GOVERNMENT OF SINDH

Irrigation Department

ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN (ESMP) FOR – 13 SMALL DAMS IN KOHISTAN REGION

Bandhaka, Baaro, Chakhri, Churlo, Sunn-2, Gadap-2, Khuda Bux, Lat-2, Jharando-2, Gorban Bhutti, Dahri Sharif, Jharando-1 and Gaib Janan






ADDITIONAL FINANCING OF SINDH RESILIENCE PROJECT – SRP (IRRIGATION COMPONENT) (P173087)

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PROJECT MANAGEMENT TEAM
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This document and its contents have been prepared and are intended solely for the information and use of the Government of Sindh, Irrigation Department concerning the **SINDH RESILIENCE PROJECT – ADDITIONAL FINANCING (SRP-AF).**

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LIST OF ABBREVIATION

ACE	Associated Consulting Engineers Ltd
AF	Additional Financing
BP	Bank Policy
BOQ	Bill of Quantity
CoI	Corridor of Impacts
DC	Deputy Commissioner
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
FGDs	Focus Group Discussions
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
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
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 P	Pakistani Rupee
PMT	Project Management Team
POPs	Persistent Organic Pollutants
PSC	Project Steering Committee
RAP	Resettlement Action Plan
RoW	Right of Way
SEPA	Sindh Environmental Protection Agency
SEPC	Sindh Environmental Protection Council
SID	Sindh Irrigation Department
SRP	Sindh Resilience Project
WB	World Bank
WHO	World Health Organization

1. EXECUTIVE SUMMARY

The Government of Sindh (GoS) has undertaken 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 last two years of the SRP implementation, fifteen dams were constructed which are at the completion stage. Now, through Additional Financing (AF) from the World Bank, the Government of Sindh under SRP (Irrigation component) is planning to construct thirteen small rainwater recharge dams (namely Bandhaka, Baaro, Chakhri & Churlo) in Tehsil Sehwan, District Jamshoro, (Sunn-2) in Tehsil Manjhan, District Jamshoro (Gadap-2, Khuda Bux, Lat-2, Jharando-2, Gorban Bhutti, Dahri Sharif & Jharando-1) in Tehsil Gadap, District Malir and (Gaib Janan) in Tehsil Gharo, District Thatta of Sindh. None of the proposed dams falls in any of the protected areas. During the survey of proposed small dams, it is observed that, none of the dam site is planned to be constructed within the boundary of any Protected Area or National Park. The closest protected area is minimum 15 km from the proposed dam sites.

In compliance with the national/ provincial regulatory requirements and World Bank safeguard policies an environmental and social assessment was carried out to address the potentially negative impacts of the proposed interventions under SRP-AF. Environmental categorization of the subprojects was done using the environmental and social assessment checklist. These subprojects are likely to cause low to moderate levels of environmental and/or social impacts, therefore, fall under category “B” under environmental categorization criteria as specified in the Environmental & Social Management Framework (ESMF) document prepared for the project and approved by World Bank. This Environmental & Social Management Plan (ESMP) has been prepared accordingly to meet the World Bank Category “B” project requirements for the subject works.

This ESMP covers information on the prevailing physical, biological, socio-economic, and environmental aspects of the sub-project areas. It provides a set of mitigation measures during the project implementation and operation to eliminate environmental and social negative impacts, up to an acceptable level. The sub-project areas are located in Kohistan region of Sindh. The local settlements in sub-project areas are also using subsurface and groundwater for drinking and irrigation. The groundwater depth varies from 80 to 250 ft. in different parts of the region. If the rains are absent for more than 2 years, the subsurface water gets dried making the local population get zero water abstraction both for drinking and harvests.

The proposed initiative by building groundwater recharge dams in the region would sustain the groundwater availability for a longer time. Water collected in the proposed dams would also serve the local livestock drinking water facility. The constructed structures would reduce

the flood velocity, and there will be fewer losses of the fertile soil erosion, public amenities like link roads, electricity polls, and local human settlements. Due to the absence of water, agriculture in the area is affected. As a result, rain-fed crops areas have been reduced with productivity going down due to moisture stress.

Millet, sorghum and castor beans are the main traditional summer rain-fed crops, while barely and mustard are grown during the winter. In addition to producing grains for human consumption, these crops are the primary sources of stalk/crop residue for livestock feeding. Livestock has been a major asset base of the local population. Lack of drinking water and vegetation in the areas has badly affected the health of livestock. Milk production of livestock has declined, which has serious implications for the nutritional status and income level of the households. Due to fodder unavailability, people are compelled to move their livestock to irrigated areas, which are also facing water shortages.

The recharge dams are in Kohistan region will augment the groundwater aquifers through percolation. The groundwater will be utilized through dug or tube wells for drinking. In addition to recharging of fresh groundwater aquifers, these investments will provide safe drinking water to local communities and livestock. Sub-projects are not financing the construction of any water supply channels / and tube wells.

The main objective of the construction of small dams is to recharge groundwater and is not deliberately designated to promote agriculture activities. The water from proposed dams may be taken directly from the reservoir for drinking and domestic use of community as well as drinking of livestock and wild animals. Local government at a later stage may construct the treatment and supply system for villages.

The Kohistan region lies in the arid zone. The availability of water in the region is scarce and the land surface consists of stunted scrub and bushes. The main natural ground cover is provided by grasses, which are nutritive and palatable fodder for the livestock. Babul, Neem, Jar and Kikar are some of the other trees and bushes found in the area. The major water resource in the area is seasonal precipitation that enables groundwater recharge, increases the vegetation covers on the top surface, and produces wild grass for animal feed. In some parts of the area, direct rainfall moisture is utilized for local crop production. The rainfall water drains in different Nais (streams).

The major sources of drinking water are the dug wells, and their depth ranges vary from 80 to 250 ft. in different parts of the Kohistan region. The other seasonal source of water is traditional manmade earthen ponds that are made by digging the ground and filled up by the surface runoff. These ponds are filled during the rainy season mainly in the summer months upon the occurrence of rains and provide water for 2-6 six months for human use and livestock. They also help in recharging groundwater aquifer. The women folks use to fetch water from an average distance ranging from 2-4 km from their villages from the existing earthen ponds.

The proposed structures will resolve the drinking water scarcity and comparatively, sweet water will be available to the local population for a long time through the year. Due to the construction of these proposed dams' total number of about 23 villages having 2425 households with 16976 male and female population (upstream and downstream) will be benefited from project intervention. The absence of significant rainfall in the last three to four seasons has triggered a drought emergency in Kohistan and other arid parts of Sindh Province.

An analysis of alternatives has been performed to review and assess different ways of meeting the project objectives that might have fewer environmental or socio-economic impacts. The dams shall be constructed as earth fill embankments using local materials of earth fill, fine and coarse filters and stone protection. Where large size stones are not available for riprap for upstream slope protection, they can be obtained from approved limestone quarries. A concrete spillway will be provided in the central part of the dam to allow safe passage of high river flow. This type of small dams are very useful, use local materials and construction industry, store more water for a long duration of time in form of groundwater recharge, are thus recommend as most suitable option to achieve the project objectives.

No acquisition of any private land is required for these subprojects because nais and nalas (Rainwater Rivers) are state-owned properties. Also, no demolition of structures will be involved and no one will be required to be resettled; as sub-project areas are lying in the less populated areas and the population is scattered. However social and environmental impacts may arise only due to temporary use of privately owned or government owned uncultivated for camp and construction material. Land for camps construction/ excavation of borrow material, and due to influx of external workforce, loss of vegetation, unattended residual wastes, and occupational health and safety issues for labors and community, therefore, ESMP has been prepared. The small dam sub-projects involve the construction of 16 to 23ft high earthen embankments and concrete structures of spillways. Existing tracks will be used for the transportation of the material, and it is capable for the transportation of material.

The water availability of Manchhar Lake from Indus River, hill torrents and Main Nara Valley Drain (MNVD).is 862,000 Ac-ft. The quality of these sources is good except MNV Drain. In the small dams (Under SRP-AF, Phase 1,II & III) only 0.103% of the water availability of Manchhar Lake will be retained for groundwater recharge. However, a part of the sub-surface flow will also join Manchhar Lake. Thus, the construction of these dams will not have any significant impact on lower riparian. Moreover, the small dams constructed under SRP-AF, Phase I, II & III on the tributaries of Malir River also have insignificant impact regarding lower riparian water avaliability. The combined reservoir storage capacity of these dams is 1014 acre-ft and the mean annual runoff of Malir River is 60,720 acre-ft. In these dams, which means only 3.33 percentage of Malir River inflow will be stored as groundwater. Since these dams are recharge dams, the groundwater will ultimately join Malir River and no significant impact on lower riparian is envisaged. Whereas, the remaining non-perennial streams will retain 4.9 to 28.3 %

of water, the rest will flow as the natural pattern hence untimately fulfill the needs of the downstream communities. This was also confirmed in the 'Performance Evaluation Study of Small Dams in Sindh Province', which stated that 'the locals also informed that water was spilled from the spillway of dams 2-3 times in monsoon season'.

During the construction of the dams cumulatively, about 706 workers will be hired by the contractors, thus their livelihood will be secured till the construction period. The contractor will restrict his outsider staff to mix with the locals to avoid any social problems. Local vendors will be provided regular business by purchasing campsite goods and services from them. The contractor shall include information about COVID-19 and the spread of sexually transmitted diseases (HIV/AIDS) within the worker's code of conduct. The operation phase of proposed dams (under SRP & SRP-AF) in addition to the already constructed dams may create a positive impact on ecology in terms of habitat restoration and vegetation cover enhancement due to the availability of water. The proposed dams will have a synergistic impact on overall water conservation and rain harvesting during the operation phase. The biodiversity/habitat (trees and vegetation) will be increased due to the availability of groundwater for a sustainable manner. An emergency response plan will be prepared for the all-dam site, which will be triggered in case of a dam break.

The construction-related impacts such as air pollution, noise and use of community resources can be well mitigated through the proper implementation of the mitigation measures. Moreover, the construction of proposed dams will improve ecological conditions of the sub-project area by the availability of water in the dry season comparatively without the proposed dam. The proposed small dams will enhance the ecological worth of the area, which usually faces acute drought. These small dams will provide drinking water for wildlife as well as residents of this area. However, mitigation measures recommended in the report would need to be strictly ensured by the Contractor during the construction period. Anticipated negative impacts can be mitigated through proper inspection and maintenance of vehicles and machinery to reduce exhaust emissions, using noise suppressors or mufflers for heavy equipment, watering of unpaved roads. Control of adverse impacts from construction debris/residual wastes by proper handling and immediate removal, control of water pollution through proper storage and handling of oil wastes and treatment of wastewater at the site, control of solid waste through sanitary storage and frequent collection for sanitary disposal.

Occupational health and safety will be ensured through continuous inspection to prevent disease and accidents, awareness-raising among labor and community, sanitation measures, COVID-19 management & monitoring and emergency response and rescue procedures, provision of adequate sanitary facilities, potable water, and garbage bins for workers. The sub-projects, after implementing the mitigation measures as detailed in this ESMP, will not have any significant and lasting negative impact on the physical, biological or socioeconomic environment of the area; rather it will have significant positive impacts that will ultimately result in sustainable development in the area. Besides, it outlines a specific description of

institutional arrangements for carrying out the mitigation measures and their monitoring; capacity building and training of field staff; implementation and cost estimates; and Grievance Redressal Mechanism (GRM). As a part of the ESMP, consultations with the stakeholders particularly the local communities were carried out. Environmental & Social Safeguard monitoring will be carried out to effectively implemented mitigation plans.

At the Project Management Team (PTM) level, the environment and social specialists will carry out safeguard monitoring to ensure that the mitigation plans are being effectively implemented, and will conduct field visits regularly. At the field level, more frequent safeguard monitoring will be carried out by the relevant staff of Project Implementation Consultants (PISSC). At the third level, PISSC and ESMU of PMT will produce monthly, quarterly and annual reports for ESMP implementation. The overall responsibility for implementing the SRP project as well as the present ESMP rests with the Project Management Team (PMT), Sindh Irrigation Department, headed by the Project Director. The PMT is supported by the Environmental and Social Management Unit (ESMU) established within the team. PMT has also engaged Project Implementation, Support, and Supervision Consultants (PISSC), responsible for construction supervision. PISSC also has environmental and social safeguard specialists to supervise and monitor ESMP implementation. Finally, the construction contractor will also have environmental, social, and health safety inspectors/officers to implement mitigation measures and other requirements defined in the present EMP. Appropriate clauses will be included in the construction contracts for this purpose. PMT has also engaged Environmental/Social Monitoring and Evaluation Consultants (ESMEC) to carry out external monitoring or third-party validation of the sub-project activities.

It has been concluded from the dam break study, the reservoir area of all thirteen (13) dams is small and not exceeding 2.58 sq. Kilometers. The area inundated in a worst-case scenario (Combined dam breach + 100-year flood) is 91.7 Sq. Km (35.41 sq. Miles) at Ghaib Janan, and the number of the person affected in the worst-case scenario is 379,510 people. Overall, the areas inundated by the breach of dams are small and consequently, the population affected in case of dam breach is small. Therefore, the incremental impact of dam breach on a 100-year design flood is not appreciable. However, an emergency preparedness plan will be prepared for all dams.

The primary corridor of impact area was surveyed physically and scanned through the HECRAS and Google map software to estimate expected loss during the construction and in case of a dam break, 100 years flood and combined impact of dam break + 100 years flood, in terms of tree cut, disturbance to track routes, agriculture land, archeological sites, and hand pumps. Since all the proposed dams are recharge dams, in which the estimated loss or disruption will be for few days (most probably 4-8 weeks) and temporary as the water will percolate to the aquifer. There are only two dirt road/katcha tracks and 166 trees will be impacted due to the construction of the proposed dams. Financial assistance in terms of

community support has been proposed in the ESMP budget to compensate for these and any other unforeseen impacts.

It is estimated that 166 trees will be felled for the construction of the above-mentioned 13 small dams. None of the protected species will be impacted. The replanting of 5 times trees against the number of cuts down trees would cost Rs. 830,000 considering the rate of Rs 1,000/- per tree. A total budget of Rs177,025,800. /- has been proposed for the implementation of the ESMP including the management of COVID-19. For general community support an amount of Rs. 7,000,000/ has been also allocated for each dam site. This has been incorporated as provisional sum item in ESMP bill of each dam and BOQ item.

2. INTRODUCTION

Sindh province is prone to multiple hazards: floods and drought. Although Sindh has not experienced a major flood since 2015, drought/drought-like conditions have been prevailing since 2013, which have impacted livelihood and food security in parts of the province. Particularly, drought has been a recurring phenomenon in the Southeast and Western districts of the province.

The Sindh Drought Needs Assessment (SDNA) conducted by the Food Security Working Group (FSWG) revealed that the arid zones in the West (Jamshoro and Dadu) and Southeast (Tharparkar, Umerkot and Sanghar) were the most droughts affected areas. These areas experienced moderate to severe drought during 2013-15 and reported livestock and crop losses. (Source: Sindh Drought Needs Assessment (SDNA) Report, January 2019).

The Government of Sindh through World Bank financing successfully implemented the Sindh Resilience Project (SRP) (Phase-I) with its focus on improving the system at the provincial Government and key agencies for managing disaster risk. Moreover, the World Bank on successful implementation of Phase – I has committed to providing additional financing for the construction of more small dams to improve resilience against drought. Total 53 dams will be constructed (8 Dams from saving amount and 45 dams from Additional financing) as depicted in Annexure – I.

In light of the above fact, the Government of Sindh launched the small dam projects in 2007. The main objectives of the small dams' project were to provide water in the arid areas to meet the demand for irrigation, domestic, livestock, potable water and serves for soil and water conservation measure to the remote areas in Sindh. The main water-scarce areas of Sindh are the Kohistan region, Nagarparkar and Ubhan Shah Hills - Nara region.

2.1 Project Background

The Government of Sindh has undertaken a project to enhance disaster and climate resilience; increase the technical capacity of government entities to manage natural disasters and climate variability construct small dams and support restoration of flood protection infrastructure on Indus River. The project designated as Sindh Resilience Project – Additional Financing (SRP-AF) is financed by World Bank and will be completed in five years 2021-2025 as stipulated time as depicted in PC-1. The funding for Sindh Irrigation Department (SID) is basically meant for mitigation measures for areas effected by frequent drought and flash floods. The project intends to undertake infrastructure interventions to address drought in water scarce regions of Malir Karachi, Jamshoro, Thatta, Shaheed Benazirabad, Sukkur, Khairpur, Qamber-Shahdadkot and Tharparkar through construction of small dams.

2.1.1 An Overview of the Sub Project

Thirteen dams have been proposed in the Kohistan region. Five small dams fall in District Jamshoro, seven in District Malir and one is in District Thatta.

The height of all proposed dams ranges from 16 to 23 ft. The water from these proposed dams will be taken directly for human and livestock consumption (mainly drinking). These will also act as recharge dams and augment the groundwater aquifers through percolation. The groundwater will be utilized through dug or tube wells for drinking, livestock, and agriculture purpose as it is presently in practice at the sub-project areas. These dams are not deliberately designated to promote agriculture needs. There will be no temporary or permanent road construction during the project activities to access the site.

The subprojects planned in this regard may potentially cause environmental and social impacts in the existing condition of the area. The environmental and social safeguards rapid screening depict that the subprojects (i) will not require land acquisition; (ii) will not involve any involuntary resettlement. However, there may be low to moderate adverse environmental and social impacts due to excavation of borrow areas, operation of machinery and vehicles, haulage routes and temporary damage to property due to the establishment of the Contractor's camp. This ESMP has been prepared through the identification of a set of responses to potentially adverse impacts; determining requirements for ensuring that those responses are made effectively and in a timely manner, and describing the means for meeting those requirements.

2.2 Objective of ESMP

The primary objectives of the ESMP are as follows:

- Identify social and environmental impacts of the sub-project and related activities.
- Suggest suitable mitigation measures for identified impacts at the planning, designing and implementation stage of the subprojects and to eliminate or reduce their adverse impacts, if any.
- Propose environmental monitoring program to ensure that mitigation measures are implemented during the subprojects execution and timely corrective actions are taken where required and
- Propose the institutional arrangements required to implement and monitor the ESMP.

2.3 Sub-Project Justification

Sindh province faces drought in the northern and eastern regions on a recurring basis. The drought from 1998 – 2002 affected 1.4 million people, 5.6 million heads of cattle and 12.5 million acres of cropped area, triggering the spread of malnutrition-based diseases in the

population and food scarcity in the province due to poor overall crop output. Similarly, the ongoing drought situation in the province since 2013 has affected 4.9 million heads of cattle and 0.5 million people, resulting in the death of 750 persons[1]. These drought events have also generally coincided with the El Niño phenomena. The strongest El Niño event in recorded history was 1998, which triggered a three-year-long drought in Pakistan. Another El Niño emerged in 2015 causing weaker monsoons over parts of Pakistan, including most of Sindh, and a strong heatwave in June-July 2015, which caused more than 1200 fatalities from heatstroke and dehydration, mostly in Karachi (the provincial capital).

For the last ten years, 50 percent of the overall population of reported sub-project areas have migrated to barrage areas to find food, because during droughts it becomes hard for them to even find water to drink, leave alone for growing crops[2].

A large number of sheep, camels, cows and goats had died in the reported sub-project areas during previous droughts. The loss of livestock has added to the severity of the situation, as many people in these areas are farmers that depend on their animals for revenue.

There are several positive effects of the proposed sub-project, which in general will improve the Socio-economic and environmental conditions of the sub-project areas, including:

- The project will help in recharging the groundwater in the areas where it is crucial for drinking, agriculture and livestock.
- The project will help in the improvement of the domestic water supply.
- Due to the project's intervention, water will be available for a longer period, which will augment to uplift socio-economic activities.

Kohistan region is the main potential site in Sindh Province to construct Small Dams, Delay Action Dams, and Weirs to retain the run-off generated from precipitation and continuous storm rainfall.

2.4 Sub-Project Categorization

The ESMF of World Bank defines that:

i. a full ESIA and ARAP/RAP will be carried out for subprojects requiring new construction or having significantly irreversible and widespread impacts or involving significant

[1] http://documents.worldbank.org/curated/en/121421468098388242/pdf/PIDISDS-APR-Print-P155350-05-26-2016-1464278669422.pdf

[2] https://dailytimes.com.pk/105392/drought-and-migration-a-brief-story-of-tharparkar/

degradation of forests of sensitive areas, requiring land acquisition or dam height more than 15meter;

ii. an ESMP (and a ARAP/RAP if needed) will be prepared for medium-sized sub-projects involving the 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 sub-projects resulting in low/negligible impacts.

According to Sindh – EPA: This sub-project falls under category schedule I – G (1) "Dams and Reservoirs with Storage volume less than 25 million cubic meters of surface area less than 4 sq.-km".

According to Donor Agency (World Bank): The sub-project is relatively small in size and it will have some minor adverse environmental impact, with reversible nature and site-specific as well therefore, this sub-project falls under category B. The present ESMP has been prepared accordingly to meet the Category B subproject requirements.

2.5 Subproject Screening Procedure

The sub-projects screening was performed through the checklist covering major environmental and social issues including storage volume and surface area of the reservoir, loss of community assets, basic facilities and services, livelihoods and income, possible affected ethnic minorities, archaeological sites and gender. Surveys were conducted to fill individual checklists and a summary of environmental and social concerns noted during surveys is given below. Checklists of thirteen proposed small dams are attached as Annexure-II.

- A total 166 number of trees (out of 509) would be felled due to the construction of thirteen small dams.
- None of the proposed dams is to be constructed in the protected area.
- No archaeological site observed near the proposed dam and no physical cultural resources at or near the proposed dam sites are observed which may likely be affected by construction activities.
- No settlement was observed near (within 500 meters) the dam sites. The nearest settlement is a minimum of 1 km away from the proposed dam site.
- During the construction of dams, some natural habitats might be disturbed, with negligible and reversible impacts.
- No protected forests were observed near proposed dam sites. The revenue department owned the land of the proposed dam sites.

- Ambient air quality, the ambient noise level is within acceptable limits of Sindh Environmental Quality Standards (SEQS).
- Water quality is generally good except the TDS, Chlorides and Total coliform; the values of these parameters are slightly high as limits set in SEQS.

2.6 Sub-Project Duration

The execution works of the sub-project are proposed to be completed in 12 months after the approval of PC-1 and the bidding process according to the procurement plan approved by the World Bank.

2.7 Policy, Legal and Administrative Framework

This section presents an overview of the policy and legal framework relevant to the environmental and social aspects of the subproject. More details have already been provided in the ESMF prepared for SRP.

2.7.1 National/ Provincial Legislation

Sindh Environmental Protection Act, 2014

The categories are defined in the Sindh Environmental Protection Agency (SEPA) Review of IEE and EIA Regulations, 2014. The sub-projects are categorized based on the storage volume and surface area of the reservoir mentioned in Schedule-I, section - G, subsection-I "Dams and Reservoirs with Storage volume less than 25 million cubic meters of surface area less than 4 sq.-km". Therefore, all sub-project dams are within limits given in Schedule-I of IEE and EIA Regulations, 2014, so fall under Schedule "I" so it will require an IEE. However, an ESMP has been prepared to satisfy the requirements of the World Bank for such types of projects. Moreover, No Objection Certificate (NOC) has been obtained, from Sindh EPA to fulfill legal compliance.

Sindh Wildlife Protection Ordinance, 2001

Sindh Wildlife Protection Ordinance 2001 provides for the Preservation, Protection, and Conservation of wildlife resources directly and specifies restrictions on hunting/poaching of wild fauna. The present park (Khirthar National Park) area was declared as a wildlife sanctuary in 1972 under the provisions of Sindh Wildlife Protection. Ordinance 1972 and in 1974 this Sanctuary was converted into Kirthar National Park.

National Park means the area declared as such under sub-section (1) of section 15 of the Sindh Wildlife Protection Ordinance 2001.

During the survey of proposed small dams, it is observed that, no any dam site is planned to be constructed within the boundary of any Protected Area or National Park. The closest protected area in Kirthar National Park, which is minimum15 km from the proposed dam sites.

Sindh Forest Act, 2012

The sub-projects will be executed in accordance with the Forest Act, 2012 and no unauthorized tree cutting will be allowed to worker or labour. Additional plantation will be made and for that, funds have been allocated in the contract under ESMP implementation budget.

During the Survey of proposed small dams, it was observed that no small dam site falls within any protected forest.

Antiquity Act, 1975

The Antiquities Act of 1975 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.”
This Act will be applicable to the physical interventions such as construction activities to be carried out for the sub-projects covered under this ESMP. 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, yet, unidentified antiquity.

2.7.2 The World Bank Operational Policies

The World Bank OP 4.01 Environmental Assessment EA. This policy defines the Environmental Assessment (EA) process and various types of EA instruments. The impacts anticipated are only during the construction period and for less than one year. The sub-project has positive impacts in the long run. Therefore, an ESMP is prepared in accordance with the WB OP 4.01 and this policy is applicable for this sub-project.

Natural Habitat (OP 4.04): The conservation of natural habitats is essential for long-term sustainable development. The World Bank, therefore, supports the protection, maintenance, and rehabilitation of natural habitats and their functions. The policy aims to limit circumstances under which conversion or degradation of natural habitats can occur. The policy can prohibit projects, which are likely to result in significant loss of critical natural habitats.
Some interventions are likely to be carried out near important habitats. Therefore, this OP is applicable for this sub-project.

Pest Management (OP 4.09): No pesticides, herbicides, or fungicides will be used in any of the subproject activities and hence this policy is not applicable for this sub-project.

Indigenous People (OP 4.10): The term “Indigenous People” is used in a generic sense to refer to a distinct, vulnerable, social, and cultural group possessing the following characteristics in varying degrees.

- Self-identification as members of distinct indigenous groups and recognition of the identity by others.

- Collective attachment to geographically ancestral territories in the project area and the natural resources in these habitats and territories.
- Customary cultural, economic social or political institutions that are separate from those of the dominant society and culture.
- An indigenous language is often different from the official language of the country or region.
- The OP defines the process to be followed if the project affects the indigenous people.

There is no known indigenous group as defined by OP 4.10 in the project area; therefore, this policy is not applicable for this sub-project.

Cultural Property (OP 4.11): The World Bank safeguards require full protection to physical cultural heritage on the World Bank-financed project sites. As the sub-project area, does not have any site of cultural, archeological, historical, or religious significance so, this policy is not applicable for this sub-project.

Involuntary Resettlement (OP 4.12): This policy protects the involuntary resettlement of the project-affected persons. However, sub-projects covered in this ESMP are to be constructed on the government's land. Therefore, this OP 4.12 does not apply to this sub-project. However, this OP 4.12 is triggered on the overall project and the Resettlement Policy Framework (RPF) has been prepared as part of the overall project instruments.

Safety of Dams (OP 4.37): This Policy relates to dam safety, but is equally applicable to reservoirs and ponds. The selected sub-projects are falling under the definition of Small Dams as specified in OP 4.37. As part of due diligence and considering that Bank's OP 4.37 is applicable.

International Waterways (OP 7.50): This OP is related to the types of projects falling within the ambit of international waterways like (a) any river, canal, lake, or a similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states. The sub-projects are to be constructed on Nais and Nalas, which cannot be considered as rivers that form a boundary between or any river or body of surface water that flows through two or more states. Therefore, this OP 7.50 does not apply to this sub-project.

World Bank Policy on Access to Information 2010: The World Bank's disclosure policy requires the environmental and social assessment report to be disclosed to the public, and a copy of the report to be sent to the Bank's Info Shop before the Bank commences the project appraisal. Under this Policy, ESMF has been disclosed to the public and has been placed on the official website of the Sindh Irrigation Department. The applicability status of World Bank environmental and social safeguard policies is given in Table - 1.

Table 1: Summary of the World Bank Policies and Their Triggering

Directive	Policy	Description	Triggered = ✓, Not Triggered= x	Comments
Environmental Assessment	OP 4.01	This OP requires environmental assessment	✓	As the subproject falls into Category B

Directive	Policy	Description	Triggered = ✓, Not Triggered= x	Comments
		(EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable. This OP also categorizes the projects based on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.		ESMP has been carried out instead of a full assessment (ESIA)
Natural Habitats	OP 4.04	The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. Through this OP, the WB, therefore, supports the protection, maintenance, and rehabilitation of natural habitats and their functions.	✓	Although the sub-project will not adversely impact natural habitats due to its small size and localized, the site-specific impact of short duration and reversible nature anyhow special provisions for the management of natural habitat has adhered to in ESMP.
Forestry	OP 4.36	The objective of this Policy is to assist the WB's borrowers to exploit the potential of forests to reduce poverty sustainably, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.	x	There will be no disruption to forests associated with the sub-project works.
Pest Management	OP 4.09	Through this OP, the WB supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides.	x	Not triggered as the Project will not use or promote the use of pesticides.
Indigenous Peoples	OP 4.20/OP 4.10	The policy requires projects to identify whether indigenous peoples are affected by the project and, if so, to undertake specific consultation activities and to avoid or mitigate impacts on this potentially vulnerable group.	x	Not triggered, as no Indigenous People or ethnic minorities will be affected by the sub-project.
Physical Cultural Resources	OP 4.11	The World Bank's general policy regarding cultural properties is to assist in their preservation and to seek to avoid their elimination.	x	No known areas of cultural heritage will be impacted by the sub-project. Procedures will be in

Directive	Policy	Description	Triggered = ✓, Not Triggered= x	Comments
				place to deal appropriately with any chance finds.
Involuntary Resettlement	OP/BP 4.12	The World Bank aims to avoid involuntary resettlement where possible. Where necessary or acquisition of land or other assets is necessary, the policy sets out requirements for participation in resettlement planning, mandates compensation for assets at replacement cost, and expects the borrower to see that incomes and standards of living of affected persons are improved or at least restored to what they were before displacement. The document also identifies the need for a Resettlement Plan, an abbreviated Resettlement Plan or otherwise.	✓	It is not relevant since there is no resettlement.
Safety of Dams	OP/BP 4.37	The Policy seeks to ensure that appropriate measures are taken and sufficient resources provided for the safety of dams the WB finances.	✓	The selected sub-projects are falling under the definition of Small Dams as specified in OP 4.37. As part of due diligence and considering that Bank's OP 4.37 is applicable.
Public Disclosure of Information	BP 17.50	This BP deals with the World Bank policy on disclosure of information. It is a mandatory procedure to be followed by the borrower and Bank and supports public access to information on environmental and social aspects of projects.	✓	ESMP summary would be available in Sindhi to the public and would be available on the SRP website.

2.8 Compliance with ESMP

This ESMP forms part of the Bid Documents and its compliance is mandatory. The contractor may request amendments in ESMP for aligning it with ground realities and requirements for each subproject/site mentioned in this ESMP. If there is any change required, the contractor shall make such a request to Project Implementation Support and Supervision Consultants (PISSC). The E&SS team of PISSC shall validate the amendments and consult with the E&SS team of PMT. If acceptable, the amendments would be communicated to the contractor by

PISSC. These site-specific ESMPs will then be embedded into the civil works contracts and therefore, will be legally binding on the contractor. The amended Site-Specific ESMP would be approved by PMT and PISSC.

The contractor will be required to prepare other site plans as mentioned in Section 7 including a traffic management plan, HSE plan, waste management plan, COVID-19 management plan, etc. The site-specific plans must be submitted to the PIU/Supervising Engineer for review and clearance within 30 days of the signing of the contract or before mobilization on-site, whichever date is earlier.

2.9 Data Collection

This report has utilized primary and secondary data, collected through field surveys, field tests and observations, laboratory testing, environmental monitoring in the field, data acquisition from concerned departments through consultation meetings, interviews and filling of questionnaires and sifting through published material to establish a baseline profile of physical, biological and socio-economic environmental conditions.

3. DESCRIPTION OF SUB-PROJECTS

3.1 Background

This sub-component will support the construction of small rainwater-fed dams, less than 10 meters in height, in Kohistan regions. The height of these all dams is ranging 16 to 23ft. The location of the SRP-AF Project area is shown in Figure – 1, and region-wise locations of sub-projects are shown in Figure – 2. In addition to recharging fresh groundwater aquifers, these investments will provide safe drinking water to local communities and livestock. Sub-projects are not financing the construction of any water supply channels / and tube wells. The main objective of the construction of small dams and weirs is to recharge groundwater and is not deliberately designated to promote agriculture activities.

3.2 Locations of Sub-Project

A detail of each proposed small dam is given below.

Figure 1: Location of the SRP Sub-Project Area

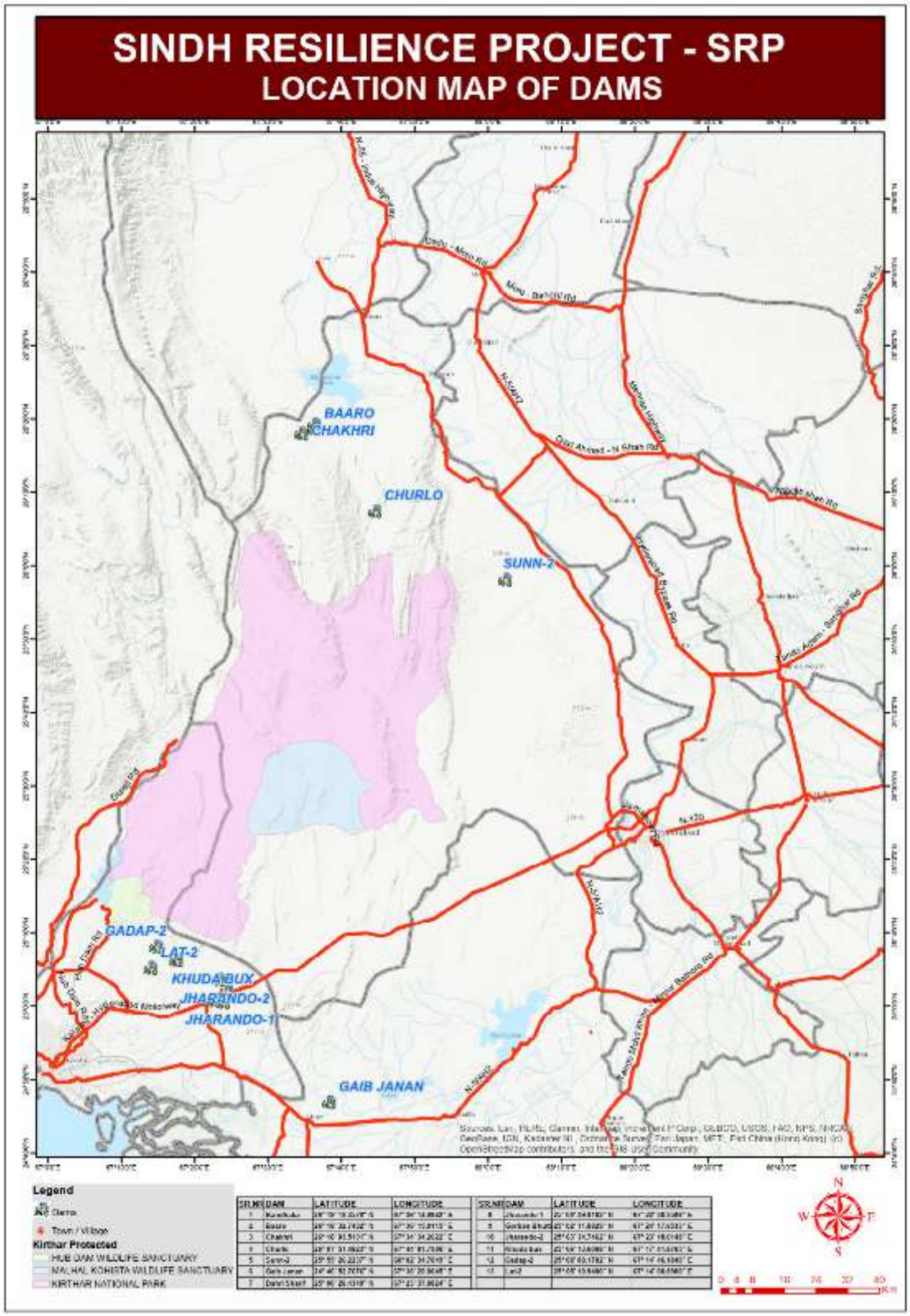
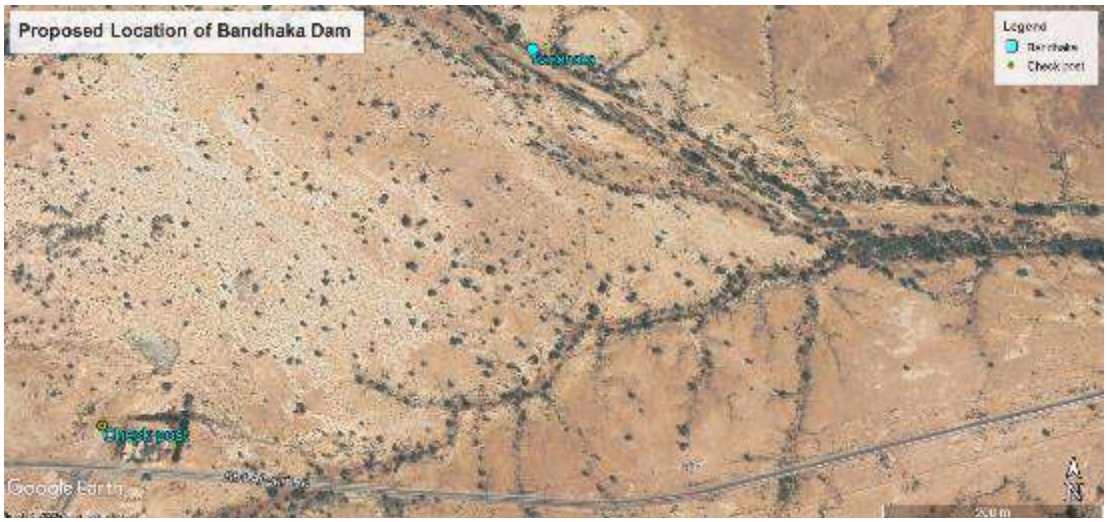


Figure 2: Location Plan of Dams in Kohistan Region

i. Bandhaka

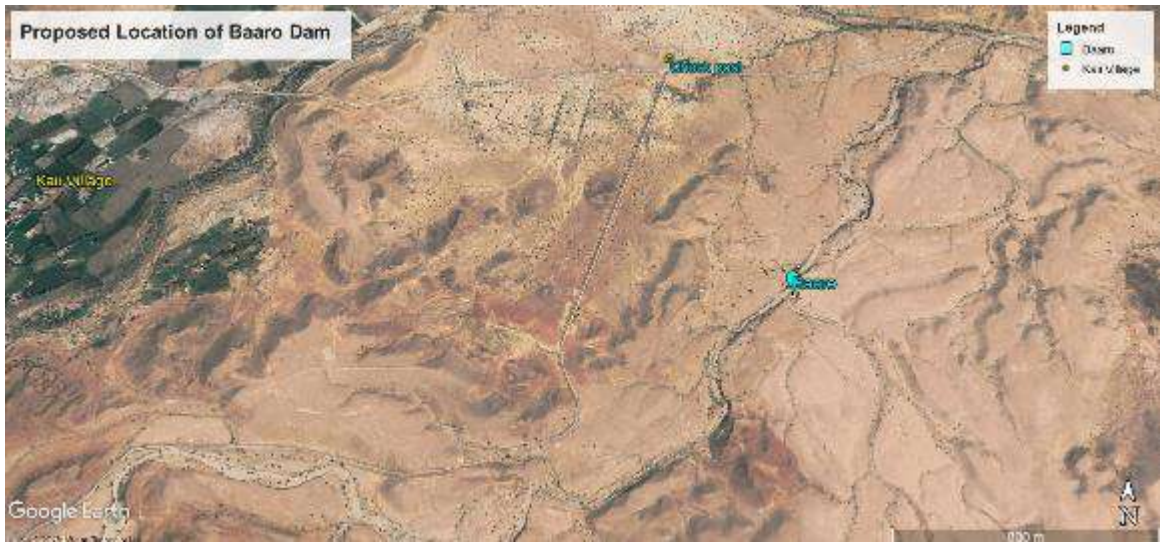
The proposed dam site is located in Taluka/Tehsil Sehwan District Jamshoro. The site is approachable by Sehwan through Indus Highway N-55 via Jhangara Town. The proposed small dam site is about 40 km from Sehwan City and 18 km away from Jhangara Town. No temporary/permanent road would be constructed for an approach to the small dam site Existing hilly tracks will be used for the transportation of the material. The proposed site is far from the human settlement (minimum about 1.5 Km away).



