk:
Villagers of the Goth Jumo Shahuk were happy to know about the SRP project, and the villagers expect the project is safety for the area.

Goth Haji Yousaf:
In consultative meeting, the village Haji Yousaf expressed pleasure that rehabilitation work of bund is most important for their protection. They are expected for labour Jobs during implantation phase.

Goth Sekhat:
The villagers expect safeguard due to the proposed rehabilitation works of the bund in flood season. This is safety for houses in flood season.

Goth Abdul Hakeem:
People of the Village Abdul Hakeem Khoso were happy about the project that it will bring labour opportunity and safety for the area.

Goth Mohammad Laique Rind:
The villagers expressed pleasure that the rehabilitation works of bund are most important for their protection and requested for commencement of the works on urgent basis before the flood season.

Goth Mohammad Ali Sangrasi:

During discussion, villagers of Mohammad Ali Sangrasi told that the project is safety for their land because in their area there is lot of seepage in flood season which is causes for damages of land. They expected that project will create many employment opportunities for unskilled villagers.

Goth Dural Khan Khoso:

The villagers were happy about the proposed scope of work and they reported that it is for their safety. Furthermore; they requested for preference to be given to the villagers in hiring unskilled labours.

7.9 Findings of Public Consultation with Female Community Members

The Key findings of 2nd round of consultation with female community members on sub-projects are summarized below.

- Female community members demanded for construction of proper ramps/path on embankment for livestock and their movement.
- The female community members demanded for the provision of basic living facilities including (health, education and drinking water)
- They demanded for water and sanitation facilities in the villages.
- The female community members requested that the project should engage local male members from the area as daily labour during project work.
- Overall, all the female villagers were happy about the proposed project.

Key findings of first consultation with female community members on sub-projects are summarized below, while these also have been given in Annex F along with photographs.

- The female community members demanded for the provision of basic living facilities including (health, education and drinking water)
- Demanded for water and sanitation water and sanitation facilities in the villages.
- Demanded for hand pumps in the villages
- Requested for provision of separate school for girls where girls school is not available
- Female community members demanded for provision of proper inclined path on embankment for livestock.
- The female community members requested that the project should engage male members as daily labour during project work.
- During asking about project impact on women activities, mostly they were favoring it and also having expectations to get benefits.
- Those women who have handicraft skill, have demanded to provide marketing support for their local products.
- Collectively, all the female villagers were happy about the proposed project.

Table 35: Summary of Stakeholder Consultations 1st and 2nd round with Female Community Members

S#	Name of village	Date	No: of Participants
First Round Consultation on S.M Bund			
1	Bhanoth	05/01/2016	24
2	Keher Colony	05/01/2016	9
3	Goth Wazeer Rind	05/01/2016	13
4	Delo Keti	05/01/2016	23
5	Goth Badar Lako	21/01/2016	34
6	Goth Jumo Shahuk	26/01/2016	25
7	Goth Haji Yousaf	26/01/2016	10
8	Sekath	21/01/2016	14
9	Goth Abdul Hakeem	20/01/2016	12
10	M. Lahiqe Rind	24/01/2016	15
11	Goth M. Ali Sangrasi	20/01/2016	29
12	Goth Dural Khan Khosa	24/01/2016	14
Second Round Consultation on S.M Bund			
1	Bhanoth	19/01/2018	2
2	Keher Colony	19/01/2018	3
3	Goth Wazeer Rind	19/01/2018	2
4	Delo Keti	19/01/2018	4
5	Goth Badar Lakho	20/01/2018	3
6	Goth Jumo Shahuk	20/01/2018	4
7	Goth Haji Yousaf	20/01/2018	3
8	Sekhat	20/01/2018	2
9	Goth Abdul Hakeem	20/01/2018	2
10	M. Laique Rind	20/01/2018	3
11	Goth M. Ali Sangrasi	21/01/2018	2
12	Goth Dural Khan Khosa	21/01/2018	3

7.10 Consultation with NGOs and Local Bodies

The project area was visited on 9 July 2018 to undertake consultations with NGOs and Local Bodies in Matiari district. During the field visit consultations were held with following NGOs: HANDS, VISWA and NRSP

The details regarding their interventions in project area are as follows:

Health and Nutrition Development Society (HANDS)

1. Worked during 2010 flood to construct more than 200 houses for affected families.
2. Providing Chingchi Rickshaw's and flour mills to improve livelihoods of affected families Girls and boys schools in project area.
3. Health
4. Disaster management centre

National Rural Support Programme (NRSP):

1. Community Physical Intervention (CPI) in Bhanoot village of the project area.
2. In Agriculture area providing seeds and others
3. Nutrition
4. Micro insurance cards
5. Income generation grants
6. Technical vocational training (TVT)

Village Improvement and Society Welfare Association (VISWA)

1. Working on Wash in Shah Alam Shah UC, Mitiari district.
2. Developed 4 schools in entire UCs of the district
3. Adequacy on local bodies election
4. Female voter registration

Chairman Town Committee Mitiari

A meeting was held with chairman Town Committee Syed Sakindar Ali Shah in his office at Mitiari. The project team briefed him about the SRP intervention in their area along SM bund. Pictures of consultation are given below.

	
Consultation meeting with Chairman TC Mitiari	**Consultation meeting in HANDS office Hala**
	
Consultation meeting in VISWA office Mitiari	**Consultation meeting in NRSP office Hala**

Figure 34: Consultation with NGOs and Local Bodies

7.11 Findings of Consultation with NGOs and Local Bodies Members

Key findings of the consultative meetings with NGOs and local bodies' members on sub-projects are summarized below:

- The participants told that this project will leave positive impacts on the communities.
- Project will provide safety to their village.
- The construction of proper ramps leave the positive impact on strengthen of entire bund.
- The construction of ramps will ensure safety of movement of the animals towards River.
- Transportation of agriculture products will be paper due to construction of ramps
- They also expect some development and social work for the villages of sub project under this project fund.
- They expected that the project will protect the roads, schools and other assets from flood in future.

- These types of projects should start before the flood season.
- Furthermore; they requested for preference to be given to the villagers in hiring unskilled labours.
- They mentioned that the people of the area feel themselves unsafe during each flood season.
- The project is not only beneficial for those villages along the bund but for the entire area.
- The participants expected that project will create many employment opportunities for unskilled labor of the area.

Table 36: List of Participants for Consultation Meeting in Sub-project area of SM Bund

Sr. No.	Name of Participants	Name of Organization	Designation	E-mail ID	Phone #
1	Azra Shakeel	HANDS	District Manager	Azra.shakeel@hands.org.pk	0346829542
2	Haji Ahamad	HANDS	Scare Disaster Manager	ahmed.khaskheli@hands.org.pk	03003076696
3	Fawad Larik	NRSP	Field Engineer	engr.fawad@yahoo.com	03342645062
4	Sultan Ahamad	NRSP	Finance & Admin	sultan.ahmed@nrsp.org.pk	03033336925
5	Ghulam Mustafa	NRSP	CNO	umranimustafa@yahoo.com	03332338708
6	Mahtab	NRSP	CNO	mahtab.shaikh110@yahoo.com	03033994663
7	Rahmatullah Turk	VISWA	Executive Director	mansoor.sindh@gmail.com	03332722988
8	Wajid Ali	VISWA	Project Manager	wajidmemon89@gmail.com	03342623144
9	Seyed Sakandar Ali Shah	TC	Chairman TC		03009377207

7.12 Information Disclosure

The Sindh Irrigation Department will disclose the ESIA to the local communities in the subproject area. This will ensure that local communities are aware of project key impacts, mitigation measures and project implementation mechanism. The executive summary of the ESIA will be translated in Sindhi language and made available to the local communities. ESIA and Sindhi version of its executive summary will be placed at the SID official website, SID relevant offices and site offices.

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This Chapter presents the Environmental and Social Management Plan (ESMP). Detailed Environmental and Social Management Impact and mititaion measure along with responsibilities is mentioned in Annexure -F

8.1 Project Management Responsibilities

Implementation of the ESMP will be a contractual obligation between the Contractor and PMT, SRP. The Contractor shall engage full time technical staff capable of carrying out the monitoring activities as proposed in the ESMP as contractual obligations under the contract agreement.

PISSC in coordination with ESMU-PMT will carry out monitoring activities related to the project during the construction phase by using check lists and notify the Contractor of any violations of the ESMP, check the progress reports, advise the client and contractor regarding any violations which require further action, and maintain a record of events and surveys for reference.

In addition, ESMEC as independent consultants firm as third party validation will routinely monitor the environmental and social aspects of ESMP implementation including those associated with the Contractor's activities as and when required.

The overall responsibility for SRP project as well as Environmental and Social Management and Monitoring will rest with the Project Management Team (PMT), Irrigation Department Government of Sindh to be headed by a Project Director. The PD is supported by Additional Director Dams, Additional Director Bunds/Flood Levees, Additional Director Coordination and Technical Assistant. In addition, the PMT will be supported during Environmental and Social Management Plan (ESMP) and Resettlement Action plan (RAP) implementation by Environmental and Social Management Unit (ESMU) to be established within PMT and Project Implementation Support and Supervision Consultants (PISSC) respectively reporting to the Project Director, Sindh Resilience Project. The specific responsibilities of the institutions involved in the ESMP.

8.2 Project Management Office

The overall responsibility for the supervision of ESMP and RAP will rest with the Project Management Team (PMT) or Project Management Team (PMT) under Irrigation Department and PDMA that will act as apex body of the project to take care of Social/Gender and environmental issues and to take policy decisions at project level. An Environmental and Social Management Unit (ESMU) shall be established within PMT under the supervision of Additional Director Coordination and Technical Assistant (AD). Key positions within the ESMU shall include: Environment Specialist; Social and Resettlement Specialist.

The ESMU shall be responsible for supervision of implementing and monitoring the ESMP and RAP. The Staff of ESMU shall be answerable to the Project Director (PD) SRP. The ESMU shall be responsible for the monitoring defined in the ESMP and RAP as part of their overall monitoring of the social and environmental management.

8.3 Project Implementation Support and Supervision Consultant (PISSC)

The Project Implementation Support and Supervision Consultant (PISSC) is to be engaged by the project proponent and shall be responsible for day to day monitoring of the ESMP and RAP on behalf of the Client through PMT during execution of the Civil Works for sub-projects under the SRP and shall submit monthly reports to the PMT regarding the ESMP and RAP implementation status. The ESMPs prepared or to be prepared shall be part of the Contract documents. In general the PISSC has the following responsibilities pertaining to the environmental and social aspects of the project:

- Prepare the required documents, review and update the available documents relevant to the Project (including ESA, ESMPs and RAP) and those to be prepared by the Contractor.
- Monitor the implementation of ESMPs and RAP on a regular basis during execution of civil works by the Contractor. An Environmental and Social Unit (ESU) within PISSC shall be established and include the following key positions:

    a. Environmental Specialist
    b. Ecologist
    c. Environmental Assistants
    d. Social and Resettlement Specialist
    e. Assistant Sociologist (s)

The ESU of PISSC shall be responsible for monitoring the contractor's compliance with the ESMPs. The role of the ESU-PISSC shall be day to day monitoring of the supervision of the ESMP with the assistance of social and environmental staff of the Contractor and reporting any non-compliances to the PISSC Chief Resident Engineer, Resident Engineers as well as PMT.

8.4 Environmental/Social Monitoring and Evaluation (ESMEC) Consultant

The ESMEC shall be an independent body responsible for regular environmental monitoring for the SRP Project on behalf of PMT. The ESMEC will have environmental and social experts and shall carryout intermittent third party monitoring of the project.

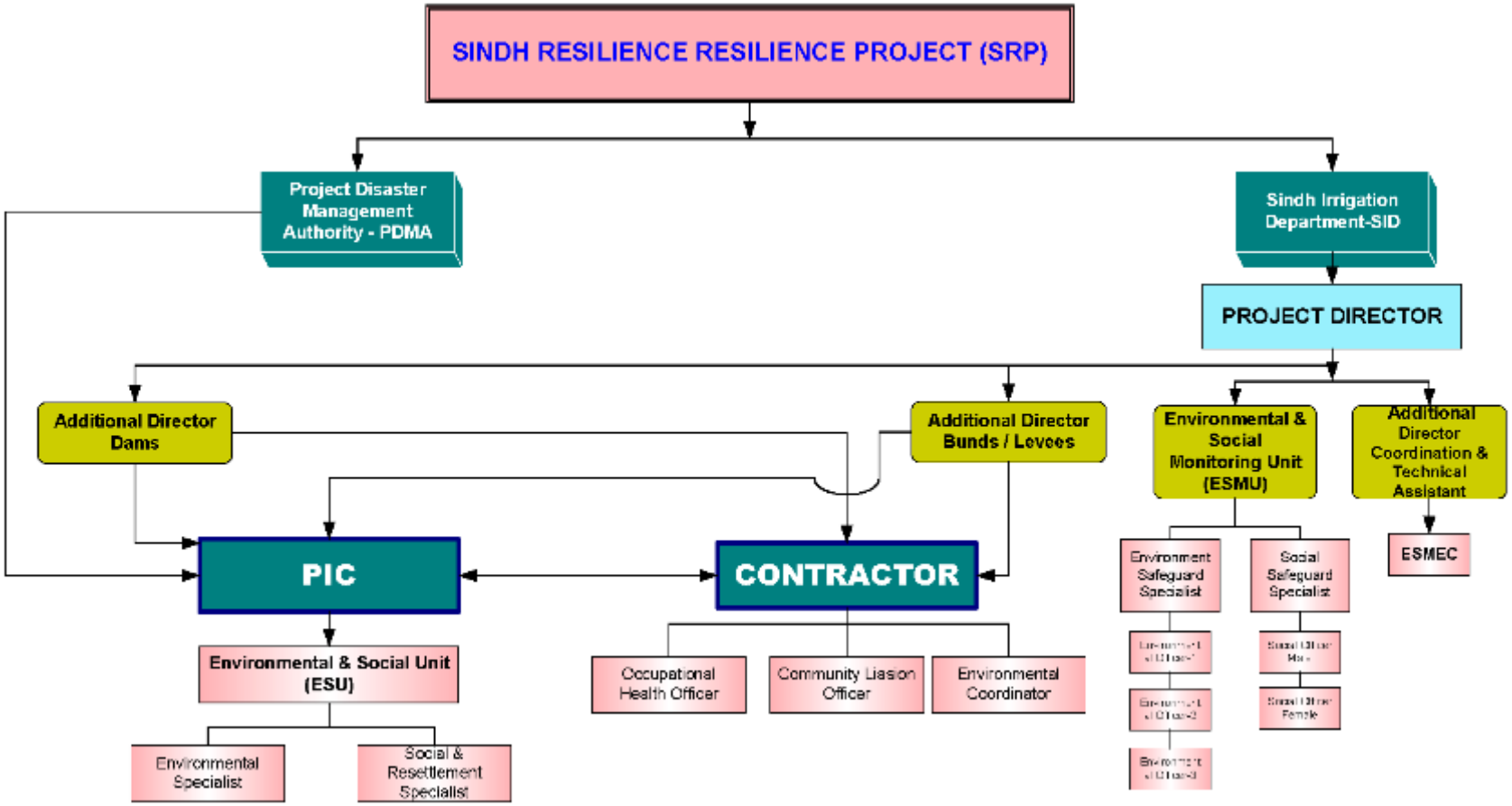


Figure 35: Institutional Arrangement for SRP Project

8.5 Contractor

The Contractor will be responsible for the on-field implementation of the ESMP as well as maintaining responsibility for environmental protection liabilities under Sindh Environmental Protection Act (SEPA), 2014, World Bank safeguard policies, ESMF, sub-project specific ESMPs and other applicable national as well as provincial policies and regulations.

The Contractor will also be responsible for training his crews on all aspects and implementation of the ESMP. The bid should include an environmental and social mitigation budget as part of the engineering costs of the respective works. The key positions to be filled within the contractor's staff for implementation of the ESMP include: Environmental Coordinator(s); Occupational Health and Safety (OHS) Officer; and Community Liaison Officer.

8.6 Environmental Code of Practices

The objective of preparation of the Environmental Code of Practices (ECoP) is to address less significant environmental impacts and all general construction related impacts for the proposed SRP project implementation. The ECoPs will provide guidelines for best operating practices and environmental management guidelines to be followed by the contractors for sustainable management of all environmental issues. This ECoP will be annexed in the general conditions of all the contracts to be carried out under the SRP project. ECoPs are provided in Annex-G of this ESIA.

8.7 Contractor's Plans

This ESMP has been prepared prior to Contract award, and therefore, certain mitigations which are dependent upon the methodology chosen by any Contractor to deliver the project, could not be specified in it. For example, haulage routes are dependent upon the exact camp site locations chosen by the Contractor. All site specific plans must be submitted to the PMT/PISSC for the review and clearance within 30 days of the signing of the contract or before mobilization onsite whichever date is earlier. Therefore, it is required that the Contractor shall produce and implement the plans described below with the help of mitigation measures discussed in Chapter 6 and ECoPs given in **Annex-G**. Once approved by the Engineer and Environment Specialist of PISSC, these documents will become part of the ESMP for the Contract.

8.8 Pollution (Air, Land and Water) Control Plan

The Contractor shall provide details of the principal pollution control facilities proposed and of contingency plans in the event of failure of these facilities. The plan shall include the details of the designated and licensed tip, oil treatment facilities and hazardous waste disposal sites which shall be used to dispose of waste.

8.9 Waste Management Plan

The Contractor shall include details of the procedures for the collection and disposal of wastes. The Plan shall deal with each waste stream separately.