Proposed Dam	Nadi /Channel	Union Council	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Down-stream Features
1. Bandhaka	Bandhaka	Jhangra	Kaii	26°19'18.87"N 67°36'14.13"E	Kirthar National Park (KNP) is 36 km, South side. Manchar Lake is about 15 km away	Barren land	Barren land

ii. Baaro

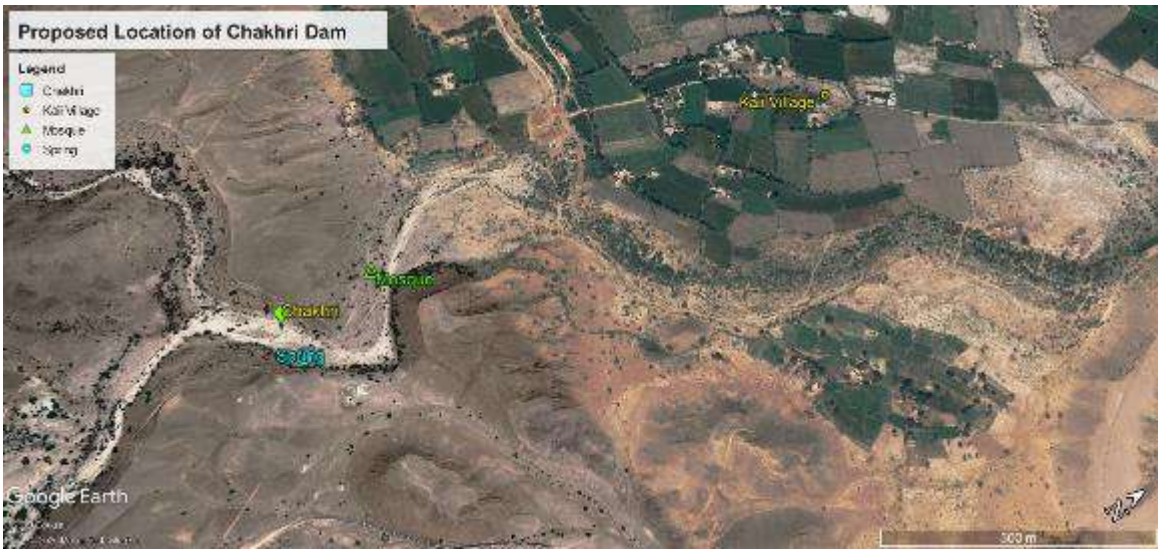
Proposed dam site is located at Taluka/Tehsil Sehwan District Jamshoro. The site is approachable by Sehwan through Indus Highway N-55 via Jhangara Town. The proposed small dam site is about 43 km from Sehwan City and 25 km away from Jhangara Town. This site is found in foothill of Kirthar range while Kirthar National Park is 35 km away from proposed site, no biological hotspots identified at this particular site. Nearby settlement is about 2.5 Km away.



Proposed Dam	Nadi /Channel	UC	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Down-stream Features
2. Baaro	Jhanl Nadi	Jhangara	Munhn Mukhri	26°18'30.45"N 67°36'14.46"E	KNP is 35 km, South side. Manchar Lake is about 20 Km away	Barren Land	Barren Land

iii. Chakhri

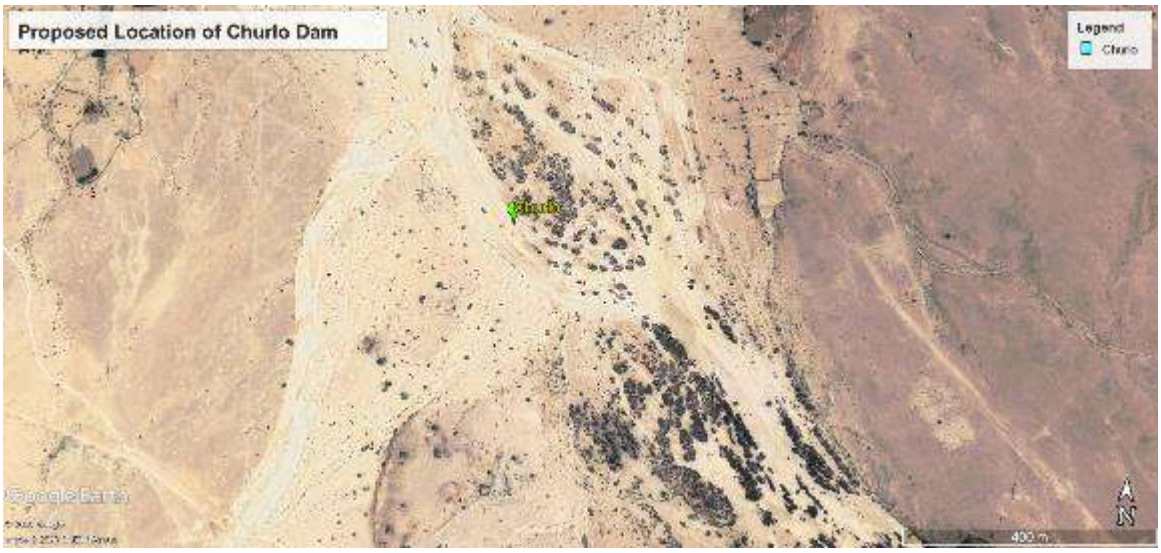
The proposed dam site is located in Union Council Jhangara of Taluka Sehwan District Jamshoro. The site is approachable by Sehwan through Indus Highway N-55 via Jhangara Town to Kai village. The proposed small dam site is about 45 km from Sehwan City and 28 km away from Jhangara Town. Nearby settlement is about 1 Km away.



Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected area	Upstream Features	Down-stream Features
3. Chakhri	Kaii nadi	Jhangara	Bakhur	26°18'3.70"N 67°34'34.06"E	KNP is about 38 km, South side. Manchar Lake is about 22 Km away	Barren Land,	Agricultural Land

iv. Churlo

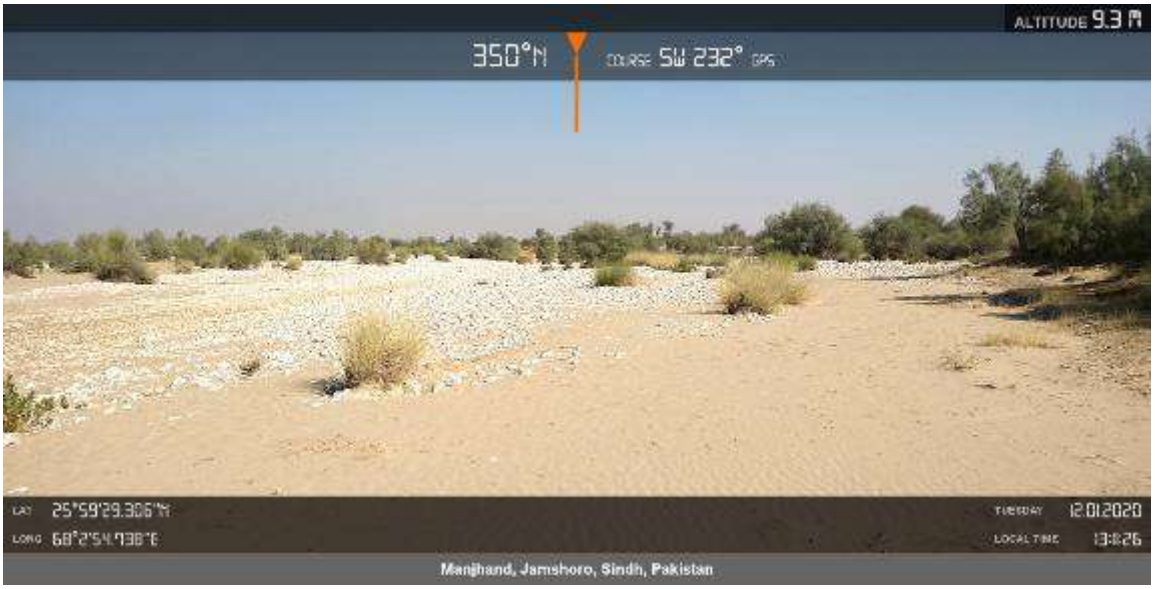
Churlo site is found on Taluka Sehwan District Jamshoro. The site is approachable by Sehwan through Indus Highway N-55 via Manchar Lake Road. The proposed small dam site is about 55 km from Sehwan on Manchar Lake road. Hilly area is draining rainwater into Bhandi stream and finally drains into Manchar lake about 25 km away. Nearby settlement is about 2 km away.



Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Down-stream Features
4. Churlo	Bhandi stream	Jhangara	Wali Muhammad Gabol	26°7'52.97"N 67°43'58.49"E	KNP is about 25 km South side. Manchar Lake is about 25 Km north side	Barren Land	Barren Land (93%) sparsely farm land (7%)

v. Sunn-2

The proposed site is located in Taluka/Tehsil Manjhand of District Jamshoro. The site is approachable by Sehwan through Indus Highway N-55 via Sunn Town. The proposed small dam site is about 60 km from Sehwan on Rani Kot Fort Road. There are two main streams Toming and Sunn contributing rainwater to Sun-Nadi. Kirthar national park jurisdiction is about 30 km from the proposed site. Nearby settlement is about 2 Km away.



Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Down-stream Features
5. Sunn-2	Sunn	Shalmani	Muharam Khan Khoso ,	25°59'51.39"N 68° 3'8.72"E	KNP is about 30 km South side Manchar Lake is about 69 Km north side	Barren Land	Barren Land

vi. Gadap-2

The site is approachable through Karachi Hyderabad Motorway M-9 via Gadap Road. The proposed small dam site is about 50 km from Karachi near Gadap Town. No temporary/permanent road would be constructed for an approach to the small dam site. Nearby settlement is about 1 km away.

Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Down-stream Features
6. Gadap-2	Gadap Nai	Gadap-2	Noor Hassan Jokhio ,	25° 7'39.61"N 67°14'27.80"E	Hub dam Wildlife Sanctuary is about 15 km – North side	Barren and Agricultural Land,	Barren and Agricultural Land

vii. Khuda Bux

The site is approachable through Karachi Hyderabad Motorway M-9 via Gadap Road. The proposed small dam site is about 45 km from Karachi near Radho Jokhio. Nearby settlement is about 1 km away.

Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Down-stream Features
7. Khuda Bux	Thando	Shah Mureed	Radho Jokhio	25° 5'38.86"N 67°16'25.41"E	Hub dam Wildlife Sanctuary is about 20 Km – North side	Barren and Agricultural Land,	Barren and Agricultural Land,

viii. Lat-2

The site is approachable through Karachi Hyderabad Motorway M-9 via Gadap Road. The proposed small dam site is about 40 km from Karachi near Ghulam Ali Jokhio village. Nearby settlement is about 1 Km away.

Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Down-stream Features
8. Lat-2	Lat	Shah Mureed	Ghulam Ali Jokhio	25° 5'10.87"N 67°14'0.39"E	Hub Dam Wildlife Sanctuary about 18 Km – Northside	Agricultural Land,	Barren and Agricultural Land,

ix. Jharando-2

The site is approachable through Karachi Hyderabad Motorway M-9 via Kathore Road. The proposed small dam site is about 55 km from Karachi near Ibrahim Goth/village about 1 Km away. Nearby settlement is about 1 Km away.

Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Downstream Features
9. Jharando-2	Jharando	Khathor	Ibrahim Goth	25° 3'3.87"N 67°23'7.02"E	Hub Dam wildlife Sanctuary about 15 Km – North side	Barren land and Mountain	Agricultural and Barren land

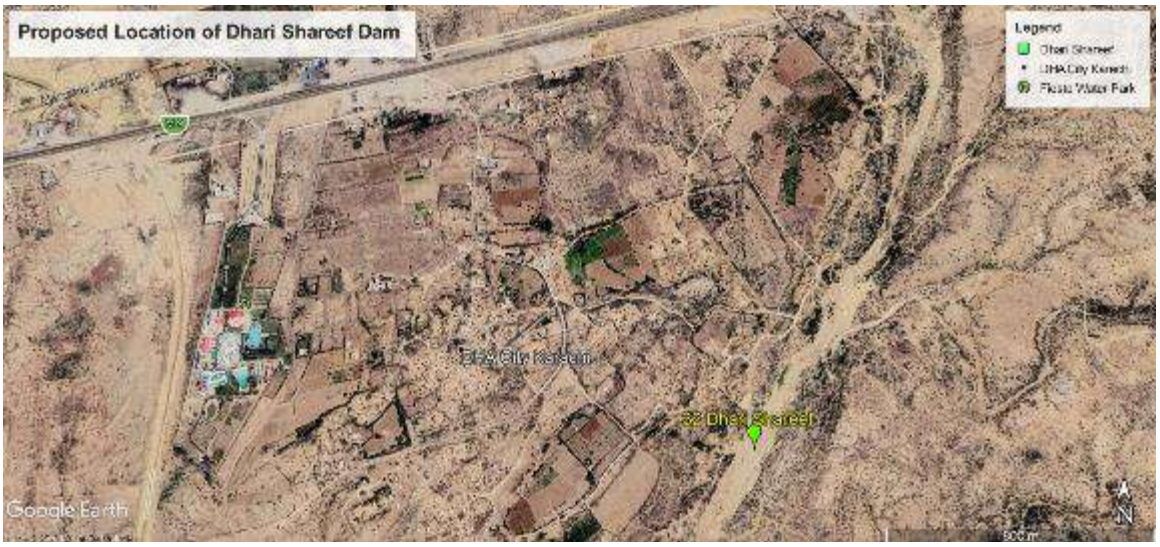
x. Gorban Bhutti

The proposed dam site is located at Taluka & District Malir. The site is approachable through Karachi Hyderabad Motorway M-9 via Kathore Road. The proposed small dam site is about 50 km from Karachi near Haji Din Muhammad/village, which is about 1 km away.

Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Downstream Features
10. Gorban Bhutti	Mol nai	Khathor	Haji Din Muham mad	25° 2'43.13"N 67°24'10.89"E	Hub Dam Wildlife sanctuary is about 20 Km North side	Barren and Agriculture land	Barren Land.

xi. Dahri Sharif

The proposed dam is situated at Tehsil & District Malir. Malir River is the largest one having non-perennial flow during the rainy season. The site is approachable through Karachi Hyderabad Motorway M-9 via M9 N5 Link Road. The proposed small dam site is about 40 km from Karachi near Haj Sadiq Goth/village (about 1km).



Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Down-stream Features
11. Dahri Sharif	Malir	Charun	Haji Sadiq Ghot	25° 0' 54.12" N 67° 24'15.05" E	Hub Dam Wildlife sanctuary is about 30 Km away towards – North side	Barren and Agriculture land	Barren Land.

xii. Jharando-1

The proposed dam site is located at Tehsil & District Malir. Low vegetation cover was observed on the proposed dam area. The site is approachable through Karachi Hyderabad Motorway M-9 via M9-N5 Link Road. The proposed small dam site is about 35 km from Karachi near Imam Ali Gaincho/village. Nearby settlement is about 1 Km away.

Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Down-stream Features
12. Jharando-1	Jharando	Charun	Imam Ali Goth	25° 0'32.16"N 67°22'31.31"E	Hub Dam Wildlife sanctuary is about 35 Km away towards – North side	Barren Land	Barren Land,

xiii. Gaib Janan

Ghain Janan is located at Taluka/Tehsil Mirpur Sakuro and District Thatta. The proposed area is almost barren. The site is approachable through N5 Super Highway via Gharo City. The proposed small dam site is about 60 km from Karachi near Gharo city. Nearby settlement is about 2 Km away.

Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates of the proposed site	Distance from Protected Area	Upstream Features	Down-stream Features
13. Gaib Janan	Kharisar	Gharo Town	Rassal Jokhio	24°46'41.40"N 67°38'24.34"E	Haleji wetland is about 18 Km towards – East side	Barren land	Agricultural and Barren Land

3.3 Salient Features of Sub-Project

The main components of the sub-project are the construction of small rain water-fed dams, less than 10 meters in height, in Kohistan region. The main objective of the construction of small dams and weirs is to recharge groundwater. Salient features of sub-projects are given in Table – 2 below.

Table 2: Salient Features of the Sub-Projects

Description	Lower Kohistan Region												
	Bandhaka	Baaro	Chakhri	Churlo	Sunn-2	Gadap-2	Khuda bux	Lat-2	Jharando-2	Gorban Bhutti	Dahri Sharif	Jharando-1	Gaib Janan
Catchment Area (sq.mile)	14	6	3	103	105	7	63	29	28	238	458	31	12
Design Flood (cfs)	7046	3233	2345	19376	13487	6012	20700	10343	9325	30757	57150	9235	7535
El.of River Bed (ft)	222	231	313	365.5	221	488	447	365	393	335	284	317	42
El.of Spillway Crest (ft)	238	247	329	379	236	504	460	378	408	347	294	332	52
Spillway Width (ft)	340	160	115	380	430	300	470	400	300	390	540	300	370
Head Over Crest (ft)	3.0	3.0	3.0	5.5	4.0	3.0	5.0	3.5	4.0	7.4	9.0	3.9	3.0
Highest Flood Level (ft)	241	249	332	384.5	240	506	465	381	412	354	303	335	55
El.of Dam Crest (ft)	244	253	335	387.5	243	510	468	384	415	358	306	339	58
Dam Height above Riverbed (ft)	22	22	22	22	22	22	21	19	22	23	22	22	16
Weir height above river bed ft)	16	16	16	14	15	16	13	13	15	12	10	15	10
Reservoir area at normal pool level (Acre)	139	16	6	23	75	28	78	16	38	26	20	15	157
Reservoir Area (Sq.-Km)	0.56	0.06	0.02	0.09	0.30	0.11	0.32	0.06	0.15	0.11	0.08	0.06	0.64
Reservoir Capacity (Acre-ft)	490	84	29	96	407	115	345	68	210	120	87	69	607
Storage Volume (million cubic meter)	0.60	0.10	0.04	0.12	0.50	0.14	0.43	0.08	0.26	0.15	0.11	0.09	0.75

The proposed dams will augment the groundwater aquifers through percolation. The groundwater will be utilized through dug or tube wells for drinking and livestock purposes as it is presently in practice at the sub-project areas.

3.4 Construction Activities

The Construction activities for various sub-project dams will span 12 months. The execution works of the sub-project are proposed to be completed in 12 months after the approval of PC -1 and bidding process according to the procurement plan approved by the World Bank. The related activities are the establishment of contractor's camp and stockyards for cement, steel, and aggregate, shifting of necessary machinery and equipment to site and exploitation of borrow areas, construction of concrete spillways, earth fill embankments and one-room building for dam O&M staff. The major activities are briefed below:

i. Contractor's mobilization: After awarding the contract the selected Contractor shall be mobilized in the field and arrange the camp for their staff and labor. The machinery and other necessary equipment shall be shifted.
ii. The concrete structures will be constructed with contraction joints. PVC water stopper shall be provided at these joints.

iii. The borrow areas will be excavated as per specifications. The borrow material will be loaded and transported by tractor trolleys through the approved traffic management plan.

iv. Formation of embankments/ bunds for the reservoir with the soil obtained from borrow areas. Activities involve unloading the soil on embankment, leveling, and compaction of soil in layers.

v. The stone shall be loaded and transported from nearby quarries or by approved material quarries to the site through trucks and unloaded/stacked at designated places.

vi. Stone pitching works shall be carried out as per specification.

vii. Restoration of campsite and Contractor's demobilization.

3.5 Construction Material

The following construction materials are foreseen to be used in the construction of concrete spillways and earthen bunds:

a) Embankment fill
b) Fine and coarse filters
c) Toe drain stones
d) Gravel bedding
e) Riprap stones
f) Cement
g) Fine and coarse aggregates
h) Reinforcement
i) Water
j) PVC water stops

Estimated quantities of construction material required are given in Table – 3. The materials used for the construction of the sub-project proposed dams includes coarse aggregates, fine aggregates (sand), rock for stone pitching and riprap, earth, water, cement and steel.

Natural materials such as coarse aggregate, toe drain stones, riprap stones, and coarse filters can be obtained from crush plants of local suppliers, which are abundant near all sub-project dam sites. The fine aggregate and fine filters will be obtained from approved query areas.

The water would be obtained from tube wells installed by the Contractors. The contractor shall strictly bound not to use community tube well as this may compete for the local water resource in the dry season when water table decline. The contractor will conduct an Electrical resistivity-surveying test along with a pump-out test to assessing the groundwater potential required for the construction activities before the tube wellbore. This condition will be included in the bid document as contractual binding.

Table 3: Estimated Quantities of Construction Materials, No.s of Trips & Water Quantities

Sr. No	Dams	Earthwork (Cft)	Dumper required. (1000cft)	Earthwork (Cft)	Dumper required. (1000cft)	Cement Concrete (Mass)	Trucks required for cement (600 bags capacity)	Dumper (1000cft) required for Sand	Dumper (1000cft) required for Caorse aggregates	Cement Concrete (RCC)	Trucks req. for cement	Dumper (1000cft) required for Sand	Dumper (1000cft) required for Caorse aggregates	Trailer required of 60 ton capacity	Protection Stones	Truck required of 28 ton capacity	Filter Media		Total trips
		Excavation	No.	Fill	No.	Mass (Cft)	No. of trips	No. of trips	No. of trips	RCC (Cft)	No. of trips	No. of trips	No. of trips	No. of trips	(Cft)	No. of trips	Fine (Cft)	Coarse (Cft)	No.
1	Bandhaka	2,189,933	2,190	1,423,544	1,424	332,367	81	91	181	212,863	41	61	122	6	528,917	1,243	266,703	316,111	6,020
2	Baaro	759,758	760	283,820	284	159,810	39	44	87	144,135	27	41	82	4	129,921	305	59,581	76,234	1,809
3	Chakhri	463,728	464	170,848	171	104,099	25	28	57	117,557	22	34	67	3	67,496	159	30,407	43,081	1,103
4	Churlo	1,348,424	1,348	388,799	389	376,009	91	103	205	232,886	44	67	133	6	185,357	436	88,925	113,341	3,024
5	Sunn-2	1,324,995	1,325	945,384	945	429,640	104	117	234	248,546	47	71	142	7	274,242	644	143,456	196,111	3,977
6	Gadap-2	1,194,196	1,194	1,046,174	1,046	283,599	69	77	155	193,442	37	55	111	5	386,955	909	189,885	230,394	4,078
7	Khuda Bux	2,168,815	2,169	2,110,213	2,110	432,907	105	118	236	261,469	50	75	149	7	640,447	1,505	329,145	424,696	7,278
8	Lat-2	2,462,995	2,463	1,090,287	1,090	322,644	78	88	176	198,680	38	57	114	5	482,791	1,134	224,677	249,185	5,717
9	Jharando-2	1,337,753	1,338	223,724	224	312,243	76	85	170	199,796	38	57	114	5	116,981	275	48,142	58,422	2,489
10	Gorban Bhutti	1,290,040	1,290	161,026	161	398,106	97	109	217	254,431	48	73	145	7	82,669	194	30,842	44,371	2,416
11	Dahri Sharif	3,514,003	3,514	245,431	245	564,406	137	154	308	338,280	64	97	193	9	109,517	257	47,570	70,536	5,097
12	Jharando-1	1,551,543	1,552	197,694	198	299,194	73	82	163	194,618	37	56	111	5	100,065	235	43,302	54,263	2,608
13	Gaib Janan	1,089,260	1,089	1,004,312	1,004	244,136	59	67	133	179,327	34	51	102	5	349,865	822	171,760	211,102	3,750
Total		20,695,444	20,695	9,291,257	9,291	4,259,160	1,033	1,162	2,323	2,776,028	529	793	1,586	73	3,455,222	8,118	1,674,397	2,087,846	49,366

Sr. No	Dams	Earthwork (Cft)	Water required for Compaction	Cement Concrete (Mass)	Water required	Cement Concrete (RCC)	Water required	Water required for construction (Total)	
		Fill	cft	Cft	cft	Cft	cft	cft	Cusec
1	Bandhaka	1,423,544	170,825	332,367	30,215	212,863	15,205	216,245	0.007
2	Baaro	283,820	34,058	159,810	14,528	144,135	10,295	58,882	0.002
3	Chakhri	170,848	20,502	104,099	9,464	117,557	8,397	38,362	0.001
4	Churlo	388,799	46,656	376,009	34,183	232,886	16,635	97,473	0.003
5	Sunn-2	945,384	113,446	429,640	39,058	248,546	17,753	170,258	0.005
6	Gadap-2	1,046,174	125,541	283,599	25,782	193,442	13,817	165,140	0.005
7	Khuda Bux	2,110,213	253,226	432,907	39,355	261,469	18,676	311,257	0.010
8	Lat-2	1,090,287	130,834	322,644	29,331	198,680	14,191	174,357	0.006
9	Jharando-2	223,724	26,847	312,243	28,386	199,796	14,271	69,504	0.002
10	Gorban Bhutti	161,026	19,323	398,106	36,191	254,431	18,174	73,688	0.002
11	Dahri Sharif	245,431	29,452	564,406	51,310	338,280	24,163	104,924	0.003
12	Jharando-1	197,694	23,723	299,194	27,199	194,618	13,901	64,824	0.002
13	Gaib Janan	1,004,312	120,517	244,136	22,194	179,327	12,809	155,521	0.005
Total		9,291,257	1,114,951	4,259,160	387,196	2,776,028	198,288	1,700,435	0.05

Cement will be procured from Jamshoro, Hyderabad, Sehwan and Karachi cities. Most of the other construction supplies such as fuel, steel, and lubricants can also be arranged from big

cities like Jamshoro, Karachi and Hyderabad. Some other construction materials such as rolled steel bars, PVC water stops, and steel plates for formwork, pump installation material may be brought from Hyderabad and Karachi.

3.6 Construction Camp and Workforce

For the construction of dams and appurtenant works, camps will be established on the government land near the dam sites, minimum 1250 ft (380 m) away from proposed dam site and 1.5 km away from settlements. As construction works are confined only to the dam's site, therefore, camps will be placed as per designated sites. The contractor will give preference to local people for unskilled labor from the communities with the consultation of elders of different communities in an equitable manner and there would be no need of setting up large-scale camp.

Only 15 to 20 workers will be accommodated in each camp. Most of the laborers will go back to their nearby homes after completion of the daily work, these will include the drivers/operators (tractor trolley, loader. etc.) and some semi-skilled labor. The contractor will be bound to provide facilities like kitchen/washing/bathing/ latrine with septic tanks and medical checkups (including COVID related) to laborers. The health screening of laborers and workers will be conducted at the start of the project. The contractor will prepare workers' code of conduct plans and Camp layout plan and get it approved by the Resident Engineer and PMT for implementation at site. The camp will be established after the approval of the layout plan. All these interventions have been discussed and consensus was built from the community during the public consultations. Details are given below in Table – 4.

Table 4: Details of the Camps Site for Each Sub-Project

Sr. No.	Subproject Name	Coordinates		Away from the Dam site (ft.)	Away from the Settlement (ft.)	Land Required
		Latitude	Longitude			
1	**Bandhaka**	26° 18' 58.1212" N	67° 36' 15.8215" E	1700	6621	4 Acre
2	**Baaro**	26° 18' 44.1059" N	67° 36' 12.6472" E	1250	9452	4 Acre
3	**Chakhri**	26° 17' 59.6943" N	67° 34' 53.8849" E	1660	4941	4 Acre
4	**Churlo**	26° 07' 36.7262" N	67° 43' 28.9574" E	5860	12422	4 Acre
5	**Sunn-2**	25° 58' 24.0107" N	68° 02' 39.9224" E	2800	9362	4 Acre
6	**Gadap-2**	25° 08' 31.4989" N	67° 15' 01.5696" E	2800	6081	4 Acre
7	**Khuda bux**	25° 06' 30.4614" N	67° 18' 02.7624" E	3400	6681	4 Acre
8	**Lat-2**	25° 05' 36.9403" N	67° 14' 15.9549" E	2700	5981	4 Acre
9	**Jharando-2**	25° 04' 07.3339" N	67° 23' 57.5705" E	4800	8081	4 Acre
10	**Gorban Bhutti**	25° 02' 20.6522" N	67° 24' 34.9012" E	1650	4931	4 Acre
11	**Dahri Sharif**	25° 00' 35.4092" N	67° 24' 26.6904" E	2700	5981	4 Acre
12	**Jharando-1**	25° 00' 50.4275" N	67° 22' 48.8241" E	1650	4931	4 Acre
13	**Gaib Janan**	24° 46' 44.5088" N	67° 37' 39.0273" E	3450	10012	4 Acre

Prospective campsites location map is shown as Annexure-III.

3.7 Borrow Material

The fill for the earthwork/embankment can be obtained from borrow areas near dam sites where suitable soil is available. The Contractors will identified their borrow areas as per their arrangement and get the approval from PMT/PISSC.. Quantities of fill material are given in Table – 3.

3.8 Machinery & Equipment

The construction work includes earthwork and concrete work. These works will require earthmoving machineries such as excavators, dumpers, graders and rollers, transit mixtures, etc. the concrete works will involve medium-size batching plant and concrete placing equipment. All equipment will be directly managed by the contractors. The estimated machinery and equipment required are given in Table – 5.

However, the actual number of equipment required on the site will be determined by the contractor to carry out the strengthening work.

Table 5: List of Machinery and Equipment to be used on all Sub-Projects

Machinery/ Equipment	Sub-project Names													Total
	Bandhaka	Baaro	Chakhri	Churlo	Sunn-2	Gadap-2	Khuda bux	Lat-2	Jharando-2	Gorban Bhutti	Dahri Sharif	Jharando-1	Gaib Janan	
Loader	3	4	3	3	3	4	3	3	4	4	3	3	3	**43**
Tractor Trolley dumper	8	10	8	8	8	12	8	8	10	10	8	8	8	**114**
Earth leveler machine	2	2	2	2	2	2	2	2	2	2	2	2	2	**26**
Excavator	3	4	3	3	3	4	3	3	4	4	3	3	3	**43**
Transit Mixtures	4	5	4	4	4	5	4	4	5	5	4	4	4	**56**
Batch Plant	1	1	1	1	1	1	1	1	1	1	1	1	1	**13**
Total	**21**	**26**	**21**	**21**	**21**	**28**	**21**	**21**	**26**	**26**	**21**	**21**	**21**	**295**

3.9 Manpower Requirement

The manpower required by the contractor during the execution of the sub-projects is given in Table – 6. For unskilled laborers, local people will be preferred. Machinery Loader/Dumper/Trucks/ Tractor Trolley will be used for bringing earth material from the designated sites. Local operators/drivers will be preferred with valid driving licenses having experience of driving vehicles like (Truck, dumpers, and Dozers, etc.). This does not include the drivers, which will carry the stone from the quarry and other items like cement and steel from the local market.

Table 6: Estimation of Required Manpower

Sr. No.	Type of Manpower	Sub-project Names													Total
		Bandhaka	Baaro	Chakhri	Churlo	Sunn-2	Gadap-2	Khuda bux	Lat-2	Jharando-2	Gorban Bhutti	Dahri Sharif	Jharando-1	Gaib Janan	
1	Construction Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	**13**
2	Environment and Social Safeguard Staff	3	3	3	3	3	3	3	3	3	3	3	3	3	**39**
3	Surveyor	3	3	3	3	3	3	3	3	3	3	3	3	3	**39**
4	Skilled laborer	4	5	4	4	4	5	4	4	5	5	4	4	4	**56**
5	Semi-skilled laborer	5	6	5	5	5	6	5	5	6	6	5	5	5	**69**
6	Unskilled laborer	15	15	15	15	15	15	15	15	15	15	15	15	15	**195**
7	Drivers/operators	21	26	21	21	21	28	21	21	26	26	21	21	21	**295**
Total		**52**	**59**	**52**	**52**	**52**	**61**	**52**	**52**	**59**	**59**	**52**	**52**	**52**	**706**

Manpower requirement is based on best estimates and subject to revision. The final requirement would be determined after the finalization of bid documents by the contractor(s).

3.10 Delineation of the Area of Project Influence

The Corridor of Impact (CoI) for the sub-projects has been considered carefully keeping in view the proposed interventions and associated impacts during construction, operation, and maintenance phases. The CoI would cover the footprint of the temporary and permanent works or the working area required to complete the works, the anticipated impacts during construction and operation phases. The spatial extent of the subproject area when preparing the ESMP has been focused on keeping in view the proposed interventions and broad impacts of the sub-project after completion. The CoI is classified as described below.

3.10.1 Primary Impact Zone

The primary corridor of impact area was surveyed physically and scanned through the HECRAS and google Maps software to estimate expected loss during the construction and in case of a dam break, 100 years flood, and combined impact of dam break + 100 years flood. Table – 7, shows the expected loss in terms of Tree cut, disturbance to track routes, agriculture land, archeological sites, and hand pumps. Since the all-proposed dams are recharge dams, in which the estimated loss or disruption will be for few days (4 to 8 weeks) and temporary as the water will percolate to the aquifer. There are only 2 dirt roads and 166 trees will be impacted due to the construction of the proposed dams. Financial assistance has been proposed in the ESMP budget to compensate for these impacts. For each site land use maps have been developed which are attached as Annexure-III. The maps cleared that there is no impact on th agricultural land in the area.

Table 7: Primary Impact Zone

Sr. No	Name of Project	Dam Type	Road Type	Trees	Agriculture Land Area (Acres)	Archeological Site (if any)	Hand pump/ Well
1	Bandhaka	Recharge	-	21	-	-	-

2	Baaro		-	06	-	-	-
3	Chakhri		-	06	-	-	-
4	Churlo		-	17	-	-	-
5	Sunn-2		-	13	-	-	-
6	Gadap-2		-	10	-	-	-
7	Khuda bux		1 (Dirt road)	05	-	-	-
8	Lat-2		-	20	-	-	-
9	Jharando-2		-	20	-	-	-
10	Gorban Bhutti		-	10	-	-	-
11	Dahri Sharif		-	02	-	-	-
12	Jharando-1		-	06	-	-	-
13	Gaib Janan		1 (Dirt road)	30	-	-	-
		Total	**2**	**166**			

3.10.2 Secondary Impact Zone

The secondary impact zone consists mainly of the settlements benefitting from the enhanced water availability in the wells. Maps regarding the Land use, camp location, and secondary impact zone have been depicted in Annexure – IV. These areas are mostly expected to be impacted positively in the medium and long term through the availability of groundwater for domestic use as well as for livestock consumption. 23 villages are located in the downstream/secondary impact zones of the proposed small dam sites are mentioned in Table – 38. Furthermore, the small dams will hold rainwater at its upstream a few times depending upon soil permeability, from where livestock drinking and other domestic needs of local communities will be met. Cumulatively, due to the construction of small dams the groundwater level both in upper and lower riparian will be increased. In addition, the project is also expected to enhance the groundwater table in the long run. This has been be elaborated on in subsequent chapters.

4. ANALYSIS OF ALTERNATIVES

4.1 Selection of Dam Site Location

The Consultants have undertaken reconnaissance survey of the Kohistan Region for selection of small dam sites. For selecting 45 dam sites, in total 63 sites were identified/scrutinized within the project area based on GIS studies. Reconnaissance surveys by the consultant's staff accompanied by the Client staff were undertaken on these 63 identified dam sites to select most feasible 45 sites. Subsequently rapid Socio-Environmental and Ecological Assessment of these sites has been also carried out before final selection. The present 13 dam sites out of 45 most feasible sites have been selected considering findings of the reconnaissance survey & recommendations of the previous studies by following criteria as given in below:

Selection Criteria	Status
(i) Dam is located in water-scarce area, which solely depends for water on groundwater and rain runoff for drinking and agriculture purposes.	(i) All thirteen proposed dams are located in highly water-scarce areas of Sindh Province.
(ii) Dam is able to either: a) Effectively recharge groundwater or b) Create a storage pond that will supply water for a longer period of time	(ii) All of the proposed dams are recharge dams
(iii) The topographical and geotechnical conditions at dam site provide suitable conditions for safe and economical structure.	(iii) The topographical and geological conditions at all 13 dams are such that they provide the most economic and safe dams.
(iv) The negative effect of dam on lower riparian's is negligible.	(iv) Average 3.43% of the available water will be retained for groundwater recharge for all proposed small dams, the rest will flow naturally and benefited the lower riparian Table 34 & 35 shows the total estimated inflow and proposed retention volume for each site. On the other hand, in recharge dams, the maximum benefit will reach the downstream communities.
(v) There should be a minimum negative social or environmental impact of the dam or on the other hand,	(v) This is true for all sub-projects.

Selection Criteria	Status
there must be a positive long-term positive impact on environmental and social conditions.	
(vi) No or small land acquisition or resettlement is involved due to the construction of dam.	(vi) In all 13 dams no land is to be acquired and no resettlement is involved, as all sub-projects will be built on lands owned by Revenue Department, Government of Sindh and there are no settlements, which need to be displaced nor even any farm or agricultural land will be impacted.
(vii) The project must be economic viability.	(vii) The economic analysis has shown that the sub-projects are economically viable with a tentative benefit cost ratio of 3.01.

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

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

- Economic;
- Environmental; and
- Social

For the alternatives considered in this chapter, each category is assigned an impact significance according to the criteria given in Table – 8.

Table 8: 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

4.2 The Available Alternatives for Sub-projects

The subject small dams are planned to be constructed in arid zones of Kohistan region in of Sindh. The geographical location of these regions is such that the source of water is rain water which normally falls for few days of a year and the ground water. The proposed small dams will primarily contribute to provision of water to communities during dry period by recharging of underground aquifers and formation of storage ponds.

To develop resilience against draughts the following alternative may be considered:

Option 0: Do nothing
Option 1: Construction of Gabion Dams
Option 2: Construction of Diversion Dams
Option 3: Construction of Small Earthen Dams with proper overflow Spillways

The scope of SRP-AF is only small dams are to be considered and as per World Bank and ICOLD criteria, the small dams shall not be higher than 10 m and reservoirs not larger than 2400 Acft (3 million cubic meters) capacity. Thus, large dams are not considered as an Option of this study

4.2.1 Option 0: No Project Alternative

In the No Project Scenario, the following issues are expected to continue:

- Communities will suffer hardships of dry seasons, particularly during long periods of droughts.
- People may increase the extraction of groundwater resulting in its depletion and deterioration of groundwater quality and quantity.
- Due to a shortage of water, local people may resort to migrations, which may increase social problems and economic burdens.
- Due reduction in crop production and livestock people may develop social vices such as armed robbery and terrorism.

4.2.2 Option 1: Construction of Gabion Dam

The gabion dams are the structures constructed across rivers / nallas / nais by placing stones in boxes/crates of steel wire mesh is an option to obstruct flows of water and recharge groundwater. This option is considered not suitable for the purpose for the following reasons.

- Gabion dams do not have a long life. The steel meshes are rusted and enclosed stones get washed away during nalla / river flows.
- Gabion dams are vulnerable to vandalism. People cut the mesh wires and steal them for their uses. A broken gabion gets easily damaged and washed away by subsequent flows.
- The heights of gabions are not kept more than 6 to 10 feet. The required heights of subproject dams vary from 16 to 23 feet.
- The gabion dams can be used as recharge delay action dams only. Due to their porous body, the gabion dams cannot be used as storage dams.

In view of the above reasons, the gabion dams are not considered technically feasible for the subprojects.

Figure 3: Gabion Dam/Weir

4.2.3 Option 2: Construction of Diversion Dams

The small diversion dams can be constructed access rivers / nallas to divert river flows to adjoining lands for spate irrigation. There are following observations on this option:

- This option is suitable in cases where river / nallas flow for a long duration of time. Whereas in arid zones of Sindh the rains are very scanty and are of short duration. However, discharges in Nais / Nallas are very high but occur for a period of 7 to 15 days in a year. Therefore, this type of dam will not be beneficial.
- There are chances that diversion of flow may become uncontrolled, which may badly inundate the adjoining crops and villages and may create shortage of water in the downstream area.

Due to above reasons, the diversion dam option is not adopted for the sub-projects.

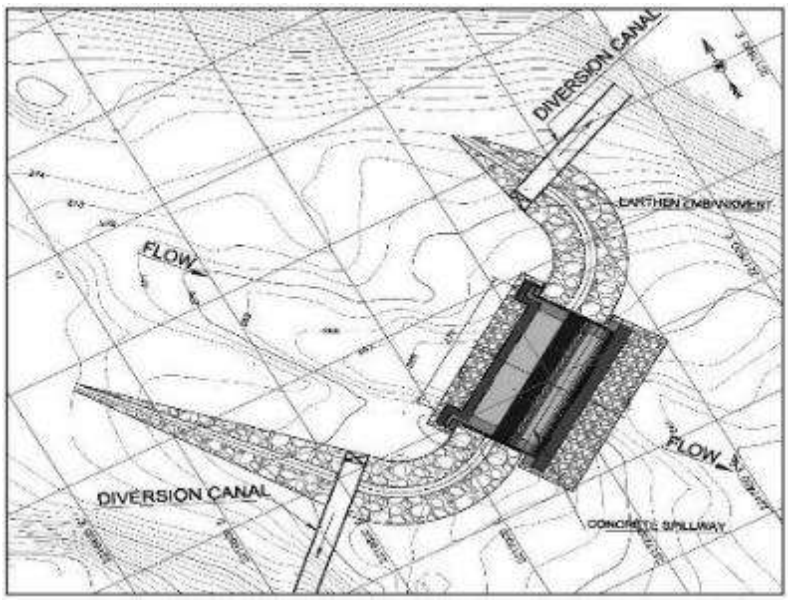


Figure 4: Diversion Dam

4.2.4 Option 3: Construction of Recharge / Storage Dams (Earthen embankments with Concrete Spillways)

The best options for Kohistan Hills are construction of recharge dam on Nais, where the dam will cause recharge of groundwater through entry of nai / nalla flow through river alluvium and underlying jointed rocks by delay action / storage and high head caused by the dams. These dams can be constructed to 16 to 23 ft height. Normally water remains in these reservoir for a period of 2 to 3 weeks. The recharged groundwater is also safe from the loss by evaporation and impurities. In these dams, though there will be some loss in evaporation, still surface water will be available for a period of 5 - 6 months. Communities and their livestock can utilize water directly from these reservoirs.

The dams shall be constructed as earth fill embankments using local materials of earth fill, fine and coarse filters and stone protection. Where large size stones are not available for riprap for upstream slope protection, it can be obtained from limestone quarries. A concrete spillway will be provided in the central part of the dam to allow safe passage of high river flow. This type of small dams are very useful, use local materials and construction industry, store more water for long duration of time in form of groundwater recharge, are thus recommend as most suitable option to achieve the project objectives.

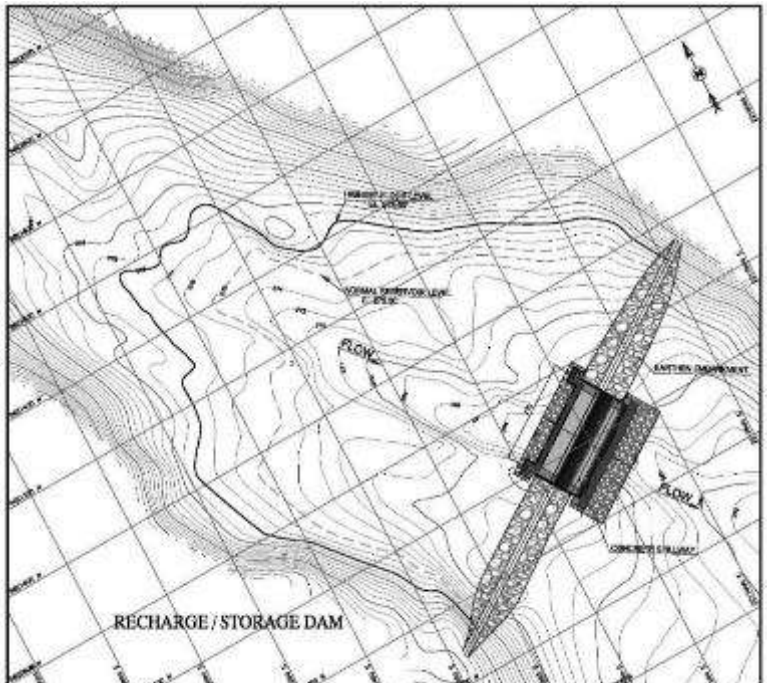


Figure 5: Recharge/Storage Dam with Earth Embankment and Concrete Spillway

. Table – 09 reviews the alternative interventions considered to improve resilience against droughts in the sub-project area.

Table 9: Analysis of Alternatives: Construction of Small Dams

Option No.	Action	Economic Impacts		Environmental Impacts		Social Impacts	
Positive	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**
0	Without project	None	• Cost of relief to be provided during draughts (major, long term) • Loss of agriculture production and livestock (major, long term)	• No disturbance to environment (neutral)	• Loss of trees, crops and livestock (major, long term)	None	• Hardships to people and livestock during draughts (major, long term) • Migration of population from draught affected areas, increase in hardships especially in female population (major, long term). • Increase in social vices such as armed robbery and terrorism (major long term).
1	Construction of Gabion Weir for groundwater recharge	• Employment during construction (Moderate, short term) • Increase in crop production and livestock (Moderate, short term as compared to Options 2 and 3)	• Moderate capital cost to implement (Moderate short term); • Due to short life not more than 5-7 years the benefit will be short lived • Due to short heights, the economic benefits will be low (moderate long term) • Storage of water not possible (major, long term) • Short lived benefit	• Improvement in water availability (Moderate, short term as compared to Options 2 and 3) • Improvement in crop production Moderate, short term as compared to Options 2 and 3) • Improvement in ecology, and green cover (Moderate, short term as compared to Options 2 and 3)	• Felling trees in construction area (Moderate short term); • Quarrying of stone (Minor long term) • Greenhouse gas emissions from machinery during construction (Minor short term)	• Resilience against draught (Moderate, short term as compared to Options 2 and 3) • Improvement in standard of life (Moderate, short term as compared to Options 2 and 3) • Reduction in migration of communities (Moderate, short term as compared to Options 2 and 3)	• Minor loss of displacement of people due to stone pitching and widening of bunds (Minor long term) • Construction stage disturbance (Moderate short term)
2	Construction of diversion dam	As for Option No. 1	• Moderate capital cost to implement – higher than alternative	As for Option No. 1	• Felling trees on new alignment (Moderate short term);	As for Option No. 1	• Borrow areas and construction of structures (Major, long term);

			#3(Moderate short term); • Moderate on-going maintenance costs(Moderate, long term) • Due to reduction floods in a downstream reduction in crop production and livestock in the downstream area		• Quarrying of stone (Minor long term) • Transport of earth material(Minor short term); • Air emissions from heavy machinery during construction Negative Positive Negative (Minor short term) • Serious decrease in water flows on the downstream affection of human life and ecology		• Construction stage disturbance (Moderate, short term) • Downstream populations may face series shortage of water supply resources of their livelihood
3	Construction of Recharge / Storage Dam of Earthen Dam with Concrete Spillway	• Increased economic activities • Prolonged availability of water	Same as Option 2 • High capital cost to implement – higher than alternative #2 (Major, long term); • Moderate on-going maintenance costs(Moderate, long term)	• Increase in greenery and plantation (after implementation) • Due to groundwater recharging water will be available for longer time. • Improvement in water availability(major, long term) • Improvement in crop production (major, long term). • Only some amount of water of Nai will be stored/recharged, remaining water will overspill. No or negligible impact on lower riparian.	• Felling trees on new alignment (Moderate short term); • Quarrying of stone (Minor long term) • Transport of earth material (Minor short term); • Air emissions from heavy machinery during construction(Minor short term)	• As for Option No. 2 but more than Option 2 and 3.	• Moderate loss of land to be acquired due to establishment of borrow areas and embankments (Major long term); • Construction stage disturbance (Moderate short term)

5. DESCRIPTION OF ENVIRONMENT

5.1 Introduction

This section describes the existing environmental and socio-economic conditions of the SRP-AF project area. The environmental and social baseline aims to provide a generic baseline against which the project impacts can be measured. This Section also identifies archaeological sites, protected areas, sensitive flora and fauna receptors in the project area. The potential impacts of the project and associated mitigation measures to address these impacts have also been discussed in this Section.

5.2 Physical Environment

5.2.1 Geography

The proposed sub-project areas lie in Western Sindh, Tehsil Sehwan & Manjhand of District Jamshoro, Tehsil Gadap of District Malir and Tehsil Gharo of District Thatta, between the Western hills of Kirthar range and the right bank Command area of Sukkur barrage. It is a strip of land which, during the monsoon period, is irrigated by rain/floodwaters but when the floodwaters recede in the Nai, this again becomes dry and barren. If water is provided by conservation of floodwater of nai, the conditions could be improved to a great extent. The rim of the cup shaped mountainous range around Manchhar Lake forms the upper or Northern part where the Nais water enters the Lake. The South-Eastern part lies on the other side of South Eastern loop, which extends up to the river Indus. The foothill of lower part mountain fans slope southward and eastward. Lakhi Range is also situated in the lower part of the Central Zone, and touches the River Indus near Sehwan and has a high altitude. The Nais of the Northern side after flowing in the North direction discharges surplus water into the Manchhar Lake.

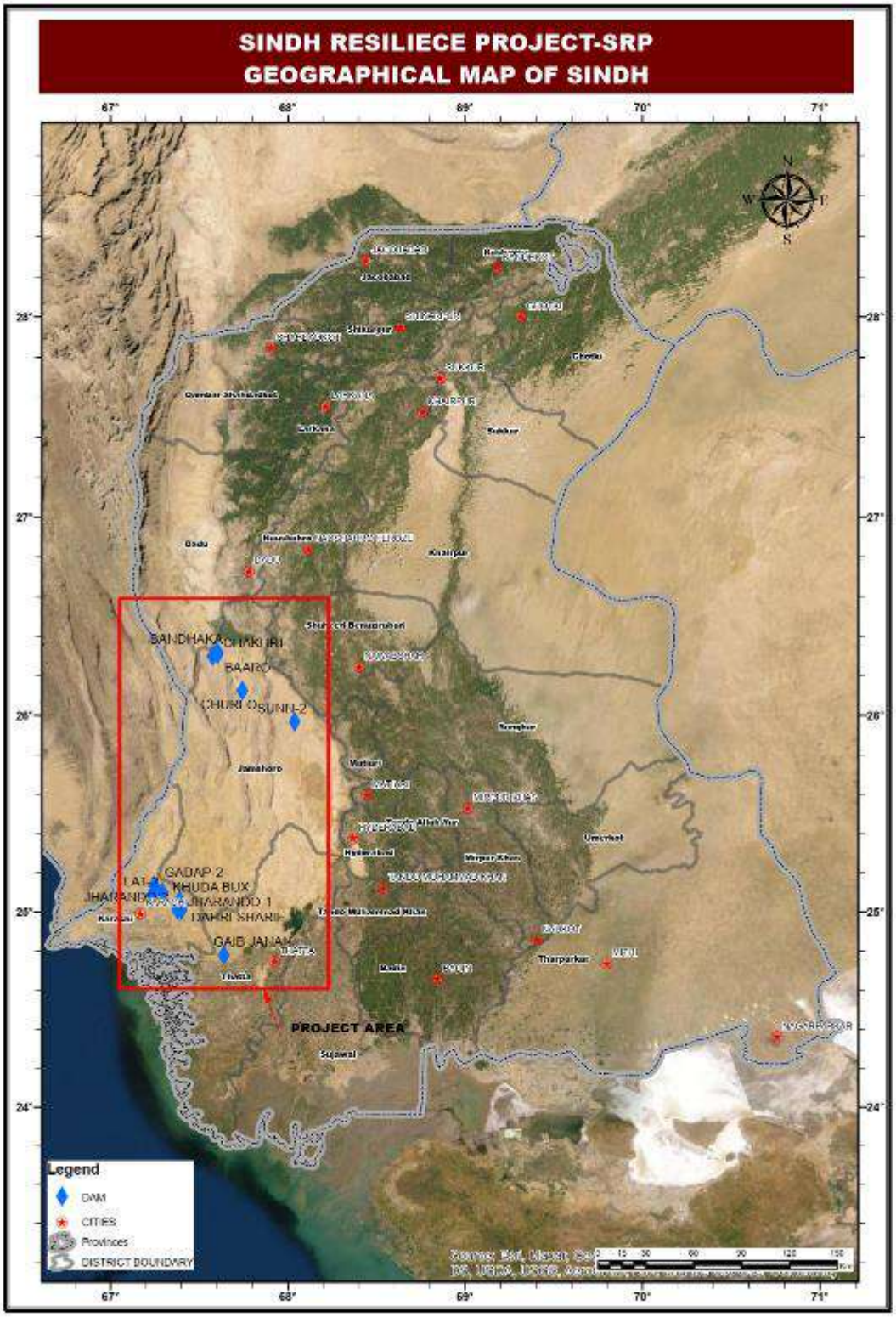


Figure 6: Topographic Map of Kohistan

5.2.2 Geology

The area of the various sites lies in central and lower Kirthar Ranges which are technically disturbed having parallel anticlines and synclines running almost north south (Figure – 7). The geological formations in the reported area are covered with Miocene and Oligocene formations.

1. Recent to Sub-recent
2. Manchar formation
3. Gaj formation
4. Nari formation

The oldest formation in the area is Nari which belongs to Oligocene. The Nari formation is dominantly comprised of yellowish brown, fine to coarse grained sandstones interbedded with layers of shales/silts and arenaceous lime stones. Gaj formation is dominated by brackish limestone, sandstone and shales of variegated gray and gypsiferrous.

The Manchhar formation contains brownish sandstone and shale with conglomerate. At places in foot hill regions where stream flows through sub-recent and recent deposits consist of sand, silt and gravel.

The geology is complex and Oligocene & Miocene formations are not easily recognized. The formations are dipping in general towards west at about 15 to 25 degree.

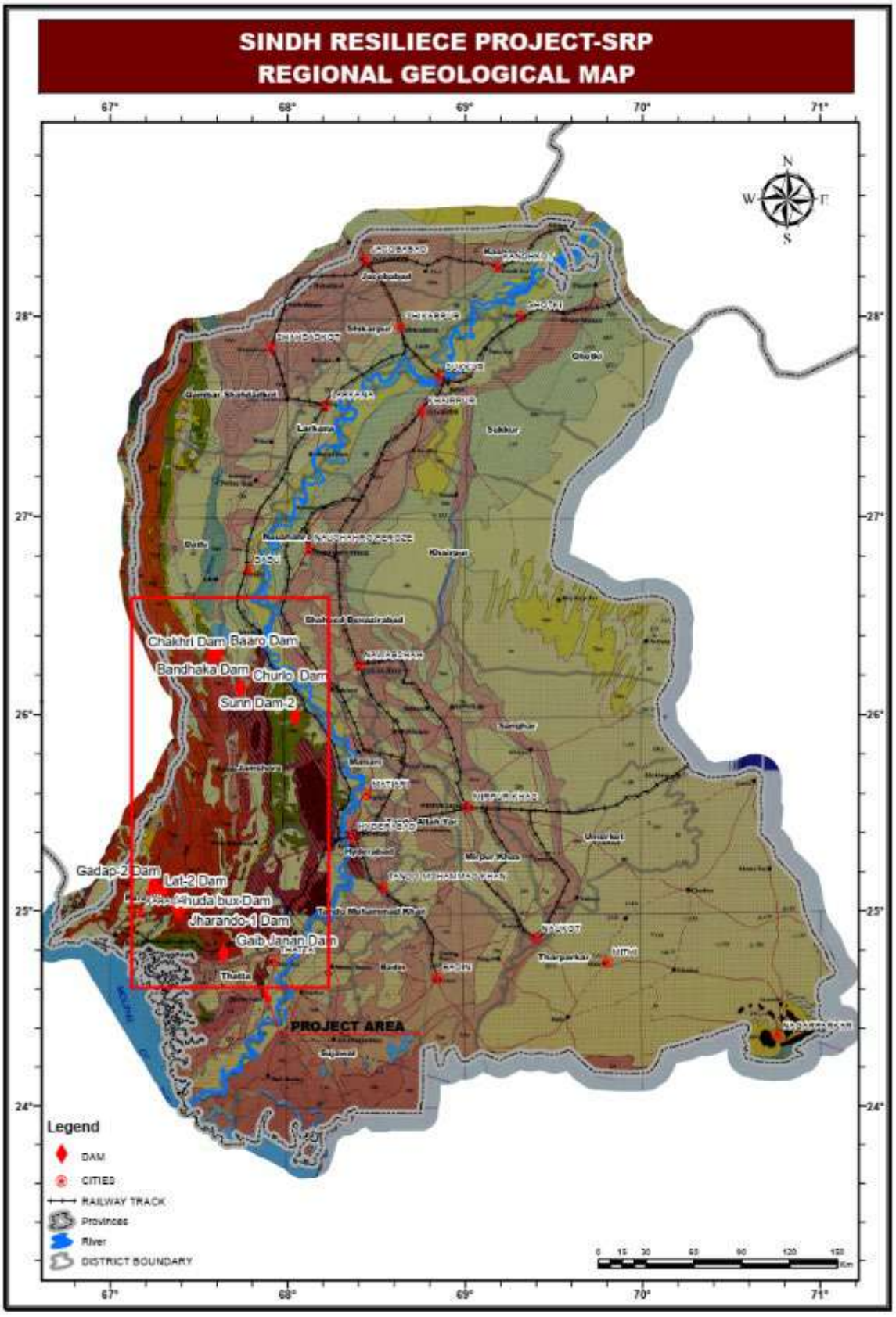


Figure 7: Regional Geological Map of Kohistan

5.2.3 Soils

According to reconnaissance soil survey carried out by the Soil Survey of Pakistan, generally, the area likely to be occupied by the proposed subproject comprises hilly sandy soil of Aeolian desert. Specifically, at places, Rock outcrop are covered with gravel and rock land and valley soil is mainly loamy soil. The soils in the plain near the subproject sites have homogenous porous structure, mainly silt and fine silt clayey, strongly calcareous with 18-20 % lime content uniformly distributed in the profile. Small patches contain shallow or very shallow, strongly calcareous, gravely and stony loams. While the soils afford very sparse shrub and grass vegetation offering limited grazing, the rocky outcrop only has a water catchment value.
Soil is mostly sandy and sandy-loam, suitable for cropping, but with the scarcity of water, fewer field crops were observed, however, agriculture depends on rainwater.

5.2.4 Seismicity

The map shown in Figure – 8 indicates that all of the sub-project areas is falling in Zone 2A & 2B, with peak ground acceleration (PGA) varying from 0.08 to 0.16 & 0.16 to 0.24g (Pakistan Building Code of Pakistan, 2007). While no site is falling in Zone 4 which is called the High Damage Risk Zone and covers areas liable to MSKVIII. Moreover, the World Bank dam expert will review all structure designs.

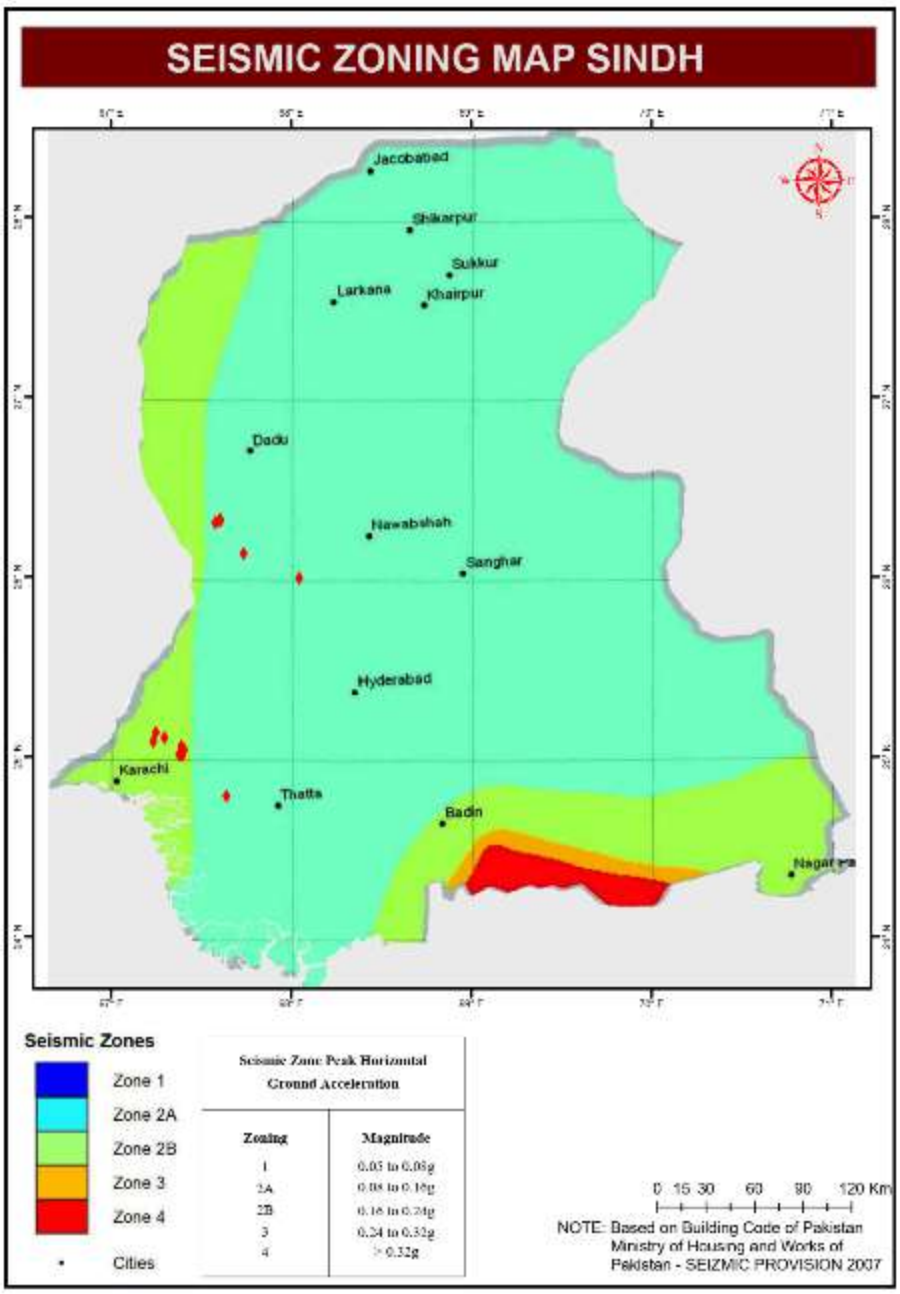


Figure 8: Seismic Zones of the Sub Project Area

5.3 Climate & Rainfall

In an average year, sub-project sites receive a maximum rainfall of 5.3 to 9.0 inches or 135-230 mm (Figure – 10).

Most of the rains occur during July-August monsoon from the southwest direction, whereas the prevailing winds are from the northeast during the rest of the year. During a good rainy

season, the area becomes "Green Hilly". The winter rains are insignificant. Dust storms are common, with winds of 140 to 150 km/hr from April to June in the desert. The maximum temperature rises to over 45^0C during the hot months of April, May, and June.

The climatological conditions of proposed dam sites are represented by the following meteorological station (Table-10).

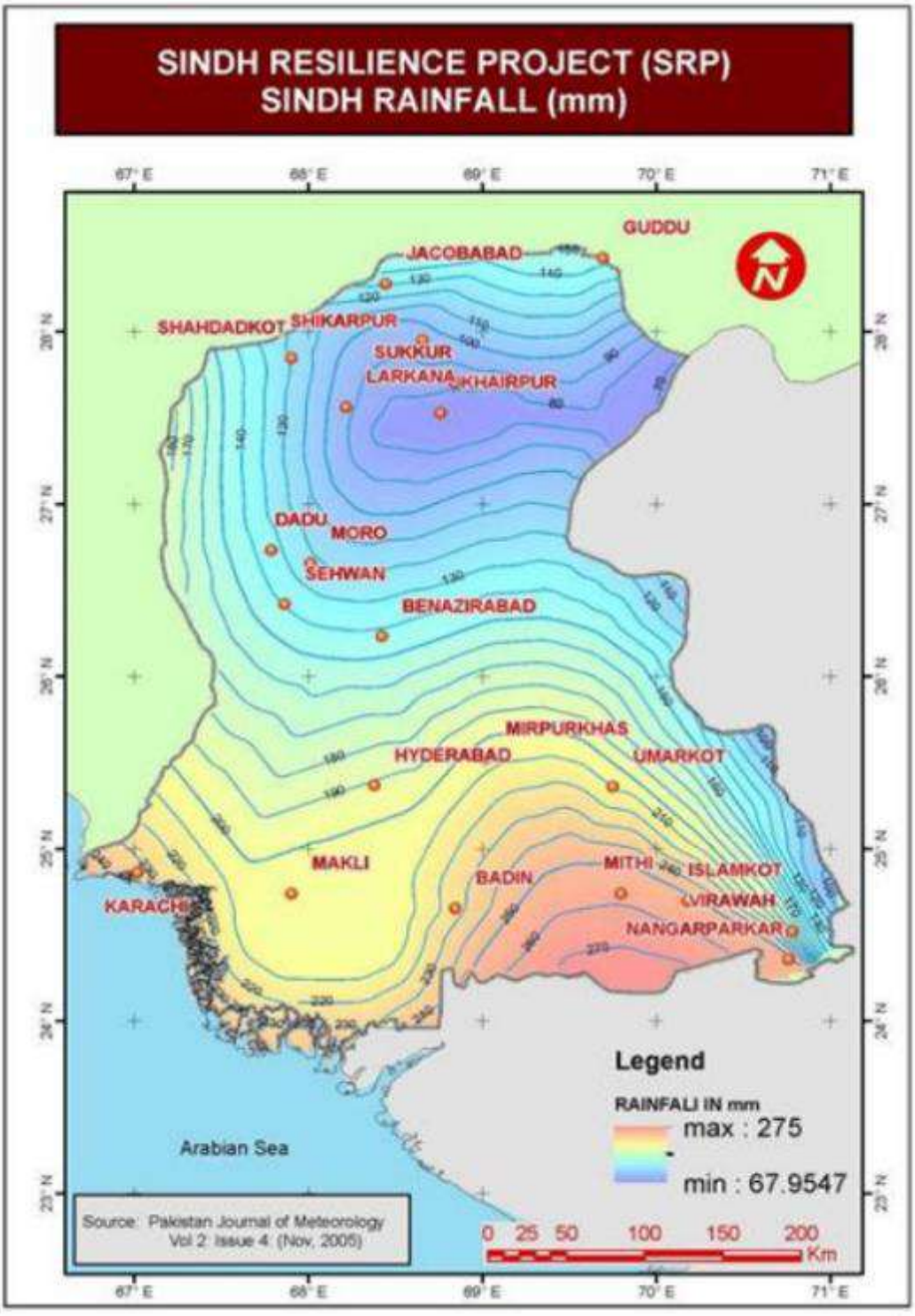
Table 10: Nearest Meteorological Stations

Name of Proposed Small Dams	Meteorological Station
Gadap-2, Khuda Bux, Lat-2, Jharando-2, Gorban Bhutti, Dahri Sharif, Jharando-1 and Gaib Janan	Karachi
Bandhaka, Baaro, Chakhri, Churlo and Sunn-2	Hyderabad

The mean monthly temperatures, rainfall and evaporation at these stations are shown in Figures 10 to 15. The mean monthly maximum and minimum limits of climatological data are given in Table – 11.

Table 11: Climatological Data of Sub-Project Areas

Meteorological Stations	Rainfall (inch)		Temperature (^{0}C)		Evaporation (inch)	
	Min.	Max.	Min.	Max.	Min.	Max.
Karachi	0.03	3.04	4.5	37.6	6.82	15.82
Hyderabad	0.1	2.8	18.1	34.1	0.69	3.01



(Source: Retrieved from http://db.world- housing.net/building/176 on 11th Nov-2015)

Figure 9: Annual Rainfall in Sub-Project Area

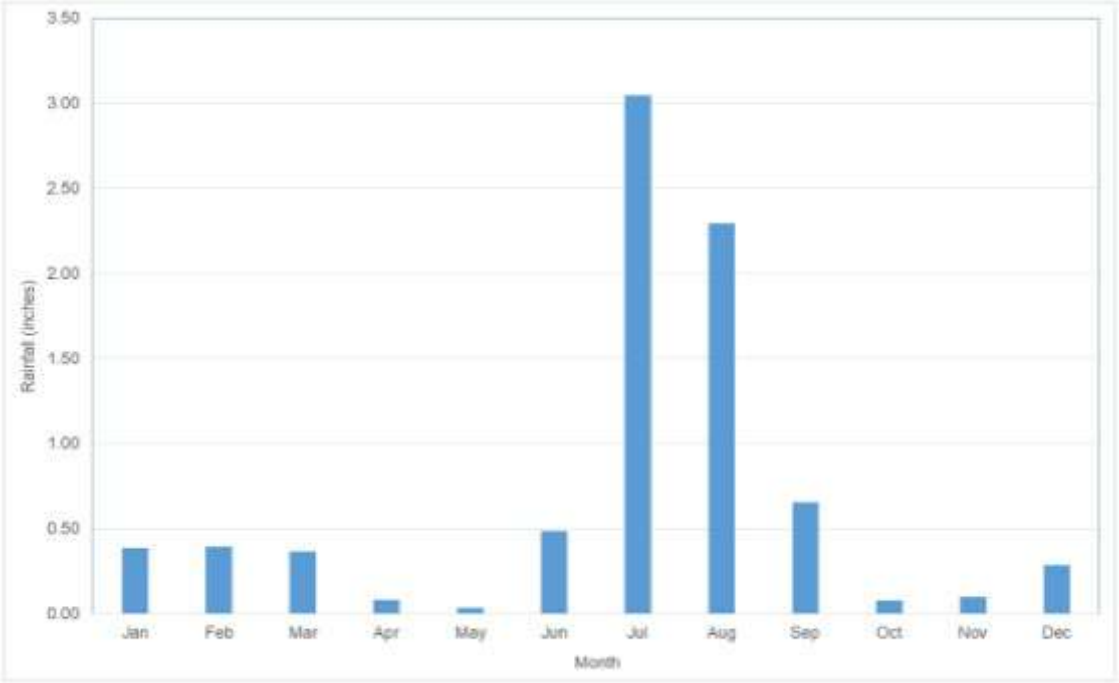


Figure 10: Monthly Average Rainfall at Karachi

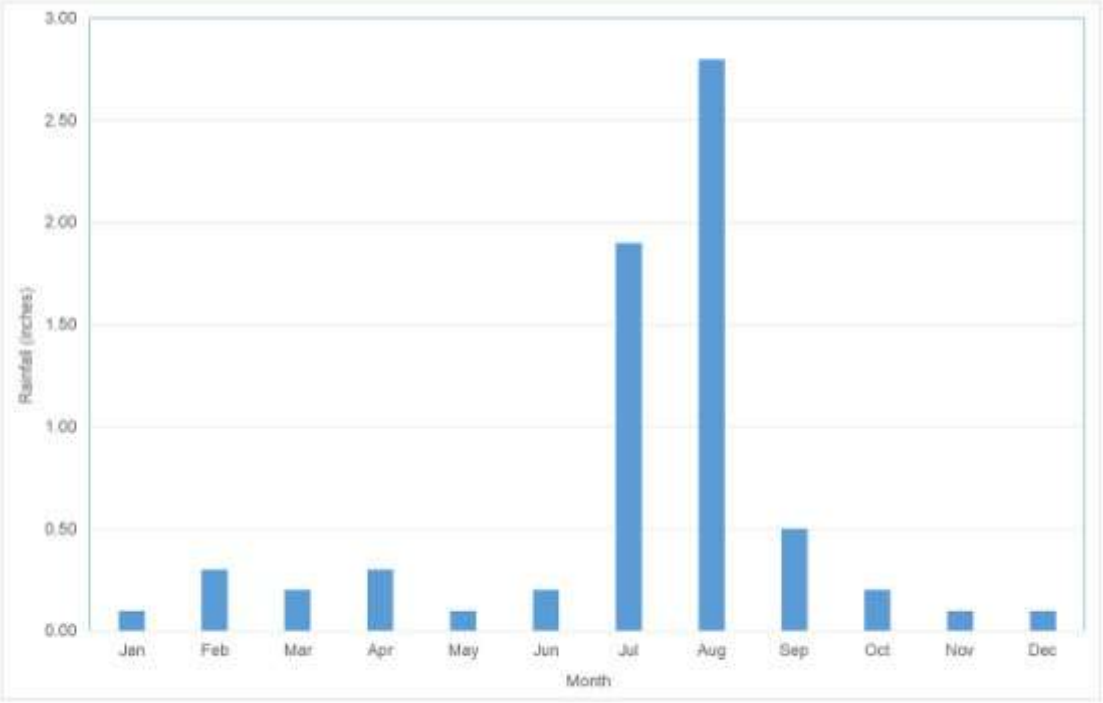
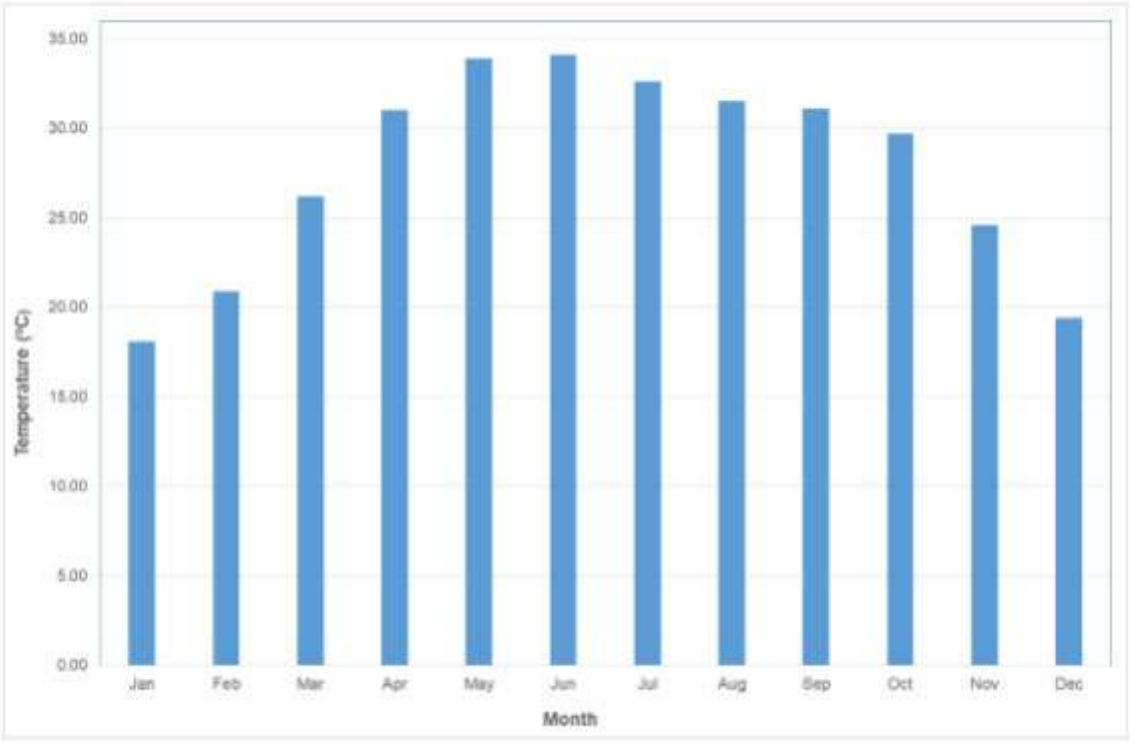