8.10 Management Plan

The basis of the Contractor's Traffic Management Plan and further information is to be provided. The Contractor is required to provide further details once camp/ work site locations and material sources are finalized. The Traffic Management Plan must include details of the proposed access routes to the project area as well as haulage and access routes throughout the project area (including access to and from borrow pits).

8.11 Plan for Handling Hazardous Material

The Contractor shall identify control measures to ensure no environmental or health impacts from the handling of hazardous materials and the collection and safe disposal of hazardous materials (this may be including within the Pollution Control Plan).

8.12 Occupational Health and Safety Plan

In producing their Health and Safety Plan, the Contractor should make reference to the General Specification and the field environment, health and safety (EHS) guidelines of the World Bank.

8.13 Environmental Awareness Training Plan

This shall include details of the Contractor's environmental awareness training program proposed for the workforce.

8.14 Emergency Response Plan

During baseline survey, it was observed that, all cities are located along the sub-project sites and easy access is possible at distance of 5-10 Kms. Three fire brigade stations are available in Saeedabad, Hala, and Matiari respectively.

In addition to this, Governmnet Basic health Units (BHUs) s are already established in these cities along with well-equipped Ambulances.

However, Contractor has to prepare the site specific emergency plans to address emergencies/events such as fire, floods, earthquake, accidents, and death/injury. The Plan will include the following details:

- Contacting the relevant agency (e.g., Fire Brigade)

- Procedure for shutdown of site;
- Indicators on site that shall prompt the shutdown of areas of work (linked to natural events, such as maximum river water level);
- Emergency evacuation procedure of staff and members of the public within range of likely impact.

8.15 Reforestation/ Tree plantation and maintenance plan

Most of the trees to be felled are Acacia nilotica, Malia indica, Eucalyptus Sp, Ziziphus jujube, Ficus religiosa, Corida dicotom, Tamariz indica, Syzyjium cumini, Magnifera indica and Phoenix dactlypfera. These trees are common in the project area. The Contractor is required to prepare an inventory of the trees to be cut/ uprooted before commencement of the physical works in presence of PISSC and PMT staff, submit a detailed tree plantation plan, defining the proposed plantation methodology, species and plantation locations. The plantation location shall be approved by the PISSC Engineer and PMT approval. All trees to be planted shall be of native species as they have more chances of survival. The Contractor shall be responsible for after care of the saplings/plantation for one year.

8.16 Mitigation and Monitoring

Mitigation measures for reduction of environmental degradation and social impacts especially relating to air quality, soil contamination, pollution of water resources, loss of habitat and disruption to wildlife will need to be implemented and monitored. Monitoring tasks will vary over the construction and operation stages of the sub-projects. Physical, biological and socio-cultural parameters will be measured/ monitored to determine compliance with national and international standards and compliance with the ESMP itself. Monitoring during the construction phase will largely consist of compliance with mitigations identified in Chapter 6. Annex-F presents the mitigation and monitoring plan.

8.17 Compliance and Effects Monitoring

PISSC shall carry out monitoring within the subproject area using the monitoring checklists to be prepared on the basis of this mitigation and monitoring plan provided in Table Annex-F**.**

To aid the monitoring process, the Contractor will complete the following:

- Submit the plans detailed earlier in this Chapter.
- Train construction staff for the implementation of the ESMP and safety measures.
- Submit various progress reports to the Environmental and Social Specialists of PISSC and ESMEC.
- Explain Implementation of various environmental aspects to visiting national and international agencies and representatives of donor.

- Receive monitoring reports/notes issued by ESMU and PISSC and take action to mitigate various violations to ESMP.
- Regularly submit Reports to PISSC Engineer and Environment Specialists about the compliance to the ESMP and various issues related to the HSE including but not limited to the following:
- OHS Measures adopted (OHS statistics), (Measures taken by Contractor for provison of task specific PPEs, Hygiene living, cooking & dining areas, washing areas, and health facilities to staff & workers).
- Fuel (provision of covered and impervious floor for fuel storage areas)
- Workforce statistics (employment/deployment etc.)
- Two complementary approaches are proposed to monitor the ESMP:
- Compliance monitoring to check whether the actions proposed in the ESMP is being carried out.
- Effects monitoring to record the impacts of mitigation measures adopted on the biophysical and social environment; as applicable, these effects are repeatedly measured.

Compliance monitoring will be completed by PISSC and ESMU-PMT with independent monitoring by ESMEC. The effects monitoring shall be the responsibility of PISSC.

Examples of compliance and effects monitoring parameters are included in Box 8.1

Compliance monitoring will also be facilitated using checklists included to be prepared by PISSC and SEMU of PMT during the project implementation.

Box 8.1: Example Indicators to Monitor Environmental Effectiveness

(i) Compliance Monitoring:

- Frequency of anti-dust water sprays during construction period;
- Safety at workplaces and working hours during construction;
- Incidence of child labour and disproportionate wages;
- Incidence of liquid/solid waste in the vicinity of work camps (type and amount of waste, amount, interference with local residents, fauna, flora and crops);
- Number of local people recruited on project works.
- Plantation of saplings of new trees against trees cut
- Survival rate of saplings of new trees
- Arrangements made at construction sites for protection of floral and faunal resources

(ii) Environmental Effects Monitoring

- Ambient air quality (Particulate matter) during construction phase;
- Surface water quality during construction phase especially at diversion sites
- Ground water quality at camp sites;
- Ground water table at construction sites;
- Number of patients suffering from malaria, cholera, diarrhoea, respiratory ailments during construction phase
- Noise levels (in dBA), monitored at fixed locations and planed schedule during construction
- Extent and degree of functionality of diversion channels to ensure un-interrupted water supply;

8.18 Environmental Non-compliance and Corrective Measures

The Contractor will be notified of any violations of the ESMP, as well as any corrective actions required.

Outlined below are a number of steps, relating to increasing severity of environmental problems, which will be implemented. The principle is to keep as many issues within the first few steps as possible.

Step 1; PISSC discusses the problem with PMT and Contractor to work out mitigations together and record the facts and the decision implemented.

Step 2: A more serious infringement is observed and PISSC notifies the Contractor of the issues in writing, with a deadline by which the problem must be rectified. All costs will be borne by the Contractor.

Step 3: PISSC/PMT shall order the Contractor to suspend part, or all, of the works. The suspension will be enforced until such time as the offending parties, procedure or equipment is corrected and/or remedial measures put in place if required. No extension of time will be granted for such delays and all cost will be borne by the Contractor.

Step 4; Breach of contract - One of the possible consequences of this is the removal of a Contractor and/or equipment and/or the termination of the contract. Such measures will not replace any legal proceedings that PMT may institute against the Contractor.

8.19 Communication, Reporting and Documentation

The following environmental meetings are proposed:

- Primary meeting between ESMU-PMT, PISSC and Contractor for setting out the format for the regular meetings shall be held before commencement of the project.
- Scheduled Environmental and Social Progress Review Meeting (ESRPM) meetings between ESMU-PMT, PISSC and Contractor shall be done on a monthly basis.
- The purpose of the meetings is to discuss the conduct of the operation, non–compliances noted by the PISSC and ESMU environmental and social teams and measures recommended for their remedy.

The Contractor and PISSC environmental and social teams will produce monthly, quarterly and works completion reports of the sub-projects based on the social and environmental issues. The distribution of the reports shall be to PMT, ESMEC and World Bank.

A photographic record of the project area shall be kept. Photographs shall be taken at key locations using digital camera of the project area in walk through survey by contractor, PISSC and ESMU-PMT. The following data shall be recorded for each photograph:

- Shot number
- All the photographs shall be referenced with GPS Coordinates
- Title of photograph
- Date and Time, and
- Photographic features.

The photographic record shall be incorporated into the monthly reports.

Completed monitoring checklists to be prepared separately during the implementation of the project by PISSC, ESMU of PMT and ESMEC shall be appended to the monthly reports.

Social Complaints Register: The Contractor will maintain a social complaints register at the camp site and work places to document all complaints received from the local communities. The register will also record the measures taken to mitigate the reported concerns. The final report will be communicated to the ESMU of PMT. All complaints/issues of the community will be reported in the monthly progress report of the following month along with status of the last month's complaints and will be reviewed by PISSC, ESMEC and ESMU of PMT.

Change Record Register: There are two scenarios in which a review of this ESMP will be triggered:

- A change to the designs which deviate from the parameters which are safeguarded in this ESMP.
- A discovery in the baseline socio-environmental conditions which is not recognized or covered by this ESMP.

In the event of either scenario, the ESMP shall be updated and reissued accordingly. The design change record shall be maintained by the Contractor and PISSC to document any change in the project design/operation. The ESMU and ESMEC would supervise the number of design change applications and suggestions received from the local people and its implementation by PISSC and Contractor.

8.20 ESMP Implementation Cost

Costs have been estimated for implementing ESMP for the proposed subproject. The estimates for the key ESMP components are summarized in the Table-37 below. A budget of about PKR 3,473,140/ has been estimated for the implementation of the ESMP. The resettlement cost shall be paid from the counterpart fund to be provided by the Government of Sindh. Appropriate

clauses will be added to the Construction Contract(s) to ensure a mechanism for compliance and payment.

Table 37: Environmental, Social Management and Monitoring Cost

S.M Bund			
Items	**Unit Cost**	**No of Units**	**Estimated**
Training (Different trainings for 50 persons)	3000	50	150,000
Generators & Construction Machinery Stack +Noise Monitoring	7000	26	1050,000
Drinking Water Quality Monitoring (During Const.)	10000	12	720,000
Workers Communicable Disease Screening Test	8000	50	400,000
Personal Protective Equipment (for 50 persons approx.)	3500	50	175,000
Fire Fighting Equipment purchase and refilling	3000	15	45,000
Health & Hygiene	Lump sum	--	150,000
Ambient Air Monitoring (Pre-Const, During Const,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Const, During Const :) at one construction location.	700	12	8,400
Compansatory tree plantation cost (27*5)=135	1000	135	135,000
Subtotal	**3,157,400**		
Contingency Cost 10%	**315,740**		
Total	**3,473,140**		

9. GRIEVANCE REDRESS MECHANISM

Broadly speaking, a grievance can be defined as any discontent of dissatisfaction with any aspect of the project or organization. Grievance Redress is a platform provided by the governance institution to the citizens to voice their dissatisfaction about poor or inadequate performance of the institution (whether as a whole, or individual stakeholders) and holds it or them accountable.

The grievance redress system as proposed for the embankment sub-project covered under this ESIA will primarily (but not exclusively) handle issues that emerge from construction activities of the sub-projects, or can be plausibly described as a consequence of these activities.

Grievances may arise from the implementation of the proposed embankment sub-project activities such as stone pitching, approving and raising/strengthening of the embankments. Most grievances would arise from the likely project affected persons or organizations.

9.1 Objectives of Grievance Redress Mechanism

A grievance redress mechanism (GRM), consistent with the requirements of the World Bank safeguard policies will be established to prevent and address community concerns, reduce risks, and assist the project to maximize environmental and social benefits. In addition to serving as a platform to resolve grievances, the GRM has been designed to help achieve the following objectives:

- Open channels for effective communication with relevant communities through discussion with men and women by sharing and identification of new environmental and social issues of concern arising during the project implementation in timely manners particularly prior to construction works;
- Demonstrate concerns about community members and their environmental well-being; and
- Prevent and mitigate any adverse environmental impacts on communities caused by project implementation and operations.
- The GRM will be accessible to diverse members of the community, including more vulnerable groups such as women and youth. Illiterate men and women will be linked up to the male and female schools in order to provide access for lodging complaints. PICCS through the contractor will remain in contact with the communities during the implementation phase. Opportunities for confidentiality and privacy for complainants are to be honoured where this is seen as important.

9.2 Principles, Procedures and Time-Lines

Bearing in mind the range of possible grievances, following three basic standards shall underpin the proposed systems for handling these:

- All grievances submitted in writing to staff assigned under the proposed Public Complaints Centre (PCC) will be formally recorded, and a written acknowledgement issued;
- Multiple means of lodging complaints should be available like letter, phone, and email/web-based portal.
- Grievances will be dealt with on a referral basis; those that the Contractor or the Project Implementation Support and Supervision Consultant (PISSC) are unable to resolve will be referred to the Grievance Redress Committee, with a final provision for appeal to Project Director PMT, SRP and the Project Management Team (PMT) or Secretary Irrigation Department Government of Sindh if an issue cannot be resolved with the Committee.
- Every effort will be made to address or resolve grievances within the following fixed time-lines, which will be an indicator against the performance of the handling system: Acknowledgement of a written submission will be issued to the complainant within three working days. If not resolved earlier by the Contractor or Supervisory staff on site, grievances will be tabled for discussion/resolution during Committee meeting within one week of receipt of the written submission. If not satisfactorily resolved by the Grievance Redress Committee, the grievance will be referred to consideration by PMT or Secretary, SID within 1 week.
- The cases that prove impossible to resolve through Grievance Redress Committee may be referred to the PMT to be established under the SID and PDMA, Government of Sindh.
- If the complainant is not satisfied, the complaint will have the option to seek redress through court of law.

9.3 Records and Monitoring

The Project Director's Office (PMT) will maintain the data base in the Office to document all complaints received from the local communities. The information recorded in the data base register will include date of the complaint, particulars of the complainant, description of the grievance, actions to be taken, the person responsible to take the action, movement of the document (forwarded to whom / which Committee), follow up requirements and the target date for the implementation of the mitigation measure. The data base will also record the actual measures taken to mitigate these concerns. All complaints received in writing or received verbally will be properly recorded and documented.

9.4 Dissemination

Once finalized, procedures to be followed through the grievance handling system will be translated into local languages (Sindhi and Urdu). These shall be made available (in both leaflet and poster format) to all stakeholders, through the PD office and Deputy Commissioner (DC) office of Matiari.

The PD will ensure that copies of the standard grievance registration form are available with, Consultants and Contractor and are kept in sufficient numbers in local government and area

administration offices as DC at Matiari during the entire period of implementation. PD shall also ensure that the database of all grievances submitted is updated on a regular basis, and that information on the status of individual cases is made available as required.

9.5 Proposed Mechanism for Grievance Redress

It is proposed to establish the following prior to commencing project implementation activities including pre-construction activities:

- A Public Complaints Centre (PCC), which will be responsible to receive, log, and resolve complaints;
- A Grievance Redress Committee (GRC), responsible to oversee the functioning of the PCC
- A non-judicial decision-making authority e.g. Project Management Team or Secretary Irrigation Government of Sindh for resolving grievances that cannot be resolved by PCC;
- Grievance Focal Points (GFPs), which will be educated people from each community on each sub-project site. The GFPs should be community members who easily approached by the community. The GFPs will be provided training by the Environment and Social Section of the PISSC and PMT, SRP.

9.6 Public Complaints Center

In its capacity as the Project Implementation Body, the PMT, in consultation with the Secretary Irrigation, Government of Sindh will establish a Public Complaints Centre (PCC) in the PMT, SRP office. The PMT and the local government bodies will issues public notices to inform the public within the project area of the Grievance Redress Mechanism. The PCC's phone number, fax, address, email address will be disseminated to the people through displays at the respective offices of the Matiari.

The PCC will be staffed by a full-time officer from the PMT and will be independent of the PISSC and contractor/operator. The officer should have experience and/or training in dealing with complaints and mediation of disputes. The PCC officer will have resources and facilities to maintain a complaints database and communicate with contractor, Site Engineers, PISSC and DC Matiari and also with complainants.

The PCC will be responsible to receive, log, and resolve grievances. Given that the female community members have restricted mobility outside of their villages and homes, the female PMT staff will be required to undertake visits to the local communities. The frequency of visits will depend on the nature and magnitude of activity in an area and the frequency of grievances.

9.7 Grievance Redress Committee (GRC)

The GRC will function as an independent body that will regulate the grievance redress process. It will comprise of, Environmental and Social Officers of PMT, Senior Engineer from PMT, Representative of DC office of Matiari, also senior members from civil society from Indus River Embankment sub-project areas. Decisions or findings taken in the Grievance Redress Committee would be binding upon the contractor.

9.8 Grievance Focal Points (GFPs)

The GFPs will be literate people from each community that will assist and facilitate the community members in reporting grievances resulting from project activities. The GFPs will be provided training by the PMT/PISSC in facilitating grievance redress. Two GFPs (a female and male) will be selected for each sub-project.

9.9 Role and Responsibilities of PCC

The responsibilities of the PCC are:

- The PCC will log complaint and date of receipt onto the complaint database and inform the PISSC and the Contractor;
- The PCC will instruct Contractors and PISSC to refer any complaints that they have received directly to the PCC. Similarly, the PCC will coordinate with local government to "capture" complaints made directly to them;
- The PCC, with the PISSC and the Contractor, will investigate the complaint to determine its validity, and to assess whether the source of the problem is due to project activities, and identify appropriate corrective measures. If corrective measures are necessary, PCC, through the PCI, will instruct the Contractor to take necessary action;
- The PCC will inform the Complainant of investigation results and the action taken;
- If complaint is transferred from local government agencies, the PCC will submit interim report to local government agencies on status of the complaint investigation and follow-up action within the time frame assigned by the above agencies;
- The PCC will review the Contractors response on the identified mitigation measures, and the updated situation;
- The PCC will undertake additional monitoring, as necessary, to verify as well as review that any valid reason for complaint does not recur.

During the complaint investigation, the PCC should work together with the Contractor and the PISSC. If mitigation measures are identified in the investigation, the Contractor will promptly carry out the mitigation. PISSC will ensure that the measures are carried out by the Contractor.

9.10 GRM Steps and Timeframe

Procedures and timeframes for the grievance redress process are as follows:

- Stage 1: When a grievance arises, the affected person may contact directly with the contractor/operator and the project manager to resolve the issue of concern. If the issue is successfully resolved, no further follow-up is required;
- Stage 2: If no ad hoc solution can be found, the affected person/s will submit an oral or written complaint to the PCC by themselves or through GRM entry points (the CFP, SDA, PMT, PISSC, and Contractor/Operator). For an oral complaint the PCC must make a written record. For each complaint, the PCC must investigate the complaint, assess its eligibility, and identify an appropriate solution. It will provide a clear response within five (5) working days to the complainant, PMT and Contractor. The PCC will, as necessary, through PISSC; instruct the Contractor to take corrective actions. The PCC will review the Contractor's response and undertake additional monitoring. During the complaint investigation, the PCC will work in close consultation with the Contractors, and the Supervising Engineer (during construction) and with the SID (during operation). The contractors during construction and the PMT during operation should implement the redress solution and convey the outcome to the PCC within seven (7) working days;
- Stage 3: If no solution can be identified by the PCC or if the complainant is not satisfied with the suggested solution under Stage 2, the PCC will organize, within two (2) weeks, a multi-stakeholder meeting under the auspices of the SID, where all relevant stakeholders (i.e., the complainant, PMT, contractor/operator, relevant local government offices) will be invited. The meeting should result in a solution acceptable to all, and identify responsibilities and an action plan. The contractors during construction and the PMT during operation should implement the agreed-upon redress solution and convey the outcome to the PCC within seven (7) working days;
- Stage 4: If the multi-stakeholder hearing process is not successful, the PCC will inform Project Steering Committee (PSC)or Secretary Irrigation Department Government of Sindh accordingly, and the PSC or Secretary SID will organize a special meeting to address the problem and identify a solution; and
- Stage 5: If the affected people are still not satisfied with the reply in Stage 4, he or she can go through to local judicial proceedings.

9.11 Reporting

The PCC will record the complaint, investigation, and subsequent actions and results in the monthly Environmental Management and Monitoring reports. In the construction period and the initial operational period covered by loan covenants the PMT will periodically report progress to the World Bank, and this will include reporting of complaints and their resolution.

The tracking and documenting of grievance resolutions within the PCC and/or PMT will include the following elements: (i) tracking forms and procedures for gathering information from project

personnel and complainant(s); (ii) dedicated staff to update the database routinely; (iii) systems with the capacity to analyse information so as to recognize grievance patterns, identify any systemic causes of grievances, promote transparency, publicize how complaints are being handled, and periodically evaluate the overall functioning of the mechanism; (iv) processes for informing stakeholders about the status of a case; and (v) procedures to retrieve data for reporting purposes, including the periodic reports to the PMT and including PCC reports into the monthly ESMP Compliance monitoring report to the World Bank.

ANNEX-A: BASELINE EMBANKMENT CONDITIONS

Condition of SM Bund at Mile 123/0

Damaged stone pitching at 127/3

Damaged Stone pitching at 123/3 of SM Bund

Condition of Community Ramp at 124/2

Condition of Embankment at 126/4

Ramp at 128/2

Ramp at Mile at 144/1

Condition of embankment at 150/2

Ramp at 150/2 inner side

Damaged stone pitching at 151/1

Existing Condition of embankment at 154/4

Ramp at 159/4

Ramp at 160/3

Existing condition of embankment at 168/0

ANNEX-B: ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT QUESTIONNAIRES

Rapid Environmental Assessment (REA) Checklist for Environmental Studies (Reconnaissance Surveys)

Social Impacts	Yes / No / Likely/Not applicable	Where possible, provide details (Expected number of households, area of land, types of structures likely to be affected)
Is land acquisition necessary"		
Presence of squatters		
Loss of structures resulting in displacement		
Displacement of people due to loss of productive assets		
People losing means of livelihood and incomes (Temp. / Permanent)		
Is there any risk of economic marginalization of farmers and smallholders		
Basic facilities / services will be Inaccessible (Temp. / Permanent)		
Impact on crops, trees and other fixed assets in terms of loss of production or drop in yields		
Tenants/Lessees losing any fixed assets		
Loss of community assets		
Loss of existing social and community ties		
Impacts on Vulnerable Groups, if any: Impacts on Vulnerable Groups, if any:		
Poverty group affected		
Women headed households affected		
Ethnic Minority Affected		
Other vulnerable groups" affected		
Is there any risk to smallholders in terms of loss of livelihoods		

ANNEX-C: SOCIO-ECONOMIC DATA

ANNEX-C-1: HEALTH FACILITIES IN EACH SUB-PROJECT AREA

Name of Village	Project Name	Health Facilities in Nos.			
		Rural Health Centre	Basic Health Unit	Dispensary	Medical Store
Bhanoth	SM bund	0	1	0	0
Keher Colony		0	0	0	0
Goth Wazeer Rind		0	0	0	0
Delo Keti		0	0	0	0
Goth Badar Lakho		0	0	0	0
Goth Jumo Shahuk		0	1	0	0
Goth Haji Yousaf		0	0	0	0
Sekhat		0	1	0	0
Goth Abdul Hakeem		0	0	0	0
M. Laique Rind		0	0	0	0
Goth M. Ali Sangrasi		0	0	0	0
Goth Dural Khan Khosa		0	0	0	2
Total		**0**	**3**	**0**	**2**

ANNEX-C-2: COMMON DISEASE IN THE PROJECT AREA

S. no	Name of Village	Common Diseases in the Villages of Project area (1 = yes 0 = no)					
		Flu / fever	Malaria	Typhoid	Diarrhoea	TB	Others
1	Bhanoth	1	1	0	1	0	Jaundice
2	Keher Colony	1	1	0	1	0	0
3	Goth Wazeer Rind	0	1	1	1	1	0
4	Delo Keti	1	1	1	1	1	Jaundice
5	Goth Badar Lakho	1	1	1	1	1	0
6	Goth Jumo Shahuk	1	1	0	0	0	Jaundice
7	Goth Haji Yousaf	1	1	0	1	0	0
8	Sekhat	1	1	1	1	0	0
9	Goth Abdul Hakeem	1	1	1	1	0	Jaundice
10	M. Laique Rind	1	1	0	1	0	Jaundice
11	Goth M. Ali Sangrasi	1	1	1	1	1	Jaundice
12	Goth Dural Khan Khosa	1	1	1	1	0	0
	Total	**11**	**12**	**7**	**11**	**4**	6
	Percentage	92	100	58	92	33	50

ANNEX-C-3: FLOOD DAMAGES IN THE PROJECT AREA

S.no	Name of Village	Total Estimated Households	Total Estimated Population	Flood Losses (yes = √ no = ×) Yes	Type of Losses
1	Bhanoth	600	5000	√	Standing Crops
2	Keher Colony	60	200	×	0
3	Goth Wazeer Rind	35	250	×	0
4	Delo Keti	400	2500	×	0
5	Goth Badar Lakho	250	1500	×	0
6	Goth Jumo Shahuk	500	4000	√	Standing Crops
7	Goth Haji Yousaf	250	1500	√	Standing Crops
8	Sekhat	800	5000	×	0
9	Goth Abdul Hakeem	80	1000	√	Houses
10	M. Laique Rind	35	180	√	Houses
11	Goth M. Ali Sangrasi	400	3000	×	0
12	Goth Dural Khan Khosa	800	6000	×	0
		4210	**30130**		

ANNEX-C-4: NGOs WORKING IN THE AREA

SINDH RESILIENCE PROJECT (SRP)								
	Name of Village	Sub-Project Name	NGO working in the village		Area of Interest			
			Yes	No	Health	Education	Micro credit	others
1	Village Bhanote	SM bund	0	1	0	0	0	0
2	Village Keher Colony	SM bund	0	1	0	0	0	0
3	Village Wazeer Rind	SM bund	0	1	0	0	0	0
4	Village Delo Keti	SM bund	0	1	0	0	0	0
5	Village Jumo Shahuk	SM bund	0	1	0	0	0	0
6	Village Haji Yousaf	SM bund	0	1	0	0	0	0
7	Village Sekhat	SM bund	0	1	0	0	0	0
8	Village Abdul Hakeem	SM bund	0	1	0	0	0	0
9	Village Badar Lakho	SM bund	1	0	1	1	0	0
10	Village Laique Rind	SM bund	0	1	0	0	0	0
11	Village Mohammad Ali Sangrasi	SM bund	0	1	0	0	0	0
12	Village Rais Dural Khan Khosa	SM bund	1	0	0	0	0	0
AVERAGE			**0.2**	**0.8**	**0.1**	**0.1**	**0.0**	**0.0**

ANNEX-C-5: EDUCATIONAL FACILITIES IN THE SUB-PROJECT AREA

Name of Village		Educational Facilities for Boys in the SM bund Project area								
		Boys Primary School (nos.)	Teachers (nos.)	Enrolments	Boys Middle School	Teachers (nos.)	Enrolments	Boys High School	Teachers (nos.)	Enrolments
S.No	Village Name									
1	Bhanoth	3	9	150	0	0	0	1	10	300
2	Keher Colony	0	0	0	0	0	0	0	0	0
3	Goth Wazeer Rind	1	1	40	0	0	0	0	0	0
4	Delo Keti	1	1	100	0	0	0	0	0	0
5	Goth Badar Lakho	1	2	20	0	0	0	0	0	0
6	Goth Jumo Shahuk	2	9	170	1	7	115	0	0	0
7	Goth Haji Yousaf	0	0	0	0	0	0	0	0	0
8	Sekhat	1	1	100	1	5	300	0	0	0
9	Goth Abdul Hakeem	0	0	0	0	0	0	0	0	0
10	M. Laique Rind	0	0	0	0	0	0	0	0	0
11	Goth M. Ali Sangrasi	0	0	0	0	0	0	0	0	0
12	Goth Dural Khan Khosa	1	2	50	0	0	0	0	0	0
	Sub-Total	**10**	**25**	**630**	**2**	**12**	**415**	**1**	**10**	**300**

ANNEX-C-5 A: EDUCATIONAL FACILITIES IN THE SUB-PROJECT AREA

Name of Village	Educational Facilities for Girls in the SM bund Project area								
	Girls Primary School (In nos)	Teachers (nos)	Enrolments	Girls Middle School	Teachers (nos)	Enrolments	Girls High School	Teachers (nos)	Enrolments
Bhanoth	1	3	100	0	0	0	1	10	70
Keher Colony	0	0	0	0	0	0	0	0	0
Goth Wazeer Rind	0	0	0	0	0	0	0	0	0
Delo Keti	0	0	0	0	0	0	0	0	0
Goth Badar Lako	0	0	0	0	0	0	0	0	0
Goth Jumo Shahuk	1	2	160	0	0	0	0	0	0
Goth Haji Yousaf	0	0	0	0	0	0	0	0	0
Sekath	1	1	50	0	0	0	0	0	0
Goth Abdul Hakeem	0	0	0	0	0	0	0	0	0
M. Lahiqe Rind	0	0	0	0	0	0	0	0	0
Goth M. Ali Sangrasi	0	0	0	1	4	200	0	0	0
Goth Dural Khan Khosa	1	3	80	0	0	0	0	0	0
Sub-Total	**4**	**9**	**390**	**1**	**4**	**200**	**1**	**10**	**70**

ANNEX-C-6: AVAILABLE FACILITIES IN THE SUB-PROJECT AREA

ame of Village		Available Facilities in Project area						
		Electricity 1 = yes 0 = no	Provided by	Since year	Market/Shops (nos.)	Link Road (in km)	Pucca (km)	Katcha (km)
S. No								
1	Bhanoth	1	GoS	1970	1	11	11	0
2	Keher Colony	1	GoS	1996	0	3	0	3
3	Goth Wazeer Rind	0	0	0	0	7	0	7
4	Delo Keti	1	GoS	2001	12	4	4	0
5	Goth Badar Lakho	1	GoS	2008	2	6	0	6
6	Goth Jumo Shahuk	1	GoS	1980	5	0	0	0
7	Goth Haji Yousaf	0	0	0	0	0	0	0
8	Sekhat	1	GoS	1995	12	0	0	0
9	Goth Abdul Hakeem	0	0	0	0	0.5	0	0.5
10	M. Laique Rind	1	GoS	2005	0	0.5	0	0.5
11	Goth M. Ali Sangrasi	1	GoS	1980	5	2	2	0
12	Goth Dural Khan Khosa	1	GoS	1990	12	0	0	0
	Total	9			49	34	17	17

ANNEX-D: CONSULTATION DETAILS

Findings of Public Consultations

Name of Sub-Project	Name of the Village	Date	Total Number of Participants	Names of Participants	Key Issues Discussed
SM Bund	Goth Bhanote	05/01/2016	10	Attached	○ Villagers told that this project will leave positive impacts on the communities. Project will provide safety to their village, agriculture land and other ○ Villagers also expect some development and social work for their village under this project fund.
SM Bund	Village Keher Colony	05/01/2016	11	Attached	○ The villagers were happy about the project and they expect that the project will protect their village roads, schools and other assets from flood in future. ○ They also expect that project will create many employment opportunities for unskilled villagers.
SM Bund	Village Wazeer Rind	05/01/2016	09	Attached	○ The project is protection for village. During consultative meeting, project activities were discussed with the villagers on which villagers shared their views that they are very happy about the project and these types of projects should start before the flood season.
SM Bund	Village Dhelo Keti	05/01/2016	7	Attached	○ People of the Goth Dhelo Keti shared their concerns that in each flood season they feel themselves unsafe. They have requested for urgent repair works or stone pitching works along the bund so that they can live with peace during flood time in their village.

Name of Sub-Project	Name of the Village	Date	Total Number of Participants	Names of Participants	Key Issues Discussed
SM Bund	Village Badar Lakho	21/01/2016	9	Attached	○ During consultative meeting, the SRP team shared the purpose of the project in the reply villagers shown their willingness about the project. ○ They told that project is a protection for the whole area.
SM Bund	Goth Jumo Shahuk	26/01/2016	24	Attached	○ Villagers of the Goth Jumo Shahuk were happy to know about the SRP project, and the villagers expect the project is safety for the area.
SM Bund	Goth Haji Yousaf	26/01/2016	14	Attached	○ In consultative meeting, the village haji Yousaf expressed pleasure that rehabilitation work of bund is most important for their protection. ○ They are expected for labor Jobs during implementation phase.
SM Bund	Sekhat/ Kalyan	21/01/2016	10	Attached	○ The villagers expect safeguard due to the proposed rehabilitation works of the bund in flood season. This is safety for houses in flood season.
SM Bund	Abdul Hakeem Khoso	20/01/2016	05	Attached	○ People of the Village Abdul Hakeem Khoso were happy about the project will bring labor opportunity and safety for the area.
SM Bund	Goth Mohammad Laique Rind	24/01/2016	11	Attached	○ The villagers expressed pleasure that the rehabilitation works of bund is most important for their protection and requested for commencement of the works on urgent basis before the flood season.

Name of Sub-Project	Name of the Village	Date	Total Number of Participants	Names of Participants	Key Issues Discussed
SM Bund	Goth Mohammad Ali Sangrasi	25/01/2016	13	Attached	○ During discussion, villagers of Mohammad Ali Sangrasi told that the project is safety for their land because in their area there is lot of seepage in flood season which is causes for damages of land. ○ They expected that project will create many employment opportunities for unskilled villagers.
SM Bund	Goth Dural Khan Khoso	24/01/2016	11	Attached	○ The villagers were happy about the proposed scope of work and they reported that it is for our safety.

Disater & Climate Resilince Enhancement Project (DACREP)

Attendence of Participants of public Consultation in Village Bhanoth on

Sub-Project S M Bund.