Figure 11: Monthly Average Rainfall at Hyderabad


35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Temperature (°C)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

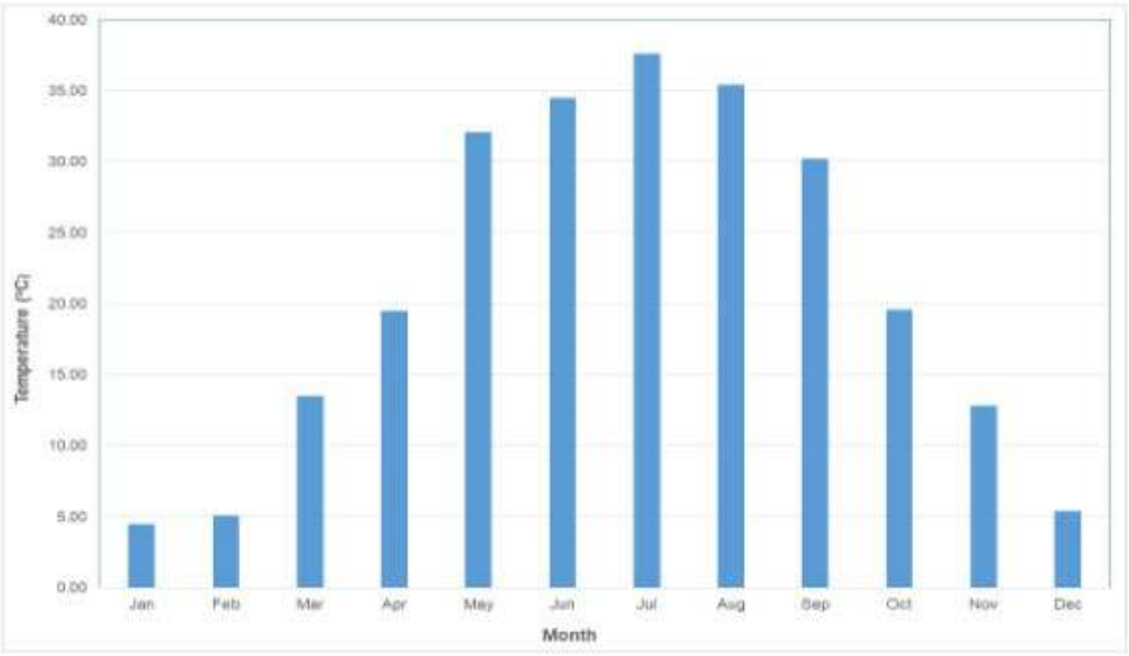


Figure 13: Monthly Average Temperature at Karachi

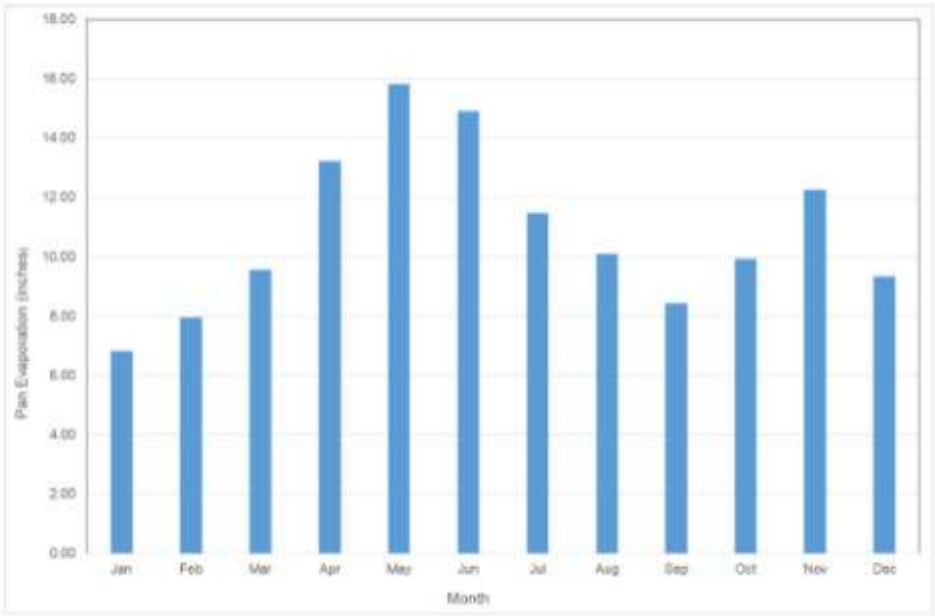


Figure 14: Monthly Average Evaporation at Hyderabad

Figure 12: Monthly Average Temperature at Hyderabad

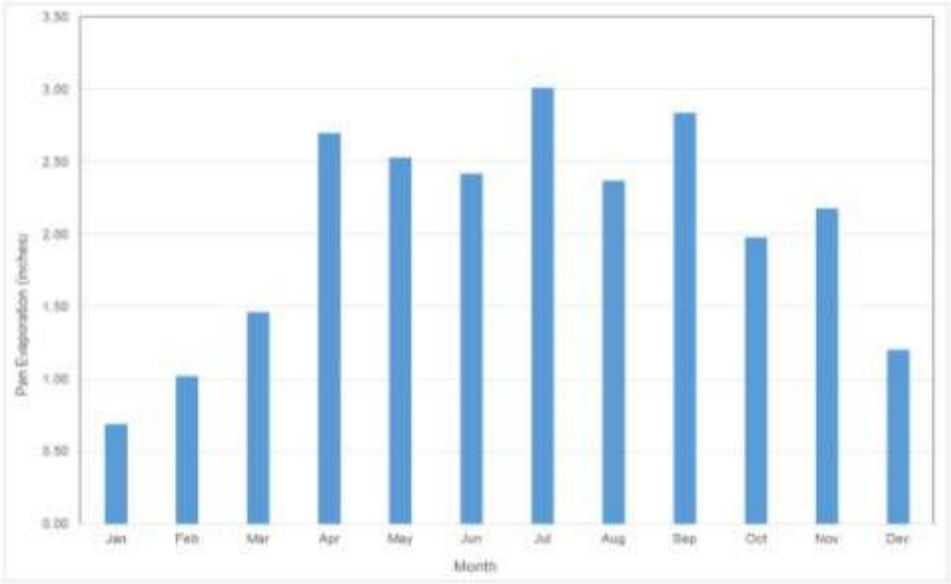


Figure 15: Monthly Average Evaporation at Karachi

5.4 Water Resources and Quality

i. Surface Hydrology

Wetlands nearest to the sub-project area are Manchhar, Hub Dam and Haleji. The details are provided in Table – 12 below.

Table 12: Nearest Wetlands in Sub-Project Area

Sr. No.	Sub-Project Area	Tehsil-District	Average Distance (km)	Wetland
1	Bandhaka	Sehwan-Jamshoro	15	Manchar
2	Baaro	Sehwan-Jamshoro	20	Manchar
3	Chakhri	Sehwan-Jamshoro	22	Manchar
4	Churlo	Sehwan-Jamshoro	25	Manchar
5	Sunn-2	Manjhan-Jamshoro	69	Manchar
6	Gadap-2	Gadap-Malir	25	Hub Dam
7	Khuda bux	Gadap-Malir	30	Hub Dam
8	Lat-2	Gadap-Malir	30	Hub Dam
9	Jharando-2	Gadap-Malir	35	Hub Dam
10	Gorban Bhutti	Gadap-Malir	45	Hub Dam
11	Dahri Sharif	Gadap-Malir	50	Hub Dam
12	Jharando-1	Gadap-Malir	55	Hub Dam
13	Gaib Janan	Gharo-Thatta	18	Haleji

All streams are non prenaninal and water is avaialbe mostly during the monsoon season. The present agriculture is low by all standards and below subsistence level (refer Annexure-V) mainly due to constraint of irrigation and its dependence on scanty rains and sporadic floods. If the rains are absent for more than 2 years, the subsurface water gets dried making the local population get zero water abstraction both for drinking and harvests. The main source of

irrigation water in the vicinity of selected dam command area is only rain and tubewell water. Two dam sites namely Chakri and Churlo have spring water in the village which is used for the drinking purpose only. Furthermore, springs are located in the secondary impact zone and not being impacted by the project interventions. Outlet have been incorporated in the design stage as depicted in Annexure – VI for the protection of the springs .

Streams/ Nais/ Nalas in Lower Kohistan (Sub-Project Area)

Large number of hill torrents emanate from Kirthar Range in Western Sindh. Kirthar Range is almost barren having rainfall mean annual in the range of 5.3 to 9.0 inches or 135-230 mm). The highest rain floods normally come in July and August, though some high discharges have been recorded in the winter and the early spring. The flows are usually low in early summer. Due to a lack of proper management, most of the water flows unused through the Indus River into the Arabian Sea. As the flashy floods rapidly disappear, the irrigation is uncertain. It is realized that if these floodwaters are harnessed, continuous irrigation supplies can be ensured.

ii. Groundwater

One of the impeding factors for the irrigated agriculture in Sindh is the brackish groundwater. More than 80% of the irrigated land in Sindh is underlain with brackish water unfit for agriculture. The shortage of irrigation water coupled with drought conditions in Sindh has increased the importance of groundwater exploitation wherever freshwater is available.

In subproject area, precipitation is the main source of natural recharge of groundwater. These streams are mostly non-perennial and water passes through them in the form of flash floods after rainfall. Depending on local conditions, the duration of such floods varies from a few hours to a few days. The recharge of groundwater is a safe, inexpensive, and reliable technique to improve the quality of water. It is also reported that watershed vegetation measures can add an average of 33% more to the groundwater recharge. Hence, after the construction of proposed small dams will increase the vegetation cover consequently recharge capacity of the catchment as well.

iii. Surface and Groundwater Analysis

Sampling from different locations in the sub-project area was done by Evergreen Environmental Lab experts and was analyzed in their laboratory (SEPA Approved). The selection of locations for monitoring was done with due consideration to sensitive receptors. The identification of appropriate monitoring locations was finalized during the baseline survey, site walkover and visit to the surrounding areas. Table – 13 depicted the rationale for the sampling locations. While results are given in Table – 14 & 15, Surface & Drinking Water analysis results respectively. The samples were tested for 31 parameters as per Sindh Environmental Quality Standard - 2016 (SEQS).

The analysis shows that all the toxic metals are below the limits except turbidity (because surface water has been used for drinking) salt contents (due to shallow brackish water) and microbiological contaminations (due to unavailability of sewerage system or open defecation in the area) sets in SEQS. The presence of Total Coliform is the source of concern, which will be mitigated by providing the water filtration system for the construction crew and elaborated in the mitigation section. The detailed results in the form of scan reports are appended as Annexure – VII. Surface water sample taken from the two sites (Gadap-2 & Gorban Bhutti). It is a stagnant water, which stored after rain and remaining for only 2-4 weeks depending on the weather conditions. This water has been used for the drinking purposes of the livestock.

Table 13: Rationale for the Baseline Environmental Monitoring

Sr. No	Monitoring Parameters	No. of samples	Rationale
1	Ambient Air	13	Taken from the area having a nearby population or near the sensitive receptor
2	Drinking-Water/Ground Water	13	at every proposed Dam site from a nearby well or potable water source
3	Surface/ Waste Water	2	where available because streams are non-perennial
4	Noise	35	1 from the Proposed Dam site, 2 from nearby sensitive receptors

Table 14: Surface Water Analysis Results

Sr. No.	Parameter (mg/l unless otherwise defined)	Analysis Method	SEQS Limit	Gadap-2	Gorban Bhutti
1	Temperature	SMWW 2550 B	≤ 3°C	24	22
2	pH	SMWW 4500 H+ B	6.0-9.0	7.85	7.62
3	Biochemical Oxygen Demand (BOD5)	SMWW 5210-B	250	18	16
4	Chemical Oxygen Demand (COD)	SMWW 5220 B	400	38	34
5	Total Suspended Solids (TSS)	SMWW 2540 D	400	56	39
6	Total Dissolved Solids (TDS)	SMWW 2540 C	3500	188	172
7	Phenolic Compounds (as Phenols)	SMWW 5530 D	0.3	0	0
8	Grease and Oil	USEPA 1664 B	10	0	0
9	Chloride (Cl-)	SMWW 4500 Cl- B	1000	15	14
10	Fluoride (F-)	SMWW 4500 F- C	10	0	0
11	Cyanide (CN-)	SMWW 4500 CN- F	1	0	0
12	An-ionic Detergents (as MBAs)	SMWW 5540-C	20	0	0
13	Sulfate (SO42-)	SMWW 4500 SO4-2 C	600	7	9
14	Sulfide (S2-)	SMWW 4500 S-2 F	1	0	0
15	Ammonia (NH3)	SMWW 4500-NH3 D	40	0	0
16	Cadmium (Cd)	SMWW 3113 B	0.1	<0.006	<0.006
17	Chromium (Cr)	SMWW 3113 B	1.0	0.004	0.004
18	Copper (Cu)	SMWW 3113 B	1.0	0.165	0.164
19	Lead (Pb)	SMWW 3113 B	0.5	0.006	0.006
20	Mercury (Hg)	SMWW 3112 B	0.01	0.002	0.002
21	Selenium (Se)	SMWW 3114 B	0.5	<0.01	<0.01
22	Nickel (Ni)	SMWW 3113 B	1.0	0.02	0.02
23	Silver (Ag)	SMWW 3113 B	1.0	0.009	0.009
24	Total Toxic Metals	Calculated Value	2.0	0.267	0.266
25	Zinc (Zn)	SMWW 3111 B	5.0	0.052	0.052
26	Arsenic (As)	SMWW 3114 B	1.0	0.007	0.007
27	Barium (Ba)	SMWW 3113 B	1.5	0.008	0.008
28	Iron (Fe)	SMWW 3113 B	8.0	0.72	0.62
29	Manganese (Mn)	SMWW 3111 B	1.5	0.022	0.022
30	Boron (B)	SMWW 3113 B	6.0	0.03	0.03
31	Residual Chlorine (Cl2)	SMWW 4500 Cl- B	1.0	0	0

Table 15: Drinking Water Analysis

Parameter	Analysis Method	SEQS	Bandhaka	Baaro	Chakhri	Churlo	Sunn-2	Gadap-2	Khuda bux	Lat-2	Jharando-2	Gorban Bhutti	Dahri Sharif	Jharando-1	Gaib Janan
Color	SMWW 2120 C	**≤ 15 TCU**	0	0	0	0	0	0	0	0	0	0	0	0	0
Taste (Non- Objectionable)	SMWW 2160 C	**N-O**	N-O	Salty	Salty	S. Salty	Salty	Salty	Salty	Salty	Salty	Salty	Salty	Salty	Salty
Odor	SMWW 2150 B	**N-O**	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
Turbidity	SMWW 2130 B	**< 5 NTU**	0.8	0	7.35	7.49	0	0	11.25	8.26	9.82	0	10.29	0	7.19
Total Hardness (as $CaCO_3$)	SMWW 2340 C	**< 500 mg/L**	166	488	768	384.4	589	875	628	816.4	640	736	681.8	598.8	437.6
Total Dissolved Solids (TDS)	SMWW 2540 C	**< 1000 mg/L**	732	1720	1920	961	1472	2188	1570	2041	1600	1840	1704	1497	1094
pH	SMWW 4500 H+ B	**6.5- 8.5**	7.15	7.57	7.82	7.92	7.47	7.51	7.19	7.98	7.71	7.42	7.37	7.72	7.28
Aluminum (Al)	SMWW 3111 B	**≤ 0.2 mg/L**	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.005	0.006	0.006	0.006	0.006	0.005
Antimony (Sb)	SMWW 3114 B	**≤ 0.005 mg/L**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic (As)	SMWW 3114 B	**≤ 0.05 mg/L**	0.009	0.01	0.009	0.02	0.01	0.03	0.03	0.04	0.02	0.02	0.02	0.03	0.02
Barium (Ba)	SMWW 3113 B	**0.7 mg/L**	0.04	0.03	0.04	0.03	0.004	0.02	0.0038	0.03	0.04	0.05	0.005	0.02	0.03
Boron (B)	SMWW 3113 B	**0.3 mg/l**	0.022	0.015	0.02	0.014	0.04	0.03	0.028	0.02	0.021	0.03	0.09	0.023	0.03
Cadmium (Cd)	SMWW 3113 B	**0.01 mg/L**	0.006	0.006	0.007	0.02	0.007	0.007	0.006	0.007	0.006	0.006	0.007	0.007	0.008
Chloride (Cl-)	SMWW 4500 Cl- B	**< 250 mg/L**	266.2	602	672	336.4	515.2	765.8	549.5	714.3	560	644	596.4	209.6	382.2
Chromium (Cr)	SMWW 3113 B	**≤ 0.05 mg/L**	0.005	0.022	0.006	0.005	0.02	0.03	0.02	0.005	0.02	0.01	0.027	0.006	0.005
Copper (Cu)	SMWW 3111 B	**2.0 mg/L**	0.165	0.171	0.164	0.166	0.165	0.168	0.166	0.169	0.166	0.169	0.168	0.166	0.168
Cyanide (CN-)	SMWW 4500 CN- F	**≤ 0.05 mg/L**	0	0	0	0	0	0	0	0.01	0.001	0.001	0.002	0	0
Fluoride (F-)	SMWW 4500 F- C	**≤ 1.5 mg/L**	0	0.01	0.03	0	0.01	0.06	0.01	0.05	0.03	0.03	0.04	0.03	0.01
Lead (Pb)	SMWW 3114 B	**≤ 0.05 mg/L**	0.005	0.006	0.006	0.005	0.005	0.006	0.04	0.01	0.021	0.008	0.009	0.009	0.007
Manganese (Mn)	SMWW 3113 B	**≤ 0.5 mg/l**	0.016	0.017	0.016	0.016	0.02	0.017	0.02	0.017	0.016	0.016	0.073	0.016	0.017
Mercury (Hg)	SMWW 3114 B	**≤ 0.001 mg/L**	<0.001	0.002	0.002	0.002	<0.001	0.002	0.002	<0.001	<0.001	0.002	<0.001	<0.001	<0.001
Nickel (Ni)	SMWW 3113 B	**≤0.02 mg/L**	0.02	0.026	0.02	0.003	0.02	0.022	0.03	0.023	0.02	0.023	0.017	0.022	0.024
Nitrate (NO3-)	SMWW 4500 NO3- B	**≤ 50 mg/L**	0.11	0.14	0.13	0.13	0.13	0.13	0.14	0.13	0.13	0.17	0.13	0.13	0.13
Nitrite (NO2-)	SMWW 4500 NO2- B	**≤ 3.0 mg/L**	0.005	0.006	0.006	0.005	0.007	0.003	0.008	0.004	0.005	0.005	0.004	0.004	0.004
Selenium (Se)	SMWW 3114 B	**0.01 mg/L**	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.03
Residual Chlorine (Cl_2)	SMWW 4500 Cl- B	**0.5 mg/L**	0	0	0	0	0	0	0	0	0	0	0	0	0
Phenolic Compounds	SMWW 5530 D	**NGVS**	0	0	0	0	0	0	0	0.001	0.02	0.002	0	0	0
Zinc (Zn)	SMWW 3113 B	**5.0 mg/L**	0.058	0.054	0.063	0.062	0.072	0.073	0.059	0.075	0.073	0.071	0.062	0.053	0.069
Microbiological Analysis															
Total Coliforms	SMWW 9222 B	**0/ 100 mL CFU**	3	5	4	3	0	1	2	0	3	2	1	2	4
Fecal Coliforms	SMWW 9222 D	**0/ 100 mL CFU**	0	0	0	0	0	0	0	0	0	0	0	0	0

5.4.1 Air Quality

The sub-project areas of lower Kohistan are located in a sparsely populated area with no industrial or commercial activity. Vehicular traffic on the dirt roads causes some dust emissions whose effect is fairly localized. The main pollutants emitted by vehicle exhaust pipes are particulate matter, carbon monoxide, sulphur dioxide, and nitrogen oxides. These emissions generally affect the air quality in the vicinity of the roads. However, traffic on the roads in the sub-project area is low compared to the national highways or other major roads. The ambient air quality tests were carried out in the month of Oct & Nov 2020 through Evergreen Environmental Lab experts (SEPA Approved). The results reveal that all parameters are within permissible limits of SEQS 2016 of ambient air quality as depicted in Table – 16. Detailed ambient air quality laboratory reports are attached as Annexure – VII.

Table 16: Ambient Air Quality Results

Sr. No	Sub-Project Areas	Parameters/ Analysis					
		Carbon Monoxide (CO)	Sulphur Dioxide (SO_2)	Nitrogen Mono oxide (NO)	Nitrogen Dioxide (NO_2)	Particulate Matter ($PM_{2.5}$)	Particulate Matter (PM_{10})
		SEQS - Ambient Air					
		10 mg/m³	***120 ug/m³***	***40 ug/m³***	***80 ug/m³***	***150ug/m³***	***75 ug/m³***
1	Bandhaka	1.2	7.8	4.0	8.4	122.5	33.5
2	Baaro	0.8	8.9	3.8	9.8	123.0	29.5
3	Chakhri	0.9	9.5	3.3	8.7	132.0	25.0
4	Churlo	0.8	6.6	3.0	8.8	114.0	32.5
5	Sunn-2	0.7	7.2	2.6	8.5	119.5	27.0
6	Gadap-2	0.7	7.3	3.3	6.7	103.0	29.5
7	Khuda bux	0.6	8.6	3.3	11.9	99.0	28.0
8	Lat-2	0.8	9.3	3.6	6.5	107.0	33.5
9	Jharando-2	0.9	8.0	4.6	10.8	97.0	34.0
10	Gorban Bhutti	0.7	7.3	4.3	8.3	88.5	32.0
11	Dahri Sharif	0.9	9.7	5.3	9.4	130.0	37.0
12	Jharando-1	0.8	6.8	3.3	7.7	90.0	29.5
13	Gaib Janan	0.7	6.9	3.3	7.7	94.5	26.5

5.4.2 Noise

Proposed sub-projects are in sparsely populated areas where traffic is very less and no existences of other noise sources are in the reported areas. During the baseline survey ambient noise levels were recorded in the sub-project areas and found within permissible limits of SEQS and WHO standards. Details are present in Table – 17.

Table 17: Ambient Noise Levels in Sub-Project Areas

Sr. No.	Proposed Small Dam Site	Location of Noise Monitoring	Coordinates	80 dBA (SEQS) Noise Levels		
				Min	Max	Average
1	Bandhaka	Dam Axis	26°19'18.85"N 67°36'14.63"E	41.1	42.3	41.7
		Mosque	26°19'4.23"N 67°36'2.62"E	33.4	34.5	34.0
2	Baaro	Dam Axis	26°18'23.65"N 67°36'4.45"E	41.4	43.5	42.5
		Village	26°18'28.82"N 67°36'16.18"E	44.2	45.2	44.7
3	Chakhri	Mosque	26°18'15.20"N 67°34'27.67"E	44.2	46.8	45.5
		Dam Axis	26°18'5.22"N 67°34'36.86"E	46.4	48.2	47.3
4	Churlo	Dam Axis	26° 7'51.89"N 67°43'59.16"E	32.5	34.8	33.7
		Village	26° 7'46.26"N 67°44'7.38"E	44.7	46.7	45.7
		Mosque	26° 7'53.66"N 67°43'28.30"E	39.1	40.8	40.0
5	Sunn-2	Dam Axis	25°59'54.61"N 68° 3'16.79"E	35.2	37.8	36.5
		Village	26° 0'15.70"N 68° 4'39.88"E	36.3	39.5	37.9
		Mosque	26° 0'5.93"N 68° 4'36.39"E	39.4	41.8	40.6
6	Gadap-2	Dam Axis	25° 7'36.27"N 67°14'28.51"E	44.7	46.8	45.8
		School	25° 7'44.95"N 67°14'13.28"E	41.9	42.5	42.2
		Mosque	25° 7'42.23"N 67°14'16.44"E	43.1	44.5	43.8
7	Khuda bux	Dam Axis	25° 5'36.80"N 67°16'24.19"E	34.3	35.8	35.1
		Village	25° 5'32.87"N 67°16'16.74"E	40.4	41.5	41.0
8	Lat-2	Dam Axis	25° 5'7.08"N 67°13'55.62"E	33.7	35.5	34.6
		Mosque	25° 4'52.14"N 67°14'8.31"E	41.2	45.8	43.5
		Village	25° 4'46.38"N 67°14'14.61"E	42.5	44.9	43.7
9	Jharando-2	Dam Axis	25° 3'2.81"N 67°23'6.43"E	32.3	35.2	33.8
		Mosque	25° 3'11.80"N 67°23'1.29"E	42.8	43.5	43.2
		School	25° 3'9.42"N 67°23'0.51"E	39.4	40.8	40.1
10	Gorban Bhutti	Dam Axis	25° 2'40.57"N 67°24'9.78"E	43.2	44.8	44.0
		School	25° 2'26.65"N 67°23'43.28"E	42.9	43.8	43.4
		Mosque	25° 2'24.30"N 67°23'45.58"E	43.4	43.4	43.4

Sr. No.	Proposed Small Dam Site	Location of Noise Monitoring	Coordinates	80 dBA (SEQS) Noise Levels		
				Min	Max	Average
11	Dahri Sharif	Dam Axis	25° 0'32.97"N 67°23'43.20"E	44.5	43.3	43.9
		Village	25° 0'47.22"N 67°23'33.59"E	39.5	40.8	40.2
		Main Track	25° 0'50.87"N 67°23'11.82"E	43.8	44.8	44.3
12	Jharando-1	Dam Axis	25° 0'38.26"N 67°22'29.36"E	38.5	42.6	40.6
		School	25° 0'45.94"N 67°21'58.23"E	35.8	39.8	37.8
		Mosque	25° 0'41.54"N 67°22'1.40"E	40.8	43.8	42.3
13	Ghaib Jahnan	Dam Axis	24°46'20.03"N 67°37'45.70"E	43.8	44.5	44.2
		Village	24°46'22.27"N 67°37'36.85"E	42.7	43.9	43.3
		Village	24°46'24.96"N 67°37'35.87"E	38.7	39.9	39.3

5.5 BIOLOGICAL ENVIRONMENT

Kohistan region of Sindh province has a diverse habitat, which supports a large variety of faunal and floral species. Common animal habitats are mountains, deserts and wetlands. These habitats support the peculiar species according to their requirements. The following broad categories have been identified for this report focusing on the sub-project areas.

5.5.1 Fauna of the Sub-Projects Area

During the field study of proposed small dams eight (8) large mammal species were observed including Desert Fox and Grey Mongoose, Indian wild boar and Asiatic Jackal recorded from different locations near the proposed area. All mammalian species in the project area are common and listed as Least Concern (LC) in IUCN red list. Eleven small mammals including rodents and insectivores 2 amphibians and 15 species of reptiles were recorded from the area. These include one Buffo toad, one Skittering frog, 6 lizards, three geckos, 2 agamas and 4 snakes. Four snake species two are poisonous and two non-poisonous. The recorded species belong to 11 Genres and 10 families. All the species were recorded through plot search in microhabitats of each proposed dam site. Some species were also recorded through indirect evidence such as tracks, burrows, skin and nests that confirmed the existence of the species in the area. Dead specimens of Saw scale viper and Black cobra was observed from the sub-project area of Gadap. Forty-six bird species were recorded surrounding areas of proposed dam sites, among them crested lark, Common many, grey shrike, Black redstart, Indian roller, Indian house crow, Bush babbler, and Red-wettle lapwing were the most common throughout the area. All recorded avian species are Least Concern (LC) by IUCN red list 2020. Detail of the Fauna of lower Kohistan sub-project areas is given in Table – 18 & 19.

Table 18: Fauna in Lower Kohistan - Sub Project Area

Sr. No.	Common Name	Scientific Name	Conservation status by IUCN
Large Mammals			
1	Golden Jackal	*Canis aureus*	LC
2	Indian Fox	*Vulpes bengalensis*	LC
3	Red fox	*Vulpes vulpes*	LC
4	Honey Badger	*Mellivora capensis*	LC
5	Grey Mongoose	*Herpestes edwardsi*	LC
6	Small Indian Mongoose	*Herpestes javanicus*	LC
7	Jungle Cat	*Felis chaus*	LC
8	Indian wild boar	*Sus scrofa*	LC
Small Mammals			
1	Indian Hedgehog	*Paraechinus micropus*	LC
2	Five Striped Palm Squirrel	*Funambulus pennantii*	LC
3	Indian Porcupine	*Hystrix indica*	LC
4	Roof Rat / House Rat	*Rattus rattus*	LC
5	House mouse	*Mus musculus*	LC
6	Little Indian Field Mouse	*Mus booduga*	LC
7	Balochistan Gerbil	*Gerbillus nanus*	LC
8	Indian Gerbil	*Tatera indica*	LC
9	Indian Desert Jird	*Meriones hurrianae*	LC
10	House Shrew	*Suncus murinus*	LC
11	Kuhl's Pipistrelle	*Pipistrellus kuhlii*	LC
Reptiles & Amphibians			
1	Indian Garden Lizard	*Calotes versicolor*	LC
2	Rock Agama	*Laudakia nupta*	LC
3	Brilliant Agama	*Trapelus agilis*	LC
4	Keeled Rock Gecko	*Cyrtopodion scabrum*	LC
5	Spotted Indian House Gecko	*Hemidactylus brookii*	LC
6	Yellow bellied House Gecko	*Hemidactylus laviviridis*	LC
7	Indian Fringe-toed Lizard	*Acanthodactylus antoris*	LC
8	Orange tail Skink Lizard	*Novoeumeces blythianus*	LC
9	Indian Sand Swimmer Lizard	*Ophiomorous tridactylus*	LC
10	Indian Spiny tailed Lizard	*Saara hardwickii*	LC
11	Desert Monitor	*Varanus griseus*	LC
12	Common Sand Boa	*Eryx johnii*	LC
13	Cliff Racer	*Platyceps rhodorachis*	LC
14	Black Cobra	*Naja naja*	LC
15	Saw scaled Viper	*Echis carinatus*	LC
16	Buffo toad	*Buffo stomaticus*	LC
17	Kettering frog	*Euphlyctis cyanophlyctis*	LC

Table 19: Avifauna in Lower Kohistan - Sub Project Area

Sr. No.	Common Name	Scientific Name	Seasonal Status
1	Black Kite	*Milvus migrans*	R
2	Shikra	*Accipiter badius*	R
3	Asiatic Sparrow-Hawk	*Accipiter nisus*	WV
4	Common Buzzard	*Buteo buteo*	WV

Sr. No.	Common Name	Scientific Name	Seasonal Status
5	Imperial Eagle	*Aquila heliacal*	WV
6	Laggar Falcon	*Falco jugger*	R
7	Pallid Merlin	*Falco columbarius*	WV
8	Common Kestrel	*Falco tinnunculus*	WV/r
9	Grey Partridge	*Francolinus Pondicerianus*	R
10	Red Wattle Lapwing	*Vanellus indicus*	R
11	Chestnut-bellied / Indian Sandgrouse	*Pterocles exustus*	R
12	Blue Rock Pigeon	*Columba livia*	R
13	Ring Dove	*Streptopelia decaocto*	R
14	Little Brown / Senegal Dove	*Streptopelia senegalensis*	R
15	Rose ringed Parakeet	*Psittacula krameri*	R
16	Common Crow-Pheasant or Coucal	*Centropus sinensis*	R
17	Syke's or Sind Nightjar	*Caprimulgus Mahrattensis*	R
18	House Swift	*Apus affinis*	R
19	Indian Pied Kingfisher	*Ceryle rudis*	R
20	White breasted Kingfisher	*Halcyon smyrnensis*	R
21	Sind Small Green Bee- eater	*Merops orientalis*	R
22	Roller or Blue Jay	*Coracias benghalensis*	R
23	Hoopoe	*Upupa epops*	WV
24	Ashycrowned Finch-Lark	*Eremopterix grisea*	R
25	Indian Desert Finch-Lark	*Ammomanes deserti*	R
26	Crested Lark	*Galerida cristata*	R
27	Indian Bush Lark	*Mirafra erythroptera*	R
28	Common Swallow	*Hirundo rustica*	WV
29	Grey Shrike	*Lanius excubitor*	R
30	Black Drongo or King Crow	*Dicrurus adsimilis*	R
31	Rosy Starling or Rosy Pastor	*Sturnus roseus*	DPM
32	Bank Myna	*Acridotheres ginginianus*	R
33	Indian Myna	*Acridotheres tristis*	R
34	Tree Pie	*Dendrocitta vagabunda*	R
35	Sind House Crow	*Corvus splendens*	R
36	White-cheeked Bulbul	*Pycnonotus leucogenys*	R
37	Red-vented Bulbul	*Pycnonotus cafer*	R
38	Common Babbler	*Turdoides caudatus*	R
39	Sind Jungle Babbler	*Turdoides striatus*	R
40	Indian Streaked Wren- Warbler / Long tailed Warbler	*Prinia gracilis*	R
41	Black Redstart	*Phoenicurus ochruros*	WV
42	Indian Robin	*Saxicoloides fulicata*	R
43	Yellow or Citrine Wagtail	*Motacilla flava*	PM
44	White or Pied Wagtail	*Motacilla alba*	WV
45	Purple Sunbird	*Nectarinia asiatica*	R
46	House Sparrow	*Passer domesticus*	R
Legend: R = Resident WV = Winter Visitor M = Migratory PM = Passage Migrant SV= Summer Visitor			

Asiatic Jackal

Sus sacrofa

Jungle cat

Red Fox

Grey mongoose

Blenford fox

Funambulus Palmarum

Balochistan gerbil

Suncus murinus

Indian Hadgehogr

House mouse

Indian desert jird

Black rock agama

Indian fring toed lizard

Indian Skittering frog

Bufo toad

Figure 16: Mammals Observed at Study Area

Junglr Babblor

Buzzerd eagle

Indian roller

Grey shrike

Common Kingfisher

Hond heron

Coller Dove

Common Kingfisher

White cheek bulbul

Cattle egret

Pide Kingfisher

Green bee eater

Indian Roller

Robin

Figure 17: Birds in the Sub-Project Areas

5.5.2 Flora of Kohistan Sub-Project Area

Vegetation of the study area can be classified as a scrub forest dominated by herbs and shrubs. The plants are best adapted to the ecological conditions either for high or low-temperature fluctuations as well as poor soil and rainfall ranges. The soils of the Kohistan region are sandy loam to sandy; the soil in the eastern part is alluvial which supports good vegetation. The monsoon rain provides enough water for the annual herbs and grasses to flourish in the study area. The herbs abundantly grow around Kohistan region, this type of vegetation may raise on the water temporarily adsorbed in the topsoil layer, synchronic to

precipitation. Further, this is supported by the added layer of moisture present in the subsurface soil and the sandstone lying beneath the soil. However, the dominance of perennials may indicate the resistance of species towards the harsh climate or access to plentiful moisture for long periods after monsoon rains.

The common plants of Kohistan sub-project area are (*Euphorbia caducifolia*), Phog (*Calligonum polygonoides*), and (*Calotropis gigantea*). In irrigated tracts, Babul (or Babur), *Acacica nilotica*), Talhi (*Dalbergia sissoo*) Neem (*Azadirachta indica*), Jar (*Salvadora oleoides*), and Lai (Tamarix gallica) are found.

Dunes are represented by xerophytic plants because of their topographical features. They are all of deserted nature with the sandy soil makeup. The dominant and frequent species like *Euphorbia caducifolia, Calligonum polygonoides, Aerva javanica, Salvadora oleoides, Indigofera Spp., Aristida Spp* and *Tribulus longipetalus* were forming common vegetation on them. Vegetation grown in desert ecosystem has its ethnobotanical values and used by local community for different propose, Neem (*Azadirachta indica*) used for cure skin disease of both human and cattle. Ak and Neem are both are used as pesticide for crops and used cure for animal skin diseases. Sindhi Babor is good fodder for goat and camel. There is no previous report available on the vegetation of this area. Details of flora found in Kohistan sub-projects areas are given in Table – 20 and a photo gallery of fauna and their habitats are given in Figure - 18.