S.No	Name of Participants	Fathers/Husband Name	Contact: No	Signature/Tumb Impression
1	Asad Ali	M. Hashim Kurar	0300 3052005	
2	Amanullah	Gagnar Sahangi	0303 3901775	
3	Aamir Hussain Soomro	Manzoor Ali Soomro	0303 2216538	
4	Ghulam Mustafa	Rasool Bux Lashari	0206 3037502	
5	Hamid Ali	Allah Dino Kurar	0300 3080542	
6	Mumtaz Ali	M. Usman Kurar	03000 815539	
7	Raja Bhatti	Sapan	0304 9846344	
8	Qadir Bux	Kando Sahangi	—	
9	Mir M Shammad Gial	Mohammad Hashim	—	
10	Sohab Dino	Pir M Shammad Khoso	—	

Disater & Climate Resilince Enhancement Project (DACREP)

Attendence of Participants of public Consultation in Village Kehar Colony on

Sub-Project S.M Bund

S.No	Name of Participants	Fathers/Husband Name	Contact: No	Signature/Tumb Impression
1	M. Ashraf Balal	Kehar Khan	0301 3457567	
2	Allah Warayo	Dost Mohammad	0312 2517927	
3	Daleel	Lowng Balal	0306 3364503	
4	Ilyas	Bachho Balal	-	
5	Mohammad Malook	Mohammad Panah	-	
6	Abdul Salam	Shahzad Balal	0306 0319523	
7	Lowng	Daleel Balal	0309 3686376	
8	Sheh Khan	Daad Ali Mari	-	
9	Zakir Hussain	M. Malook	-	
10	Jalaldeen	Shahlad	0306 3564621	
11	Imam Bux Balal	Daleel Balal	0305 4155106	

Disater & Climate Resilince Enhancement Project (DACREP)

Attendence of Participants of public Consultation in Village Wagah Rind on

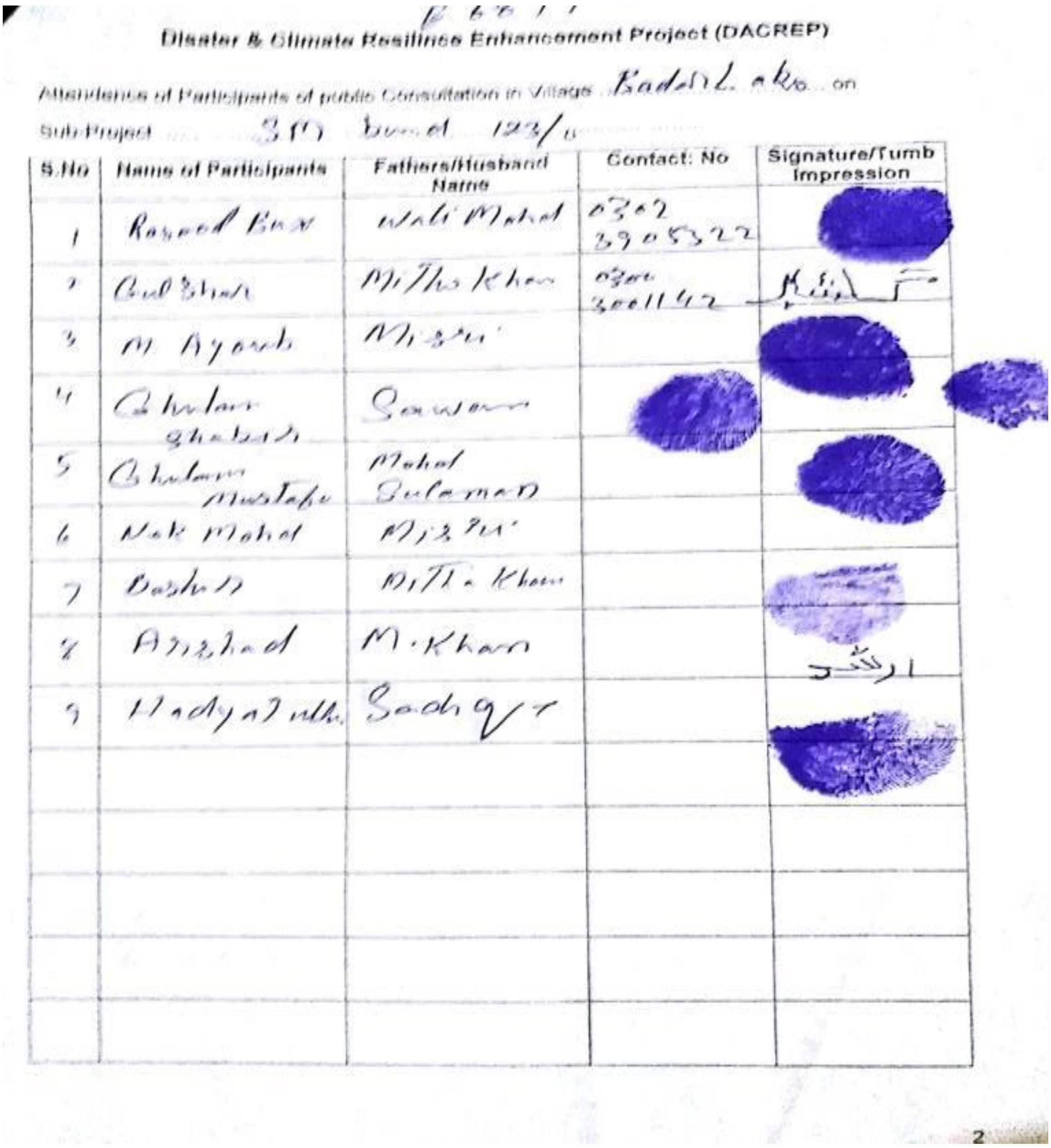
Sub-Project S.M - 132/2

S.No	Name of Participants	Fathers/Husband Name	Contact: No	Signature/Tumb Impression
1	Shah Mir	Jamal	0303 2826499	
2	Mando Rind	Kaleri		
3	Rahim Bux	Ramozan	0307 1312675	
4	Khan	Mir Dost		
5	Ghulam Rasool	M. Malook		
6	Mir Dost	Tarwkhan		
7	Shazil	Jamal		
8	Yaqoob	M. Ayub		
9	Mir Aman	Jam		

Disaster & Climate Resilience Enhancement Project (DACREP)

Attendance of Participants of public Consultation in Village Dado Rahu Goth on
Sub Project SM bund 23/4 mile

S.No	Name of Participants	Fathers/Husband Name	Contact: No	Signature/Tumb Impression
1	Sadique	M Bux	0304 8327634	[thumb impression]
2	Moula Bux	M. Malook	0307 2511865	[thumb impression]
3	Teeh	Pathan		[thumb impression]
4	Ali Bux	Khuda Bux	0303 7682062	[thumb impression]
5	Ghulam Rasool	M. Rahim	0300 3305080	G Rasool
6	Darya Khan	[illegible]	0305 2928396	[thumb impression]
7	Waseem	Hazoor Bux		[thumb impression]



Disaster & Climate Resilince Enhancement Project (DACREP)

Attendance of Participants of public Consultation in Village Kadan Lako on

Sub-Project SM bund 123/0

S.No	Name of Participants	Fathers/Husband Name	Contact: No	Signature/Tumb Impression
1	Rasool Bux	Wali Mohd	0302 3905322	
2	Gul Khan	Mitho Khan	0300 3001142	
3	M Ayoob	Mirza		
4	Ghulam Shabir	Sawan		
5	Ghulam Mustafa	Mohd Suleman		
6	Nek Mohd	Mirza		
7	Bashir	Mitha Khan		
8	Arshad	M. Khan		ارشد
9	Hadyatullah	Sadiq		

2

Disater & Climate Resilince Enhancement Project (DACREP)

Attendence of Participants of public Consultation in Village Jeme Shahok on

Sub-Project S M Bund

S.No	Name of Participants	Fathers/Husband Name	Contact No	Signature Tumb Impression
1	Abdul Azeez Lund	Soomar	0301 2566576	[illegible]
2	Pervaiz Ahmed Shahok	Nazeer Ahmed	0334 3240500	[illegible]
3	Abdul Wahid	Haji Mubarak Shahok	0301 3585507	[illegible]
4	Dodo	Lal Khan Shahok	0300 9236651	[illegible]
5	Didar Ali	Haji Dost Ali	0310 3052206	Deedar
6	Hayat Khan Shahok	Fateh Mohd.	0347 3454691	[illegible]
7	M. Younes	Abdul Wahid	0302 3063266	M. Younis
8	Haseebullah	Azeezullah	0308 8254022	Haseeb
9	Rafiq Rehman	Abdul Rehman	0345 3574733	[illegible]
10	Allah Bachayo	Shah Mohd.	0301 2425110	[illegible]
11	Nisar Ahmed	Baksh Ali	0345 5835424	[illegible]
12	Habibullah	Ali Zaman	0304 3230247	حبیب
13	Ali Mohammad	Soomar	0301 3488887	[illegible]
14	Ali Akbar	Sono Khan	0301 2521702	علی اکبر

Disater & Climate Resilince Enhancement Project (DACREP)

Attendence of Participants of public Consultation in Village Jumo Shahook on

Sub Project S.M. 155/7

S.No	Name of Participants	Fathers/Husband Name	Contact: No	Signature/Thumb Impression
12	Sadam Hussain	Kamal Khoso	0306 2392516	
13	Rehem Khan	Sher Khan Khoso	0301 3478830	
14	Sono Khan	Allah Bachayo Khoso	—	
15	Malhar	Hamro Khoso	0302 2230305	
16	Jumo Rind	Allah Bux	0306 3653033	
17	Wahid Ali	Chawdi Manghanhar	—	
18	Allah Yar	Hardi Bux	0301 3566613	
19	M. Saleem Domki	Mohd Ali Domki	0307 3048353	
20	Ghulam Nabi Domki	Bachal Domki	—	
21	M. Ali Domki	Phulai Khan	-	

Disater & Climate Resilince Enhancement Project (DACREP)

Attendence of Participants of public Consultation in Village ... on ...

Sub-Project S.M Bund

S.No	Name of Participants	Fathers/Husband Name	Contact: No	Signature/Tumb Impression
1	Abdul Azeez Meer	Abdul Majeed	0333 8687830	
2	Abdul Hakeem	Hebtan	0338 2771838	
3	M. Ramzan	M. Ismail Khoso	0302 5734713	
4	M. Haroon	Haji Wali M Khoso	0307 2653298	
5	Syed Mohammad	Moosa Mari	0301 2010970	
6	Haji Ummar Khoso	Haji Bakshal	—	
7	Baax. Mohd.	Abdul Rehman	0331 3870473	
8	Rehmatullah	Hebtan	—	
9	M. Ashraf	Taj Mohd. Mari	—	
10	Habib-Rehman	Kaloy Khan	0302 3001095	
11	Ashraf Hussain	Taj Mohd Mari	—	
12	Aslam	Baax Mohd	—	
13	Shah Nawax	Mo Hussain	—	
14	Ghulam Murtaza	Moosa Khan	—	

Disater & Climate Resilince Enhancement Project (DACREP)

Attendance of Participants of public Consultation in Village Kalyan .... on
Sub-Project S M Bund . RS / 3

S.No	Name of Participants	Fathers/Husband Name	Contact: No	Signature/Tumb Impression
1	Pehlaj	Chandu	0307 3955646	
2	Naseem	Mangal		
3	Soma	Mohan	—	
4	Jhalo	Parmo	0304 3985796	
5	[illegible]	Ranjho	—	
6	Jhamandas	Keeamal	0308 3737450	
7	Pehlaj	Nanak	0304 2663113	
8	[illegible]	Khandu	—	
9	Gonee	Pehlaj	—	
10	[illegible] Khan	Mubarak	0306 3553091	

2

DISASTER & CLIMATE RESILIENCE ENHANCEMENT PROJECT (DACREP)

Attendance of Participants of public Consultation in Village A. Hakeem Khoso on

Sub-Project S.M. 170/0 mile

S.No	Name of Participants	Fathers/Husband Name	Contact: No	Signature/Tumb Impression
1	Bashir Ahmed	Perozo	0307 3172397	
2	M. Sohail	M. Murad		
3	Sain Dad	Pataho		
4	Abdul Jabbar	M. Yameen		
5	M. Yameen	Jalaludin		

DISASTER & CLIMATE RESILIENCE ENHANCEMENT PROJECT (DACREP)

Attendance of Participants of public Consultation in Village ... on ...

Sub-Project ...

S.No	Name of Participants	Fathers/Husband Name	Contact No	Signature/Tumb Impression
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				

2

Disaster & Climate Resilince Enhancement Project (DACREP)

Attendence of Participants of public Consultation in Village M. Ali Sangsari on

Sub-Project E.A1 Bund (15)

S.No	Name of Participants	Fathers/Husband Name	Contact: No	Signature/Tumb Impression
1	Jan Mohammad	Missri Khaskheli	0301 3591736	
2	Ali Khan	Karo Khaskheli	0369 3313095	
3	Haji Usman	Ahmed Ali Sangsari		
4	Haji M. Murad Sangsari	Ahmed Ali Sangsari	0300 (Son) 3025729	
5	Nabi Bux	Sain Bux Sangsari	—	
6	Yar Mohd Sangsari	Baboo	03	
7	Ali Akbar	Haji Dean Mohd Sangsari	0308 2507979	
8	Manthar	Mir Mohd Sangsari	0308 2858767	
9	M. Hanif Bhatti	Masad Mohd	—	
10	Saeedullah	Dr M. Ali Sangsari	—	
11	Missri Khaskheli	Baharo Khaskheli	—	
12	Rasool Khan	Dost Ali Sangsari	0302 2279126	
13	Iftikar Pahoo	M. Moosa Pahoo	0308 3846454	

Disater & Climate Resilince Enhancement Project (DACREP)

Attendence of Participants of public Consultation in Village Dinal Khan Khaso
Sub-Project S. M Bund 15/B

S.No	Name of Participants	Fathers/Husband Name	Contact. No	Signature / Thumb Impression
1	Aslam Khaso	Mir Hasan Khoso	0346 7/4 [illegible] 14	
2	Ghulam Nabi	Kirir Khoso	—	
3	Rasheed Ahmed	Hazar Bux Khan	0343 [illegible] 318	
4	Shabeer	Hazoor Bux	—	
5	Nazar-M	Amb Khan	0300 2334027	
6	Habi Bux	Pohalu Khaso	—	
7	Kamardeen	Ali Shair Khoso	—	
8	Mir Hasan Baloch	Pohalu Khoso	—	
9	Badardeen	Ali Shair	—	
10	Allah Deen	Ali Shair	—	
11	Khabir Mohd:	Amb Khan	-	
12				

Public Consultations with Female Community Members

Name of Sub-Project	Name of the Village	Number of Participants	Key Issues Discussed
SM Bund	Goth Bhanote	24	• During the asking about project impact on women activities, mostly they favouring it and also having expectations to get benefits. • The female community members demanded for the provision of basic living facilities including (health, education and drinking water)
SM Bund	Village Keher Colony	9	• Very deprived community, no basic living facilities availability in village. • Demanded for water and sanitation water and sanitation facilities in the villages.
SM Bund	Village Wazeer Rind	13	• Women of the village happy with project • Female facing basic health problems, girls have no school, they are working handicraft making • They said mostly contractors bring their own labour for work, this is unfair. The labour jobs should give to villagers.
SM Bund	Village Dhelo Keti	23	• During the asking about project impact on women activities, mostly they favouring it and also having expectations to get benefits, • They were demanded for education facility and link road for the village.
SM Bund	Village Badar Lakho	25	• They were happy with project, that their home will be safe by strengthening of Bund. • Inhabitants of the area have no road access, if they will provide road to locals they can travel other big town for getting education, health and other facilities. • They also demanded for unskilled labour during the implementation phase.

Name of Sub-Project	Name of the Village	Number of Participants	Key Issues Discussed
SM Bund	Goth Jumo Shahuk	10	• Female were not aware about the rehabilitation of protected Bund, after briefing they about the project, they were much happy. They demanded for the provision of basic living facilities including (electricity, sewerage system and street lights)
SM Bund	Goth Haji Yousaf	14	• This area is living below to poverty line; they demanded for living facilities including health, education electricity and sewerage system.
SM Bund	Sekhat/ Kalyan	12	• Villagers have no living facilities including school, health and electricity; • They demanded for electricity and school for boys and girls both.
SM Bund	Abdul Hakeem Khoso	34	• They have no basic living facilities including (health, education and electricity and road communication is not available in the village.
SM Bund	Goth Mohammad Laique Rind	15	• The female community members requested that engage male members as daily labour during project work. • They also demanded for education facilities for their village.
SM Bund	Goth Mohammad Ali Sangrasi	29	• The village of Mohammad Ali Sangrasi women demanded for education health and jobs. • They also demanded for natural gas connection for their village.
SM Bund	Goth Dural Khan Khoso	14	• Women of this village were not aware about the project; though after briefing them about the project it was observed that they were very happy. • They also demanded some basic benefits like education facility, health and natural gas connection.

		
SM bund Village Bhanote	SM bund village Keher colony	SM Bund: Village Mohammad Ali Sangrasi
		
SM bund village Laique Rind	SM bund village Sekhat	SM bund village Haji Yousaf

ANNEX-E: ENVIRONMENTAL CODE OF PRACTICES (ECoPs)

Introduction

The objective of preparation of the Environmental Code of Practices (ECoPs) is to address less significant environmental impacts and all general construction related impacts for the proposed SRP project implementation. The ECoPs will provide guidelines for best operating practices and environmental management guidelines to be followed by the contractors for sustainable management of all environmental issues. This ECoPs will be annexed in the general conditions of all the contracts to be carried out under the SRP project. The list of ECoPs prepared for the SRP is given below:

ECoP 1: Waste Management
ECoP 2: Fuels and Hazardous Substances Management
ECoP 3: Water Resources Management
ECoP 4: Drainage Management
ECoP 5: Soil Quality Management
ECoP 6: Erosion and Sediment Control
ECoP 7: Borrow Areas Development and Operation
ECoP 8: Air Quality Management
ECoP 9: Noise and Vibration Management
ECoP 10: Protection of Flora
ECoP 11: Protection of Fauna
ECoP 12: Protection of Fisheries
ECoP 13: Road Transport and Road Traffic Management
ECoP 14: Construction Camp Management
ECoP 15: Cultural and Religious Issues
ECoP 16: Workers Health and Safety

The Contractor shall prepare a 'Construction Environmental Action Plan' (CEAP) demonstrating the manner in which the Contractor will comply with the requirements of ECoPs and the mitigation measures proposed in the ESMP of the ESIA Report. The CEAP shall be submitted to the ESU of PISSC and ESMU of PMT for review and finally shall be approved by the ESU of PISSC. The CEAP will form the part of the contract documents and will be used as monitoring tool for compliance. Violation of the compliance requirements will be treated as non-compliance leading to the corrections or otherwise imposing penalty on the contractors.

ANNEX-E-1: ECOP 1: WASTE MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	The Contractor shall: o Develop waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste.) prior to commencing of construction and submit to SID and PISSC for approval. o Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of disposal site, so as to cause less environmental impact. o Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach. o Segregate and reuse or recycle all the wastes, wherever practical. o Collect and transport non-hazardous wastes to all the approved disposal sites. o Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process. o Provide refuse containers at each worksite. o Request suppliers to minimize packaging where practicable. o Place a high emphasis on good housekeeping practices. o Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.
Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	The Contractor shall: o Collect chemical wastes in 200 litre drums (or similar sealed container), appropriately labelled for safe transport to an approved chemical waste depot. o Store, transport and handle all chemicals avoiding potential environmental pollution. o Store all hazardous wastes appropriately in bunded areas away from water courses. o Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction. o Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations. o Construct concrete or other impermeable flooring to prevent seepage in case of spills

ANNEX-E-2: ECOP 2: FUELS AND HAZARDOUS SUBSTANCE MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Fuels, oil, lubricants, paints and other hazardous substance.	Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous substance on-site, and potential spills from these goods may harm the environment or health of construction workers.	The Contractor shall: ○ Prepare spill control procedures and submit the plan for PISSC and SID for approval. ○ Train the relevant construction personnel in handling of fuels and spill control procedures. ○ Store dangerous goods in bunded areas on a top of a sealed plastic sheet away from water course. Refuelling should occur only within bunded areas. ○ Make available MSDS for chemicals and dangerous goods on-site. ○ Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by Sindh EPA. ○ Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored and personnel trained in the correct use. ○ Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use. ○ Make sure all containers, drums, and tanks that are used for storage are in good condition and are labelled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur. ○ Store hazardous materials above flood plain level. ○ Put containers and drums in temporary storages in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area should preferably slope or drain to a safe collection area in the event of a spill. ○ Put containers and drums in permanent storage areas on an impermeable floor that slopes to a safe collection area in the event of a spill or leak. ○ Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. ○ Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials.