Table 20: Flora of Lower Kohistan Sub-Project Area

Sr. No.	Common Name	Scientific Name	Plant type	IUCN status
1	Sindhi babur	*Acacia nilotica*	Tree	LC
2	Kumbat	*Acacia senegal*	Tree	NA
3	Lamb gaah	*Aristida funiculata*	Grass	NA
4	Neem	*Azadirachta indica*	Tree	LC
5	Ak	*Calotropis procera*	Shrub	NA
6	Kirar	*Capparis decidua*	Shrub	LC
7	Dhaman	*Cenchrus ciliaris*	Grass	LC
8	Trooh	*Citrullus colocynthis*	Climber	NA
9	Gugur	*Commiphora wightii*	Tree	CR
10	Sussai	*Convolvulus spinosus*	Herb	NA
11	Chag	*Crotalaria burhia*	Shrub	NA
12	Drabh	*Desmostachya bipinnata*	Grass	LC
13	Thohar	*Euphorbia caducifolia*	Shrub	NA
14	Khip	*Leptadenia pyrotechnica*	Shrub	LC
15	Pesh	*Nannorrhops ritchiana*	Tree	NA
16	Ghander	*Ochthochloa compressa*	Grass	NA
17	Dhaman	*Panicum turgidum*	Grass	NA
18	Nar khip	*Periploca aphylla*	Shrub	LC
19	Kandi	*Prosopis cineraria*	Tree	NA
20	Kikar	*Prosopis juliflora*	Tree	NA
21	Wekho	*Pteropyrum aucheri*	Shrub	NA
22	Sar	*Saccharum spontaneum*	Grass	LC
23	Jar/Peroon	*Salvadora oleoides*	Tree	NA

Sr. No.	Common Name	Scientific Name	Plant type	IUCN status
24	Rohiro	*Tecomella undulata*	Tree	NA
25	Lawo	*Tamarix aphylla*	Tree	NA
26	Lawo	*Tamarix dioica*	Shrub	NA
27	Lai	*Tamarix indica*	Shrub	NA
28	Paneer	*Withania coagulans*	Shrub	NA
29	Ber	*Ziziphus mauritiana*	Tree	LC
30	Ber	*Ziziphus nummularia*	Shrub	NA
LC= Least Concern, NA= Not Assessed, CR=Critically Endangered				

Acacia senegal

Acacia nilotica

Calotropis procera

Capparis decidua

Commiphora wightii

Euphorbia caducifolia

Nannorrhops ritchiana

Leptadenia pyrotechnica

Periploca aphylla

Rhazya stricta

Prosopis juliflora

Prosopis cineraria

Saccharum spontaneum

Salvadora oleoides

Stipagrostis plumosa

Tecomella undulata

Ziziphus nummularia

Withania coagulans

Tamarix dioica

Ziziphus mauritiana

Figure 18: Key Floral Species of the Study Area

5.5.3 Endemic and Endangered Species

Sindh Ibex (*Capra agaggrusblathii*) is not assessed by IUCN red data book, however it has protected by Sindh wildlife protection ordinance 1972, Wild sheep (*Ovis vignie*) is vulnerable VU with decreasing population and Chankara deer (*Gazella bennettii*) is the least concern LC with decreasing wild population. As far as the sub-project area is concerned, none of the endemic or endangered species of both flora and fauna recorded from sub-project sites.

5.5.4 Trees

Since the subproject area lies in the arid zone, there is a general scarcity of water, vegetation is scarce and consists of stunted scrub and bushes. The main natural ground cover is provided by grasses, which are nutritive and palatable fodder for the livestock. The trees present around the proposed dam structures were counted during the field survey as shown in Table – 21.

Table 21: Trees Identified on the Sub-projects

Sr. No	Name of Proposed Small Dam	Name of Species		Plant type	IUCN Status	Mature (Girth more than 24")		Immature (Girth less than 24")	
		Common	Scientific			Existing	To be cut	Existing	To be cut
1	Bandhaka	Kandi	*Prosopis cinereria*	*Tree*	*NA*	25	5	5	0
		Bair	*Zizyphus*	*Tree*	*NA*	5	2	10	0
		Lai	*Tamarix indica*	Shrub	*NA*	5	2	15	10
		Jar/Peroon	*Salvadora oleoides*	*Tree*	*NA*	4	0	5	2
2	Baaro	Sindhi babur	*Acacia nilotica*	*Tree*	LC	8	2	15	4
		Kandi	*Prosopis cinereria*	*Tree*	*NA*	0	0	5	0
		Lai	*Tamarix indica*	Shrub	NA	4	0	8	0
3	Chakhri	Sindhi babur	*Acacia nilotica*	Tree	LC	8	2	10	4
		Kandi	*Prosopis cinereria*	*Tree*	*NA*	2	0	5	0
4	Churlo	Lai	*Tamarix indica*	Shrub	NA	10	5	20	10
		Jar/Peroon	*Salvadora oleoides*	*Tree*	NA	5	2	5	0
		Kandi	*Prosopis cinereria*	*Tree*	*NA*	5	0	0	0
5	Sunn-2	Kandi	*Prosopis cinereria*	*Tree*	NA	10	4	6	2
		Sindhi babur	*Acacia nilotica*	*Tree*	LC	2	0	0	0
		Lai	*Tamarix indica*	Shrub	NA	10	2	15	5
6	Gadap-2	Kikar	*Prosopis juliflora*	Tree	NA	25	5	10	5
7	Khuda bux	Kikar	*Prosopis juliflora*	Tree	NA	15	0	10	5
8	Lat-2	Kikar	*Prosopis juliflora*	Tree	NA	35	15	5	0
		Kandi	*Prosopis cinereria*	*Tree*	NA	10	0	15	5
9	Jharando-2	Kikar	*Prosopis juliflora*	Tree	NA	20	5	15	10
		Kandi	*Prosopis cinereria*	*Tree*	NA	5	0	10	5
10	Gorban Bhutti	Kikar	*Prosopis juliflora*	Tree	NA	15	5	20	5
11	Dahri Sharif	Kumbat	*Acacia senegal*	Tree	NA	5	0	5	0
		Kikar	*Prosopis juliflora*	Tree	NA	10	0	5	2
12	Jharando-1	Kikar	*Prosopis juliflora*	Tree	NA	12	4	5	2
13	Gaib Janan	Kikar	*Prosopis juliflora*	Tree	NA	35	20	25	10
					Sub Total	**265**	**80**	**244**	**86**
					Total Number of Existing Trees	**509**			
					Total Number of Cut Down Trees	**166**			

LC= Least Concern, NA= Not Assessed

6. SOCIO-ECONOMIC PROFILE OF THE SUB-PROJECT AREA

6.1 Methodology

This section describes the socio economic condition of the subproject area. The team used a questionnaire and checklist for Focus Group Discussions (FGDs) (Attached at Annexure - VIII). In order to have comprehensive detailed information, consultation meetings were also held with the stakeholders and general public. The main objectives of consultation were to provide a platform to the stakeholders to voice their concerns and suggestions to the project team and to develop a sense of collective ownership for the activities of sub project. The participants of the consultation meetings and focus group discussions actively provided support in data collection and understanding the socio- economic fabric of the people living in the sub-project area.

6.2 Livelihood Improvements due to the Small Dams

The construction of small dams would lead to improvement in overall socioeconomic conditions in the sub project areas. The people inhabiting these areas are exposed to drought and food insecurity and will be directly benefiting from the construction of small dams for rain water harvesting and recharging of groundwater aquifers.

It is expected that small dams would bring significant livelihood improvement in sub project areas. Since the local communities are heavily dependent livestock and rain fed agriculture and the small dams would recharge the ground water level. This would have multiplier effect not only on the sustenance of livestock and agriculture but on human population and environment as well. It is expected that dams will raise water table depth, and contribute in reduction of livestock mortality (current mortality rate is 8.5%) through water availability.

Moreover, it is expected that farmers will have crop residues and variety of grasses to feed their livestock. The increased availability of water, fodder for livestock and improved agriculture will impact positively on the migration pattern as the population used to migrate from the sub project areas to canal areas.

6.3 Social Aspect for Study

The social economic survey was carried out to collect the following information's:

a) Demographic data,(population and literacy levels)
b) Occupations. Source of Livelihood and income Levels
c) Socio –Cultural fabric (Ethnicity, Language, religion, and vulnerability).
d) Access to civic facilities (water, sanitation, health, education, and communication)
e) Assessment of the impact of the proposed sub-project on the subject population.

f) In case of negative impacts exposed, suggest mitigation measures.

A survey and consultation was carried out in 13 villages namely Bandhaka, Baaro, Chakery, Churlo, Sunn Dam 2, are located in, District Jamshoro in Central Kohistan Region and some other Dams are namely, Gadap- 2, Khuda Bux, Lat- 2, Jharando-2, Gorban Bhutti, Dahri Sharif, Jharando-1 Gaib Janan, which are located in District Malir, Jamshoro and Thatta in lower Kohistan Region. All of these villages were within primary impact zone and are located in upstream, while villages located in downstream/secondary impact zone are mentioned in Table 38.(Refer Annexure IV). This survey was conducted in the month of October, to December 2020. In order to establish a social baseline of the project area. A list of the location of the villages visited is provided in Table -22.

The information gained 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) was also collected. These FGDs were participated by village elders, community activists, farmers, herders, and religious leaders, (Imams) separate male and female FGDs were conducted in each village to ensure that gender dimensions of vulnerability were captured.

Table 22: Villages (Upstream) Visited for Socio-Economic Baseline Data

Sr. No.	Name of Sub-Project	Village	Distance from Proposed site (Km)	Union Council	Taluka	District	Coordinates	
							Northing	Easting
1	Baandhako	Kai Sharif	1.5	Jhangara	Sehwan Sharif	Jamshoro	26° 19' 20.63" N	67° 36' 11.13" E
2	Baaro	Munhn Mukhri	2.5	Jhangara	Sehwan Sharif	Jamshoro	26° 18' 26.35" N	67° 36' 07.44" E
3	Chakhri	Bakhur	1	Jhangara	Sehwan Sharif	Jamshoro	26° 18' 06.41" N	67° 34' 37.68" E
4	Churlo	Wali Muhammad Gabol	2	Jhangara	Sehwan Sharif	Jamshoro	26° 07' 34.00" N	67° 44' 23.37" E
5	Sunn -2	Muharam Khan Khoso	2	Shalmani	Manjhand	Jamshoro	25° 59' 52.99" N	68° 03' 10.51" E
6	Gadap-2	Noor Hassan Jokhio	1	Gadap-2	Gadap	Jamshoro	25° 07' 39.81" N	67° 14' 27.77" E
7	Khuda Bux	Radho Jokhio	1	Gadap	Gadap	Malir Karachi	25° 05' 38.92" N	67° 16' 25.43" E
8	Lat-2	Ghulam Ali Jokhio	1	Shah Mureed	Shah Mureed	Malir Karachi	25° 05' 10.82" N	67° 14' 00.39" E
9	Jharando-2	Haji Ibrahim Baloch	1	Kathore	Gadap	Malir Karachi	25° 03' 04.08" N	67° 23' 06.86" E

Sr. No.	Name of Sub-Project	Village	Distance from Proposed site (Km)	Union Council	Taluka	District	Coordinates	
							Northing	Easting
10	Gorban Bhutti	Haji Din Muhammad Baloch	1	Kathore	Gadap	Malir Karachi	25° 02' 43.27" N	67° 24' 10.97" E
11	Dahri Sharif	Haji Muhammad Siddique Jokhio	1	Chuhar	Gadap	Malir Karachi	25° 00' 28.51" N	67° 23' 37.85" E
12	Jharando-1	Imam Ali Gaincho	1	Chuhar	Gadap	Malir Karachi	25° 00' 32.19" N	67° 22' 31.30" E
13	Gaib Jan	Rassal Jokhio	2	Gharo	Mirpur Sakro	Thatta	24°46'41.61" N	67°38'17.91" E

6.4 Population

Most inhabitants are Muslims. The population represents different casts groups including Noohani, Khosa, Khaskheli, Marri, Shahani, Gaincha, Khaskheli, Rind, Gabol, Jokhia, Burfat, Brohi, Lashari, Bhatti, Wadhela and Kalmati.

The social harmony is prevalent in the area and people maintain their social relations and participate in each other's social events. The area is deprived with high poverty line and low literacy rate. The main livelihood of the people is related to the rain-fed agriculture and livestock rearing followed by daily wages earners who primarily work as labourers. People along with livestock temporarily move to barrage areas before start of drought season in order to avoid adverse effects during drought and return after drought impacts are minimized. The details of the populations and tribes in sub-project areas are given in the Table 23.

Table 23: Population and Tribes on Sub-Projects

Name of Sub-Project	Village	Tribes	Religion	Households	Population	Average Family size
Baandhako	Kai Sharif	Noohani, Khaskheli, Gabol, Barecha, Rind	Muslims	500	3590	7.2
Baaro	Munhn Mukhri	Noohani, Khaskheli, Gabol, Barecha, Rind	Muslims	230	1680	7.3
Chakhri	Bakhur	Noohani, Khaskheli, Gabol, Barecha, Rind	Muslims	153	1156	7.6
Churlo	Wali Muhammad Gabol	Gabol	Muslims	30	220	7.3
Sunn -2	Muharam Khan Khoso	Khosa	Muslims	110	820	7.5

Name of Sub-Project	Village	Tribes	Religion	Households	Population	Average Family size
Gadap-2	Noor Hassan Jokhio	Jokhio, Brohi, Burfat, Khaskheli, Gabol,	Muslims	100	736	7.4
Khuda Bux	Radho Jokhio	Jokhio, Brohi, Khaskheli	Muslims	550	4270	7.8
Lat-2	Ghulam Ali Jokhio	Jokhio, Brohi, Lashari, Gabol	Muslims	50	370	7.4
Jharando-2	Haji Ibrahim Baloch	Jokhio, Kalmati, Wadhela, Gaincha, Rind	Muslims	300	2170	7.2
Gorban Bhutti	Haji Din Muhammad Baloch	Jokhio, Kalmati, Wadhela, Gaincha, Rind	Muslims	50	360	7.2
Dahri Sharif	Haji Muhammad Siddique Jokhio	Jokhio, Gabol, Brohi, Khaskheli, Wadhela, Kalmati	Muslims	71	512	7.2
Jharando-1	Imam Ali Gaincho	Jokhio, Gaincha, Khosa, Brohi, Rindh, Gabol	Muslims	200	1450	7.25
Gaib Jan	Rassal Jokhio	Jokhio, , Khaskheli, Burfat, Gabol	Muslims	60	445	7.4
		Total		**2404**	**17,779**	

6.5 Languages

Sindhi is the dominant language spoken in the sub-project area, as 100 percent of the population speaks Sindhi. Moreover, people of the area also speak Sindhi, Balochi, and Sraiki languages. National languages, Urdu is spoken and understood by the majority of the people in the sub-project area.

6.6 Family system

The majority of population 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 each family to purchase immediately or from their own source.

6.7 Religious Affiliation

During the socio-economic field survey, it was observed that in the in the sub-project area the Muslims and non-Muslim population live together within the same villages. In surveyed

villages, 100 percent population belongs to Muslim religion. There are Mosques in most of the villages.

Figure 19: Mosques in the Sub-Project area

6.8 Occupations, Sources of Livelihood and Income Levels

Within the study area of sub-projects rain- fed agriculture, and livestock are the main sources of income for the people. Agriculture depends on rainfall, which is often erratic and falls between July and September only. After the rains, the subsoil aquifers are recharged and the pasture lands are regenerated. However, by February, the aquifers are often depleted and the pasturelands dry up. Generally, livestock depends on the grazing in pastures and crop residues. Women are especially involved in livestock herding and play an important role in this occupation.

In the sub-project areas, average livestock head per household is 2 , while average agri landholding per household is 1.3 acres . The average non-agri landholding is 1.5 acres. The other source of livelihood includes daily wage laborers, small business (shops) and tailoring.

Due to the lack of an industrial base, the sources of income of households are less diversified, with their heavy dependence on livestock and casual labor. The social indicators such as large household size, poor literacy level, higher mortality rate, inadequate infrastructure with poor access to education and health facilities shows a higher level of poverty and deprivation in the sub-project areas.
Furthermore, during the survey, it was revealed that minimum monthly income level in the surveyed villages is Rs.10, 000 while maximum monthly income level is Rs.40, 000.

6.9 Village Wise Losses Due to the Drought

The village wise losses due to the drought were assessed during the focus group discussions (FGDs). It was revealed that due to the drought in 2018-2019 significant livestock mortality,

agriculture losses and reduction in ground water levels was witnessed in the villages of sub project areas. The details are provided in below Table - 24.

Table 24: Village wise losses due to drought in 2018-2019

Name of Sub-Project	Village	Total Livestock Population	Livestock Mortality	Total Agriculture Area (Acres)	Reduction in Ground water
Baandhako	Kai Sharif	835	139	600	65%
Baaro	Munhn Mukhri	730	338	200	66%
Chakhri	Bakhur	615	102	160	55%
Churlo	Wali Muhammad Gabol	250	41	180	57%
Sunn -2	Muharam Khan Khoso	456	76	190	55%
Gadap-2	Noor Hassan Jokhio	210	35	230	57%
Khuda Bux	Radho Jokhio	420	403	190	50%
Lat-2	Ghulam Ali Jokhio	78	15	210	55%
Jharando-2	Haji Ibrahim Baloch	215	35	290	57%
Gorban Bhutti	Haji Din Muhammad Baloch	150	25	310	56%
Dahri Sharif	Haji Muhammad Siddique Jokhio	105	21	190	57%
Jharando-1	Imam Ali Gaincho	255	51	250	53%
Gaib Jan	Rassal Jokhio	420	70	205	54%
	Total	**4739**	**1351**	**3205**	

6.10 Social Cohesion and Conflict

Social organization in all the villages is strongly based on the community (tribal) system, where each tribe has a tribal leader. There is minor interaction between villages of different tribes and therefore low chance of tribal conflict. The villages are multi tribal, but instead of that they live within the same villages, there is a single leader of the entire village, which is recognized by all tribes. Out of the 13 surveyed villages two villages are mono tribal. While the 11 villages are bi tribal which all are (Muslims) the minor scale conflicts are resolved by the village leader.

The tribe leaders are mostly landlords and politically active. All families belonging to the same tribes have strong interactions with one another but mostly remain separate from other tribes. This extends to marriages, where it is the preference for young tribal members to marry a

member of the same tribe. During the survey it was found that most communities had built their own mosques and while maintenance of these is the joint responsibility of community.

6.11 Social Vulnerability

Social vulnerability refers to inequality in social systems that discriminate against and marginalize certain groups of the people from accessing resources and services. People who have been marginalized in social, economic or political terms are vulnerable. Disasters, poverty and vulnerability are interlinked as it has been observed that, during the disaster, the most affected population is the poor of the community. In the surveyed villages, incidence of poverty has increased as droughts have reduced income level of the households by damaging their assets and sources of income and thus have aggravated the household poverty. In many households, there is just one earning person with many dependents.

During the survey it was found that most people in the sub project areas lack job opportunities, health and educational facilities, which escalate the social vulnerability to various hazards including drought.

6.12 Conflict Resolution within Tribes and Villages

According to the socio-economic survey, there is no major dispute among the people (inter or intra tribal conflicts) in the sub-project area. mutual conflicts, marriage settlements and other matters are usually resolved by the village head, while the head of tribes shall resolve intra baradari (community) disputes. It was found during survey that 95 percent of the conflicts were resolved at village level. Those living within the communities of the project area feel obliged to accept the decision of the village 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 caste or tribal leaders, matters may go to the police and ultimate a court of law. The police and the court of law are the last options and these are rarely exercised.

6.13 Housing

The project area consists of rural population living comparatively in isolation. Majority of the population live in small settlements of 150 to 200 houses. Some of the houses usually have a boundary wall enclosing enough space for cattle and storage. The study area consists on various types of housing pattern such as Paka (cemented), Semi-Paka, Kacha (roofs of grasses with mud plaster). It was observed that all the people were living in self-owned houses.

Figure 20: Housing pattern in the Sub-Project Area

6.14 Literacy and Education Facilities

The overall literacy rate of the Sindh province is 45.29 percent (pc). According to the Economic Survey of Pakistan 2019, the literacy rate of urban Sindh is 72 pc and rural Sindh is 39 pc, while literacy rate of urban male 79 pc, urban female is 64 pc, rural male 55 and rural female 21 pc.

The Economic Survey of Pakistan further reveals that the literacy rate for females and males in Sindh has decreased from 63pc to 62.2pc. Considering the fact that the sub-project areas are located in remote and backward parts of the province, the overall literacy rate is quite low in both male and female population and this is attributed to number of factors including inaccessible areas, lack of basic infrastructure non-existence of schools, non-availability of teachers particularly female teachers in existing schools etc.

During socio-economic field survey, it was noted that, there are 12 primary boys' schools, in which 383 boys and 194 girls' are enrolled with 22 teachers. In some villages girls are getting education through the co-education system, there are only two middle schools in the sub-project area; most of the girl's schools are dysfunctional according to the community members. The education facilities in the sub-project areas are given in Table - 25.

Table 25: Education Facilities in the Sub Project Area

Name of sub-project	Village Name	Boys primary school	Teachers	Enrollment		Boys Middle Schools	Teachers	Enrollment	Girls Middle Schools	Teachers	Enrollment
				Boys	Girls						
Baandhako	Kai Sharif	1	2	77	33	0	0	0	0	0	0
Baaro	Munhn Mukhri	1	1	25	19	0	0	0	0	0	0
Chakhri	Bakhur	1	1	29	12	0	0	0	0	0	0
Churlo	Wali Mohammad Gabol	0	0	0	0	0	0	0	0	0	0
Sunn -2	Muharam Khan Khoso	1	1	27	15	0	0	0	0	0	0
Gadap-2	Noor Hassan Jokhio	2	4	33	13	0	0	0	0	0	0
Khuda Bux	Radho Jokhio	2	4	55	23	1	7	210	1	6	233
Lat-2	Ghulam Ali Jokhio	1	2	44	22	0	0	0	0	0	0
Jharando-2	Haji Ibrahim Baloch	1	1	23	17	0	0	0	0	0	0
Gorban Bhutti	Haji Din Muhammad Baloch	0	0	0	0	0	0	0	0	0	0
Dahri Sharif	Haji Muhammad Siddique Jokhio	0	0	0	0	0	0	0	0	0	0
Jharando-1	Imam Ali Gaincho	1	4	45	27	0	0	0	0	0	0
Gaib Jan	Rassal Jokhio	1	2	25	13	0	0	0	0	0	0
Total		**12**	**22**	**383**	**194**	**1**	**7**	**210**	**1**	**6**	**233**

6.15 Health Facilities

It was found that in sub- project area many of the people have suffered from hepatitis, typhoid, malaria, eye problems, diarrhea and other hygiene related complaints. Sometime women die during the delivery cases. Majority of the women are malnourished usually being the last ones to eat their meals in the family in the sub-project area, there are no health facilities like Basic Health Units (BHU) dispensary midwifery centers and medical stores in immediate vicinity. The serious ill patients are taken to Karachi and Hyderabad hospitals and other cities including Thatta, Sehwan, Jamshoro, Hyderabad and Karachi. However, in some villages quakes were operating as reported by the community.

6.16 Transport

Most of the surveyed villages have an average 25 to 50 km village tracks or in some areas its distance do vary area to area, and unsurfaced (Katcha) roads that are in bad condition except some of the villages. The construction and maintenance of the village roads is the responsibility of local government. The sub-projects area is connected with super highway Indus highway and national highway roads.

The socio-economic baseline survey reveals that the major source of the human transport in the villages of the sub-project area is public transport including buses, Van/Pickups, Jeeps, Quinqi Rickshaw, while individual cars and motor bikes are another mode of transport in the sub-project area. The farm inputs and outputs are transported through trucks and tractor trolleys. The animals from the sub-project area are transported to Hyderabad and Karachi by trucks. The firewood is also transported through trucks and trolleys. Transport facility of sub-project area is given in Table - 26.

Table 26: Transport Facilities in the Sub Project Area

Name of sub-project	Van/Pickup	Bus/Truck	Car	Motor Bike	Distance from Village to Closest Metallled Road (km)
Baandhako	5	6	4	19	35
Baaro	3	5	2	11	35
Chakhri	2	4	2	10	35
Churlo	2	2	1	7	65
Sunn -2	3	1	2	19	17
Gadap-2	7	5	4	13	5
Khuda Bux	5	3	5	21	7
Lat-2	2	2	4	10	5
Jharando-2	3	5	4	9	9
Gorban Bhutti	4	2	4	13	7
Dahri Sharif	3	2	3	15	9
Jharando-1	5	3	5	27	8
Gaib Jan	2	2	3	17	16
Total	**46**	**42**	**43**	**191**	**-**

Figure 21: The view of transportation in sub-project areas

6.17 Telecommunication

During the field survey, the community reported that there is no landline facility available in the sub-project area. Mobile phone communication is not widely spread in sub-project area. While only major towns are connected with some networks.

6.18 Energy Sources

All the surveyed villages in the sub-project area are without electricity. The area people collect firewood from the surrounding area and some people purchase firewood from nearby town. The cost of firewood is Rs.500 per 40 kg. Moreover use of both solar system and diesel for irrigation purpose was also witnessed in some villages of sub-project areas.Diesel is mostly used in night time.

6.19 Drinking Water and Sanitation

It was observed that women and children were responsible for fetching water for drinking and domestic use. They fetch water depending on the availability of water source within and outside village. The underground water results sheet Table – 15 reveal that, all ground water

quality parameters are within SEQS & WHO permissible limits, except TDS, chlorides, total hardness and total coliforms, which were exceeding permissible limits in some sub project areas. The reason for exceeding TDS, Chlorides and total hardness is due to the natural strata or geological conditions of the area. The reason for exceeding coliform might be due to unavailability of the sewerage system or open defecation in the area. The underground water is not safe for the consumptive purposes. . In Chakri and Churlo dam site area spring water is used for the drinking proposed while in the rest of sub project area there is no any drinking water source and the villagers use the rain water stored in earthen reservoir or bores/hand pumps were additional source of drinking water.

Sanitation: during the survey, it was found that there was no proper sanitation in surveyed villages. In most of the villages open defecation is practiced, while small segment of population use direct pit latrines.
Within the sub-project area, people drain out used water in an open place and dump solid waste in the open. The details of sources of drinking water are provided in Table - 27.

Table 27: Drinking Water Source in the Sub-Project Areas

Sr. No.	Name of the sub project	Hand pumps	Bore wells	Water Table in ft (Min-Max)	Number of Tube-Wells and Use			Piped water
					Number	Drinking	Irrigation	
1	Bandhaka	2	2	100 - 250	2	✓	✓	0
2	Baaro	1	2	100 - 250	2	✓	✓	0
3	Chakhri	0	1	Spring	1	✓	✓	0
4	Churlo	0	1	Spring	1	✓	✓	0
5	Sunn -2	1	2	100 - 150	2	✓	✓	0
6	Gadap-2	2	4	150 - 200	4	✓	✓	0
7	Khuda bux	0	2	100 - 180	2	✓	✓	0
8	Lat-2	0	4	100 - 150	4	✓	✓	0
9	Jharando-2	1	4	150 - 220	4	✓	✓	0
10	Gorban Bhutti	2	2	80 - 120	2	✓	✓	0
11	Dahri Sharif Dam	1	4	100 - 150	4	✓	✓	0
12	Jharando-1	1	2	80 - 120	2	✓	✓	0
13	Gaib Janan	1	2	150 - 180	2	✓	✓	0
Total		**12**	**32**	**-**	**32**	✓	✓	**0**

Figure 22: The source of drinking water in the Sub-Project Area

6.20 NGOs

During the field survey it was observed that four major NGOs were reported working in the sub-project area namely, Thardeep Rural Development Program (TRDP), Sindh Education Foundation, HANDS and Sindh Graduates Association (SGA).

Thardeep Rural Development Program (TRDP)

Thardeep Rural Development Program (TRDP) works with poor and vulnerable segments of society particularly women in the sub-project areas. Currently TRDP is working in the sub-project areas with two major interventions including Sindh Union Council Community Economic Strengthening Support (SUCCESS) and Programme for Improved Nutrition in Sindh (PINS). The SUCCESS programme consists on various components such as, micro health investment, income generation grant, community investment fund, training of vocational skill programme, community physical infrastructure. The PINS programme includes agriculture, livestock, poultry through Farmer Field School and WASH improvement.

Sindh Education Foundation (SEF)

Sindh Education Foundation is one of the prominent organizations in Sindh Province, which is striving for the promotion of quality education in the rural areas of the Sindh Province. SEF is supporting elementary and primary schools for girls and boys in sub-project areas.

Health & Nutrition Development Society (HANDS)

HANDS is a national NGO working mainly in health and education sectors in the sub-project area. The organization is working on number of projects including community midwifery school, rural health centre (RHC), rural based community schools, SEF assisted schools and take a child to school project.

The Sindh Graduates Association (SGA)

Sindh Graduate Association (SGA) is a nonprofit social organization working for the uplift of the society, and striving for the promotion of education for the poorest people of the Sindh province. SGA is operating Gadap Public School with enrolment of 400 students.

6.21 Priority Needs of Community

During consultation meetings with the male and female 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 and female consultation meetings in the sub-project area different types of problems were identified and prioritized for each village are summarized as follows;

- Demanded the potable drinking water.
- Demanded for the employment opportunities for local people.
- Demanded male and female vocational centers for the youth.
- Demanded for construction of road pavement and link roads.
- Demanded for the provision of basic health facilities.

6.22 Archaeological and Cultural Heritage

During baseline survey, no archaeological sites observed in the impact zone of dam sites and no graveyard is situated within the sub-projects impact area. However, as far as district level is concerned, the area has a rich cultural and historical background with various ancient buildings. However, these are not situated within the primary impact zone of the sub-project area.

Figure 23: Archaeological Map of the Study Area

7. STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

The objective of conducting stakeholder consultations during the ESMP process was to inform all the stakeholders about the project, record and take into account their opinions, suggestions and concerns and establish confidence amongst the project stakeholders that the project was developed in a responsible way. This was achieved by informing the stakeholders in a timely manner about the proposed project, its potential consequences on the environment and local community itself, and by encouraging their feedback.

7.1 Consultation

This section provides the objectives, process and outcome of the stakeholder consultation conducted as part of the ESMF and ESMP. The primary objective of consultations was to disseminate the subproject information and to incorporate recommendations/ concerns of the stakeholder's particularly the local communities in the subproject design and implementation plan. Subproject stakeholders were identified through initial social impact assessment of each subproject. Stakeholder consultations were carried out during the preparation of the subproject through community meetings and focused group discussion and interviews of key informants.

Engagement approach

For the community level consultations, three days before the consultations, representatives of all the segments of the community were approached to invite for the consultations to ensure their participation in the consultation sessions. During this invitation purpose, date and time of the consultation was shared with the stakeholders

7.2 Community Consultation for Sub-Projects

The consultation was carried out during field visits conducted from 16 October 2020 to 9 December, 2020. The consultation was carried out in strict compliance with SOPs in light of WB guidance for COVID 19. The SOPs were implemented to mitigate COVID 19 related risks. Meetings were arranged in open locations or rooms with cross ventilation. Face-to-face community interaction has had to be conducted in small groups in suitable locations allowing for light, air, and for participants to sit at a reasonable distance. Field team comprising on the Environment and Social Safeguard Consultants along with staff of concerned sub-divisions of Sindh Irrigation Department visited the nearby villages of dams' sub-projects to get the views of the people of the sub-project, who are going to be affected and beneficiaries. They appreciated the Sindh Irrigation Department for taking up the initiatives for building small dams to recharge groundwater. The community was eager to have small dams in their area.

According to the community, these small dams would serve water requirement for human population, agriculture and livestock. (Annexure – IX Photo Log). Detailed consultation has been conducted with these villages as these are within the primary impact zone while the villages of the secondary impact zone have also been consulted through their village elders/leaders. (List of villages provided in Table 38)

Table 28: List of Villages Visited During the Consultation

Name of Sub Project	Name of Village	Date of Consultation	No of Participants
Baandhako	Kai Sharif	November 30, 2020	12
Baaro	Munhn Mukhri	November 30, 2020	18
Chakhri	Bakhur	December 2, 2020	13
Churlo	Wali Muhammad Gabol	November 30, 2020	15
Sunn -2	Muharam Khan Khoso	December 1, 2020	12
Gadap-2	Noor Hassan Jokhio	October 16, 2020	17
Khuda Bux	Radho Jokhio	December 17,2020	21
Lat-2	Ghulam Ali Jokhio	October 22, 2020	19
Jharando-2	Haji Ibrahim Baloch	October 17,2020	14
Gorban Bhutti	Haji Din Muhammad Baloch	October 17,2020	14
Dahri Sharif	Haji Muhammad Siddique Jokhio	October 17,2020	16
Jharando-1	Imam Ali Gaincho	October 17,2020	12
Gaib Jan	Rassal Jokhio	December 9, 2020	14
Total			**197**

Figure 24: Public Consultations at Sub-Project Area

7.3 Community Consultations with Females of the Sub Project Areas

During the survey, consultations with women were also conducted by female resource person, where local males were discouraged from attending. Sessions were conducted with women in eight sub-project areas, while total attendees were 138, while in five sub-project areas, the community did not allow female resource person to conduct sessions with female due to social and cultural barrier. The details of project were described and explained using simple language. During the meetings the women were encouraged to ask questions and share their views and concerns related to the project, which were noted accordingly.

They were informed that with the successful completion of the sub-projects, it will boost up living standard of the inhabitants through conservation of the flood flows and to utilize the same for irrigation and other purposes etc. They were happy and told that these sub-projects are most important for their better livelihood and also help them during drought period. They also told that these sub-projects will leave positive impacts on women and their livestock and they do not have any concerns with these sub-projects.

Table 29: List of villages visited during the women consultation

Name of the Sub project	Name of the village	Date of consultation	No of participant's
Baandhako	Kai Sharif	November 30, 2020	Community did not allow to conduct female sessions
Baaro	Kai Sharif	November 30, 2020	
Chakhri	Kai Sharif	December 2, 2020	
Churlo	Wali Muhammad Gabol	November 30, 2020	
Sunn -2	Muharam Khan Khoso	December 1, 2020	
Gadap-2	Noor Hassan Jokhio	October 16, 2020	22
Khuda Bux	Radho Jokhio	December 17,2020	17
Lat-2	Ghulam Ali Jokhio	October 22, 2020	16
Jharando-2	Haji Ibrahim Baloch	October 17,2020	19
Gorban Bhutti	Haji Din Muhammad Baloch	October 17,2020	15
Dahri Sharif	Haji Muhammad Siddique Jokhio	October 17,2020	13
Jharando-1	Imam Ali Gaincho	October 17,2020	21
Gaib Jan	Rassal Jokhio	December 9, 2020	15
		Total	138




Figure 25: Female Community Consultation Meetings in the Sub-Project Area

During consultation process, they were briefed that the barren land/ excavated earth will be used for borrow material and contractor will be bound to take borrow material from nearby areas from proposed small dam sites. If material borrowed from private land or someone want to sell the material, the contractor will have to do written agreement with the landowner and after completion, the purpose the contractor will restore the land as per approved site-specific environmental management plan. They applauded the efforts of Sindh Irrigation Department. They were also informed that the continuous liaison with local community will be maintained to update them about status of sub-projects implementation. Their complaints, if any will be redressed through Grievances Redress Mechanism. It will provide local community a chance to address their concerns during construction activities. During public consultation/ interviews, the people of the sub-project areas were fully involved and they came up with positive conclusion: Some comments/ observations with actions/ responses from the community (male and female) are as follows.

Comments /Observations	Action /Response
Employment should be given to local persons especially to those from villages within the study area, Participants from the sub-project villages, during the consultation	Participants were told that local community people would be employed through contractor coordinator and this is strictly mentioned in monitoring plan.

strongly demanded that unskilled labour should be hired from local area, as there is availability of unemployed young men.	
Participants were of the views that proper dissemination of information about the sub-project may be ensured	Participants were briefed about the sub-project in detail during field focus group discussion, interviews, consultation while preparing ESMP. They were informed that community members are on board and are aware about the sub-projects, while the interaction between project and community would be ongoing process throughout project.
Livestock is scared by the increase in traffic and noise from machinery during project construction and operation, which may cause stress and disease. The community is dependent on the livestock for income.	Techniques to reduce the noise will be employed. Road and traffic route will be planned to avoid disturbance to community.
The privacy of women may be affected due to the project. Women currently collect fuel wood, tend to livestock etc. and the family is not concerned about their safety. However, with the increase of outsiders this freedom of movement for women will be reduced.	Cultural sensitization training will be a part of the induction program for new employees. Moreover, specific clause would be made part of contract/biding document as below. No interaction of labor with women and children.

Keeping in view the comments and responses it is very essential that the concerns of people may be addressed by applying good governance and management practices before and during the construction work.

7.4 Consultation with Institutional Stakeholders

Institutional consultations were conducted with the representatives of government departments and major NGOs working for environmental conservation. In these stakeholder consultations, the identified institutional stakeholders were briefed about the salient features of proposed sub projects and their opinion about the sub projects were requested. The list of identified institutional stakeholders and date of consultation with their representatives is given in Table 30.

Table 30: List of Institutional Stakeholders

Stakeholder	*Date of Consultation*
World Wide Fund for Nature (WWF)	November 23, 2020
International Union for Conservation of Nature (IUCN)	November 24, 2020
Sindh Wildlife Department	November 24, 2020
Sindh Environmental Protection Agency (SEPA)	November 27, 2020

Summary of concerns raised by institutional stakeholders

Comments/Observations	*Actions Responses*
Generally, all the stakeholders agreed with the proposed sub project and positive opinions were found about the project along with a few concerns.	Noted.
Majority of the stakeholders expressed that they have no direct or indirect concerns or issues and they all appreciated the proposed development.	Noted.
The stakeholders suggested that lower riparian of small dams should not be affected	The small dams will recharge the groundwater and percolation would take place towards downstream areas. As a result, the downstream communities would be major beneficiaries of the dams.
The stakeholders suggested that construction of small dams would lead to improvement in overall socioeconomic conditions in the sub project areas.	Noted
The stakeholders suggested that construction work must be carried out with quality.	Adherence to construction standards with high quality is an integral part of the project implementation.
The stakeholders suggested that care must be given to protect fauna and flora during the construction phase	Adequate measures to protect fauna and flora have been provided in section 5.5
The stakeholders recommended that the project proponent help the local communities' plant fruit and palatable tree species in the nearby surroundings that would not only help in greening of the area, but also provide feed for livestock.	The planation would be undertaken with preference of local species no exotic species will be promoted.

Additional Consultation with Stakeholders

Additional consultations were conducted with the representatives of Agriculture Department and NGOs working in the area. In these consultations, the identified stakeholders were briefed about the salient features of proposed sub projects and their opinions about the sub projects were requested. The list of identified stakeholders and date of consultation with their representatives is given in Table 31.

Table 31: List of Stakeholders

Stakeholders	Date of Consultation
Health and Nutrition Development Society (HANDS)	April 14,2021
Sindh Graduate Associate (SGA)	April 14,2021
Agriculture Department	April 15, 2021
Thardeep Rural Development Programme (TRDP)	April 15,2021

Summary of concerns raised by stakeholders

Comments/Observations	*Actions Responses*
The stakeholders were of the view that water scarecity is a major prblem of the sub-prject areas, and these dams will bring positive change in the area. They appriciated the efforts of the Sindh Irrigation department for such initiatives.	Noted
The stakeholders suggested that, the list of the proposed dams alongwith beneficiary villages may be shared with them. So that they may also cover these villages through their interventions.	The list of the dams and beneficiary villages was shared with stakeholders, this would enable the organiztaions and department to cover these areas through their project interventions.
It was suggested by the stakeholders that during the construction phase, local tradditions and customes need to be valued and repected. The camp office should be established away from the vilages/settlements.	It was assured that local cultural values and traditions will be given full consideration and site camps will be establihsed away from the villages.
The stakeholders suggested that, constructions of the local road pavements for the local comunities as they can easily move.	Though this is not in purview of the project. However, the communities may approach relvent departments.
The representative of Agriculture Department stated that the department is promoting high efficiney irrigation system in these areas and they would also cover the sub project areas for their interventions.	The SRP will extend full support to such inititves and facilitate the concerned departments to promote high efficeney irrigation system in the sub project areas.

Meeting with HANDS

Meeting with Sindh Graduate Association (SGA)

Meeting with Agriculture Department Government of Sindh

Meeting with Thardeep Rural Development Program (TRDP)

Figure 26: Photographs of Additional Consultations

Consultation with IUCN

Consultation with World Wide Fund for Nature (WWF)

Consultation with Sindh Wildlife Department Consultation with Agricultural & Livestock

Figure 27: Photographs of Institutional Consultation

7.5 Information Disclosure

As disclosure requirement, the Environmental and Social Management Framework. (ESMF) has been uploaded on the SRP Sindh Irrigation Department website, while an executive summary of ESMP of the reported sub-projects will be translated into Sindhi after approval from the World Bank and it will be uploaded on the website of SRP Sindh Irrigation Department. The hard copy would also be made available at the campsites.

8. ENVIRONMENTAL & SOCIAL IMPACTS AND MITIGATIONS

The reconnaissance field visit was carried out to assess the social and environmental impacts of the activities to be undertaken for the Construction of Small Dams/ Weirs. A checklist showing rapid assessment of potential environmental and social impacts, mitigation measures and residual impacts after mitigation reveals that the project activities will not cause significant disturbance and inconvenience to the local community and natural environment of the area. All the impacts which have been identified during the reconnaissance are associated with the construction phase, and minor to moderate in severity, and can easily be mitigated through planning or adopting appropriate management measures that are included in this ESMP. The minor impacts can be resolved through the best management practices. Social impacts such as getting borrow pit areas, hiring of laborers and setting up of labour camps will be mitigated according to applicable policies and procedures. The sub-projects will be highly beneficial for the inhabitants of water-scarce areas of Kohistan. The nature and scope of the construction activities would bring a number of the associated potential social and environmental impacts.

The social impacts associated with the borrow pit area will be managed by proper guidance and strict monitoring of subproject activities. The labourers are expected to be recruited largely from local areas, which will enhance economic opportunity for them. The environmental and social safeguards rapid screening depicts that: (i) the sub-project will not require land acquisition; and (ii) the sub-project will not involve any involuntary resettlement.

8.1 Impacts and Mitigations

8.1.1 Major Social & Environmental Impacts and Mitigations

Many positive impacts like socio-economic uplift of the area and creation of job opportunities for the local people are envisaged during the construction and operation stages of the sub-project. The groundwater table around the command area will rise and will be utilized for drinking and irrigation purposes. In other conditions, flooding of the downstream area will be less as compared to past conditions. An increase in per capita income and other opportunities and general uplift of the area are expected.

The possible negative impacts of the construction of proposed dams on air, water, land and also on socioeconomic matters, issues at the proposed dam-site as well as surroundings include agriculture, water quality, watershed erosion and siltation, downstream erosion and water-borne diseases.

It is evident from the checklist that the sub-project is environment friendly concerning the reservoir area and the command area. As regards the command area, the people of this area

will be the main beneficiaries. The following sections give in detail the possible environmental impacts and their mitigations.

8.1.2 Temporary Impacts during Construction Phase

During the construction of proposed dams, the surrounding area will face some undesirable effects. A number of impacts are temporary and may occur during project construction or early years of project operation. Some of them are described below:

8.1.3 Health and Safety of Community and Construction Staff/Workers

During the construction stage of proposed small dams, there might be impacts on the health, safety and hygienic conditions of both the workforce and the local community. The potential impacts to the local communities shall be direct, such as being struck by moving plants or vehicles within and outside the sub-project area and indirect through the decrease in air quality surrounding the sub-project area. The air quality will reduce as a result of increased dust generated from construction and on transport routes, as well as due to emissions from plants and vehicles. The impact will continue for the duration of the works (12 months) and can be mitigated by using water bowsers (The water will be obtained from tube wells installed by the Contractors. The contractor shall strictly bound not to use community tube well) to prevent the creation of dust and by keeping plant and vehicles to a high standard through regular servicing to ensure they meet the SEQS.

8.1.4 Health and Safety Related Mitigations

All works shall be excluded from within 500 m of any residential area. The following steps are suggested for proper management of traffic on routes to be used for material transport within the sub-project area:

- The contractor will have to prepare an Occupational Health and Safety Plan and will submit it to the PISSC and PMT for review and approval. When approved, the contractor will implement the OHS plan during the construction period according to Sindh Occupational Safety and Health Act 2017. This plan will need to describe all jobs, their risks, and the controls that will reduce risks; these controls may include PPEs, restrictions on activities or locations, and other measures. The plan also needs to describe what type of training will be given to the workers. Those who work near water, at heights, with heavy equipment will need special training so those hazards can be managed and minimized.

- The contractor will ensure the use of Personal Protective Equipment (PPEs) for his labors during the construction period;

- 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 hire an HSE officer with adequate experience to address the above impacts.

- The Contractor will display signboards and banners about traffic diversion at places on detour routes;

- Provision of speed breakers at appropriate places in consultation with/approval of the Engineer which should be removed after completion of the project;

- Establish and obey speed limits;

- The Contractor will maintain workers' hygienic conditions in labour camps.

- The Contractor shall make available the first aid kit and bandages at all times and all the sites. The location of these kits shall be marked and shall be easy to access by all. Moreover, paramedic staff will be available on-site and the cost of hiring will be a part of the BOQ item.

- No private property without permission of the owner will be used for transportation;

- Drivers will fix net on containers while transporting stones etc.

Community liaison will be maintained during the construction stage and GRM will be established to address complaints related to safety hazards. The contractor will prepare an emergency response plan to address events such as fire, floods, earthquakes, injury/death, and accidents.

8.1.5 Health and Safety of Community and Construction Staff/Workers related to COVID-19

During the construction stage of small dams, there might be impacts of Corona Virus on the health conditions of the local community through the workforce.

8.1.6 COVID -19 Related Mitigations

Addressing COVID-19 at a project site goes beyond occupational health and safety, and is a broader project issue, which requires the involvement of different members of a project

management team. Given the project context, a designated team would be established to address COVID-19 issues, at the PMT level, PISSC level, and contractor level. Detailed SOPS are prepared as per World Bank SOPs of COVID-19. Detailed Mitigation measures are given in SOPs attached in Annexure - XII.

8.1.7 Noise Pollution

During the Construction stage, Noise will be created because 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). 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.

8.1.8 Noise Related Mitigation

The mitigations shall be to limit working hours to between 8 am and 6 pm, six days a week. The campsites shall be situated at least 500 m from any settlement. Noise monitoring will be conducted every month as recommended in ESMP as per SEQS. In spite of this, On-demand noise monitoring will also be carried out in case of any complaint or request by the affected communities. The noise level of machines to be used during the construction will be controlled and measured will be taken to limit the levels as SEQS, as far as possible and the workers will be provided earmuffs, where necessary. 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. As the proposed Dam sites are far away from the population so, excavation noises would not affect the local population and only vehicular movement would cause minor noise and would disturb the air quality. While no noise issue is anticipated during the operational stage there would be no machinery movement and other noise-related activities.

8.1.9 Air Pollution

Keeping in view the distance of proposed dam sites and the population there would be no major impact of air and noise pollution. During construction following minor issues may arise and are as under,

i) Air Quality

Air quality would be disturbed during the construction stage due to cuttings for excavation of weir construction, vehicular movement, and release of particulate matter $PM_{2.5}$ from vehicular emission. Construction activities will generate dust and pollute the surrounding area. The emission from the machinery used in earthwork activities will also degrade the air quality of the site. Exhaust of noxious gases from movement of heavy machinery will further pollute the

air, which will adversely affect the health and vigor of plants. Smoke emission from the vehicular movement and heavy machinery would slightly cause the smoke problem in the nearby villages, which are located on the way of the proposed dam site

ii) Dust

The impact of dust is restricted only to the few villages, which are very closely located on the route to the proposed dam sites. The dust problem is expected to be minimal. During the operational stage, the area would be dust-free as there would be no operational activities and heavy vehicular movement.

8.1.10 Air Pollution Mitigation Measures

The air-related mitigation is discussed as follows, during the construction phase of the proposed sub-projects; some adverse impacts on the environment by suspended dust are foreseen. These will be effectively mitigated by adopting the following preventive measures;

- Regular spraying of water should be undertaken to minimize dust pollution. The water would be obtained from tube wells installed by the Contractors or maybe greywater from the camp areas and reuse of wastewater from batching plant.
- All vehicles, machinery, equipment and generators used during construction activities will be kept in good working condition to minimize exhaust emissions.
- The Contractor will regularly spray water on the site traffic routes to minimize dust pollution.
- Enforce the maximum speed limit to 20km/h for vehicles to reduce dust emissions.
- Native species trees shall be planted, no rapidly growing trees, shrubs and grasses in the project area shall be allowed during the operation stage of the sub-project with the collaboration of the Forest department.

8.1.11 Water-Related Impacts

i. Water Quality

The water samples were collected from the dug wells near the proposed dam site and were analyzed from the SEPA-approved lab; the results have already been summarized earlier.

The streams are non-perennial and flow only a few hours during rain months. During the construction stage, different types of activities such as cutting, earthwork and concrete work would alternately result in deteriorating the surface water quality.

A secondary adverse impact is potential spillage of chemicals, hydrocarbons, 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 Waste

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 greywater	Kitchen and washing areas sewage
Workshop waste including solid and Fluid	Used oil, ferrous /nonferrous materials, batteries, etc.
Medical waste	Syringes, glass bottles, Bandages, 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

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.

ii. Anticipated Aquatic and Terrestrial Life

Impacts on aquatic and terrestrial life during the construction stage are given below.

- **Impact on Impoundment Area**

The Reservoir area houses the population of plants, animal habitats, and reptile animals except for fish fauna due to the non-perennial system in the reservoir. After the construction of the proposed dams, a positive impact on plants, animal habitats and reptile animals in the impoundment area is anticipated. It is expected that reservoirs would retain water for two to three weeks.

- **Impact on Command/Lower Riparian**

The table 35 reveals that the ratio of reservoir capacity against the mean annual flow of thirteen small dams varies. These nais recharge the groundwater on the way and sometimes spread on banks. The combined reservoir storage capacity of four dams (Bandhaka, Baaro, Chakhri, Churlo) is 1106 acre-ft. As an average year, these small dams will be reducing flows to Manchhar by that amount annually. However, it may be noted that the sources of water for feeding Manchhar Lake are; Indus River, hill torrents and Main Nara Valley Drain (MNVD).

The water availability of Manchhar Lake from the above sources is 862,000 Ac-ft, as given below Table - 33.

Table 33: Existing Inflows to Manchhar Lake (Acre-ft)

Inflow Source	Existing Inflows to Manchhar Lake (Acre-ft)
Naing and Jhal Nai Systems	106,000
Shol Nai System (including Nai Gaj Flows)	178,000
Indus River	83,000
MNV Drain	661,000
Total	**1,028,000**
Evaporation Loss	-166,000
Net Water Availability	**862,000**

The quality of these sources is good except MNV Drain. The water availability of Manchhar Lake from the above sources is 862,000 Ac-ft. In the small dams (Under SRP-AF, Phase 1,II & III) only 0.103% of the water availability of Manchhar Lake will be retained for groundwater recharge. However, a part of the sub-surface flow will also join Manchhar Lake. Thus, the construction of these dams will not have any significant impact on lower riparian at mcro ecosystem level.

While, the small dams constructed under SRP-AF, Phase I, II & III on the tributaries of Malir River also have insignificant impact regarding lower riparian water avaliability. (refer Annexure –I). The combined reservoir storage capacity of these dams is 2022 acre-ft and the mean annual runoff of Malir River is 60,720 acre-ft, which means only 3.33 percentage of Malir River inflow will be retained as groundwater recharge. Since these dams are recharge dams, the groundwater will ultimately join Malir River and no significant impact on lower riparian is envisaged.

Table 34: : Ratio of Retention Water against Mean Annual Flow – Macro Level

Sr. No	Small Dam	Water to be retained for groundwater recharge by the Dams (Reservoir Capacity in Ac-ft)	Existing Inflows (Acre-ft)	The ratio of Water to be retained by the dams against Existing Inflows (%)
1	Bandhaka (SRP-AF)	490	862,000 (Manchhar Lake)	0.057
2	Baaro (SRP-AF)	84		0.010
3	Chakhri (SRP-AF)	29		0.003
4	Churlo (SRP-AF)	96		0.011
5	Dhal Dhoro (Phase II)	87		0.010
6	Gabol (Phase II)	110		0.013
7	Sunn-2 (SRP-AF)	407	5642	7.214
8	Gadap-2 (SRP-AF)	115	60720 (Malir River)	0.189
9	Khuda Bux (SRP-AF)	345		0.568
10	Lat-2 (SRP-AF)	68		0.112

11	Karmatiani (Phase I)	51		0.084
12	Jharando-2	210		0.346
13	Gorban Bhutti	120		0.198
14	Aripir (Phase I)	218		0.359
15	Upper Mole - II (Phase II)	139		0.229
16	Sangchat Jo Tar (Phase III)	600		0.988
17	Dahri Sharif (SRP-AF)	87		0.143
18	Jharando-1 (SRP-AF)	69		0.114
19	Gaib Janan (SRP-AF)	607	1009	60.159

Water retention against the mean annual flow of the small dams with respect to each nais/streams have been given in the Table 35. The table depicts that highest value is the 65.7 % at Bandhaka Dam and lowest at Jharando -1 which is 2.6%. Whereas, the remaining non-perennial streams will retain 4.9 to 28.3 % of water, the rest will flow as the natural pattern. This was also confirmed in the 'Performance Evaluation Study of Small Dams in Sindh Province', which stated that 'the locals also informed that water was spilled from the spillway of dams 2-3 times in monsoon season'.

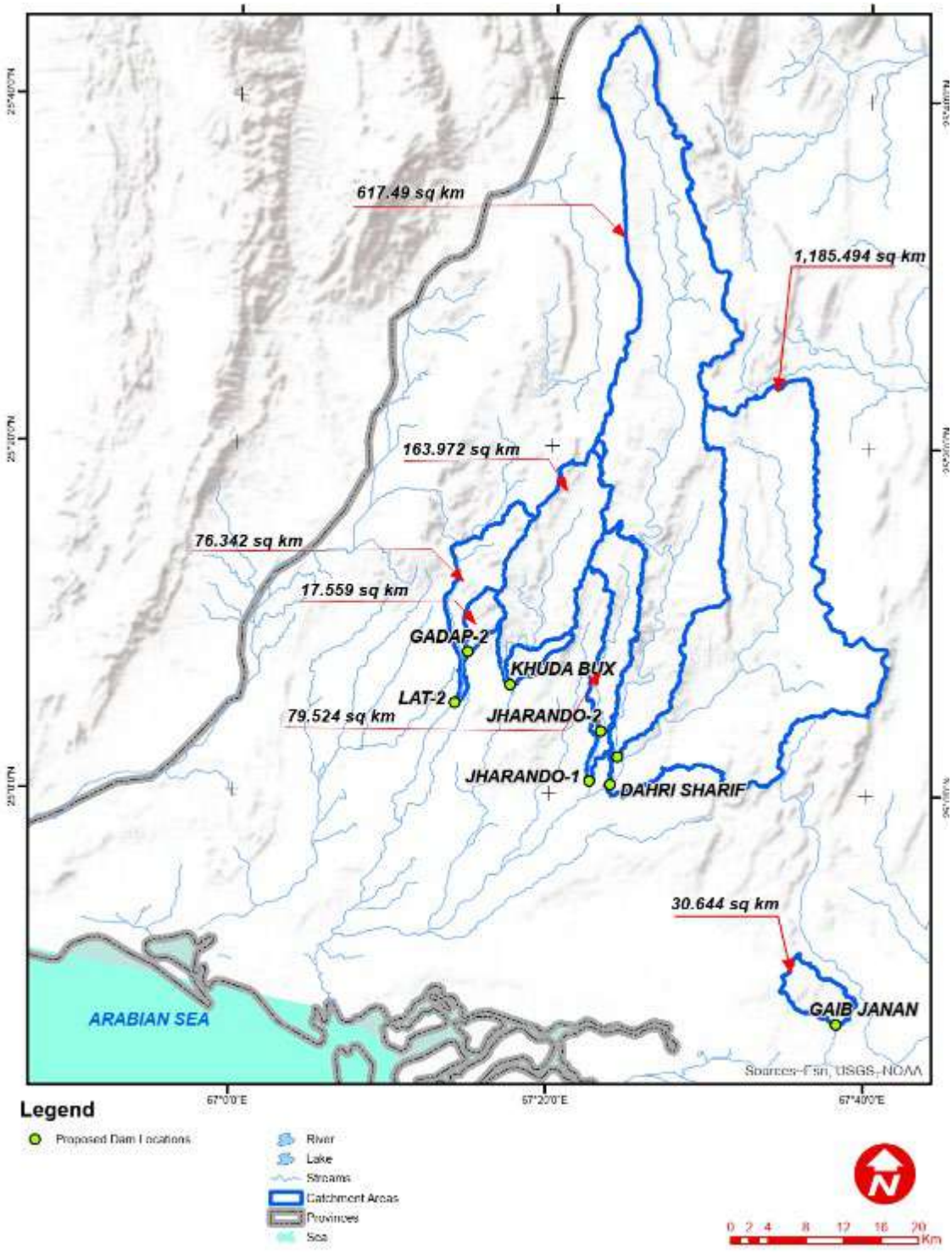
Table 35: Ratio of Retention Water against Mean Annual Flow – Micro Level

Sr. No	Small Dam	Water to be retained for groundwater recharge by the Dams (Reservoir Capacity in Ac-ft)	Water avaliability in Catchment Area (Acre-ft)	The ratio of Water to be retained by the dams against Water Availability in the catchment (%)
1	Bandhaka (SRP-AF)	490	746	65.7
2	Baaro (SRP-AF)	84	297	28.3
3	Chakhri (SRP-AF)	29	140	20.7
4	Churlo (SRP-AF)	96	5553	5.3
5	Dhal Dhoro (Phase II)	87		
6	Gabol (Phase II)	110		
7	Sunn-2 (SRP-AF)	407	5642	7.2
8	Gadap-2 (SRP-AF)	115	580	19.8
9	Khuda Bux (SRP-AF)	345	5401	6.4
10	Lat-2 (SRP-AF)	68	2515	4.7
11	Karmatiani (Phase I)	51		
12	Jharando-2	210	2369	8.9
13	Gorban Bhutti	120	21989	4.9
14	Aripir (Phase I)	218		
15	Upper Mole - II (Phase II)	139		
16	Sangchat Jo Tar (Phase III)	600		
17	Dahri Sharif (SRP-AF)	87		
18	Jharando-1 (SRP-AF)	69	2619	2.6
19	Gaib Janan (SRP-AF)	607	1009	60.2

It may further be noted that in sub-projects areas, the local population is already collecting rainwater for their use by constructing earthen embankments near proposed dam locations. The sub-project will replace those poor structures with properly designed safe structures with spillways. Practically there will be no additional intervention to the rainwater runoff towards

salty marshes due to the construction of these dams. Thus, there will be a negligible impact of the sub-projects on the eco-system of marshy lands. Since all the dams are of small reservoir capacity, there will be very small retention as compared to total flows in streams. Thus, there will be a negligible impact on the downstream flows. On the other hand, the groundwater recharge will percolate towards downstream areas; hence, the downstream communities would be major beneficiaries of these dams.

The bio-diversity including plants and animals in the command / downstream area during the construction period would experience little or no adverse impacts. After the construction of the dams, the command area and lower riparian will directly benefit by getting perennial groundwater supplies for drinking and domestic purposes.


617.49 sq km
1,185.494 sq km
163.972 sq km
76.342 sq km
17.559 sq km
GADAP-2
KHUDA BUX
LAT-2
79.524 sq km
JHARANDO-2
JHARANDO-1
DAHRI SHARIF
30.644 sq km
GAIB JANAN
ARABIAN SEA
Sources: Esri, USGS, NOAA
67°0'0"E
67°20'0"E
67°40'0"E
Legend
Proposed Dam Locations
River
Lake
Streams
Catchment Areas
Provinces
Sea
0 2 4 8 12 16 20
Km

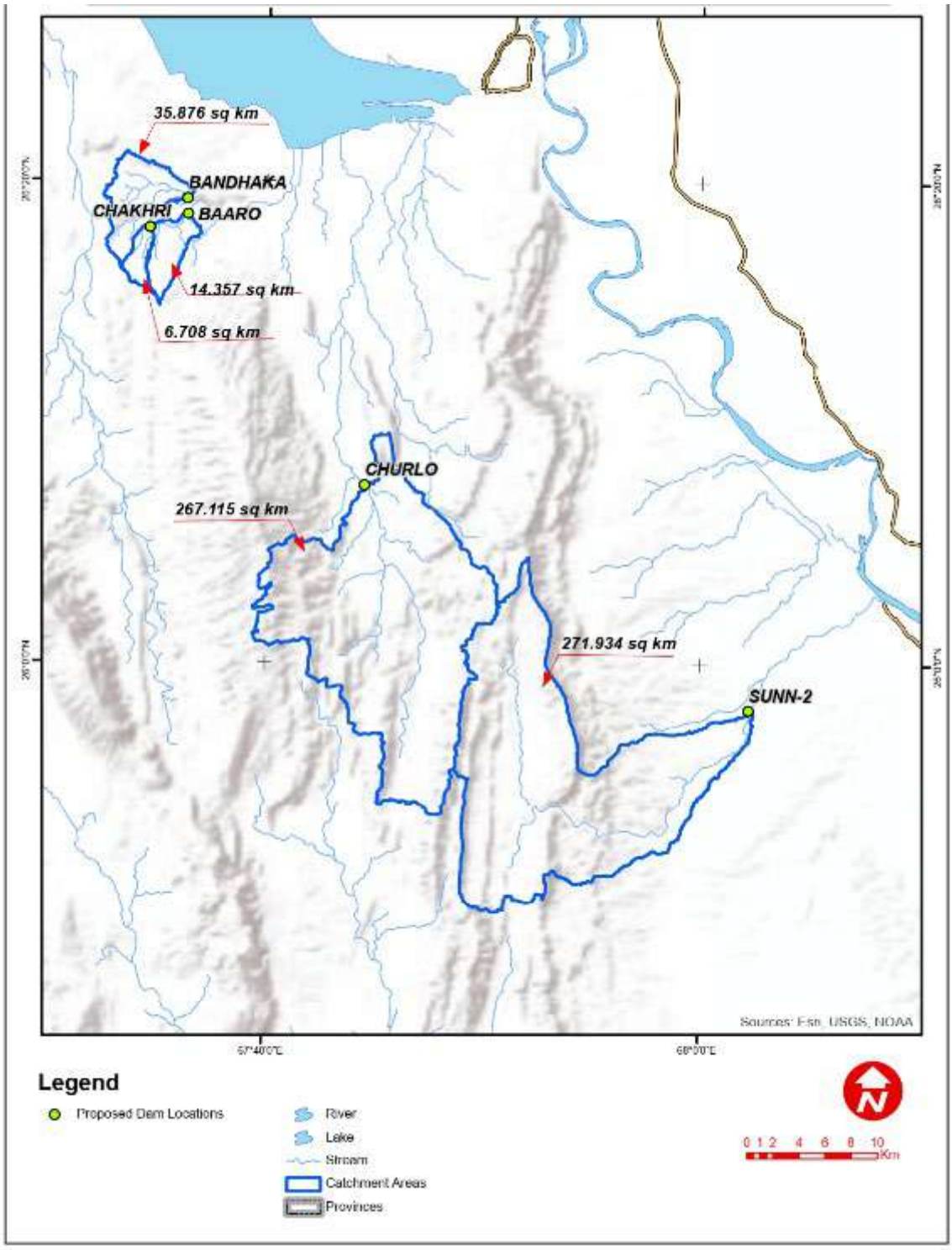


Figure 28: Watershed of Proposed Small Dams in Kohistan Region

Impacts of Dam Breach

The study of dam break was conducted as a part of the detailed design by PISSC. In their report titled “Detailed Design” the results of the dam break study are given in Table - 36 below.

Table 36: Summary of Dam Break Study

Sr. No.	Parameters	Bandhaka	Baaro	Chakhri	Churlo	Sunn-2	Gadap-2	Khuda bux	Lat-2	Jharando-2	Gorban Bhutti	Dahri Sharif	Jharando-1	Gaib Janan
1	**Flood Volumes:**													
1.1	Reservoir Volume at Normal Reservoir Level (Acre-ft)	490	84	29	96	407	607	87	69	120	210	345	115	68
1.2	Design (100-year) Flood Hydrograph Volume (Acre-ft)	2,523	1,319	395	20,155	22,523	5,822	226,983	14,843	120,112	13,991	42,197	1,655	11,137
1.3	Combined volume: Dam Breach+100-year Flood (Acre-ft)	3,013	1,403	424	20,251	22,930	6,429	227,070	14,912	120,232	14,201	42,542	1,770	11,205
2	**Discharge Peaks:**													
2.1	Case 1: Breach Hydrograph Peak (cfs)	19,666	19,788	7,265	21,928	19,788	17,065	24,788	17,122	23,244	21,484	18,156	19,788	12,715
2.2	Case 2: Design (100 year) Flood Peak (cfs)	7,046	3,233	2,164	19,374	13,492	7,536	57,272	9,243	31,147	9,325	20,672	5,991	10,334
2.3	Case 3: Combined : Dam Breach + 100 year Flood (cfs)	26,711	23,021	9,428	41,302	33,280	24,600	82,060	26,364	54,390	30,809	38,828	25,779	23,049
3	**Inundated Area (Sq.Miles):**													
3.1	Case 1: Dam Breach only	8.34	3.21	1.56	4.50	6.40	1.40	5.62	2.96	6.17	4.19	18.13	9.45	5.93
3.2	Case 2: Design (100-year) Flood only	6.92	4.48	3.09	35.29	5.85	6.98	30.49	24.07	77.11	28.31	19.12	16.10	34.43
3.3	Case 3: Combined : Dam Breach + 100 year Flood	8.99	6.01	4.33	36.14	7.08	7.33	30.82	24.72	77.63	29.60	20.73	31.30	35.41
4	**Estimated population affected according to Land Scan Population Grid:**													
4.1	Case 1: Dam Breach only	2,714	428	51	1,599	1,469	151	1,263	804	1,405	1,263	130,279	14,895	7,158
4.2	Case 2: Design (100-year) Flood only	2,714	2,766	2,405	10,156	5,483	15,542	299,728	188,983	224,883	194,734	283,230	130,791	396,630
4.3	Case 3: Combined : Dam Breach + 100 year Flood	3,126	2,986	2,705	10,753	6,360	16,209	300,716	195,661	336,157	199,440	283,230	181,624	379,510

It has been concluded from the dam break study, the reservoir area of all thirteen (13) dams is small and not exceeding 2.58 sq. Kilometers. Thus, the area inundated in the worst-case scenario (Combined dam breach + 100-year flood) 91.7 Sq. Km (35.41 sq. Miles) at Ghaib Janan, and the number of the person affected in the worst-case scenario is 379,510 people (Refer Annexure X). Overall, the areas inundated by the breach of dams are small and consequently, the population affected in case of dam breach is small. Therefore, the incremental impact of dam breach on 100-year design flood is not appreciable. The number of populations affected depends on the human settlements downstream of the dam. In the case of Ghaib Janan Dam, the appreciable population may be affected in event of a high flood. An emergency preparedness plan will be prepared for all dams.

8.1.12 Water-Related Mitigations

A contractor will make his arrangement and would not rely on existing community resources and would not extract from sources currently used by the community. The water would be obtained from tube wells installed by the Contractors. The contractor shall strictly bound for not to use community tube well as this may compete for the local water resource in the dry season when the water table decline. The contractor will conduct an Electrical resistivity surveying test along with a pump-out test to assessing the groundwater potential required for the construction activities before the tube wellbore. This condition will be included in the Bid document as contractual binding. Moreover, the Contractor must provide the following facilities at each campsite: Latrines; lined washing areas; septic tanks and soaking pits for toilet waste. Key mitigation measures are listed below.

- There should be proper septic tanks and soaking pits for sewage treatment and disposal, sewage/sanitation at work camps and proper wastewater collection facilities. Wastewater effluent from contractors' will be passed through an oil skimmer and to gravel/sand beds to remove oil/grease contaminants before discharging it into natural streams. Septic tank and soak pit shall be covered properly to avoid any obnoxious smell in the surrounding areas. Soak pit will be built in absorbent soil and located 300m away from a water well. Soak pits will be designed to accommodate wastewater generated during the total during of the operation. Soak pit will be constructed such that surface runoff cannot enter the pits. At the time of restoration, septic tanks will be dismantled in place and backfilled with at least 1m soil cover keeping in view landscape of surrounding natural surface
- To overcome the contamination issue, at each construction camp, the contractor shall install a solar oprated domestic water filter/150GDP with Ultraviolet (UV) to ensure safe and healthy drinking water for the workforce.

- Proper collection and disposal of water used for construction (to be the contractor's responsibility).

- Collection drains and oil interceptors.

- Regular monitoring of water quality shall be carried out by the PISSC and ESMU of PMT.

- Contractor / PISSC will purchase water from nearby available resources as well as dig his own well.

- Water consumption will be monitored during construction stage and records will be maintained to avoid any wastages.Moreover grey water will be used for the sprinkling as well.

- Diesel, oil and lubricants should be properly stored in accordance with the petroleum regulations. This will be the responsibility of the contractor.

- Appropriate arrangements will be made to stop stones and soil to slip into the river water.

- Community liaison will be maintained and GRM will be established to address complaints related to waste disposal.

8.1.13 Impacts of Solid Waste

Domestic waste will be the main type of waste generated from construction camps. Domestic waste contains high percentage of readily degradable hydrocarbon which gives a bad smell on decomposition, especially in hot and humid environments.

The total quantity of domestic waste generated will vary depending on the strength of labor that the contractor poses to use. It has been estimated that the strength of labor will be about 600 at the peak of the works. Most of the labor will be locals who will return to their homes at the end of the working day. A maximum of about 25 % of labour comprising mainly skilled labour will reside at construction camps at the peak of the works. Solid waste generation in Pakistan ranges between 0.283 to 0.612 kg/capita/day and the average dry weight per capita solid waste generated per day turns out to be 0.447 kg/capita/day. From the construction camps, it is estimated that up to 72 kg of domestic waste (including food waste) would be generated daily during the peak of the works.

8.1.14 Mitigation for Solid Waste

For solid wastes, the following mitigation measures are recommended:

- No Solid waste will be disposed of in the field. All solid waste will be disposed of in the waste bins provided within the working area.
- Combustible noncombustible and hazardous waste will be temporarily stores on site and handed over to approve waste contractor for recycling purposed and safe disposal.

- Encourage staff (through training) to reduce and reuse waste wherever possible.
- Arrange for regular collection of camp waste and transfer to storage area/disposal with the cooperation local admiration.
- Furthermore, the contractor will draft The Waste Management Plan (WMP)and get approval from PSSIC/PMT. The Contractor shall include details of the procedures for the collection and disposal of wastes. The Plan shall deal with each waste stream separately. WMP will be prepared and implemented by the Contractor based on ECPs 1, 2, 5 & 10 and WBG EHS Guidelines (2007).

8.1.15 Income and Employment

The employment opportunities generated by the growth in the local agricultural sector by enhanced availability of groundwater both in quantity and quality and some other sectors, the economy that stems from the agriculture improvement and livestock will increase significantly.

8.1.16 Land and Property Value

Due to improvement in the environmental quality in terms of groundwater availability and quality, some increase in land and property value is also expected.

8.1.17 Development of Borrow Land

The proposed raising of the proposed dams involves concreting and earthworks. Borrow areas for bunds are proposed in existing bunds to increase their capacities. Therefore no major effects on the borrow areas is anticipated.

8.1.18 Reclamation of Land

During operational stage no water logging, salinity and erosion properties are anticipated, so, no reclamation of the land would be required at later stages.

8.1.19 Development of Roads

For the transportation of construction material, equipment and heavy machinery the existing Motorway M9 from Karachi to Hyderabad and 40 km link roads from Motorway will be used. From Jamshoro to Dadu and Sehwan N55 Highway will be used. No permanent or temporary roads therefore required to be constructed for accessibility of the proposed small dam site. Existing tracks will be used for the transportation of the material, and these are capable for the transportation of material

8.1.20 Land Use Changes

During the construction of the dams and associated works some technical staff, workers and officials would be staying near the dam-site and would require land for their residence such as contractor's camp, staff residences & dam. During the construction stage, necessary localized arrangements for electric power and telephone exchange is needed as the area is lacking these two facilities. During construction stage, the clearing of vegetation or land use changes will only be anticipated at dam axis points and the camp areas. These have been proposed at already cleared/barren land. Moreover, no Permanent or temporary road will be constructed existing alignment will be used. The operation phase of proposed dams will create positive impact on land use and ecology in terms of enhanced vegetation cover & habitat restoration due to availability of water. With reference to a research paper published in Civil Engineering Journal on Land Covers Change Assessment After Small Dam's Construction Based on the Satellite Data (Accepted 08 March 2019). It has been concluded that the constructions of small dams have a positive impact not only on land cover changes but also on livelihood resources directly and indirectly and reduce the wastage of water and store the water for future needs..

8.1.21 Biodiversity

A detailed baseline of the main habitats and mammals, reptiles, amphibians and birds present in the sub-project area is given in Section 5.

During the baseline survey of the sub project area, no endemic or rare species were observed in the primary impact zone. All species recorded during the field survey have a wide range of distribution. Since the proposed dam and camp sites will occupy small areas and will be located in existing clearings, because of sparse vegetation cover, the impacts are reversible and localized by adopting the mitigation measures. However, dense patches of vegetation wherever encountered along the small dam axis will be avoided to the extent possible. Furthermore, development of new tracks will be avoided existing tracks will be used. Use of local vegetation as fuel by labor will be prohibited. Work force while working along will concentrate within a corridor of 4.5m.

No hunting, harassment or netting of wildlife will be permitted. No clearing of bushes will be allowed during nesting/breeding season of birds. Maximum effort will be made to save rodent colonies during construction.

Due to establishment of labor camps, food storage, setting up of kitchens production of sewage and waste water may result in multiplication of rodents like rats, mice and shrew etc. and vectors like mosquitoes, bugs and flies which will have a negative impact. Temporary impacts during the construction of the proposed dams on wildlife.

Moreover, the total reservoir areas of proposed dams is small about 2.58 sq. km (0.9 sq. miles) hence there will be no impact on wildlife species due to project activities in terms of habitat destruction. After the creation of reservoirs diverse wildlife including migratory birds may be attracted.

During the transect walk in the sub-project area especially proposed dam construction areas none of the species have been observed. Average aerial distances of Kirthar National Park (KNP) from the proposed small dam sites are given in following Table – 37. Only five proposed dams are within 20000 m (20 Km) away from the KNP area. In these proposed Dams construction activities strictly limited and monitored by the environmentalist.

Table 37: Distance of Kirthar National Park (KNP) from Proposed Dams

Sr. No.	Sub-Project Area	Tehsil-District	Distance (Km)
1	Bandhaka	Sehwan-Jamshoro	36
2	Baaro	Sehwan-Jamshoro	35
3	Chakhri	Sehwan-Jamshoro	38
4	Churlo	Sehwan-Jamshoro	25
5	Sunn-2	Manjhan-Jamshoro	30
6	Gadap-2	Gadap-Malir	25
7	Khuda bux	Gadap-Malir	30
8	Lat-2	Gadap-Malir	25
9	Jharando-2	Gadap-Malir	20
10	Gorban Bhutti	Gadap-Malir	25
11	Dahri Sharif	Gadap-Malir	35
12	Jharando-1	Gadap-Malir	38
13	Gaib Janan	Gharo-Thatta	85

The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly, wastes of the camps will be properly disposed of to prevent it being eating by wild animals.

In addition to this no-poaching or hunting will be allowed to project staff; also, Sindh Wildlife Department (SWLD) is vigilant for the protection of wildlife in the sub-project area. The Contractor's staff and labor will be strictly directed not to damage any vegetation such as trees or bushes. They will use the paths and roads for movement and will not be allowed to trespass through farmlands or forested areas. Special measures will be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding. Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.

8.1.22 Watershed Erosion and Sedimentation

As there would be no intervention in the watershed area, therefore no erosion is expected due to the construction activities of the dams. However, during operation stage watershed erosion may result in the accumulation of silt in the reservoir resulting the effective life of the dams. Proper watershed management is, therefore, required in the catchment area.

8.1.23 Downstream Erosion and Siltation

The water quality may be temporarily disturbed at dam-sites due to construction activities and temporary residential areas for the workers/staff, which is one of the causes for water borne diseases. Water utilization would be minimal as the distance of the dams to the nearest settlements is significant that would prevent use of water on the daily basis.

8.1.24 Wastewater Discharge

Domestic wastewater from the contractor's camp will be collected in the septic tanks, before reaching top level treated water will be collected in the water tanker then after same water will be used for sprinkling purpose on the haul routes to settle down the dust. Therefore, no adverse impact is foreseen in the area. However, the design of septic tanks will be done during construction stage by contractor on the basis of occupancy in the camp and same will be ensured in Contractors' ESMP.