ANNEX-E-3: ECOP 3: WATER RESOURCES MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Hazardous Material and Waste	Water pollution from the storage, handling and disposal of hazardous materials and general construction waste, and accidental spillage	The Contractor shall: ○ Follow the management guidelines proposed in ECoPs 1 and 2. ○ Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables
Discharge from construction sites	During construction both surface and groundwater quality may be deteriorated due to construction activities in the river, sewerages from construction sites and work camps. The construction works will modify groundcover and topography changing the surface water drainage patterns, including infiltration and storage of storm water. The change in hydrological regime leads to increased rate of runoff and in sediment and contaminant loading, increased flooding, groundwater contamination, and effect habitat of fish and other aquatic biology.	The Contractor shall: ○ Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials ○ Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site ○ Divert runoff from undisturbed areas around the construction site ○ Stockpile materials away from drainage lines ○ Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot ○ Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bunded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This should be done in every exit of each construction vehicle to ensure the local roads are kept clean.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	The Contractor shall: ○ Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion ○ Ensure that roads used by construction vehicles are swept regularly to remove sediment. ○ Water the material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)
Construction activities in water bodies	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology.	The Contractor shall: • Dewater sites by pumping water to a sediment basin prior to release off site – do not pump directly off site • Monitor the water quality in the runoff from the site or areas affected by dredge plumes, and improve work practices as necessary • Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers • Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables. • Use environment friendly and nontoxic slurry during construction of piles to discharge into the river. • Reduce infiltration of contaminated drainage through storm water management design • Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Drinking water	Groundwater at shallow depths might be contaminated and hence not suitable for drinking purposes.	The Contractor shall: • Control the quality of groundwater to be used for drinking water on the bases of NEQS and World Bank standards for drinking water. Safe and sustainable discharges are to be ascertained prior to selection of pumps. • Tube wells will be installed with due regard for the surface environment, protection of groundwater from surface contaminants, and protection of aquifer cross contamination • All tube wells, test holes, monitoring wells that are no longer in use or needed shall be properly decommissioned
	Depletion and pollution of groundwater resources	• Install monitoring wells both upstream and downstream areas near construction yards and construction camps to regularly monitor and report on the water quality and water levels. • Protect groundwater supplies of adjacent lands

ANNEX-E-4: ECOP 4: DRAINAGE MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Excavation and earth works, and construction yards	Lack of proper drainage for rainwater/liquid waste or wastewater owing to the construction activities harms environment in terms of water and soil contamination, and mosquito growth.	The Contractor shall: • Prepare a program for prevent/avoid standing waters, which PISSC and ESMU of PMT will verify in advance and confirm during implementation • Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line • Establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there. • Rehabilitate road drainage structures immediately if damaged by contractors' road transports. • Build new drainage lines as appropriate and required for wastewater from construction yards connecting to the available nearby recipient water bodies. Ensure wastewater quality conforms to the relevant standards provided by Sindh EPA, before it being discharged into recipient water bodies. • Ensure the internal roads/hard surfaces in the construction yards/construction camps that generate has storm water drainage to accommodate high runoff during downpour and that there is no stagnant water in the area at the end of the downpour. • Construct wide drains instead of deep drains to avoid sand deposition in the drains that require frequent cleaning. • Provide appropriate silt collector and silt screen at the inlet and manholes and periodically clean the drainage system to avoid drainage congestion • Protect natural slopes of drainage channels to ensure adequate storm water drains. • Regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem. • Reduce infiltration of contaminated drainage through storm water management design
Ponding of water	Health hazards due to mosquito breeding	• Do not allow ponding of water especially near the waste storage areas and construction camps • Discard all the storage containers that are capable of storing of water, after use or store them in inverted position

ANNEX-E-5: ECOP 5: SOIL QUALITY MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Storage of hazardous and toxic chemicals	Spillage of hazardous and toxic chemicals will contaminate the soils	The Contractor shall: • Strictly manage the wastes management plans proposed in ECoP1 and storage of materials in ECoP2 • Construct appropriate spill contaminant facilities for all fuel storage areas • Establish and maintain a hazardous materials register detailing the location and quantities of hazardous substances including the storage, use of disposals • Train personnel and implement safe work practices for minimizing the risk of spillage • Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site • Remediate the contaminated land using the most appropriate available method to achieve required commercial/industrial guideline validation results
Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall: • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds

ANNEX-E-6: ECOP 6: EROSION AND SEDIMENT CONTROL

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Clearing of construction sites	Cleared areas and slopes are susceptible for erosion of top soils that affects the growth of vegetation which causes ecological imbalance.	The Contractor shall: • Reinstate and protect cleared areas as soon as possible. • Mulch to protect batter slopes before planting • Cover unused area of disturbed or exposed surfaces immediately with mulch/grass turfings/tree plantations
Construction activities and material stockpiles	The impact of soil erosion are (i) Increased run off and sedimentation causing a greater flood hazard to the downstream, (ii) destruction of aquatic environment in nearby lakes, streams, and reservoirs caused by erosion and/or deposition of sediment damaging the spawning grounds of fish, and (iii) Destruction of vegetation by burying or gullying.	The Contractor shall: • Locate stockpiles away from drainage lines • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds • Remove debris from drainage paths and sediment control structures • Cover the loose sediments and water them if required • Divert natural runoff around construction areas prior to any site disturbance • Install protective measures on site prior to construction, for example, sediment traps • Control drainage through a site in protected channels or slope drains • Install 'cut off drains' on large cut/fill batter slopes to control water runoff speed and hence erosion • Observe the performance of drainage structures and erosion controls during rain and modify as required.

ANNEX-E-7: ECOP 7: BORROW AREAS DEVELOPMENT AND OPERATION/RESTORATION

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Development and operation of borrow areas	In case, the borrow pits developed by the Contractor, there will be impacts on local topography, landscaping and natural drainage.	The Contractor shall: • Reuse excavated or disposed material available in the project area to the maximum extent possible • Identify borrow pits in consultation with the local governments and PISSC as well as PMT. • Obtain the borrow material from: • barren land or land without tree cover outside the road reserve; • Do not dug the borrow pits within 5m of the toe of the final section of the road embankment. • Dig the borrow pits continuously. Ridges of not less than 8 m widths shall be left at intervals not exceeding 300 m and small drains should be cut through the ridges to facilitate drainage • Borrow areas should not exceed 0.6 m (2ft.) in depth. • Slope the bed level of the borrow pits, as far as possible, down progressively towards the nearest cross drain, if any, and do not lower it than the bed of the cross-drain, to ensure efficient drainage. Follow the below for restoration of borrow areas are: • Return stockpiled topsoil to the borrow pit if is used for agriculture; • Return stockpiled topsoil to the borrow pit and all worked areas to be stabilized through re-vegetation using local plants. • Control at each site by ensuring that base of the borrow pit drains into a sediment trap prior to discharging from the site.

ANNEX-E-8: ECOP 8: AIR QUALITY MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	The Contractor shall: • Fit vehicles with appropriate exhaust systems and emission control devices, in compliance with the NEQS. Maintain these devices in good working condition. • Operate the vehicles in a fuel efficient manner • Cover haul vehicles carrying dusty materials moving outside the construction site • Impose speed limits on all vehicle movement at the worksite to reduce dust emissions • Control the movement of construction traffic • Water construction materials prior to loading and transport • Service all vehicles regularly to minimize emissions • Limit the idling time of vehicles not more than 2 minutes
Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	The Contractor shall: • Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. • Focus special attention on containing the emissions from generators • Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites • Service all equipment regularly to minimize emissions
Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard.	• Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds) • Minimize the extent and period of exposure of the bare surfaces • Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary to avoid during periods of high wind and if visible dust is blowing off-site • Restore disturbed areas as soon as practicable by vegetation/grass-turfing • Store the cement in silos and minimize the emissions from silos by equipping them with filters.

ANNEX-E-9: EC0P 9: NOISE AND VIBRATION MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	The Contractor shall: • Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures • Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours.
Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall: • Appropriately site all noise generating activities to avoid noise pollution to local residents • Use the quietest available plant and equipment • Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipelines) • Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures • Install acoustic enclosures around generators to reduce noise levels. • Fit high efficiency mufflers to appropriate construction equipment
Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall: • Notify adjacent residents prior to any Typical noise event outside of daylight hours • Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions • Employ best available work practices on-site to minimize occupational noise levels • Install temporary noise control barriers where appropriate • Notify affected people if noisy activities will be undertaken, e.g. blasting • Plan activities on site and deliveries to and from site to minimize impact • Monitor and analyse noise and vibration results and adjust construction practices as required. • Avoid undertaking the noisiest activities, where possible, when working at night near the residential areas

ANNEX-E-10: ECOP 10: PROTECTION OF FLORA

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and overall keep the environment very friendly to human-living. As such damage to flora has wide range of adverse environmental impacts.	The Contractor shall: • Reduce disturbance to surrounding vegetation • Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation. • Get approval from supervision consultant for clearance of vegetation. • Make selective and careful pruning of trees where possible to reduce need of tree removal. • Control noxious weeds by disposing of at designated dump site or burn on site. • Clear only the vegetation that needs to be cleared in accordance with the plans. These measures are applicable to both the construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill and construction of diversion roads. • Do not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can limit embankment erosion, retains soil moisture and nutrients, and encourages re-growth and protection from weeds. • Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from. • Avoid work within the drip-line of trees to prevent damage to the tree roots. • Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest practically possible. • Ensure excavation works occur progressively and re-vegetation done at the earliest • Provide adequate knowledge to the workers regarding nature protection and the need of avoid felling trees during construction • Supply appropriate fuel in the work caps to prevent fuel wood collection

ANNEX-E-11: ECOP 11: PROTECTION OF FAUNA

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction Activities	The location of construction activities can result in the loss of wild life habitat and habitat quality,	The Contractor shall: • Limit the construction works within the designated sites allocated to the contractors • check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animal
	Impact on migratory birds, its habitat and its active nests	The Contractor shall: • Not be permitted to destruct active nests or eggs of migratory birds • Minimize the tree removal during the bird breeding season. If works must be continued during the bird breeding season, a nest survey will be conducted by a qualified biologist prior to commence of works to identify and located active nests • Minimize the release of oil, oil wastes or any other substances harmful to migratory birds to any waters or any areas frequented by migratory birds.
Vegetation Clearance	Clearance of vegetation may impact shelter, feeding and/or breeding and/or physical destruction and severing of habitat areas	The Contractor shall: • Restrict the tree removal to the minimum required. • Retain tree hollows on site, or relocate hollows, where appropriate • Leave dead trees where possible as habitat for fauna • Fell the hollow bearing trees in a manner which reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified and readily accessible will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved overnight to allow animals to move of their own volition.
Construction Camps	Illegal poaching	• Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.

ANNEX-E-12: ECOP 12: PROTECTION OF FISHERIES

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction Activities in River	The main potential impacts to fisheries are hydrocarbon spills and leaks from boats and disposal of wastes into the river	The Contractor shall: • Ensure that boats used in the project are well maintained and do not have oil leakage to contaminate river water. • Contain accidental spillage and make an emergency oil spill containment plan to be supported with enough equipment's, materials and human resources • Do not dump wastes, be it hazardous or non-hazardous into the nearby water bodies or in the river
Construction Activities on the land	The main potential impacts to aquatic flora and fauna River are increased suspended solids from earthworks erosion, sanitary discharge from work camps, and hydrocarbon spills	The Contractor shall: • follow mitigation measures proposed in ECoP – 3 : Water Resources Management and ECoP – 4: Drainage Management

ANNEX-E-13: ECOP 13: ROAD TRANSPORT AND ROAD TRAFFIC MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction Vehicular Traffic	Increased traffic use of road by construction vehicles will affect the movement of normal road traffics and the safety of the road-users.	The Contractor shall: • Prepare and submit a traffic management plan to PISSC and PMT for their approval at least 30 days before commencing work on any project component involved in traffic diversion and management. • Include in the traffic management plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all detours, temporary road, temporary diversions, necessary barricades, warning signs/lights, road signs. • Provide signs at strategic locations of the roads complying with the schedules of signs contained in the Sindh and Pakistani Traffic Regulations. • Install and maintain a display board at each important road intersection on the roads to be used during construction, which shall clearly show the following information in Urdu: • Location: chainage and village name • Duration of construction period • Period of proposed detour/alternative route • Suggested detour route map • Name and contact address/telephone number of the concerned personnel • Name and contact address/telephone number of the Contractor • Inconvenience is sincerely regretted.
	Accidents and spillage of fuels and chemicals	• Restrict truck deliveries, where practicable, to day time working hours. • Restrict the transport of oversize loads. • Operate road traffics/transport vehicles, if possible, to non-peak periods to minimize traffic disruptions. • Enforce on-site speed limit

ANNEX-E-14: ECOP 14: CONSTRUCTION CAMP MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Siting and Location of Construction Camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	The Contractor shall: • Locate the construction camps at areas which are acceptable from environmental, cultural or social point of view. • Consider the location of construction camps away from communities in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. • Submit to the PMT for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps. • Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective surveillance over public health, social and security matters. • Code of Conduct to be prepared by the Contractor, signed by his workers and approved by the PMT of SRP.
Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	Contractor shall provide the following facilities in the campsites: • Adequate housing for all workers • Safe and reliable water supply. Water supply from tube wells that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. Female toilets should be clearly marked in language understood by the persons using them to avoid miscommunication. The minimum number of toilet facilities required is one toilet for every ten persons. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. Both sides of roads are to be provided with shallow v drains to drain off storm water to a silt retention pond which shall be sized to provide a minimum of 20 minutes retention of storm water flow from the whole site. Channel all discharge from the

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		silt retention pond to natural drainage via a grassed swale at least 20 meters in length with suitable longitudinal gradient. • Paved internal roads. Ensure with grass/vegetation coverage to be made of the use of top soil that there is no dust generation from the loose/exposed sandy surface. Pave the internal roads of at least haring-bond bricks to suppress dusts and to work against possible muddy surface during monsoon. • Provide child crèches for women working on the construction site. The crèche should have facilities for dormitory, kitchen, indoor/outdoor play area. Schools should be attached to these crèches so that children are not deprived of education whose mothers are construction workers • Provide in-house community/common entertainment facilities. Dependence of local entertainment outlets by construction camps to be discouraged/prohibited to the extent possible.
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	The Contractor shall: • Ensure proper collection and disposal of solid wastes within the construction camps • Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at household level. • Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipment's/vehicles needed. • Dispose organic wastes in a designated safe place on daily basis. At the end of the day cover the organic wastes with a thin layer of sand so that flies, mosquitoes, dogs, cats, rats, are not attracted. One may dig a large hole to put organic wastes in it; take care to protect groundwater from contamination by leachate formed due to decomposition. Cover the bed of the pit with impervious layer of materials (clayey, thin concrete) to protect groundwater from contamination. • Locate the garbage pit/waste disposal site min 500 m away from the residence so that peoples are not disturbed with the odour likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place by fencing and tree plantation to prevent children to enter and play with. • Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approval waste disposal sites.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	The Contractor shall: • Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or other biomass. • Make available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them using biomass for cooking. • Conduct awareness campaigns to educate workers on preserving the protecting of biodiversity in the project area, and relevant government regulations and punishments on wildlife protection.
Health and Hygiene	There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS.	The Contractor shall: • Provide adequate health care facilities within construction sites. • Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. • Provide ambulance facility for the labourers during emergency to be transported to nearest hospitals. • Initial health screening of the labourers coming from outside areas • Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work • Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication for all workers on regular basis • Complement educational interventions with easy access to condoms at campsites as well as voluntary counselling and testing • Provide adequate drainage facilities throughout camps to ensure that disease vectors habitats (stagnant water bodies, puddles) do not form. Regular mosquito repellent sprays in monsoon. • Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices
Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	• The Contractor shall: • Provide appropriate security personnel (police / home guard or private security guards) and enclosures to prevent unauthorized entry in to the camp area. • Maintain register to keep track on a head count of persons present in the camp at any given time.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Encourage use of flameproof material for the construction of labour housing/site office. Ensure that these houses/rooms are of sound construction and capable of withstanding storms/cyclones. • Provide appropriate type of fire fighting equipment suitable for the construction camps • Display emergency contact numbers clearly and prominently at strategic places in camps. • Communicate the roles and responsibilities of labourers in case of emergency in the monthly meetings with contractors.
Site Restoration	Restoration of the construction camps to original condition requires demolition of construction camps.	The Contractor shall: • Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates at the completion of the construction work. • Dismantle camps in phases as the work decreases (do not wait for completion of the entire work. • Give prior notice to the labourers before demolishing their camps/units • Maintain the noise levels within the national standards during demolition activities • Different contractors should be hired to demolish different structures to promote recycling or reuse of demolished material. • Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site by PMT. • Handover the construction camps with all built facilities as it is if agreement between both parties (contactor and land-owner) has been made so. • Restore the site to its original condition or to an agreed condition with the landowner defined prior to the commencement of the works (in writing). • Not make false promises to the labourers for future employment in O&M of the project.

ANNEX-E-15: ECOP 15: CULTURAL AND RELIGIOUS ISSUES

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction Activities near Religious and Cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances.	The Contractor shall: • Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction. • Do not block access to cultural and religious sites, wherever possible • Restrict all construction activities within the foot prints of the construction sites. • Stop construction works that produce noise (particularly during prayer time) should there be any mosque/religious/educational institutions close to the construction sites and users make objections. • Take special care and use appropriate equipment when working next to a cultural/religious institution. • Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given by the PMT. • Provide separate prayer facilities to the construction workers. • Show appropriate behaviour with all construction workers especially women and elderly people • Allow the workers to participate in praying during construction time • Resolve cultural issues in consultation with local leaders and supervision consultants • Establish a mechanism that allows local people to raise grievances arising from the construction process. • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works so as to maintain effective surveillance over public health, social and security matters
Best Practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries	The Contractor shall: • An Occupational, Health and Safety Plan shall be prepared by the Contractor and submitted to ESU of PISSC and ESMU of PMT for review and approval. The plan shall be approved by the ESU of PISSC. The OHS shall include a job hazard analysis and safety

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases), (ii) risk factors resulting from human behaviour (e.g. STD and HIV) and (iii) road accidents from construction traffic.	precautions (like PPEs, barriers, change to design) and make ensure use of the PPEs and other measures during construction time. • The contractor will train his workers and project management staff in (not limited to) first aid and basic infection control at work, transportation and handling of hazardous wastes, use of PPEs, fire safety etc. • Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international standards (e.g. International Labour Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national acts and rules of the Government of Sindh • Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, • Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. • Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job • Appoint an environment, health and safety manager to look after the health and safety of the workers • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters. •
	Child and pregnant labour	The Contractor shall: • Not hire children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Pakistani Labour Laws and Employment of Child Act (1977).
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will	• The contractor will arrange first aid facilities at the site. A trained first-aider should be present at the site and arrangements made with a local doctor to be available on call.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	aggravate the health conditions of the victims	Appropriately equipped first-aid stations should be easily accessible throughout the place of work • Contact numbers and location of the nearest healthcare/emergency centre should be displayed at the worksite. • Document and report occupational accidents, diseases, and incidents. • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. • Provide awareness to the construction drivers to strictly follow the driving rules • Provide adequate lighting in the construction area and along the roads
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECoP 14 Construction Camp Management: • Adequate ventilation facilities • Safe and reliable water supply. Water supply from deep tube wells that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals in accordance with ECoP 2 • Solid waste collection and disposal system in accordance with ECoP1. • Arrangement for trainings • Paved internal roads. • Security fence at least two m height. • Sick bay and first aid facilities
Water and Sanitation Facilities at the Construction Sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers	• The contractor shall provide toilets at the construction sites. • Location of toilet facilities should be at least six meters away from storm drain system and surface waters. These toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	and affect their personal hygiene.	septic tank for further treatment. Alternatively, each toilet facility should have septic tank and soaking pit. • Contractor should provide clean drinking water facilities to the construction workers at all the construction sites.
Other ECoPs	Potential risks on health and hygiene of construction workers and general public	The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community: • ECoP 2: Fuels and Hazardous Substance Management • ECoP 4: Drainage Management • ECoP 8: Air Quality Management • ECoP 9: Noise and Vibration Management • ECoP 13: Road Transport and Road Traffic Management
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	The Contractor shall: • Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. • Train all construction workers in general health and safety matters, and on the specific hazards of their work Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. • Commence the malaria, HIV/AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to condoms in the area as well as to voluntary counselling and testing. • Implement malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on on-going and regular basis. This should be complemented by easy access to condoms at the workplace as well as to voluntary counselling and testing.

ANNEX-E-16: ECOP 16: WORKER HEALTH AND SAFETY

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best Practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases), (ii) risk factors resulting from human behaviour (e.g. STD and HIV) and (iii) road accidents from construction traffic.	The Contractor shall: • An Occupational, Health and Safety Plan shall be prepared by the Contractor and submitted to ESU of PIC and ESMU of PMU for review and approval. The plan shall be approved by the ESU of PIC. The OHS shall include a job hazard analysis and safety precautions (like PPEs, barriers, change to design) and make ensure use of the PPEs and other measures during construction time. • The contractor will train his workers and project management staff in (not limited to) first aid and basic infection control at work, transportation and handling of hazardous wastes, use of PPEs, fire safety etc. • Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international standards (e.g. International Labour Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national acts and rules of the Government of Sindh • Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, • Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. • Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job • Appoint an environment, health and safety manager to look after the health and safety of the workers • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters.
	Child and pregnant labour	The Contractor shall:

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Not hire children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Pakistani Labour Laws and Employment of Child Act (1977).
	Gender Based Violence	• The contractor shall: • Train the workers regarding (Gender Based Violence GBV) and also train workers about sexual harassment, child abuse, human trafficking for reducing the risk of GBV. • The contractor will also raise awareness among workers regarding coordination with local law enforcement and code of conduct.
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	• The contractor will arrange first aid facilities at the site. A trained first-aider should be present at the site and arrangements made with a local doctor to be available on call. Appropriately equipped first-aid stations should be easily accessible throughout the place of work • Contact numbers and location of the nearest healthcare/emergency centre should be displayed at the worksite. • Document and report occupational accidents, diseases, and incidents. • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. • Provide awareness to the construction drivers to strictly follow the driving rules • Provide adequate lighting in the construction area and along the roads
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local	The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECoP 14 Construction Camp Management: • Adequate ventilation facilities • Safe and reliable water supply. Water supply from deep tube wells that meets the national standards

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	services and generate substandard living standards and health hazards.	• Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals in accordance with ECoP 2 • Solid waste collection and disposal system in accordance with ECoP1. • Arrangement for trainings • Paved internal roads. • Security fence at least two m height. • Sick bay and first aid facilities
Water and Sanitation Facilities at the Construction Sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	• The contractor shall provide toilets at the construction sites. • Location of toilet facilities should be at least six meters away from storm drain system and surface waters. These toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common septic tank for further treatment. Alternatively, each toilet facility should have septic tank and soaking pit. • Contractor should provide clean drinking water facilities to the construction workers at all the construction sites.
Other ECoPs	Potential risks on health and hygiene of construction workers and general public	The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community: • ECoP 2: Fuels and Hazardous Substance Management • ECoP 4: Drainage Management • ECoP 8: Air Quality Management • ECoP 9: Noise and Vibration Management • ECoP 13: Road Transport and Road Traffic Management
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	The Contractor shall: • Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. • Train all construction workers in general health and safety matters, and on the specific hazards of their work Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Commence the malaria, HIV/AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to condoms in the area as well as to voluntary counselling and testing. • Implement malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on on-going and regular basis. This should be complemented by easy access to condoms at the workplace as well as to voluntary counselling and testing.

ANNEX-F: ENVIRONMENTAL AND SOCIAL MITIGATION AND MONITORING PLAN

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
A. DESIGN PHASE											
A.1	Design / pre-construction considerations	A.1.1	Slope Instability		Excavated Material Disposal Plan to include siting and detailed assessment of the suitability of the proposed excavated materials disposal site	SID	SID	All excavated surplus materials to be disposed of in designated sites.	Once at the end of design stage	SID Divisional Office	Design Stage
		A.1.2	Geology and seismology		Stone pitching of the degraded reaches	SID	SID	Emergency Preparedness Plan in place prior to commencement of construction.	Once at the end of design stage	SID Divisional Office	Before Construction
		A.1.3	Erosion and Breach of the embankment		Raising and strengthening of the embankments	SID	SID	Emergency plan is in place	Once at the end of design stage	SID Divisional Office	Before Construction
		A.1.4	Loss of flora and disturbance of fauna within CoI		Tree inventory has been prepared and avoidance of trees cutting to the possible extent is recommended	SRP Consultants	SID	Tree inventory prepared	Once at the end of design stage	SID Divisional Office	Design Stage
		B. CONSTRUCTION PHASE									
		B.1. EMBANKMENT SITE PREPARATION and CLEARANCE									

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
B.1.1	Vegetation Clearance				Plans should be prepared prior to mobilization. The Contractor shall take full care to preserve and protect from damage trees, native shrubbery and vegetation. Preparation of following plans: Restoration and Tree Plantation and Maintenance Plan	Contractor	PISSC	Approved Plans	Once before mobilization	-	Construction stage
		B.1.1.1	Loss of faunal habitat at the location of Embankments and access routes		Vegetation clearance shall be limited to the area required for works	Contractor	PMT-ESMU and PISSC	Vegetation clearance shall be limited to the extent required for execution of the works	Weekly	Along the embankments	Site preparation
					use of existing accessing tracks	Contractor	PMT-ESMU and PISSC			Along the embankment	Construction Period
					Photographs of pre-construction state of camps	Contractor	PMT-ESMU and PISSC	Photographs taken	Once	Along the embankments	Construction Period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					Biodiversity monitoring	PMT	PMT-ESMU and PISSC	Status of terrestrial and avifauna	Quarterly	Along the embankments	Construction Period
B.1.2	Trees cutting	B.1.2.1	Loss of habitats		Tree inventory prepared by SRP Consultant will be verified and updated and trees likely to be cut down shall be marked in advance and approved by PISSC and PMT	Contractor	PMT-ESMU and PISSC	Written approval for cutting of marked trees prior to cutting	Weekly	Along the embankments	Construction Period
					Cutting only of trees approved by PISSC Engineer, Environmentalist and PMT SRP	Contractor	PMT-ESMU and PISSC	Cutting only of marked trees	Weekly	Along the embankments	Construction Period
					Trees cutting and clearance of dense vegetation for establishment of temporary haul routes prohibited	Contractor	PMT-ESMU and PISSC	No tree cutting on temporary haul routes	Monthly	Along the embankments	Construction Period
					Contractor shall prepare an inventory of cut trees including detail of girth, specie and height	Contractor	PMT-ESMU and PISSC	Maintenance of inventory	Monthly	Along the embankments	Construction Period
					Compensatory planting and aftercare of saplings of native trees at a ratio of 5 trees for each 1 tree cut	Contractor	PMT-ESMU and PISSC	Planting of 5 times the number of trees cut and survival rate of trees	Monthly	Along the embankments	Construction Period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					Biodiversity monitoring of impacts on fauna	PISSC	PMT-ESMU and PISSC	Status of terrestrial and avifauna	Quarterly	Along the embankments	Construction Period
					Areas having thick/dense vegetation will be avoided as far as possible.	Contractor	PMT-ESMU and PISSC	Vegetation are avoided	Monthly	Along the embankments	Construction Period
		B.1.2.2	Loss of habitats due to Sitting of new haul routes		use of existing accessing tracks	Contractor	PMT-ESMU and PISSC	Use of existing access tracks and width of new access tracks not more than 3m	Monthly	Haul routes	Construction Period
					Construction of haul routes through forest is prohibited		PMT-ESMU and PISSC	Use of existing access tracks and width of new access tracks not more than 3m	Monthly	Haul routes	Construction Period
B.1.3	Disposal of Excavated Material	B.1.3.1	Identification of re-use of excavated material on site, to reduce off site effects		All excavated materials to be disposed of in designated sites.	Contractor	PMT-ESMU and PISSC	Surplus material are disposed of in designated place	Monthly	Along the embankments	Construction Period
		B.1.3.2		Community Disturbance	Community liaison will be maintained during construction stage and GRM will be established to address complaints	Contractor	PMT-ESMU and PISSC	Surplus material are disposed of in designated place	Monthly	Along the embankments	Construction Period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					related to community disturbance.						
			Noise		Limiting working hours to between 6am and 6pm, six days a week. The camp sites shall be situated at least 500m from any settlement. On-demand noise monitoring will be carried out in case of any complaint or request by the affected communities. Additional mitigation measures will be identified and implemented in case the noise levels exceed the permissible limits. Community liaison will be maintained to ensure that complaints and grievances are addressed as soon as possible.	Contractor	PMT-ESMU and PISSC	Community complaints; Monitoring record	Monthly	All work sites and camp sites	Construction phase
		B.1.3.3	Disturbance of marsh and swamps		No disposal in the marsh and swamps	Contractor	PMT-ESMU and PISSC	Surplus material are disposed of in designated place	Monthly	Along the embankments	Construction Period
			Damage to existing		Contractor will repair/restore all damaged infrastructures.	Contractor	PMT-ESMU and PISSC	Evidence of restored infrastructure;	Regularly	All works areas	Construction Period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
			infrastructure Need to relocate infrastructure such as electricity transmission lines		Concerned department will be contacted for the relocation of electricity transmission lines. Community liaison to be maintained. GRM to be established to address related complaints.			Number of related complaints			
	B.2. CONSTRUCTION AND LABOR CAMPS										
B.2.1	Locating Camp	B.2.1.1		Community disturbance	Locate camp at least 500m away from the communities Community consultations will be carried out and liaison will be maintained GRM to be established to address related complaints.	Contractor	PMT-ESMU and PISSC	Review of Camp layout plan	Once	Camp site	Before camp construction
					Employment of Community Liaison Officer	Contractor	PMT-ESMU and PISSC	Community Liaison Officer Employed	Once	Camp site	After mobilization of Contractor
					Compensation for loss of land and standing crops	PMT	ESMEC	The landowner is compensated	Once	Camp site	

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
			Loss of flora and fauna		Submit layout plans for each camp to the approval of the Engineer before construction of camp	Contractor	PMT-ESMU and PISSC	Construction of camp site: do not begin before approval of the layout plan.	Once before camp establishment.	All Camp site	Before Camp construction.
			Surface water pollution		Locate camps away from the embankments of drainage line, watercourses and Indus River		PMT-ESMU,PISSC and ESMEC	Surface water quality at camp and construction sites.	Monthly	Camps and construction site.	Throughout construction phase
B.2.2	Supply of Drinking Water	B.2.2.1		Depletion of local drinking water resources	Contractor shall make his own arrangements for supply of water ensuring water supply and availability to local communities is unaffected	Contractor	PMT-ESMU and PISSC	Contractor is not using public water resources	Monthly	Contractor and Engineer's Offices	Throughout construction phase
		B.2.2.2	Spread of disease through unsuitable water supply		Provision of safe drinking water and annual testing according to the SEQS/NEQS	Contractor	PMT-ESMU and PISSC	Water Supply provided at Camp and test results are within the permissible limit of NEQS	Annually	Contractor and Engineer's Offices	Following the camp construction
B.2.3	Construction of Impermeable Areas	B.2.3.1	Flood risk within Camp		Drainage provided and maintained to convey storm water away from camp and settlement	Contractor	PMT-ESMU and PISSC	Drainage provided in camps	Monthly	Construction Camp	Following the camp construction
					Camp shall be located above or beyond the river/tributary	Contractor	PMT-ESMU and PISSC	Review of Camp layout plan	Once	Contractor and engineer's Offices	Before camp construction

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
		B.2.3.2	Surface run-off through camp and pollution to surface water		Drainage provided to divert surface run-off from surrounding	Contractor	PMT-ESMU and PISSC	Drainage provided in camps	Monthly	Construction Camp	Throughout construction phase
					Camp shall be located above or beyond the river/tributary	Contractor	PMT-ESMU and PISSC	Review of Camp layout plan	Once		Before camp construction
					Hazardous material storage area shall be covered	Contractor	PMT-ESMU and PISSC	Covered storage of hazardous materials	Once	Construction Camp	Following the camp construction
					Run-off from refuelling and wash down areas collected from treatment	Contractor	PMT-ESMU and PISSC	Measures are in place to collect the run-off from refuelling and wash down areas	Once	Construction Camp	Following the camp construction
		B.2.3.3	Spread of disease due to unhygienic looking/cooking/eating/ sanitary quarters		Provision of solid flooring and work surfaces which are easily to clean	Contractor	PMT-ESMU and PISSC	Solid flooring and surfaces are provided	Once	Construction Camp	Following the camp construction
					Contractor shall regularly clean camps	Contractor	PMT-ESMU and PISSC	Regular cleaning in all areas of camps	Monthly	Construction Camp	Throughout construction phase

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					Suitable latrines and washing facilities provided in the camps	Contractor	PMT-ESMU and PISSC	Latrines are provided at each camp	Once	Construction Camp	Following the camp construction
					Lined washing facilities including shower, available near each latrine, including clean running water, soap and drying facilities	Contractor	PMT-ESMU and PISSC	Suitable washing facilities provided at each camp	Once	Construction Camp	Following the camp construction
B.2.4 Health, Safety and Wellbeing of Work Force.		B.2.4.1	Wellbeing of staff	Wellbeing of staff	Provision of electricity and lighting	Contractor	PMT-ESMU and PISSC	Lighting and electrical supply provided with generator back-up	Monthly	Construction Camp	Throughout construction phase
					Provision of sheltered kitchens, separated from living quarters with raised washable preparation surfaces	Contractor	PMT-ESMU and PISSC	Provision of adequate kitchen	Once	Construction Camp	Following the camp construction
					Provision of on-call doctor	Contractor	PMT-ESMU and PISSC	Doctor visiting camp site regularly	Monthly	Construction Camp	Throughout construction phase
					Adequately stocked dispensary shall be provided Trained first-aider to be available on site on fulltime basis	Contractor	PMT-ESMU and PISSC	Adequately stocked dispensary available to all site staff	Monthly	Construction Camp	Throughout construction phase