8.1.25 Socio Economic Impacts

The sub-projects will be instrumental in considerably improving the socio economic conditions of the local population, both during the construction and operation stages, through provision of considerable job opportunities. Employment, health, life style and cultural uplift are the direct benefits during these stages.

i. Population and Settlement Pattern

During the construction stage considerable job opportunities will be created. The standard ratio will be applied by the contractor while hiring labour i.e. 70% local and 30% non-local. For skilled jobs people from other parts of the country would be employed. There would be some temporary increase in the visitor population who would however leave the area after the completion of the construction activities. During the operation stage no adverse impact is envisaged.

ii. Human Resource Development

During the construction stage local population would get jobs in the form semi and unskilled labor. The wages for unskilled labour would be Rs.600/day, semi-skilled labour Rs.800/day, while skilled labour Rs.1200 to 1500/day These wages are as prescribed by Government of Sindh. Due to their interaction with skilled labor, their skills would be developed for future development activities of this kind.

iii. Impacts of Labor Employed from Outside

Gender Based Violence (GBV), Sexual Expliotation and Abuse (SEA) and Violence Against Children (VAC)

Some social impacts could arise due to labour influx. There shall also be a risk to community health from HIV/AIDS / COVID-19 or other transmitted infections as a result of the presence of a migrant construction labour. There could be risk of gender based violence from the migrant labour, which often remains away from home on the site. This may lead to inappropriate behavior including sexual harassment of women girls and boys of the local community. This could especially be relevant in case the nearby population is from any marginalized group e.g. Hindu community. Cultural sensitization is necessary as a mitigation. Problem of child labour could also arise due to increased opportunities for the host community to sell goods and services to the incoming workers can lead to child labor to produce and deliver these goods and services, which in turn can lead to enhanced school dropout.

Mitigation

The PMT will conduct training of PMT, PISSC and contractor's staff at the outset of construction work. This training will include a component on the handling of complaints pertaining to GBV, VAW/G, VAC, SEA and SH and referral mechanisms available in the health and justice sectors, including helplines, and psychosocial counselling support.

While, the contractor shall also include proposals for awareness on HIV/AIDS/COVID-19 and the spread of sexually transmitted diseases in the CESMP and in training plan. The contractor will train the workers regarding (Gender Based Violence GBV) and also train workers about sexual harassment, child abuse, child labour, human trafficking for reducing the risk of GBV. First aid and medical facilities will also be provided by Contractor on site and camp areas.

Preference will be given to local labour for work; most of the labour will go back to their homes on daily basis. Limited number of labours (35 – 40) labour would be resident in the camp. The contractor shall include information about HIV/AID/COVID-19 and the spread of sexually transmitted diseases within the workers code of conduct. The contractor shall also include proposals for awareness on HIV/AIDS/COVID-19 and the spread of sexually transmitted diseases in the CESMP and in training plan. The contractor will train the workers regarding (Gender Based Violence GBV) and also train workers about sexual harassment, child abuse, child labour, human trafficking for reducing the risk of GBV. First aid and medical facilities will also be provided by Contractor on site and camp areas.

Moreover, Contractor will purchase water from nearby available resources, as well as dig his own well, for the consumption of water in camps for domestic purpose. In ecological sensitive areas, construction activities will be confined in the designated areas. No new access routes will be developed for borrow areas or for the movement of supply vehicles. Existing routes will be used for such activities.

iv. Socio Economic Uplift

During the construction stage of the sub-project socio economic condition of the population of the area may improve as a result of increase in per capita income through creation of direct and indirect opportunities of jobs. During operation stage of small dams, the communities of targeted command area would get perennial groundwater.

v. Impact of Dams on Lower Riparian

All 13 recharge dams of lower kohistan region will be constructed on well-defined nais (rivers). The natural drainage pattern of surrounding areas is towards wetland and after the overspill the remaining water will also flows to wetland area. Thus, construction of these small dams will not have any significant impact on lower riparian, however, the command area and lower riparian will directly benefit by getting perennial groundwater supplies for drinking and domestic purposes. All the 13 villages visited (primary impact zone) and 23 villages are located in the downstream/secondary impact zones of the proposed small dam sites are mentioned in Table – 38. During the consultation, the community of downstream villages appreciated the proposed construction of small dams and said that this is the need of the area. They further said that they have been practicing agriculture through rainwater harvesting on a small scale. They said that small dams would recharge the aquifers in the downstream area and would bring positive impacts on water availability in their villages. Major cops of the area includes wheat (40 Maunds/acre) and vegetables. The area is famous for onion (50 Maunds/acre) crop.

Table 38: Consulted Villages Located at Lower Riparian and Secondary Impact Zone

Name of Sub Project area	Name of Downstream Villages	Distance from the proposed dam site (km)	No of Household	Population
Bandhako	-	-	-	-
Baaro	Bakur	1	150	1050
Chakhri	Rahim Shahani	3	50	350
	Mondrani Noohani	2	35	245
	Haji Azizullah Gaincho	4	15	105
Churlo	Sujawal Gabol	2	10	70
	Sajjan Gabol	4	15	105
Sunn-2	-	-	-	-
Gadap -2	Pub Malir	2	40	280
	Molana Arzi Baloch	3	50	350
	Ali Bux Baloch	5	20	140
Khuda Bux	Sohrab Fakir Jokhio	1	200	1400
	Khamiso Jokhio	3	500	3500
	Rab Dino Zargar	2	25	175
	Gajan Baloch	3	250	1750
Lat-2	Akbar Gabol	2	100	700
Jharando-2	Wali Muhammad Baloch	2	60	421

Name of Sub Project area	Name of Downstream Villages	Distance from the proposed dam site (km)	No of Household	Population
	Siraj Ahmed Baloch	3	300	2100
Gorban Bhutti	Morio Fakir	1	350	2450
	Mubarak Brohi	2	50	350
	Murad Ali Baloch	4	40	280
Dahri Sharif	Hussain Baloch	3	75	525
Jharando-1	-	-	-	-
Gaib Jan	Suleman Jkhio	3	30	210
	Mehrab Mallah	2	40	280
	Allah Rakhyio Khaskheli	4	20	140
Total			**2425**	**16976**

8.1.26 Cumulative Impacts of the Project

The proposed project will have mostly positive impacts and slightly negative impacts in the subproject area. The cumulative impacts have been evaluated both during the construction and operation phases. The Impacts have been focused on biodiversity, labor influx, socioeconomic, lower riparian, excessive agriculture, and population migration due to availability of water.

The proposed thirteen dams under SRP-AF, planned under SRP and already constructed dam in the sub project area (as refer Annexure I) may have temporary and reversible impacts on habitat and wildlife. The first can be the loss of habitat due to the clearing of vegetation and the other one is a sensory disturbance to wildlife species due to the physical presence of people, vehicles, and equipment at sub project area. Around 250 trees including young and mature expected to be removed from site cumulatively. Plan for compensatory planting for at least five (5) trees against each removed tree have been proposed. Cost for tree plantation in has been included in ESMP Implementation budget.

In terms of habitat and wildlife, the cumulative impacts of these dams will be mitigated through appropriate measures such as, the clearing of habitat will only be done at dam axis points and the camp areas have been proposed at already cleared/barren land. No permanent or temporary road will be constructed existing alignment will be used.

The construction activities might be completed before the arrival of winter migrants or suggested to be done in phases. Moreover, the camps will be properly fenced and gated to prohibit the entry of wild animals in search of eatable goods. All these mitigation measures will be strictly implemented by the contractor's environmentalist and monitored by the supervisory consultant.

In terms of other terrestrial wildlife species, previous studies have shown that the effect of sensory disturbance during projects on small mammals, reptiles, and birds to be insignificant. Large mammals have a large home range and therefore, disturbance during construction may only result in short-term displacement from the immediate work areas not having any impact on the survival of the species.

During the construction of the dams cumulatively, about 706 worker will be hired by the contractor, thus their livelihood will be secured till the construction period. Good relations with the local communities will be promoted by encouraging the Contractors to provide opportunities for skilled and unskilled employees to the locals. However, the contractor will restrict his outsider staff to mix with the locals to avoid any social problems. Local vendors will be provided regular business by purchasing campsite goods and services from them. The contractor shall include information about COVID-19 and the spread of sexually transmitted diseases (HIV/AIDS) within the worker's code of conduct.

During operation phase of proposed dams (under SRP & SRP-AF) in addition to the already constructed dams may create positive impact on ecology in terms of habitat restoration and vegetation cover enhancement.

During operation phase reduction in surface water flow could be main cumulative impact of these small dams in addition to other already constructed dams, lower riparian communities could raise the issue. Since all the dams are of small reservoir capacity, there will be very small retention as compared to total flows in streams. Thus, there will be a negligible impact on the downstream flows. On the other hand, the groundwater recharge will percolate towards downstream areas; hence, the downstream communities would be major beneficiaries of these dams.

During the operation phase local population ‘s reverse migration may be expected due to availability of water, excessive agriculture activity may also increase.

The operation phase of proposed dams in addition to the other already constructed dams will create positive impact on ecology in terms of habitat restoration and vegetation cover enhancement due to availability of water. The proposed dams will have synergistic impact on over all water conservation and rain harvesting during operation phase.

The biodiversity/habitat (trees and vegetation) will be increased due to the availability of groundwater for a sustainable manner. With reference to a research paper published in Civil Engineering Journal on Land Covers Change Assessment After Small Dam’s Construction Based on the Satellite Data (Accepted 08 March 2019). It has been concluded that the constructions of small dams have a positive impact not only on land cover changes but also on livelihood resources directly and indirectly and reduce the wastage of water and store the water for future needs. Moreover, Small Dams Organization of Sindh Irrigation Department

conducted a study in April 2020 through consulting firm for 32 Small dams namely "Performance Evaluation Study of Small Dams in Sindh Province-" of previously constructed small dams in Sindh Province. This study also concludes that due to construction of small recharge dams in the area has positive impacts on biodiversity in terms of habitat improvement.

Keeping in view the terrain, topography, and available facilities in the project area, there are chances of reverse migration or enhanced agriculture activity due to the water availability. However, according to the recent study conducted in April 2020 conducted in project area, shows that, before the construction of small dams, the community of 53% migrated to other areas due to unavailability of water. Out of these 37% resettled back (reverse migration) to their villages after rainwater availability but 16% did not come back and settled at other places. However, locals of 31% after the construction of small dams never migrated in droughts conditions because of ground water availability. Therefore, migration ratio has been decreased due to construction of small dams in the area.

The proposed project will provide enhanced water availability for domestic and livestock. The small dams will hold rainwater at its upstream a few times depending upon soil permeability (generally 4-8 weeks), from where livestock drinking and other domestic needs of local communities will be met. Cumulatively, due to the construction of small dams the groundwater level both in upper and lower riparian will be increased. Currently, the groundwater level near all proposed dam sites ranges 80 to 250 ft. and it would be increased and available for a longer period as well. Moreover, as refer earlier "Performance Evaluation Study of Small Dams in Sindh Province" of previously constructed small dams in Sindh Province also conclude that due to construction of small recharge dam in the area have positive impacts on socio-economic uplift. For the instance in one case, the water table depth before the construction of the dam is 200 feet, which was raised after the construction of the dam 110 feet and Groundwater quality was poor which improved after the dam construction of the small dam. Moreover, during droughts, the water level in wells drops up to 45 feet but is available for the whole of the year, which dries up completely before the dam.

Hence, in the light of the above discussion, it has been concluded that cumulative impacts will be positive because due to the construction & operation of these small dams the shortage of Water for domestic and livestock use is reduced.

8.1.27 Post Construction Monitoring Plan

Flora

A care should be required for the newly planted trees. The Contractor shall be responsible under the supervision of SID for after care of the newly planted trees for the first year during defect liability period, after which trees will be handed over to the community.

Fauna

The contractor will conduct regular inspection of structures against burrowing by animals (Rodents, porcupines, reptiles etc.) for one year after the construction. Removal of the animals from burrow without harming them and filling/ compaction of pit will be sole responsibility of contractor and monitored by the PISSC/PMT.

Ground Water Quality & Quantity

With the construction of proposed small dams, the aquifer will recharge. It is expected that groundwater level will be raised. The sub-projects are expected to provide required water quantity, improve water quality and stabilize the current water supply losses. It will also be contributing to the reduction of water pollution and water-borne diseases all this will be closely monitored on monthly basis by the contractor and supervised through the SID and PMT.

9. GRIEVANCE REDRESS MECHANISM (GRM)

The following GRM mechanism has been established, which which covers activities during project implementation and pre-construction phases:

- A Public Complaints Centre (PCC), is responsible to receive, log, and resolve complaints;

- A Grievance Redress Committee (GRC), is 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), who will be educated people (perferabbly) 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.

9.1 Public Complaints Centre (PCC)

In its capacity as the Project Implementation Body, the PMT, in consultation with the Secretary Irrigation, Government of Sindh has already established 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 sub-project area of the Grievance Redress Mechanism. The PCC's phone number, fax, address, the email address will be disseminated to the people through displays at the respective offices of the Deputy Commissioner of respective Districts.

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.

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.

GRM for workers

At the contractor level, CLO would be responsible for managing worker's complaints, while at the PMT level public complaint centre (PCC) would be responsible. The following reporting lines will be adopted for resolving workers' grievances.

Contractor level: Community Liaison Officer (CLO) will serve as Grievance Focal Point (GFP) to file the grievances. If the issue is successfully resolved, no further follow-up is required. In case the grievance is unresolved at the contractor level, the workers may directly approach PCC about their grievance. The prominent signage containing the contact details of PCC in the Sindhi language would be displayed at each site.

PMT level: The PCC along with the PISSC, will investigate the complaint to determine its validity, and identify appropriate corrective measures. If corrective measures are necessary, PCC will instruct the Contractor to take necessary action; the PCC will inform the Complainant of investigation results and the action taken; 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.

Moreover, monitoring of work-related grievances will be carried out jointly by the PISSC and PMT.

9.2 Grievance Redress Committee (GRC)

The GRC functions as an independent body that to regulate the grievance redress process. It comprises on , Environmental and Social Safeguard Specialists of PMT, Senior Engineer from PMT, Representative of DC office, also senior members from community/ civil society from sub-project areas. Decisions or findings taken in the Grievance Redress Committee would be binding upon the contractor.

9.3 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. The GFP will be selected by the Social Safeguard team of PMT (Irrigation Department), PISSC and CLO n consultation with the community. While selecting, preference would be given to literate person with willingness to perform the role.

Two GFPs (a female and male) will be selected for each sub-project. In the sub-project areas, where communities did not allow consultations with females, the female GFPs would be selected either through village notables or through female PMT staff.

9.4 Role and Responsibilities of PCC

The responsibilities of the PCC are:

- The PCC is resposnble to log the complaint and date of receipt onto the complaint database and inform the PISSC and the Contractor;

- The PCC is responsible to 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 is responsible to 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 is responsible to inform the Complainant of investigation results and the action taken;

- If the complaint is transferred from local government agencies, the PCC submits 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 is responsible to review the Contractors response on the identified mitigation measures, and the updated situation;

- The PCC is responsible to 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 work together with the Contractor and the PISSC. If mitigation measures are identified in the investigation, the Contractor promptly carry out the mitigation. PISSC is responsible to ensure that the measures are carried out by the Contractor.

9.5 GRM Steps and Timeframe

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

Stage 1: In this stage services of Community Liaison Officer (CLO) of Contractor will be utilized at site to register the complaints and grievances in the community. The CLO would maintain the complaint register, while the complaint box installed at the site/camp would be managed by PISSC and PMT jointly. The complainant can also directly approach PCC/PMT, as prominent signage containing

the contact details of PCC in Sindhi language would be displayed at all sites. 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;

The contractor will also formally maintain a record of all complaints and issues raised, through CLO assigned for each sub-project. The contractor will also display prominent signage containing the contact details of PCC in Sindhi language.

Stage 2: If no ad hoc solution can be found at stage-1 at site level, the affected person/s will submit an oral or written complaint to the PCC by themselves or through GRM entry points (the CFP, 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;

In addition, the E&SS team of PISSC and PMT will also encourage oral and written feedback from the community during monitoring visits.

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.

9.6 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 analyze 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.

9.7 Conclusion

The sub-projects will not harm the environment. The anticipated adverse impacts on the regional environment can be avoided or minimized by taking necessary mitigation measures and properly implementing environmental and social monitoring plan. There are number of positive effects of the proposed sub-project which in general will improve the environment and social aspects of the sub-project area: These may include the following.

- Increased water supply through wells due to the recharging of the aquifer.
- Good quality water for drinking thereby eliminating water-borne diseases and good health.
- Extra supplies to grow more food crops like bajra, moong dal, and vegetables.
- More anticipated income means a rise in the standard of living.

10. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

10.1 Objectives of ESMMP

This chapter provides an overall approach for managing and monitoring environment and social issues and describes the institutional framework and resource allocations required to implement the ESMMP for the sub project. The environmental and social management plan and its institutional requirements have been given in tabular form in Table - 41.

The ESMMP will help the Proponent to address the adverse environmental impact of the project, enhance project benefits and introduce standards of good environmental practice. The primary objectives of the plan are to:

- Define the responsibilities of project proponents, contractors and other role players and effectively communicate environmental issues among them.
- Facilitate the implementation of the mitigation measures identified in Chapter - 7 by providing the instructions on how to handle the issues and providing an implementation schedule.
- Define a monitoring mechanism and identify monitoring parameters to ensure that all mitigation measures are completely and effectively implemented.
- Identify training requirements at various levels and provide a plan for implementation.
- Identify the resources required to implement the ESMMP and outline corresponding financing arrangements.

10.2 Institutional Arrangements for Implementation of ESMMP

10.2.1 Project Management Responsibilities

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

Project Implementation Support and Supervision Consultants (PISSC) in coordination with Environmental and Social Management Unit (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 ESMMP, 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 will regularly monitor the environmental, ecological and social aspects of ESMMP 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 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 ESMMP implementation by ESMU to be established within PMT and PISSC respectively.

The specific responsibilities of the institutions involved in the ESMMP implementation is shown in the Figure – 29 and described below.

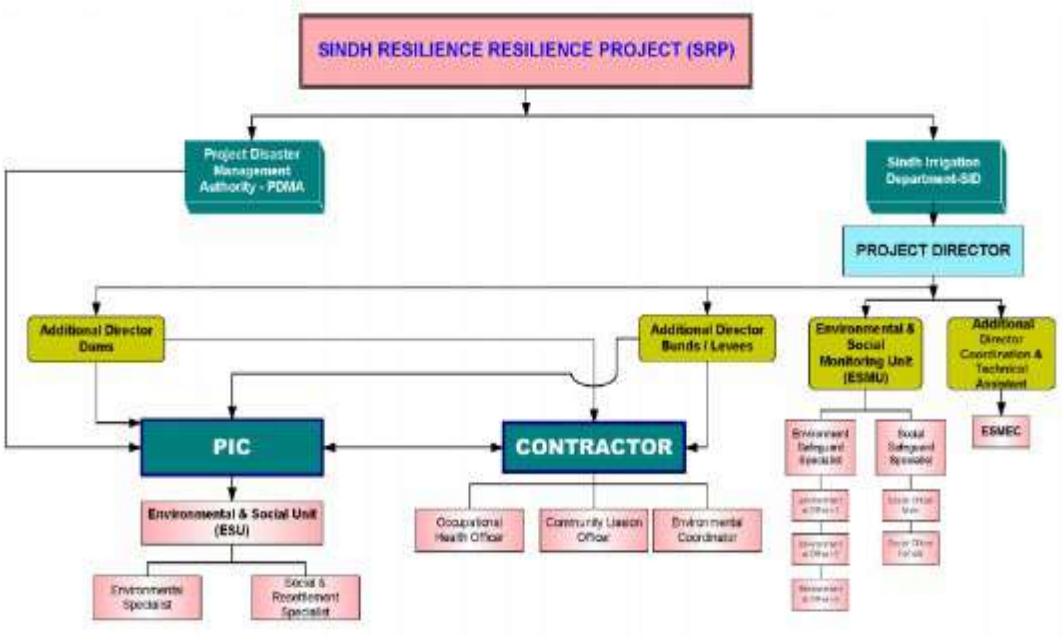


Figure 29: Organizational Chart of Sindh Resilience Project (SRP)

10.2.2 Project management Team (PMT)

The overall responsibility for the supervision of ESMMP will rest with the PMT under Sind Irrigation Department and PDMA that will act as apex body of the project to take care of Social/Gender, Ecological and Environmental issues and to take policy decisions at project level. An Environmental and Social Management Unit (ESMU) has been established within PMT under the supervision of Additional Director Coordination and Technical Assistant. Key

positions within the ESMU include Environment Specialist; Ecological Expert Social/Resettlement Specialist.

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

10.2.3 Project Implementation Support and Supervision Consultants (PISSC)

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

- Prepare the required documents, review and update the available documents relevant to the sub project (including ESIA, 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 has been established which include the following key positions:

    a) Environmental Specialist
    b) Assistant Environmental Specialist
    c) Social and Resettlement Specialist
    d) Assistant Sociologist (s)

The ESU of PISSC shall be responsible for monitoring the contractor's compliance with the ESMMPs. The role of the ESU-PISSC shall be day to day monitoring of the supervision of the ESMMP 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.

10.2.4 Environmental/Social Monitoring and Evaluation (ESMEC) Consultant

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

10.2.5 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) Officers; and Community Liaison Officers.

10.3 Environmental Code of Practices (ECOPs)

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 sub project implementation. The ECOPs (Refer Annexure XI) 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 have been available on web for guideline in the general conditions of all the contracts to be carried out under the SRP sub project.

10.4 Contractor's Plans

This Environmental and Social Management Plan (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. Therefore, it is required that the Contractor shall prepare plans within 30 days of the signing of the contract or before mobilization and implement the plans described below with the help of mitigation measures discussed in Section 7. Once approved by the Engineer and Environment Specialist of PISSC, these documents will become part of the ESMP (Site Specific Environmental management Plan -SSEMP) for the Contract.

10.4.1 Corona Virus Management Plan (COVID-19)

The contractor shall provide the details of prevention measures, arrangements planned for the Management of COVID. The Plan shall include the details of the designated quarantine area, disinfection facilities for Vehicles, and inventory arriving on site. The plan shall also include

necessary supplies, such as face mask, soap, hand sanitizers, temperature monitoring infrared guns, etc. Disposal of COVID related waste plan shall also be prepared.

10.4.2 Biodiversity Management Plan

The contractor shall prepare the comprehensive biodiversity management plan and get the approval from PISSC before contractor mobilization. This plan must include the role and responsibilities (in the form of TOR) of wildlife /Ecologist expert who will be monitored the all construction related activities as described in ESMP.BMP will be prepared by the Contractor on the basis of ECPs 8, 9 and 10 and mitigation measures proposed to address impacts.

10.4.3 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 that shall be used to dispose of waste. Plan shall also include Environmental effects monitoring.

10.4.4 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.WMP will be prepared and implemented by the Contractor on the basis of ECPs 1, 2, 5 & 10 and WBG EHS Guidelines (2007), as well as the mitigation plans given in the report. The Plan will include the camp layout, details of various facilities including supplies, storage, and disposal.

10.4.5 Traffic 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).

10.4.6 Plan for Handling of Hazardous Materials

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).

10.4.7 Occupational Health and Safety

Upon mobilisation, and within 15 days of commencement, the Contractor shall prepare an Occupational Health and Safety Plan in accordance with Sindh Occupational Safety and Health act 2017, which shall be relevant to his chosen methodology. This plan shall detail the following:

- Health and safety management structure, responsibilities, supervision and reporting scheme
- Health and safety goals for the project
- Identification of potential hazards (health risks, safety risks)
- Proposed measures to reduce the risk of identified hazards
- Arrangements to implement such measures
- A system for reporting and investigating accidents, incidents and near misses
- A plan for emergency transfer of staff or public from site to medical facilities
- Fire and emergency procedures
- Site security.
- Management and Monitoring of COVID-19

10.4.8 Environmental and Social Awareness Training Plan

This shall include details of the Contractor's environmental and social awareness training program proposed for the workforce. Details are given in Table – 39 given below.

Table 39: Environmental and Social Awareness Training Plan

Areas of Training	Key Aspects to be Covered	Target Group	Frequency	Budget.
Environment & Social	**a.** Environmental and social awareness; **b.** Key environmental and social issues associated with the project and subprojects ESMPs findings; c. Awareness regarding open defecation and better WASH	PMU, PIC and Contractor staff as well as relevant communities.	Before project/physical works commencement, during construction and after construction.	Total nine types of trainings for 13 proposed dams are to be conducted throughout the life of sub

	practices for relevant community **d.** Subproject monitoring and reporting; **e.** Occupational Health and Safety Issues associated with Construction. **f.** Grievance Redress Mechanism implementation **g.** Gender Based Violence (GBV) **h.** Child Labor **i.** COVID -19 Management and Monitoring **j.** Safety measure for COVID-19			project. Training will cost about 1,765,000 rupees.

10.4.9 Emergency Response Plan

The contractor will prepare an emergency plan 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)
- Emergency evacuation procedure of staff and members of the public within range of likely impact.)

10.4.10 Tree Plantation and Maintenance Plan

The Contractor is required to prepare an inventory of the trees to be cut/uprooted before the 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 Sindh Forest Department, the PISSC Engineer and PMT approval. All trees to be planted shall be of native species as they have more chances of survival and plantation of invasive species shall be prohibited. The Contractor shall be responsible for the aftercare of the samplings/plantation for one year.

10.4.11 Emergency Preparedness Plan in Case of Dam Break

A consolidated emergency preparedness plan will address emergencies in case of Dam break; this plan will be prepared the Supervisory Consultant for all dams covered under SRP-AF by

(Supervision & Design Consultants) before the completion of all dams and the same will be submitted to the World Bank.

10.5 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 sociocultural 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 Section 7. Table 41 presents the mitigation and monitoring plan.

10.6 Compliance and Effects Monitoring

PISSC shall carry out monitoring within the subproject area using the monitoring checklists to be prepared based on this mitigation and monitoring plan. To aid the monitoring process, the Contractor will complete the following:

- Submit the plans detailed earlier in Section 8.
- 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 the implementation of various environmental aspects to visiting national and international agencies and representatives of the 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)
- Fuel and hazardous material consumption
- Workforce statistics (employment/deployment etc.)

- Compliance monitoring to check whether the actions proposed in the ESMMP 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 below. Both approaches will be conducted using the monitoring parameters given in Table 41 by visual observation, photographic documentation, and measurement where necessary. A record of events and surveys will be maintained. Compliance monitoring will also be facilitated using checklists included to be prepared by PISSC and ESMU of PMT during the project implementation.

Box 10.1

(i) Compliance Monitoring:

- Frequency of anti-dust water sprays during construction period;
- Installation of signage regarding community health and safety
- Safety at workplaces and working hours during construction;
- 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);
- 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
- Assurance of installation of signage regarding community health and safety

(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;
- (iii) Social Effects Monitoring
- Number of local people recruited on project works.
- Incidence of child labour and disproportionate wages
- Conflict at community level
- Chance find archaeological site
- Grievance redressal mechanism is in place
- Health screening of labour at site

10.7 Environmental Non-compliances and Corrective Measures

The Contractor will be notified of any violations of the ESMMP, as well as any corrective actions required. Outlined below are some steps, relating to the 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 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 costs 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.

10.8 Communication Reporting and Documentation

The following environmental meetings are proposed:

- Primary meetings between ESMU-PMT, PISSC, and Contractor for setting out the format for the regular meetings shall be held before the commencement of the project.

- Scheduled Environmental and Social Progress Review Meeting (ESRPM) meetings between ESMU-PMT, PISSC, and Contractor shall be done every month.

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's 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 will be taken at key locations using a digital camera of the project area in a walkthrough survey by contractor, PISSC, and ESMU-PMT. The following data shall be recorded for each photograph:

- Shot number
- All the photographs will 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.

Complaints Register. The Contractor will maintain a complaint register at the campsite and workplaces 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 the status of the last month's complaints and will be reviewed by PISSC, ESMEC, and ESMU of PMT.

Moreover, telephone numbers and addresses of all concerned tiers within the GRM would be displayed in Sindhi and Urdu at all sites, and the same would be distributed in community training/meetings.

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

- A change to the designs that deviate from the parameters which are safeguarded in this ESMMP.

- A discovery in the baseline socio-environmental conditions, which is not recognized or covered by this ESMMP.

In the event of either scenario, the ESMMP 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.

10.9 Environmental and Social Management and Monitoring Cost

It is estimated that 166 trees will be felled for the construction of the proposed dams. The replanting of 5 times trees to this number would cost Rs 830,000 rupees @ the rate of Rs. 1000 per tree. Adding the cost in budget for the implementation of the ESMP has been allocated. Details are given in Table – 40 below. The cost of Rs. 177,025,800 /- budget for the implementation of the ESMMP has been allocated.

Table 40: Cost of Environmental / Social Management and Monitoring

Items	Unit Cost	No of Units	Estimated
A. Bandhaka			
Training	2500	52	130,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	52	260,000
COVID-19 Test for staff and worker for two rounds	6000	104	624,000
Personal Protective Equipment	3000	52	156,000
Fire Fighting Equipment purchase and refilling	3000	21	63,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,185,000**
		Contingency Cost 10%	**1,218,500**
		Total	**13,403,500**
B. Baaro			
Training	2500	59	147,500
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	26	1,092,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	59	295,000
COVID-19 Test for staff and worker for two rounds	6000	118	708,000
Personal Protective Equipment	3000	59	177,000
Fire Fighting Equipment purchase and refilling	3000	26	78,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,567,500**
		Contingency Cost 10%	**1,256,750**
		Total	**13,824,250**

Items	Unit Cost	No of Units	Estimated
C. Chakhri			
Training	2500	52	130,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	52	260,000
COVID-19 Test for staff and worker for two rounds	6000	104	624,000
Personal Protective Equipment	3000	52	156,000
Fire Fighting Equipment purchase and refilling	3000	21	63,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,185,000**
		Contingency Cost 10%	**1,218,500**
		Total	**13,403,500**
D. Churlo			
Training	2500	52	130,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	52	260,000
COVID-19 Test for staff and worker for two rounds	6000	104	624,000
Personal Protective Equipment	3000	61	183,000
Fire Fighting Equipment purchase and refilling	3000	21	63,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,212,000**
		Contingency Cost 10%	**1,221,200**
		Total	**13,433,200**
E. Sunn-2			
Training	2500	52	130,000

Items	Unit Cost	No of Units	Estimated
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	52	260,000
COVID-19 Test for staff and worker for two rounds	6000	104	624,000
Personal Protective Equipment	3000	52	156,000
Fire Fighting Equipment purchase and refilling	3000	21	63,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,185,000**
		Contingency Cost 10%	**1,218,500**
		Total	**13,403,500**
F. Gadap-2			
Training	2500	61	152,500
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	28	1,176,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	61	305,000
COVID-19 Test for staff and worker for two rounds	6000	122	732,000
Personal Protective Equipment	3000	61	183,000
Fire Fighting Equipment purchase and refilling	3000	28	84,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,702,500**
		Contingency Cost 10%	**1,270,250**
		Total	**13,972,750**
G. Khuda bux			
Training	2500	52	130,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000

Items	Unit Cost	No of Units	Estimated
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	52	260,000
COVID-19 Test for staff and worker for two rounds	6000	104	624,000
Personal Protective Equipment	3000	52	156,000
Fire Fighting Equipment purchase and refilling	3000	21	63,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,185,000**
		Contingency Cost 10%	**1,218,500**
		Total	**13,403,500**
H. Lat-2			
Training	2500	52	130,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	52	260,000
COVID-19 Test for staff and worker for two rounds	6000	104	624,000
Personal Protective Equipment	3000	52	156,000
Fire Fighting Equipment purchase and refilling	3000	21	63,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,185,000**
		Contingency Cost 10%	**1,218,500**
		Total	**13,403,500**
I. Jharando-2			
Training	2500	59	147,500
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	26	1,092,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000

Items	Unit Cost	No of Units	Estimated
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	59	295,000
COVID-19 Test for staff and worker for two rounds	6000	118	708,000
Personal Protective Equipment	3000	59	177,000
Fire Fighting Equipment purchase and refilling	3000	26	78,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,567,500**
		Contingency Cost 10%	**1,256,750**
		Total	**13,824,250**
J. Gorban Bhutti			
Training	2500	59	147,500
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	26	1,092,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	59	295,000
COVID-19 Test for staff and worker for two rounds	6000	118	708,000
Personal Protective Equipment	3000	59	177,000
Fire Fighting Equipment purchase and refilling	3000	26	78,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,567,500**
		Contingency Cost 10%	**1,256,750**
		Total	**13,824,250**
K. Dahri Sharif			
Training	2500	52	130,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	52	260,000
COVID-19 Test for staff and worker for two rounds	6000	104	624,000

Items	Unit Cost	No of Units	Estimated
Personal Protective Equipment	3000	61	183,000
Fire Fighting Equipment purchase and refilling	3000	21	63,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,212,000**
		Contingency Cost 10%	**1,221,200**
		Total	**13,433,200**
L. Jharando-1			
Training	2500	52	130,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	52	260,000
COVID-19 Test for staff and worker for two rounds	6000	104	624,000
Personal Protective Equipment	3000	61	183,000
Fire Fighting Equipment purchase and refilling	3000	21	63,000
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,212,000**
		Contingency Cost 10%	**1,221,200**
		Total	**13,433,200**
M. Gaib Janan			
Training	2500	52	130,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality Monitoring (During Cons) (per month)	10000	12	120,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	52	260,000
COVID-19 Test for staff and worker for two rounds	6000	104	624,000
Personal Protective Equipment	3000	61	183,000
Fire Fighting Equipment purchase and refilling	3000	21	63,000

Items	Unit Cost	No of Units	Estimated
Health, Hygiene and COVID-19 Management and Monitoring as per SOPs	Lump sum	--	100,000
Ambient Air Monitoring(Pre-Cons, During Cons,) at one construction location	27000	12	324,000
Ambient Noise Monitoring (Pre-Cons, During Cons:) at one construction location.	500	12	6,000
Environmental, Social and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	210000	12	2,520,000
General Community support needs (if any)	Lump sum	--	7,000,000
		Subtotal	**12,212,000**
		Contingency Cost 10%	**1,221,200**
		Total	**13,433,200**
		TOTAL (A+B+C+D+E+F+G+H+I+J+K)	**176,195,800**
		Compensatory tree Plantation	**830,000**
		GRAND TOTAL COST	**177,025,800**

Table 41: Environmental, Social and COVID-19 Management and Monitoring Plan

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
Design and Pre- construction Phase					
Site Selection	No Impacts has been envisaged during site selection which require mitigation measures	Not required	Nil	Nil	Nil
Construction Phase					
Establishment of camp and machinery/equipment/ stone stacking yard/workshop etc.	Conflict due to use of privately owned agriculture land for camp construction	Establishment of camp on designated sites or at alternative suitable site within state owned land/ Irrigation Department. Community consultations will be carried out and liaison will be maintained Approval of campsite from the Engineer will be obtained.	Approval obtained from the Engineer; Photographic record maintained; Camp established on designated government land.	At time of camp establishment	Execution by contractor Monitoring by PISSC/PMT
Social conflicts due to influx of external workforce	Establishment of camp on designated sites or at alternative suitable site within Right of Way of the bund belong to irrigation department. Contractor to obtain approval from the Engineer.	Camp shall be established at least 500m away from the nearest community; Local hired workforce; Any complaint from the local community.		Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Child labor	Hiring of work force from local communities; Awareness raising of residents for safety protection. Awareness raising of labor to ensure respect for local customs. No child labor will be used.	Presence of National Identity card or relevant document.		
	Conflicts arising due to mixing of local and migratory job seekers.	Preference to provide jobs to local job seekers; Motivation to the workers for a good workmanship.	Jobs will be given to locals; Any complaint will be registered in complaint box.	Fortnightly	Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
Workers safety and hygienic conditions	Health risks due to unsafe and unhygienic living environment	Preparation and implementation of OHS Plan. Safety measures taken by the contractor such as installation of firefighting equipment, safe storage of hazardous material, fencing, provision of first aid facilities etc.; Contingency measures in case of accidents; Obligatory insurance of contractor's staff and laborers against accidents; Provision of adequate sanitation, washing, lighting, cooking and dormitory facilities. OHS trainings to construction and camp staff.	Approved OHS Plan. Evidence of OHS trainings conducted Accident/Incident reported.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Camp site security	Security hazards. Security related conflicts with local community.	Proper fencing of the campsite; Deployment of guards for security; Friendly relations with the local community.	Any security issue emerged.	Monthly	Execution by contractor Monitoring by PISSC/PMT
Parking/repair of machinery and equipment	Soil and water contamination due to spillage of liquid wastes (Lubricants, fuel, chemicals from the machinery yard).	Proper maintenance of machinery and equipment; Ensuring proper storage and disposal of used oil etc.; Ensuring good housekeeping practices at workshop areas; Avoiding waste oil spill into soil and adjoining area; Appropriate arrangements such as usage of concrete base drip pans to avoid spills during fueling/oil change	Any spill observed; Availability of sealed containers for used oils and lubricants;	Fortnightly	Execution by contractor Monitoring by CSC/ PIU/SEMU
Operation of diesel operated generators	Deterioration of air quality; Noise exceeding 80 dB is harmful for receptors.	Proper tuning and maintenance of generators.	Low smoke emissions; Noise levels within permissible limits (80 dB at daytime and 65dB at night time).	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Use of water for construction and consumption	Conflict with local water demand.	The contractor to make his own arrangements for water required for construction ensuring that water availability and supply to nearby communities remain unaffected.	Any conflict on the water availability.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Water supply to labour camp	Water related health risks (Gastroenteritis, Diarrhea etc.)	Provision of safe drinking water supply at the camp as well as at working places by the contractor. Ensuring water quality as per SEQS from a SEPA certified laboratory.	Any water borne disease observed; Water quality analysis reports.	Quarterly	Execution by contractor Monitoring by PISSC/PMT
Sanitation and wastewater disposal	Soil and water contamination	No disposal of sewage into adjoining area; Construction of sewage treatment arrangement such as lined septic tank and collection chamber/ soaking pit;	Inspection to ensure that sewage system is actually operating; Photographic record;	Monthly	Execution by contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
Solid waste generation	Land pollution	Ensure proper collection and disposal of waste generated from camp at designated disposal pit (away from the camp site) approved by the Engineer; Prohibition on burning of waste; Good housekeeping practices to minimize Waste generation.	Covered disposal containers placed at camp; Designated disposal pit available; Visual inspections.	Fortnightly	Execution by Contractor Monitoring by PISSC/PMT
Storage, handling, and transport of hazardous materials	Work safety and human health risks	Provision of double containment for storage of hazardous material (if any).	Record of harmful incident occurred.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Restoration of camp area	Low aesthetic value if campsite is not restored to its original landscape	Remove all types of waste, debris, and discarded construction materials and machinery from the camp site and other site facilities.	Camp area restored. Photographic record;	At time of demobilization of the contractor	Execution by Contractor Monitoring by PISSC/PMT
Work Places					
Manpower at work	Occupational Health and Safety (OHS) issues	During activity of steel formation, concreting work, entry of unauthorized persons will be restricted. Without PPEs no any person will be allowed to enter in work area. Job specific PPEs will be provided. Prior to activity TBTs will be provided. Training on the benefits of use of PPEs, and work at height will be provided on periodically basis. Housekeeping will be maintained on site and in Camp areas to avoid any trip hazard. Provision of first aid facilities and standby emergency vehicle (ambulance). Occupational Health and Safety officers will be deputed on site to supervise the OHH related issues. Orientation of project will be provided to all construction workers to increase their understanding and sensitivity to the challenges of the special environment in which they will be working	Approved OHS Plan. Evidence of OHS trainings conducted. PPE provided and used; First aid facilities provided; Record of injuries/ illness and near misses.	Preparation at the start of execution of civil works and monitoring of its implementation on daily basis.	Execution by contractor Monitoring by PISSC/PMT
	Workers code of conduct.	The contractor will prepare workers code of conduct plans and Camp layout plan and get it approved from the Resident Engineer and PMT for implementation at site.	The approved code of conduct is implemented.	During the life of contract.	
	Child Labor	The contractor should maintain the labor registry for workers at site, and age verification should be conducted	Labor register is made available at site containing complete data of all	During the life of contract.	