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
		B.2.4.2	Trees cutting		Contractor shall supply staff with cooking fuel like LPG Cylinders	Contractor	PMT-ESMU and PISSC	Tree wood not used in kitchen	Monthly	Construction Camp	Throughout construction phase
		B.2.4.3	Signing of Code of Conduct.		The contractor will prepare a code of conduct and sign by his work crews		PMT-ESMU and PISSC	Code of conduct signed by all staff	Monthly	Construction Camp	Throughout construction phase
					Include awareness raising on HIV/AIDS and sexually transmitted disease and prevention and treatment of vector borne disease in Contractor training plan	Contractor	PMT-ESMU and PISSC	Approval of Contractor training plan	Once		At mobilization
							PMT-ESMU and PISSC	Training as per approved plan	Monthly	Construction Camp	Throughout construction phase
		B.2.4.3		Community Conflicts	Set up a complaint register at Contractor and Engineer office	Contractor	PMT-ESMU and PISSC	Complaint register maintained	Monthly	Contractor and Engineer's Offices	Throughout construction phase
					Contractor shall develop a code of conduct to govern behaviour of workers and all staff shall sign	Contractor	PMT-ESMU and PISSC	Code of conduct approved by Engineer	Once	Contractor and Engineer's Offices	At mobilization
					Contractor shall deliver training on cultural sensitivity to all workforce during induction	Contractor	PMT-ESMU and PISSC	Code of conduct signed by all staff	Monthly	Contractor and Engineer's Offices	Throughout construction phase

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					Contractor's Community Liaison Officer to consult local communities and focus on impacts to women and girls	Contractor	PMT-ESMU and PISSC	No complaint received regarding mobility of women and girls	Monthly		Throughout construction phase
					Migrant staff prohibited to from entering local villages	Contractor	PMT-ESMU and PISSC	No complaint received regarding migrant staff entering the local villages	Monthly		Throughout construction phase
		B.2.4.4	Hunting and loss of Fauna		Ban on hunting, poaching and trapping of all fauna by all project personnel's	Contractor	PMT-ESMU and PISSC	No hunting reported/observed	Monthly	Project area	Throughout construction phase
					Biodiversity monitoring of impacts of fauna	Contractor	PMT-ESMU and PISSC	Status and behaviour of terrestrial and avia-fauna	Quarterly	Project office	Throughout construction phase
		B.2.4.5	Accidents and Emergencies		Contractor shall prepare a shutdown procedure and evacuation plan	Contractor	PMT-ESMU and PISSC	Plan submitted to Engineer			
					Emergency Response Plan to man-made and natural disasters (including floods, fire, etc.)		PMT-ESMU and PISSC	Annual evacuation drill	Annually	Construction Camp	Throughout construction phase
					Emergency access routes shall be signed and maintained	Contractor	PMT-ESMU and PISSC	Emergency access routes clear and signed	Monthly	Construction Camp	Throughout construction phase

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					Fire extinguishers to be provided through out camp	Contractor	PMT-ESMU and PISSC	Fire extinguishers provided	Monthly	Construction Camp	Throughout construction phase
					Public areas at risk from fire in camp identified in emergency plan with evacuation measures	Contractor	PMT-ESMU and PISSC	Plan submitted to Engineer include evacuation procedure of public in event of major fire	Once		At mobilization
		B. 2.4.6		Child labour	No any person below the age of fourteen year shall be allowed to work on site as per Sindh Prohibition of Employment of Children Act 2017	Contractor	PMT-ESMU and PISSC	Verification of Birth Certificate / Matriculation certificate	Once	Construction site	Throughout construction phase
B.2.5	Camp Planning	B.2.5.1	Community Disturbance		Camp layout plan to be submitted to Engineer	Contractor	PMT-ESMU and PISSC	Review of Camp layout plan	Once	Construction Camp	Before camp construction
		B. 2.5.2	Loss of Flora and Fauna		Locate camps away from the embankments of Watercourses.	Contractor	PMT-ESMU and PISSC	Commencement of works not before approval of plan	Once	Construction Camp	Before camp construction
		B.2.5.3		Environment and Social conflicts due to influx of external workforce	Preference will be given to local labours from adjacent communities. Awareness raising of residents for safety protection. Awareness raising of labour to ensure respect for local customs.	Contractor	PMT-ESMU and PISSC	Camp will be established at least 500 m away from community, Local hired workforce, any complaint from local community, presence of CNIC or relevant documents.	Fortnightly		During construction

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
B.2.6	Security	B.2.6.1		Conflict with local communities, attack on staff	Security for avoiding any conflict with local communities	Contractor	PMT-ESMU and PISSC	Fencing and security shall be provided by Contractor at all camps. Entrance to camp shall be monitored and restricted	Monthly	Construction Camp	Throughout construction phase
					Preparation and Implementation of communication strategy	Contractor	PMT-ESMU and PISSC	Approval of Contractor's Communication Strategy	Once		At mobilization
							PMT-ESMU and PISSC	Implementation of Contractor's Communication Strategy	Monthly	Project area	Throughout construction period
					Contractor shall provide all staff with Identity Cards showing their association with the project	Contractor	PMT-ESMU and PISSC	All staff issued with identity cards	Monthly	Project area	
					Sindh speaking staff to be available to all active work sites to communicate with local community	Contractor	PMT-ESMU and PISSC	Sindhi staff available at all active work sites	Monthly	All active work sites	
					The Contractor shall include in the Emergency Plan, a procedure for emergency evacuation of camp and practice this procedure	Contractor	PMT-ESMU and PISSC	Plan submitted and approved	Once		At mobilization

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
								Annual evacuation drill	Annual	Construction camps	Throughout construction period
		B.2.6.2	Change in Landscape after closure of works		All temporary facilities shall be removed by Contractor after completion of the works	Contractor	CSC,EMECs and EMU	Temporary facilities are removed on completion of works	Once	Construction camps	at completion of works
			Noise		The camp sites shall be situated at least 500m from any settlement. On-demand noise monitoring will be carried out in case of any complaint or request by the affected communities. Additional mitigation measures will be identified and implemented in case the noise levels exceed the permissible limits. Community liaison will be maintained to ensure that complaints and grievances are addressed as soon as possible. Community liaison will be maintained during construction stage and GRM will be established to address complaints related to noise generation.	Contractor	PMT-ESMU and PISSC	Community complaints; Monitoring record	Monthly	All work sites and camp sites	Construction phase

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
	B.3. STORAGE OF MATERIAL										
B.3.1	Stockpile Storage of Materials	B.3.1.1	Increase in particulate matter		Proper covered storage. Water sprinkling of any uncovered stockpile where dust is generated	Contractor	PMT-ESMU and PISSC	No dust generated from stockpiles	Monthly	Stockpiles	Throughout construction period
		B.3.1.2	Ground and surface water pollution		Locate storage area away from water courses, drain and transport routes	Contractor	PMT-ESMU and PISSC	Review of camp layout plan	Once		Before camp construction
					Locate storage area above or beyond the flood plain	Contractor	PMT-ESMU and PISSC	Review of camp layout plan	Once		Before camp construction
					Use only designated storage areas	Contractor	PMT-ESMU and PISSC	Stockpile only in storage areas identified in Camp layout plan	Monthly	Project area	Throughout construction period
B.3.2	Storage of Hazardous Materials	B.3.2.1	Health and safety due to improper use of hazardous material		Fuel tanks and other hazardous material storage containers will be properly marked to highlight their contents.	Contractor	PMT-ESMU and PISSC	Hazardous material storage containers adequately labelled	Monthly	Hazardous material storage areas	Throughout construction period
					Hazardous areas to be secure and access limited to trained personnel only	Contractor	PMT-ESMU and PISSC	Untrained personnel's are not accessing	Monthly	Hazardous material	Throughout construction period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
								hazardous storage areas		storage areas	
					Provide hard compacted impervious and bunded flooring or secondary storage containers to stop run-off and seepage into the soil/ground/river from hazardous material storage areas.	Contractor	PMT-ESMU and PISSC	Hazardous material storage must be provided impervious flooring or secondary containment.	Monthly	Hazardous material storage areas	Throughout construction period
					Hazardous material sites identified on site	Contractor	PMT-ESMU and PISSC	Signs provided to identify hazardous material storage area	Once	Hazardous material storage areas	Following camp construction
					Provide fire extinguishers	Contractor	PMT-ESMU and PISSC	Fire extinguishers are provided	Monthly	Hazardous material storage areas	Throughout construction period
					Provide and enforce use of PPEs as per Contractor Health and Safety Plan	Contractor	PMT-ESMU and PISSC	PPEs used	Monthly	Hazardous material storage areas	Throughout construction period
		B.3.2.2	Ground or Surface Water Pollution		Storage areas for fuels and other hazardous substances shall have masonry or concrete secondary containment bund with 120% capacity of fuel stored	Contractor	PMT-ESMU and PISSC	Bunding provided at fuel bowsers	Once	Fuel tanks	Following camp construction

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					Hazardous material storage areas shall be covered and provided with concrete floor	Contractor	PMT-ESMU and PISSC	Concrete flood and cover to hazardous material storage areas and generators	Once	Hazardous material storage areas	Following camp construction
					Concrete or masonry bunding provided at perimeter of hazardous material storage area	Contractor	PMT-ESMU and PISSC	Bunding provided to hazardous material areas and generators	Once	Hazardous material storage areas and generators	Following camp construction
					Daily check of fuel tanks and immediate plugging of leaks	Contractor	PMT-ESMU and PISSC	No leakage observed at fuel tanks	Weekly	Fuel tanks	Throughout construction period
					Shovels, plastic bags and sand provided at fuel tanks and hazardous material storage area	Contractor	PMT-ESMU and PISSC	Spill kits provided	Monthly	Hazardous material storage areas and fuel tanks	Throughout construction period
					Spill prevention and contingency plan prepared by Contractor	Contractor	PMT-ESMU and PISSC	Approval of Plan	Once		At mobilization
					Hazardous material storage area or fuel tank not be situated adjacent to watercourse	Contractor	PMT-ESMU and PISSC	Review of camp layout plan	Once		Before construction camp
					Space maintained between containers to allow inspection	Contractor	PMT-ESMU and PISSC	Containers spaced to allow inspection	Monthly	Hazardous material	Throughout construction period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
										storage area	
					Select access roads to avoid run-off to river.	Contractor	PMT-ESMU and PISSC				
					The materials should be stored away from sunlight and direct exposure to air/wind	Contractor	PMT-ESMU and PISSC	Material storage must be sheltered	Monthly	Hazardous material storage area	Throughout construction period
		B.3.2.3	Health and Safety and Pollution		Oil designated storage area used	Contractor	PMT-ESMU and PISSC	Stockpiles only in storage areas identified in camp layout plan	Monthly	Project area	Throughout construction period
					Training on handling, use and disposal of hazardous material must be given to all those with access to hazardous material area	Contractor	PMT-ESMU and PISSC	Training as per Contractor's approved training plan	Monthly	Hazardous material storage area	Throughout construction period
					Covered transportation of hazardous material	Contractor	PMT-ESMU and PISSC	Hazardous material covered during transport to site	Monthly	Project area	at completion of works
		B.3.2.4	Ground and Surface Water Pollution After Closure of Works		All excess materials (other than earth stockpiles) shall be removed on completion of works	Contractor	PMT-ESMU and PISSC	Excess construction material removed	Once	Project area	at completion of works

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
				Ground and Surface Water Pollution after closure of works	Community liaison to be maintained.	Contractor	PMT-ESMU and PISSC	Number of complaints	Regular	Project area	Construction phase
B.4. WASTE MANAGEMENT											
B.4.1	Generation of Sanitary Wastes	B.4.1.2	Surface and Groundwater Pollution and Health of Staff		Provide latrines at the camps and prohibit staff from fouling the camp. Provide septic tank for collection and treatment of septic sanitary waste.	Contractor	PMT-ESMU and PISSC	Provision of latrines and septic tank for collection and treatment of sanitary waste.	Monthly	Camp site	Up to completion of works
B.4.2	Disposal of sanitary wastes using municipal system (if available)	B.4.2.1	Introduction of Inappropriate Contaminants or Waste Volume to Municipal System		Annual testing of wastes and submission of results to Engineer.	Contractor	PMT-ESMU and PISSC	Test results show wastes is within NEQS limit for pre-treatment	Annual	Construction camps	Throughout construction period
					Written consent from the operator of the municipal system submitted to Engineer	Contractor	PMT-ESMU and PISSC	Consent submitted	Once		At mobilization
		B.4.2.2	Use of municipal system which falls below		Only government approved system to be approved	Contractor	PMT-ESMU and PISSC	Government approved system used	Once	Construction camps	At mobilization

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
			NEQS standards								
B.4.3	Treatment of Sanitary Wastes using Septic Tank	B.4.3.1	Introduction of inappropriate contaminants septic system		Camps and offices to have septic tanks and soaking pits to treat sewage Only sanitary wastes treated in septic tanks	Contractor	PMT-ESMU and PISSC	No construction waste water entering septic tank	Monthly	Construction camps	
		B.4.3.2	Ineffective treatment of waste leading to ground or surface water pollution		Regular maintenance of the system by Contractor	Contractor	PMT-ESMU and PISSC	Monitoring of effluents against NEQs	Quarterly	septic tanks	Throughout construction period
					Submit pollution plan to Engineer including design or specifications of system to show treatment rate exceeds loading rate and include plan for treatment/disposal of sludge.	Contractor	PMT-ESMU and PISSC	Plan submitted and approved	Once		Throughout construction period
		B.4.3.3	Overflow of septic system surface		Location of system to ensure overflow shall not reach surface water bodies. Camp shall be located away from water course or water body. Monitoring will be carried out on weekly basis.	Contractor	PMT-ESMU and PISSC	Review of camp layout plan	Once	Construction camps	Before construction camp

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
B.4.4	Collection of domestic wastes	B.4.4.1	Surface and groundwater pollution		Provide garbage bins within all camps for domestic wastes	Contractor	PMT-ESMU and PISSC	Provision of bins	Monthly	Construction camps	Throughout construction period
		B.4.4.2	Regular collection and disposal of wastes		Regular collection and disposal of wastes	Contractor	PMT-ESMU and PISSC	Bins are not full	Monthly	Construction camps	Throughout construction period
B.4.5	Generation of wastes	B.4.5.1	Air, ground and surface water pollution		Return excess construction material to supplier	Contractor	PMT-ESMU and PISSC	Used construction material not disposed of	Monthly	Landfills and burns sites	Throughout construction period
					Use of recycling Contractor	Contractor	PMT-ESMU and PISSC	Recyclable material not disposed of	Monthly	Landfills and burns sites	Throughout construction period
					Sell steel of the old gates to contractor through auction as per procedure prescribed by the Government of Sindh		PMT-ESMU and PISSC		Monthly	Landfills and burns sites	Throughout construction period
					Reuse of domestic wastes (if applicable)	Contractor	PMT-ESMU and PISSC	Demolition wastes not disposed of where use available elsewhere	Monthly	Landfills and burns sites	Throughout construction period
					Community liaison to be maintained. GRM to be established to address related complaints.	Contractor	PMT-ESMU and PISSC	Number of complaints	Monthly	Landfills and burns sites	Throughout construction period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
B.4.6	Disposal of domestic wastes using Municipal facilities.	B.4.6.1	Ground and groundwater pollution, spread of disease		Domestic waste shall be collected from waste bins on alternate days and transport through tractor trolley to dispose of in nearby Municipal facility. A written agreement shall be made in between Municipal operator and contractor for disposal of domestic waste.	Contractor	PMT-ESMU and PISSC	Licence or Written agreement b/w Municipal operator and Contractor checked.	Monthly	Licenced site.	Throughout construction period
					Domestic wastes only to be disposed of in licenced site.	Contractor	PMT-ESMU and PISSC	No hazardous waste, medical waste or sanitary in licenced site	Monthly	Licenced site.	Throughout construction period
B.4.7	Disposal of medical wastes	B.4.7.1	Surface water pollution, health and safety of staff and public.		Medical wastes will be stored on site Contractor will engage third party contractor for treatment and ultimate disposal of medical waste in controlled manner.	Contractor	PMT-ESMU and PISSC	No medical wastes in municipal facility.	Monthly	Collection point	Throughout construction period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
B.4.8	Disposal of hazardous wastes	B.4.8.1	Ground, groundwater and surface water pollution, health and safety		Hazardous wastes to be passed to licensed contractor, or, available wastes to be stored in long term storage facilities meeting requirement of hazardous material storage area to be taken on client following construction. Details to be provided in pollution plan to the Engineer.	Contractor	PMT-ESMU and PISSC	Approval of Plan	Once		At mobilization
B.4.9	Transport of wastes	B.4.9.1	Littering, pollution		Wastes shall be covered (e.g. with a tarpaulin) during transport	Contractor	PMT-ESMU and PISSC	No wastes littering the project area	Monthly	Routes from camps landfill	Throughout construction period
B.4.10	Disposal of washout	B.4.10.1	Ground, groundwater and surface water pollution, health and safety		Treatment plan to be included in Contractor's plan to include, as necessary , flow and local equalization, pH adjustment, sedimentation using settling basins or clarifiers	Contractor	PMT-ESMU and PISSC	Approval of Plan	Once		
B.4.11	Closure of works	B.4.11.1	Ground, groundwater and surface water pollution, health and safety.		All solid wastes not within the landfill shall be removed from the project area on completion of works		PMT-ESMU and PISSC	All solid wastes landfill or removed from the site	Once	Project area	On completion of works

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
B.5. CONSTRUCTION PLANT AND VEHICLES											
B.5.1	Movement/operation of vehicles on site	B.5.1.1	Air pollution		All vehicles are regularly services as per manufacturers requirements	Contractor	PMT-ESMU and PISSC	Black smoke not observed emitting from Vehicles/plant	Monthly	Project area	Throughout construction period
							PMT-ESMU,PISSC and ESMEC	Monitoring of ambient air quality as per NEQS as shown in Box 8.1	Bi-annual	Project area	Throughout construction period
					Efficient driving practices included in Contractor's training plan	Contractor	PMT-ESMU and PISSC	Submittal and approval of plan	Once		At mobilization
							PMT-ESMU and PISSC	Training as per approved plan	Monthly	Project area	Throughout construction period
		B.5.1.2	Generation of dust		Access road to be adequately compacted or regularly sprinkled to prevent dust generation during use	Contractor	PMT-ESMU, PISSC and ESMEC	Dust not reaching the settlements in the project area Frequency of anti-dust water sprays during movement of vehicles	Monthly	Settlement in the project area	Throughout construction period
					Construction traffic limited to work area and established tracks	Contractor	PMT-ESMU and PISSC	Construction traffic use only established tracks	Monthly	Project area	Throughout construction period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
		B.5.1.2	Soil and Groundwater pollution		Vehicles/plants will be checked daily for fuel oils and leaks and fixed as required	Contractor	PMT-ESMU and PISSC	No fuel oil leaks observed form plant/vehicle	Monthly	Project area	Throughout construction period
		B.5.1.3		Community disturbance due to increase in traffic	Project vehicles in plant parked in designated areas as per camp layout plan.	Contractor	PMT-ESMU and PISSC	No vehicle observed parked outside the approved areas	Monthly	Project area	Throughout construction period
					Movement of vehicles/plant restricted to work hours	Contractor	PMT-ESMU and PISSC	No movement of vehicles/plant beyond works hours	Monthly	Project area	Throughout construction period
					Warning signs must be provided where access routes pass adjacent to settlements	Contractor	PMT-ESMU and PISSC	Warning signs provided near settlement	Monthly	Settlement in the project area	Throughout construction period
		B.5.1.4		Safety of community, other road users,	Vehicles speed limited to 30km/hr.	Contractor	PMT-ESMU and PISSC	Submittal and approval of plan	Once		At mobilization
			Fauna and staff		Safe driving practices included in Contractor's training plan	Contractor	PMT-ESMU and PISSC	Training as per approved plan	Monthly	Project area	Throughout construction period
					All Drivers hold a valid license	Contractor	PMT-ESMU and PISSC	Drivers able to show valid license	Monthly	Project area	Throughout construction period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					Flag persons to be provided where plant cross/meet village road	Contractor	PMT-ESMU and PISSC	Flag persons provided	Monthly	Road approaching and crossing	Throughout construction period
					Contractor's Community Liaison Officer to collaborate with communities to identify sensitive areas and inform communities prior to movement of large plant	Contractor	PMT-ESMU and PISSC	No complaint received from communities	Monthly	Settlement in the project area	Throughout construction period
					Vehicles with restricted rear visibility to be fitted with audible back-up alarm or provided with banks men	Contractor	PMT-ESMU and PISSC	Back-up alarms or banks men provided	Monthly	Project area	Throughout construction period
					Mud shall be cleared from vehicle before entering public roads, or else public roads shall be cleared of mud regularly	Contractor	PMT-ESMU and PISSC	No mud on public roads	Monthly	Project area	Throughout construction period
					Driving in project area after nigh fall is prohibited except on public highways	Contractor	PMT-ESMU and PISSC	No driving after dark	Monthly	Haul roads and temporary access roads	Throughout construction period
				Damage to public infrastructure	Damage to roads, infrastructure and property immediately	Contractor	PMT-ESMU and PISSC	No damage to roads/infrastructure	Monthly	Public roads	Throughout construction period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					repaired/compensated by Contractor						
					Use of horns is prohibited near the settlement	Contractor	PMT-ESMU and PISSC	Nor horns heard at settlement	Monthly	Settlement in the project area	Throughout construction period
			Disturbance of Fauna		Biodiversity monitoring of impacts on fauna	Contractor	PMT-ESMU and PISSC	Status and behaviour of terrestrial and avia-fauna	Quarterly	Project area	Throughout construction period
				Reduction in access to women and girls	Avoid routes use by women and girls as far as possible, if unavoidable, identify alternate routes for women and girls	Contractor	PMT-ESMU and PISSC	No complaint received from women and girls	Monthly		Throughout construction period
B.5.2	Deliveries to Site	B.5.2.1	Air pollution		Delivery vehicles engines should be off when queuing	Contractor	PMT-ESMU and PISSC	Queuing vehicles engines are not idling	Monthly	Construction camp	Throughout construction period
		B.5.2.2	Dust		Covered transportation of loose materials	Contractor	PMT-ESMU and PISSC	No dust generation from delivered materials	Monthly	Approach roads	Throughout construction period
		B.5.2.3	Community disturbance increase in traffic		Traffic management plan to be submitted to Engineer for approval and to include routes for delivery vehicles	Contractor	PMT-ESMU and PISSC	Submittal and approval of plan Delivery vehicles are following designated routes	Once		At mobilization

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					Deliveries should be carried out during the normal working hours and prohibited at night.	Contractor	PMT-ESMU and PISSC	No deliveries carried out in night.	Monthly	Construction camp	Throughout construction period
					Delivery vehicles are prohibited form queuing on public roads	Contractor	PMT-ESMU and PISSC	No queuing delivery vehicles on public roads	Monthly	Construction camp	Throughout construction period
					Vehicles to be unloaded off	Contractor	PMT-ESMU and PISSC	No unloading on public roads	Monthly	Construction camp	Throughout construction period
B.5.3	Road Closure/Congestions	B.5.3.1		Community disturbance due to increase in traffic	Flag persons to be provided where plant cross/meet village road.	Contractor	PMT-ESMU and PISSC	Flag persons provided	Weekly	At road partial closure	During partial road closure
					Contractor's Community Liaison Officer to collaborate with communities to identify sensitive areas and inform communities prior to movement of large plant	Contractor	PMT-ESMU and PISSC	No complaint received	Monthly	Settlement in the project area	Throughout construction period
					Traffic by-pass should be provided and signed	Contractor	PMT-ESMU and PISSC	By-pass provided and signed	Monthly	At road full closure	During road closure
					Request for road closure must be approved by relevant authority	Contractor	PMT-ESMU and PISSC	Approval for road closure submitted to Engineer	Once for each closure		Throughout construction period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
B.5.4	Refuelling of vehicles and plant on land or filling of fuel drums	B.5.4.1	Ground and surface water pollution		Refuelling points to be provided with a concrete pad and bund or drip trays used. Spill fuel disposed of as hazardous waste (of reused If possible)	Contractor	PMT-ESMU and PISSC	No fuel spillage from refuelling operations	Monthly	Project area	Throughout construction period
B.5.5	Noise Levels	B.5.5.1	Health of Community	Health of Community	Limiting working hours to between 6am and 6pm, six days a week. On-demand noise monitoring will be carried out in case of any complaint or request by the affected communities. Noise levels should be measured where work is undertaken or where sensitive locations and settlements exist. Additional mitigation measures will be identified and implemented in case the noise levels exceed the permissible limits. Community liaison will be maintained during construction stage and GRM will be established to address complaints related to noise generation.	Contractor	PMT-ESMU and PISSC	Community complaints; Monitoring record	Monthly	Where work is undertaken, camp sites and other sensitive locations.	Throughout construction period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
B.6. HEALTH AND SAFETY OF WORKFORCE											
B.6.1	General construction works	B.6.1.1	Health and safety of staff		Contractor shall prepare and submit occupational health and safety plan. This plan will need to describe all jobs, their risks, and the controls that will reduce risks; these controls may include PPE, restrictions on activities or locations, and other measures. The plan also needs to describe what training will be given to what workers. Those who work near water, at heights, with heavy equipment will need special training so those hazards can be managed. The contactor will ensure the use of Personal Protective Equipment (PPE) for his labours during construction period; The contractor will train his crews on the aspects covered in the above described OHS Plan; The	Contractor	PMT-ESMU and PISSC	Submittal and approval of plan. Number of reported accidents. Number of reported near-misses. Non-compliance observed. Community complaints.	Regularly		During construction phase

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					contractor shall fence the working area and unauthorized shall not be allowed to enter in the area; The Contractor will display sign boards and banners about traffic diversion at places on detour routes; He will provide a traffic man at appropriate places particularly near settlements to control traffic; Provision of speed breakers at appropriate places in consultation with/approval of the Engineer which should be removed after completion of the project; Obey speed limits; The Contractor will arrange a rescue team and first-aid facility in case of any accident; No private property without permission of the owner will be used for transportation; Drivers will fix net on containers while transporting stones and soil etc. Community liaison will be maintained during construction stage and GRM will be established to						

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					address complaints related to safety hazards.						
					Contractor will submit accident report to the Engineer following any accident on site. Report must details actions to be taken to reduce risk of occurrence	Contractor	PMT-ESMU and PISSC	Submittal of accident report	Monthly	Project area	Throughout contract period
					Qualified health and safety manager will be appointed by Contractor	Contractor	PMT-USMU and PISSC	Qualified health & safety manager present on site	Monthly	Project area	Throughout contract period
					Contractor shall engage a full time first-aider on site Contractor to have on-call doctor	Contractor	PMT-ESMU and PISSC	On site Presence of qualified Doctor	Monthly	Project area	Throughout contract period
					Provision of dispensary for treatment of staff. Dispensary to be stocked with appropriate medicines for likely incidents, diseases and ailments to be occurred on site. Stock	Contractor	PMT-ESMU, PISSC and ESMEC	Dispensary available on site and regularly restocked.	Monthly	Project area	Throughout contract period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					to be replenished as necessary. Contractor will maintained the record of patients regarding patients suffering from malaria, cholera, diarrhoea, respiratory ailments during construction phase.						
					First aid facility shall be provided at each work site in the project area	Contractor	PMT-ESMU and PISSC	First aid facilities provided at each work site	Monthly	Project area	Throughout contract period
					The Contractor shall include in the health and safety plan a procedure for the transfer of injured staff from the site to medical facilities including transport and provision of medical treatment in en-route.	Contractor	PMT-ESMU and PISSC	Submittal and approval of plan	Once		At mobilization
								Provision of resources required for implementation	Monthly	Project area	Throughout contract period
					Community liaison to be maintained. GRM to be established to address related complaints.	Contractor	PMT-ESMU and PISSC	Number of complaints	Regularly	All areas	During construction

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
B.7 STONE PITCHING AND FORMATION OF EMBANKMENTS											
B.7.1	Vegetation Clearance	B.7.1.1	Loss of flora		The area of clearance shall be limited to the area of work		PMT-ESMU and PISSC	the area of clearance is limited to the area of work	Weekly	Project area	Throughout contract period
B.7.2	Trees Cutting	B.7.2.1	Impacts on flora and fauna		Tree inventory is prepared	Contractor and PISSC	PMT-ESMU and PISSC	Tree inventory prepared	Weekly	Project area	Throughout contract period
					Compensatory tree plantation is proposed	Contractor	PMT-ESMU and PISSC	compensatory tree plantation is carried out	Monthly	Project area	Throughout contract period
B.7.3	Forming Embankments	B.7.3.1	Flooding		Provide alternative drainage for rainwater if earthworks fill established drainage lines	Contractor	PMT-ESMU and PISSC	alternative drainage is provided	Monthly	Project area	Throughout contract period
		B. 7.3.2	Resettlement/ Relocations of public, private and commercial structures.		ARAP has been prepared according to WB policy 4.12 to compensate the relocation.	PMT and PISSC	PMT ESMEC	Compensation amount received before the relocation.	Once	Project area	Before relocation
B.7.4	Formation of Borrow Areas	B.7.4.1	Habitat loss		Borrow areas shall not be established in the agriculture active land	Contractor	PMT-ESMU and PISSC	Borrow areas are not established in the agriculture active lands	Weekly	Project area	Throughout contract period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
		B.7.4.2	Borrowing from toes of embankments		the material shall not be borrowed from the outer and inner toe of the embankments	Contractor	PMT-ESMU and PISSC	Material are not borrowed from the toe of the embankments	Weekly	Project area	Throughout contract period
		B.7.4.3	Borrow area in environmental sensitive sites		Borrow areas shall not be established in the wetlands, forest and any other environmental and social sensitive areas	Contractor	PMT-ESMU and PISSC	Borrow areas are not established in the environmental and social sensitive sites	Weekly	Project area	Throughout contract period
		B.7. 4.4	Restoration/ rehabilitation of borrow areas		Restoration of borrow areas	Contractor	PMT-ESMU and PISSC	Borrow areas are restored to its original condition if situated in the private land	Monthly	Project area	Throughout contract period
		B.7.4.5	Loss of wetlands		Borrow areas within wetlands is prohibited	Contractor	PMT-ESMU and PISSC	Borrow areas are not located in wetlands/marsh lands and swamps	Weekly	Project area	Throughout contract period
		B.7.4.6	Loss of topsoil		Remove and stockpile topsoil which is unsuitable for use in embankment formation	Contractor	PMT-ESMU and PISSC	top soil is removed	Weekly	Project area	Throughout contract period
		B.7.4.7		Loss of access to Indus River	Access across borrow areas to the embankments shall be maintained by ensuring a 3m (10ft) wide strip remains unexcavated at 300m	Contractor	PMT-ESMU and PISSC	access routes are maintained	Weekly	Project area	Throughout contract period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
		B.7.4.8	Increased seepage losses from Indus River		A clearance of 5m (16ft) must be maintained between proposed embankment toe and borrow areas	Contractor	PMT-ESMU and PISSC	A clearance of 5m is maintained	Weekly	Project area	Throughout contract period
			Noise		Limiting working hours to between 6am and 6pm, six days a week. On-demand noise monitoring will be carried out in case of any complaint or request by the affected communities. Additional mitigation measures will be identified and implemented in case the noise levels exceed the permissible limits. Community liaison will be maintained to ensure that complaints and grievances are addressed as soon as possible. Community liaison will be maintained during construction stage and GRM will be established to address complaints related to noise generation.	Contractor	PMT-ESMU, PISSC and ESMEC	Noise levels (in dBA), monitored at fixed locations and planed schedule during construction Community complaints; Monitoring record	Monthly	All work sites and camp sites	Construction phase

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
B.7.5	Access to Borrow Areas	B.7.5.1	Impacts on flora and fauna		available/existing access routes shall be followed	Contractor	PMT-ESMU and PISSC	existing access routes are followed	Weekly	Project area	Throughout contract period
		B.7.5.2	Impacts on agriculture land and crops		access routes in agriculture land shall be avoided			Same as above	Weekly	Project area	Throughout contract period
		B.7.5.3	if access rout in the agriculture land is unavoidable , the owner of the land and crop shall be compensated		Compensation to the affected person shall be paid			the affected person is compensated	Weekly	Project area	Throughout contract period
B.7.6	Loading lorries/dump trucks	B.7.6.1	Disturbance of ambient air		Minimize height between loader (excavator) and bed of lorry/dump truck	Contractor	PMT-ESMU and PISSC	minimum height is maintained	Weekly	Project area	Throughout contract period
B.7.7	Restoration of borrow areas	B.7.7.1	Loss of habitat and landscape change		Potential for shallow wetland creation shall be maximized by limited restored depth of borrow area to 0.3m	Contractor	PMT-ESMU and PISSC		Monthly	Project area	Throughout contract period
		B.7.7.2	Loss of topsoil		Spread stockpiled topsoil (where topsoil is unsuitable for formation of	Contractor	PMT-ESMU and PISSC		Weekly	Project area	Throughout contract period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					embankment) over borrow areas						
		B.7.7.3	Landscape change		Grade sides of borrow areas to 1:3	Contractor	PMT-ESMU and PISSC		Weekly	Project area	Throughout contract period
					Community liaison to be maintained. GRM to be established to address related complaints.	Contractor	PMT-ESMU and PISSC	Number of complaints	Regularly	Project area	Throughout contract period
B.8 ARCHAEOLOGY AND CULTURAL SITES											
B.8.1	Construction near cultural sites	B.8.1.1		Community disturbance	Exclude all works (including transport and haulage) from vicinity of community structures Identified in Socio-Environmental Map	Contractor	PMT-ESMU and PISSC	All works excluded from within 6m (20ft) of community structures	Weekly	Project Area	Throughout contract period
B.8.2	Construction near religious sites	B.8.2.1		Community disturbance	All works excluded from mosques and Graveyards if any.	Contractor	PMT-ESMU and PISSC	All works excluded from the identified locations			Throughout contract period
					Works do not block access to sites	Contractor	PMT-ESMU and PISSC	access to the sites is not blocked			
B.8.3	Discovery of unidentified cultural or religious site	B.8.3.1		Community disturbance	Contractor shall not trespass into the site, shall exclude all works and immediately inform Site Engineer	Contractor	PMT-ESMU and PISSC	Engineer informed of discovery of unidentified cultural or religious sites	Monthly	Project Area	Throughout contract period

Sr. No.	Project Activities	Section	Environmental Impacts	Social Impacts	Mitigation Measures	Responsibility		Key Performance Indicators	Monitoring Frequency	Location	Time Frame
						Execution	Monitoring				
					Community liaison to be maintained. GRM to be established to address related complaints.	Contractor	PMT-ESMU and PISSC	Number of complaints	regularly	Project Area	Throughout contract period
C. OPERATION PHASE											
C.1	Spoil heaps	C.1.1	Change in landscape		Use of surplus excavated material in agricultural fields or for construction of homes by the farmers to increase fertility and raising of low lying fields	SID	SID	Spoil heaps are used by the farmers	Continues	Entire project area	Continuous
C.2	Care of newly planted trees	C.2.1	Mortality of newly planted saplings		The Contractor shall be responsible for after care of the newly planted trees for the first year, after which trees will become responsibility of SID	Contractor and SID	SID	Survival of trees	Once	Entire project area	Continuous