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		upon employment to make sure that children are not employed in the project	employees hired by the contractor		
	Prohibition of gender based violence.	Awareness will be raised regarding prohibition of gender-based violence through trainings.	Evidence of training	During the life of contract.	
	Employment opportunities for local community	The contractor would hire employees from the local community (skilled and unskilled) and this would be part of the contract with the contactor.	Employment data from the contractor On site verification of the data provided by the contractor	During the all phases of contract.	
Operation and movement of machinery and equipment	Deterioration of air quality due to exhaust gases and dust emissions	Proper engine tuning of machinery/equipment; Water sprinkling at dust prone areas.	Gas emissions minimized; Dust emissions controlled.	Monthly	Execution by contractor Monitoring by PISSC/PMT
		Heavy equipment will be cleaned to prevent importation of non-native plant species, hydraulic fittings will be tighten , and it will be ensured that hydraulic hoses are in good condition and shall be replaced and repaired if petroleum leaks observed. Proper and timely maintenance will be provided for vehicles and equipment used during construction to reduce the potential for mechanical breakdowns	Check the fitness of the heavy machinery / equipment.		Execution by contractor Monitoring by PISSC/PMT
	Noise from vehicles, compaction rollers concrete mixers and construction equipment exceeding 80 dB is harmful for receptors.	Proper engine tuning of machinery/equipment; Avoid night time traffic particularly near communities.	Levels within permissible limits (75dB at day time and 65dB at night time).		Execution by contractor Monitoring by PISSC/PMT
Transportation of construction material	Smoke and dust generation; Fall of transported material; Chance of accidents;	Use earth material with the approval of the Engineer; Prepare traffic Management Plan to procure shingle from approved quarry and get approved by the Engineer; Regular inspection, tuning, and maintenance of transport vehicles; Material transport in closed containers or covered with canvas (Tarpal) sheets. Avoid night time activity;	Vehicles properly maintained; Designated borrow and quarry areas used; No fall of transported material; Damaged road repaired. Evidence of	Fortnightly	Execution by contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	damage to access roads.		implementation of Traffic Management Plan.		
		Maintain liaison with communities; Repair of damaged roads.			
		Truck and related construction equipment speeds will be limit in active construction areas to a maximum of 20 KM/hr. and strictly adhering to regulations and posted speed limits in other areas			
	Soil erosion and contamination	Vehicle speeds to 20km/h.; Restriction on repair of vehicles and equipment in the field.	Monitoring compliance; Log of vehicle and equipment repairs; Soil erosion observed		Execution by contractor
	Air pollution	Use of machinery and vehicles with properly tuned to avoid the exhaust emissions. Sprinkling of water on site and on routes near communities. Water bowsers will be used to control excess airborne particulates at staging areas, active construction zones, and unpaved roads leading to/from active construction areas It will be ensured and implemented that the project remains within the parameters of Sindh Environmental Quality Standards.	Route maps of vehicle movement; Log of vehicle maintenance.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Water pollution	Avoiding washing of vehicles along the pond area. It will be ensured and implemented that the project remains within SEQS	Monitoring compliance; Water quality testing.	Monthly	Implementation by Contractor Monitoring by PISSC/PMT
	Noise pollution	Use of muffles (silencers) in vehicles to minimize noise; Avoiding movement of vehicles at night near communities.	No construction activities at night; Log of vehicle movement; Visual inspections of the vehicles.	Fortnightly	Execution by construction contractor Monitoring by PISSC/PMT
	Occupational, Health and Safety issues	Preparation and implementation of OHS Plan. Fixing of sign board at detours; Use of PPE; Awareness raising of drivers; Avoiding speedy movement of vehicles near communities; Training of construction workers and others; Regular liaison with communities.	Approved OHS Plan. Evidence of OHS trainings conducted. PPEs used by workers; Reflectorized road signs; Visual inspections.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Construction works	Soil erosion and contamination	Proper compaction to minimize wind and water erosion; strengthening of bunds with earth filling and stone pitching	Erosion observed; Photographic record;	Fortnightly	Execution by contractor

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		according to design specifications will minimize erosion; The top and slope of the proposed dam bunds will not be left un-compacted during construction works; Machinery and equipment will not be repaired and maintained at the site; No waste effluents will be released in to the ponds.	contamination signs observed.		Monitoring by PISSC/PMT
	Accident risks	Preparation and implementation of OHS Plan. Preparation of emergency response procedures (ERPs); Usage of PPEs; Provision of first aid kits and emergency vehicle. Trained drivers will be hired to operate machinery safely: Availability of trained operator to operate machinery.	PPEs provided and used; Record of any accident. Availability of ERPs	Fortnightly	Execution by contractor Monitoring by PISSC
	Loss of natural vegetation and associated fauna	166 Trees including young and mature expected to removed/relocated from site. On place of cut down/uprooted trees 830 new trees will be planted. Cost has been allocated for tree plantation for better environment in ESMP Implementation Cost. Tree plantation plan for indigenous species will be prepared including the type of species, location for plantation and other necessary information. No invasive species will be planted.	Record of tree cutting; Photographic record;	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Damage to infrastructure	Restoration/ rehabilitation of damaged infrastructure with entire satisfaction of the affected persons. Construction activities will be confined in the designated areas.	Visual inspections; Photographic records; Consultations/Interviews Infrastructure restoration records.	Monthly	Execution by contractor Monitoring by PISSC/PMT
	Breaking up of Land for Cultivation or mining purpose	It will ensured that, project activities will remain isolated as per design excavations, no other activities will be permitted.	Review the designs and layout	Monthly	Execution by contractor Monitoring by PISSC/PMT
	Noise pollution	Noisy work shall be performed (such as the operation of heavy equipment) between the hours of 6:30 a.m. and 5:00 p.m. to minimize disruption to nearby community. Use of noise reduction devices; Regular inspection, maintenance and lubrication of the construction vehicle and equipment; Use of PPEs such as earplugs and earmuffs by the workers; Avoid night time activity. Construction activities will be confined in the designated areas	Noise levels measured.	Fortnightly	Execution by construction contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	Air pollution	Proper engine tuning of machinery equipment; Water sprinkling particularly at work sites near the communities.	Dust emission controlled; Monitoring on stack of machinery and equipment; Evidence of measurement records;	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Land degradation; soil erosion; pooling of water and drainage problem	Excavation of borrow sites as per specifications from river bed.	Visual inspections; Photographic records.	Fortnightly	Executing agency and contractor Monitoring by PISSC/PMT
	Residual wastes; construction material waste	Remove any left-over construction material/wastes from the construction sites. Trash will be properly secured during the workday and all trash shall be removed from site at the end of each workday.	Waste material removed.	End of the rehabilitation works	Execution by contractor Monitoring by PISSC/PMT
Safety/health measures for local population	Accident risks, particularly for local population living within/near the subproject especially women, children and elderly people; Public awareness campaigns through displaying sign board at site and haulage routes; Vulnerability to accidents; Deterioration of health due to dust	Restriction on movement of machinery on the designated haulage routes for transportation of materials; Public awareness campaigns through displaying sign board at site and haulage routes; Interaction with community; Setting up speed limits (not more than 20 Km in work areas); Availability of first aid box for locals; Strict enforcement keeping non-working persons, particularly children, away from work sites; Adequate signage to manage traffic at sites, haulage and access roads; Ensure water sprinkling.	Visual observations; Record of accident; any complaint from the community.	All activities on daily basis except public consultation that will be carried out on monthly basis	Executing agency and contractor Monitoring by PISSC/PMT

Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
Working near Wildlife Habitats	Damage to Wildlife, Hunting ,poaching to wildlife	Effects of light and noise on adjacent habitat shall be limited through controls on construction equipment. Orientation of project will be provided to all construction workers to increase their understanding and sensitivity to the challenges of the special environment in which they will be working. Construction activities will be confined in the designated areas Adequate education will be provided and enforcement to limit construction worker activities that are destructive to wildlife and habitats. Firing any gun or doing any other act which may disturb any animal or bird shall be prohibited which interferes with the breeding places.	Ensure that all workers have signed the code of conduct.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Operation Phase					
Animal burrowing	Damage to the structure	Regular inspection of structures against burrowing by animals. (Rodents, porcupines, reptiles etc.). Removal of the animals from burrow and filling/ compaction of pit.	Visual observation.	Fortnightly	Executing agency Monitoring by PISSC/PMT (Liability period)
Care of newly planted trees	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 be handed over to the client.	Survival of trees	Fortnightly	Executing agency Contractor (Liability period) and SID
Impacts on lower riparian	Strom water will be blocked for lower riparian / downstream users.	With the construction of proposed dams aquifer will recharge. It is expected that groundwater level will be raised. Solar operated tube well will be installed for closely monitoring of groundwater level.	Make sure that groundwater level is recharged	Monthly basis	Contractor, PMT(Liability period) SID
Impacts on existing community tracks	Two kacha tracks of villages are expected to affect	All the pedestrian and vehicular tracks, which could be blocked by proposed dam reservoirs or affected by construction activities will be realigned by providing unmetalled vehicle tracks. Cost estimation has been made	Make sure that works is undertaken as per Bill of Quantities.	Start of execution of civil works	Contractor, PISSC, PMT (Liability period)

Reference

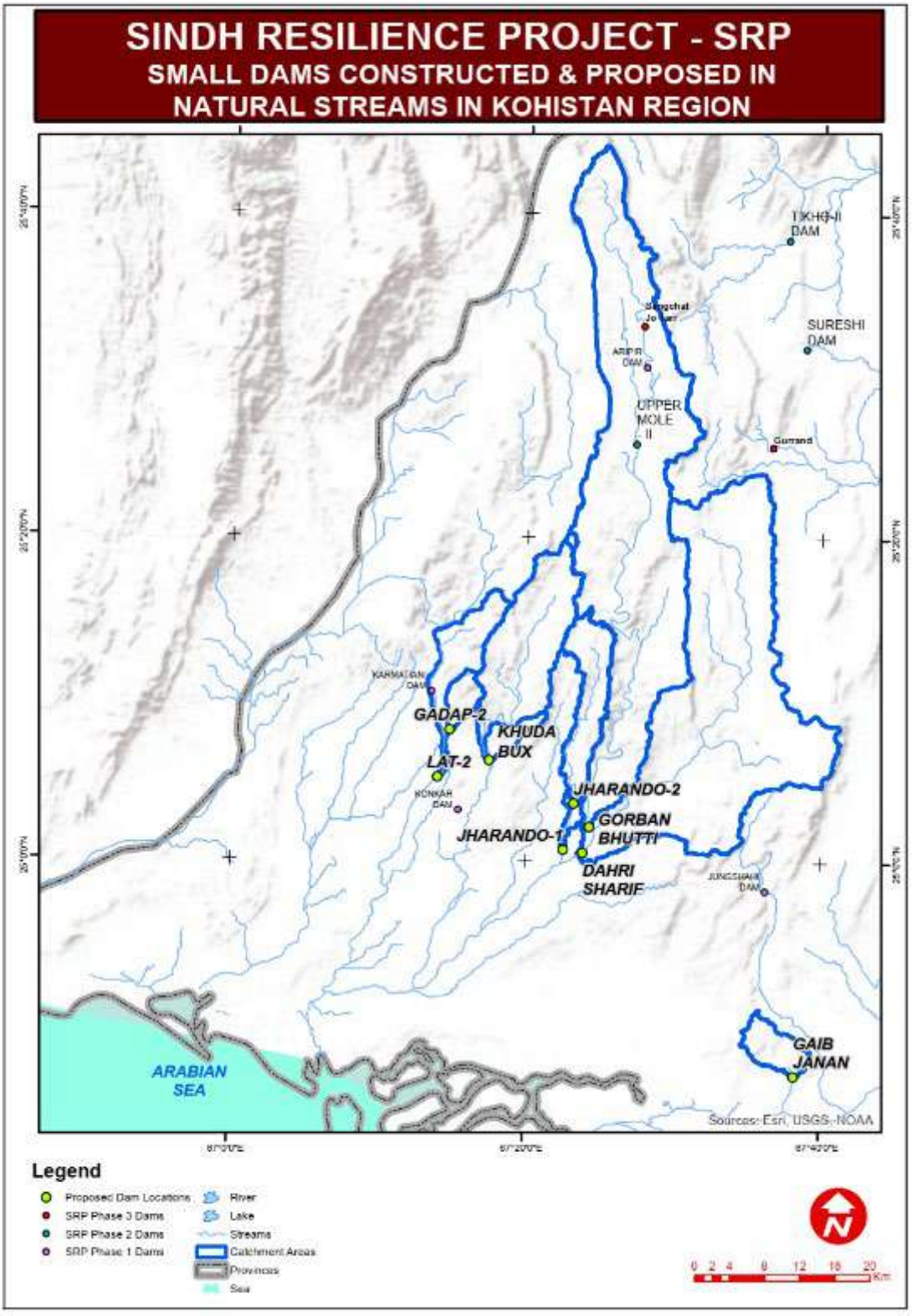
Sindh Drought Needs Assessment (SDNA) Report, January 2019).

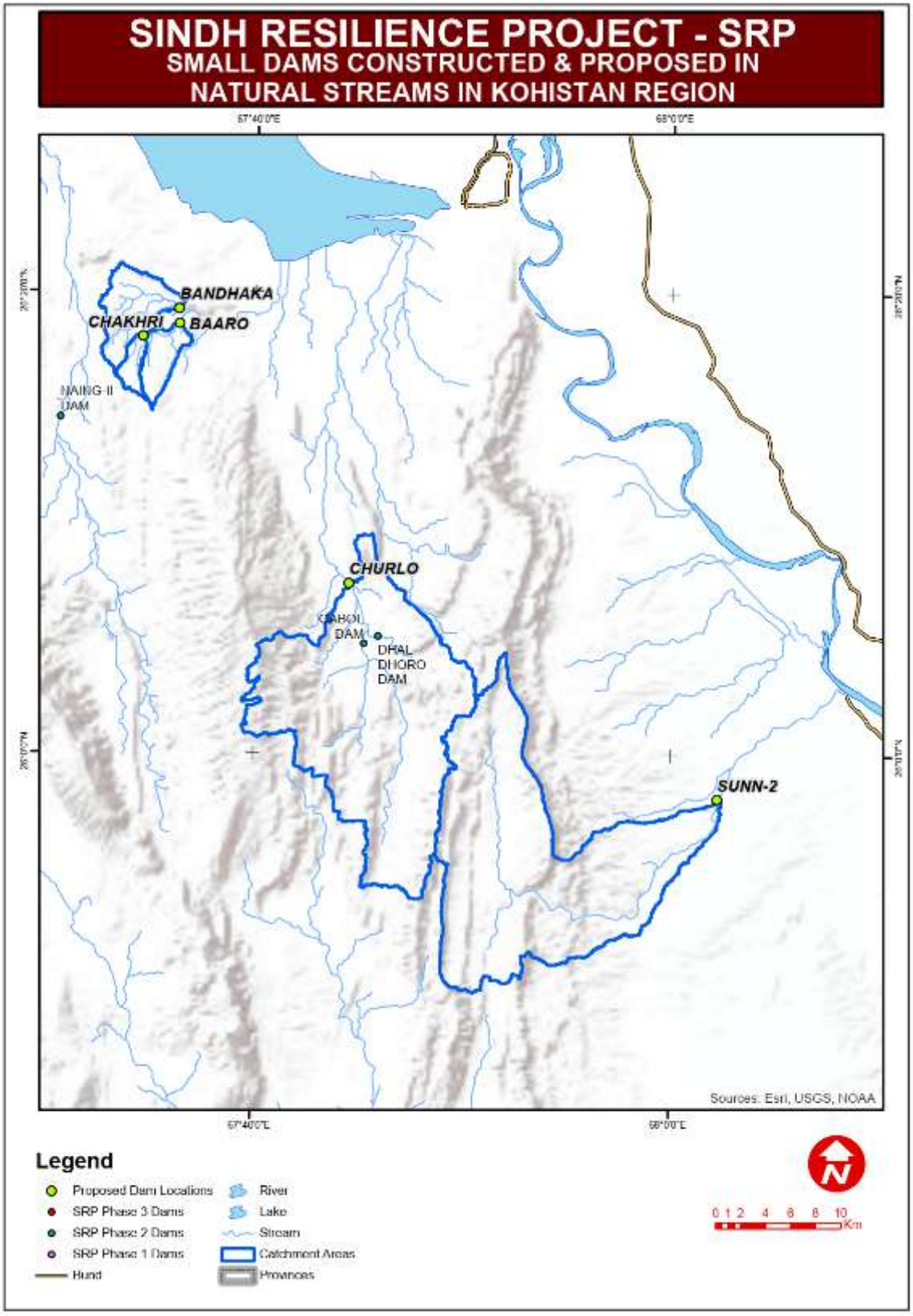
PMDA Situation Report 28/08/2010) UNOCHA (Situation Overview - Situation Report 30/08/2010

Research paper published in Civil Engineering Journal on Land Covers Change Assessment After Small Dam's Construction Based on the Satellite Data (Accepted 08 March 2019).

Small Dams Organization of Sindh Irrigation Department conducted a study in April 2020

Annexure I: Small Dams Constructed and Proposed Under SRP & SRP-AF




SINDH RESILIENCE PROJECT - SRP
SMALL DAMS CONSTRUCTED & PROPOSED IN
NATURAL STREAMS IN KOHISTAN REGION
67°40'0"E
68°0'0"E
BANDHAKA
CHAKHRI
BAARO
HAING-II
DAM
CHURLO
DAM
DHAL
DHORO
DAM
SUNN-2
Sources: Esri, USGS, NOAA
67°40'0"E
68°0'0"E
Legend
Proposed Dam Locations
SRP Phase 3 Dams
SRP Phase 2 Dams
SRP Phase 1 Dams
Road
River
Lake
Stream
Catchment Areas
Provinces
N
0 1 2 4 6 8 10
Km

Annexure II: Screening Criteria to Determine Environmental Category of Sub-Projects

Title of Sub-project: Bandhaka			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 21 number of trees located within area of Bandhaka Dam.			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site, which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.60 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.56 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

Title of Sub-project: Baaro			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 06 number of trees located within area of Baaro Dam.			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.10 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.06 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

Title of Sub-project: Chakhri			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 06 number of trees located within area of Chakhri.			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.04 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.02 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies	**Triggered (Yes/No)**	**Explanation**	
Environmental Assessment OP/BP/GP 4.01	Yes		
Natural Habitats OP/BP 4.04	No		
Forest OP/BP 4.36	No		
Pest Management OP/BP/4.09	No		
Physical Cultural Resources OP/BP 4.09	No		
Involuntary resettlement OP/BP 4.12	No		
Safety of Dams OP/BP 4.37	Yes		
Project in International Waterways OP/BP 7.50	No		
Projects in Disputed Areas OP/BP 7.60	No		

Title of Sub-project: Churlo			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 17 number of trees located within area of Churlo.			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.12 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.09 sq-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

Title of Sub-project: Sunn-2			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 13 number of trees located within area of Sunn-2			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.50 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.30 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

Title of Sub-project: Gadap-2			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 10 number of trees located within area of Gadap-2			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.14 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.11 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

Title of Sub-project: Khuda bux			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 5 number of trees located within area of Khuda bux			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.43 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.32 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

Title of Sub-project: Lat-2			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 20 number of trees located within area of Lat-2			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.08 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.06 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

Title of Sub-project: Jharando-2			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 20 number of trees located within area of Jharando-2			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.26 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.15 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

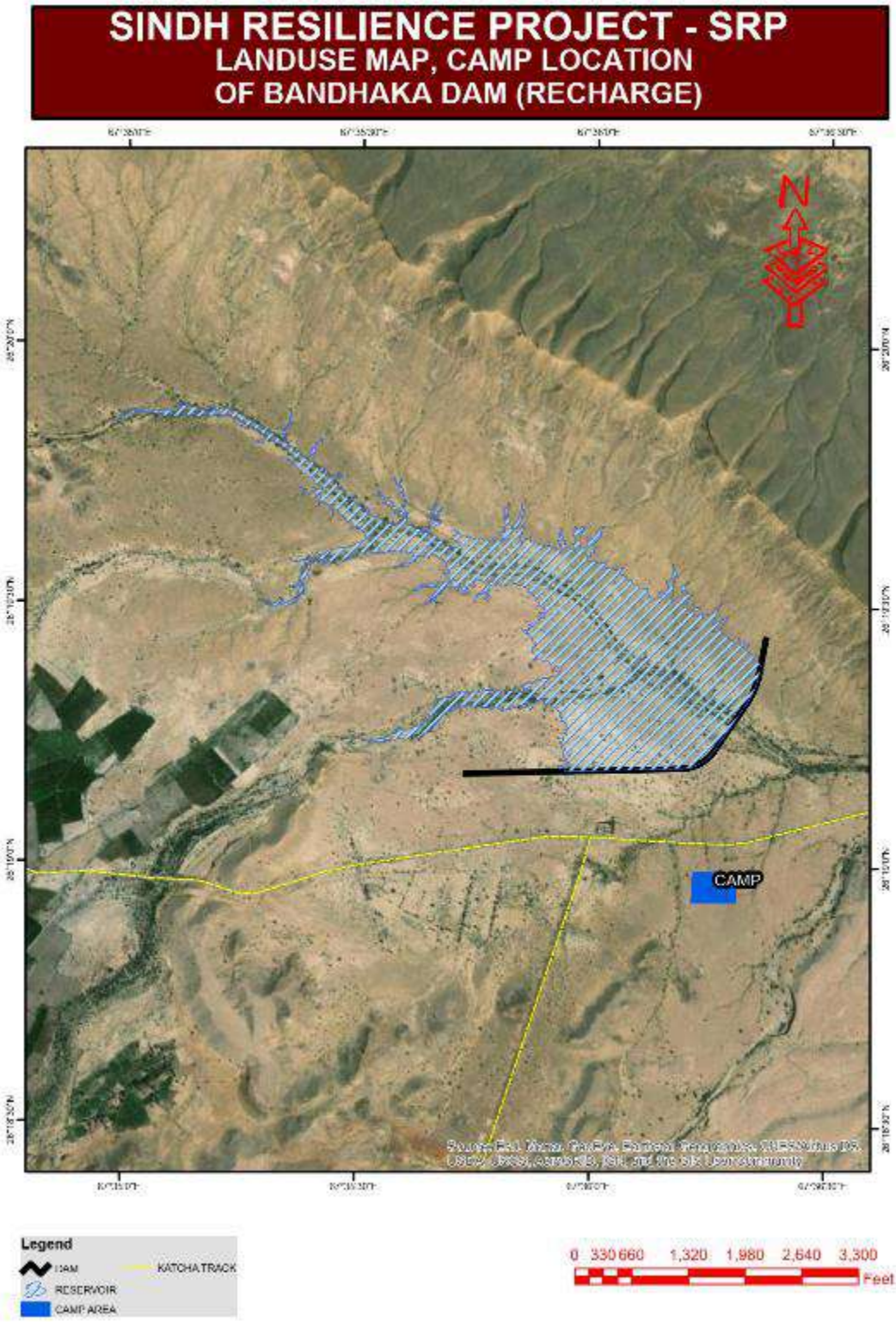
Title of Sub-project: Gorban Bhutti			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 10 number of trees located within area of Gorban Bhutti			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.15 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.11 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

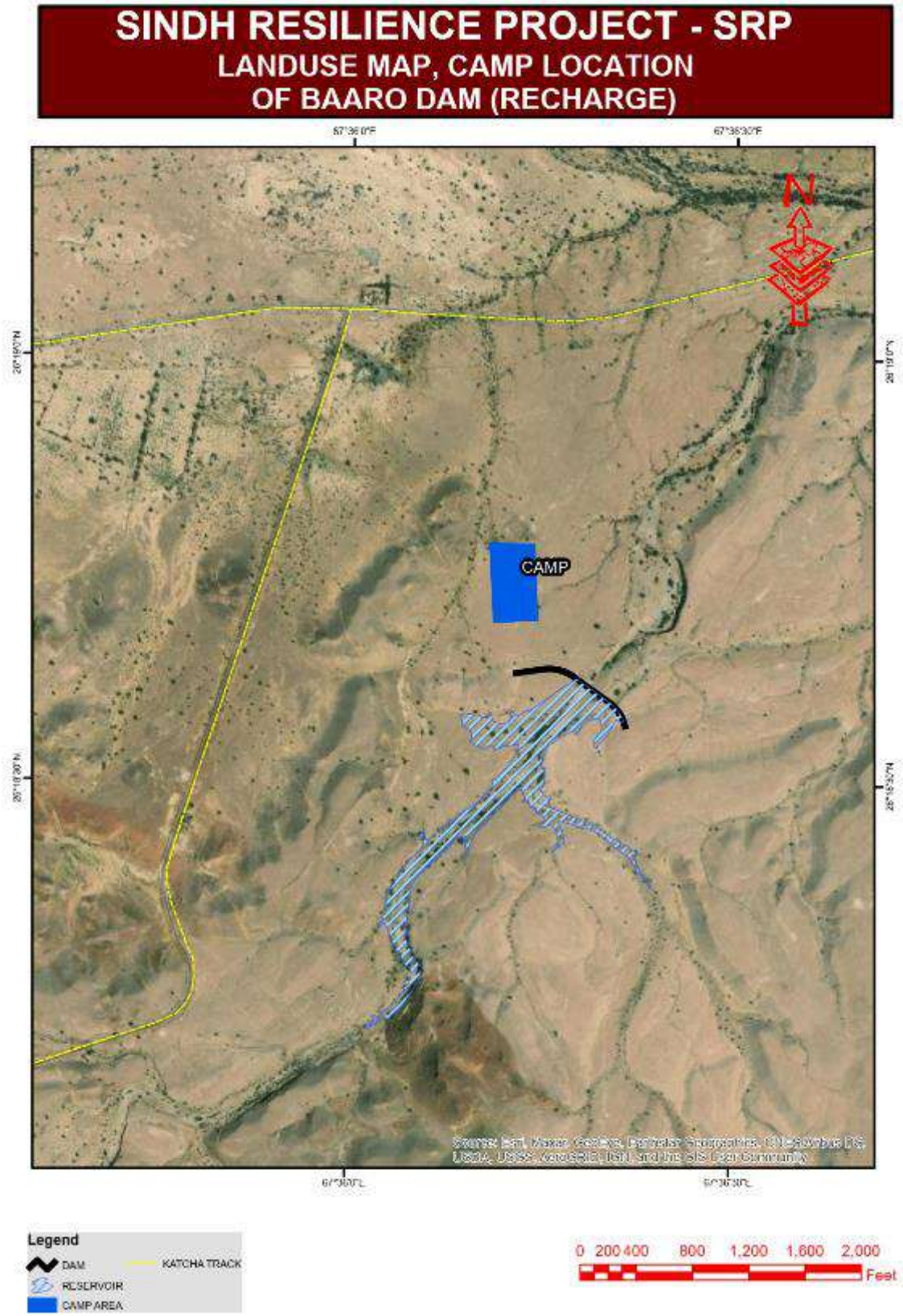
Title of Sub-project: Dahri Sharif			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 02 number of trees located within area of Dahri Sharif			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.11 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.08 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

Title of Sub-project: Jharando-1			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 06 number of trees located within area of Jharando-1			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.09 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.06 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

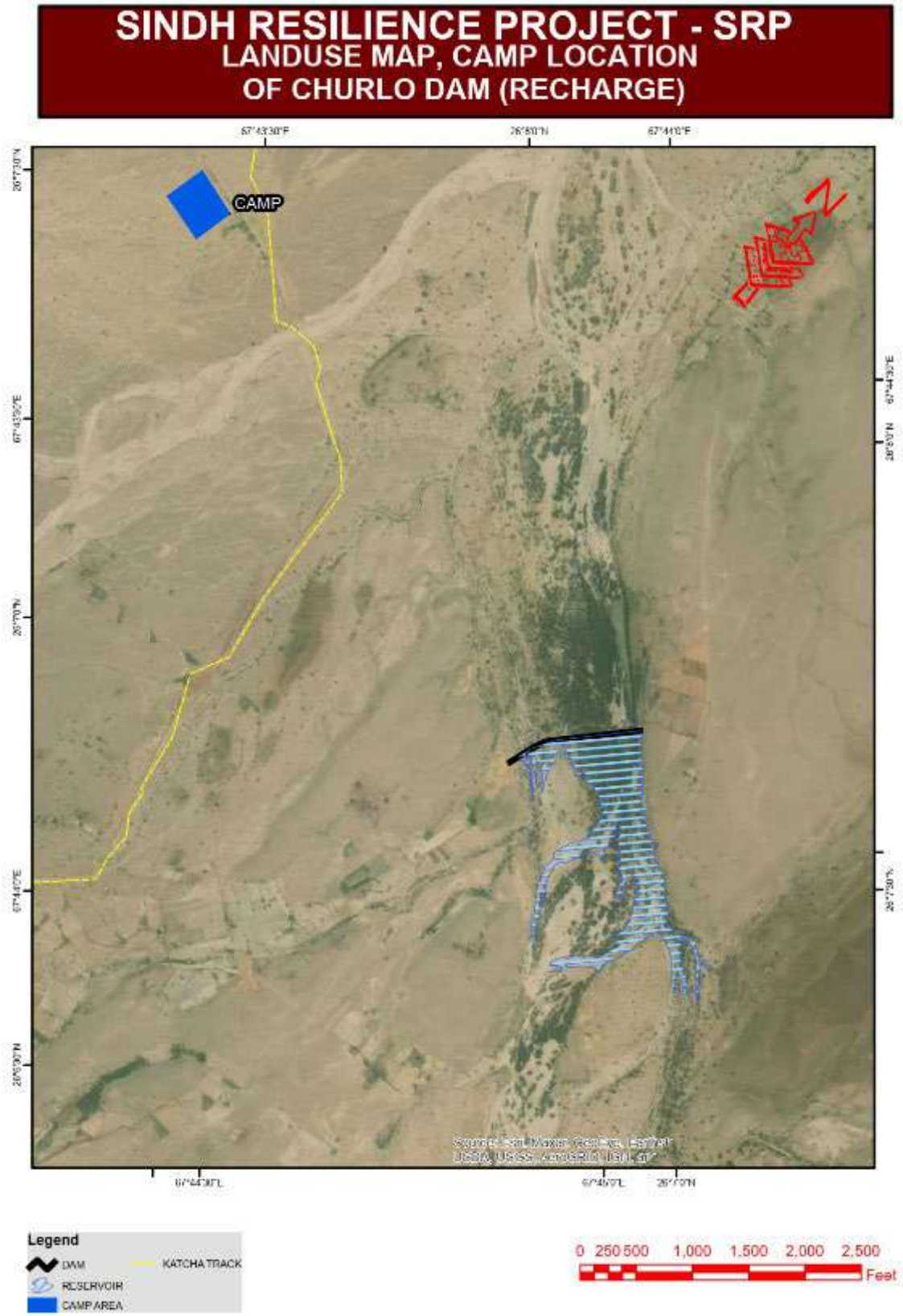
Title of Sub-project: Gaib Janan			
Scope of Works: Construction of Composite Concrete weir with Earth fill Embankment			
Duration:12 Months			
Client Project: Irrigation Department, Govt: of Sindh			
Funded by: World Bank			
Section: B Assessment			
Environmental Issues			
· There are 30 number of trees located within area of Gaib Janan			
· There are no settlement near the proposed dam site			
· There are no protected areas like, as National Parks, game reserve, wildlife sanctuaries located at or near the proposed area.			
· During construction some natural habitats might be disturbed.			
· There are also no physical cultural resources at or near the proposed dam site which may likely to be affected by construction activities.			
· No any forests observed near the dam site.			
· Ambient Air quality is clear and noise level is under SEPA standard.			
Section C: Environmental Category w.r.t Sindh Environmental Protection Agency (Review of IEE and EIA) Regulations, 2014.			
Type of Project: Water Management, Dams, Irrigation, and Flood Protection			
Type of Project	**Category**	**Applicable (Yes/No)**	**Comments**
Dams and reservoirs with storage volume less than 25 million cubic meters	Schedule-I	Yes, the proposed dam has storage volume 0.75 (million cubic meters)	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Dams and reservoirs having surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has surface area of 0.64 sq.-km	Sub-project is falling in schedule-I requiring the filling of an IEE with the provincial EPA.
Section D: World Bank Operational Policies that Might Apply			
Safeguard Policies		**Triggered (Yes/No)**	**Explanation**
Environmental Assessment OP/BP/GP 4.01		Yes	
Natural Habitats OP/BP 4.04		No	
Forest OP/BP 4.36		No	
Pest Management OP/BP/4.09		No	
Physical Cultural Resources OP/BP 4.09		No	
Involuntary resettlement OP/BP 4.12		No	
Safety of Dams OP/BP 4.37		Yes	
Project in International Waterways OP/BP 7.50		No	
Projects in Disputed Areas OP/BP 7.60		No	

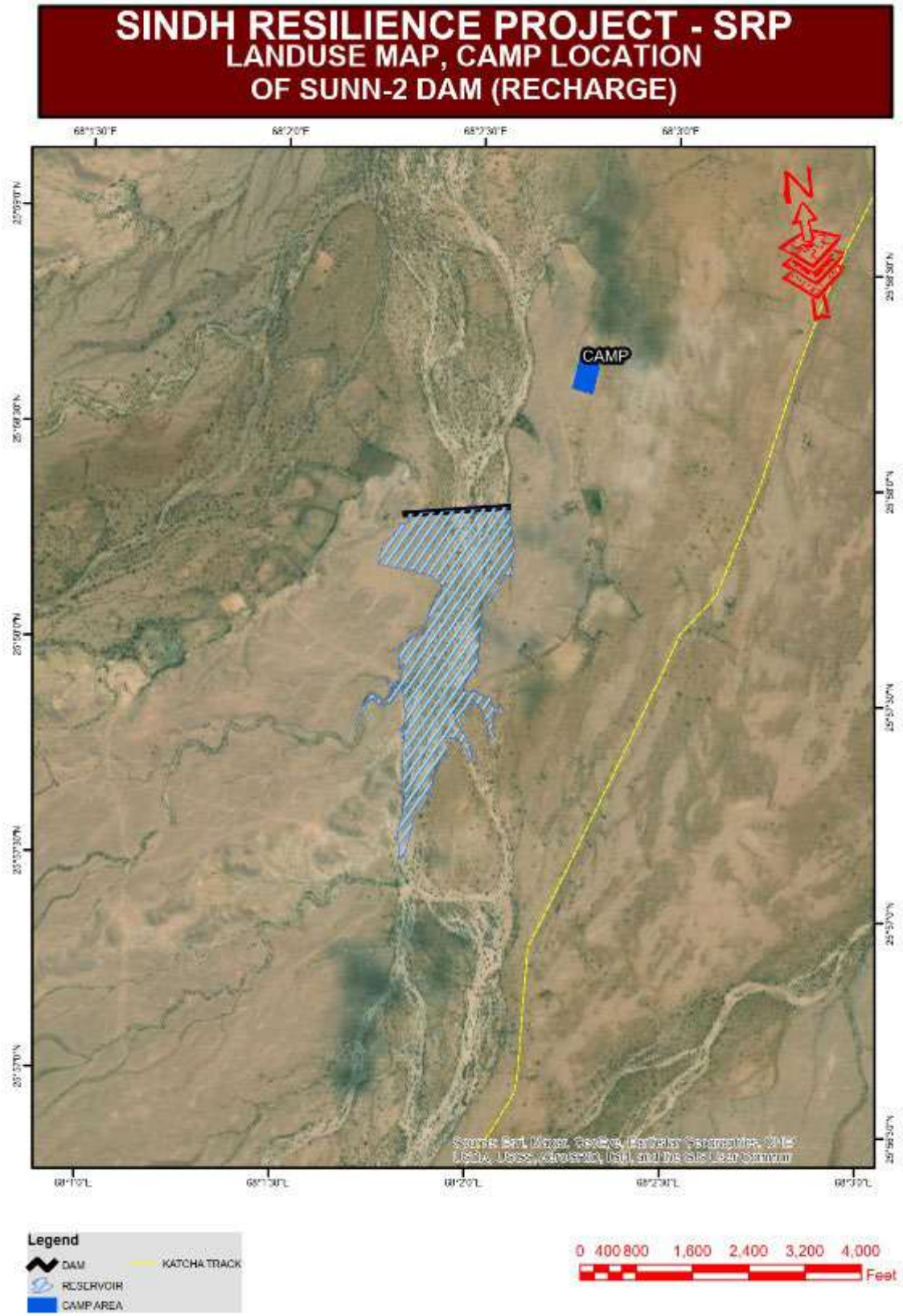
Annexure III: Land Use & Proposed Camp Area Maps of Sub-Project

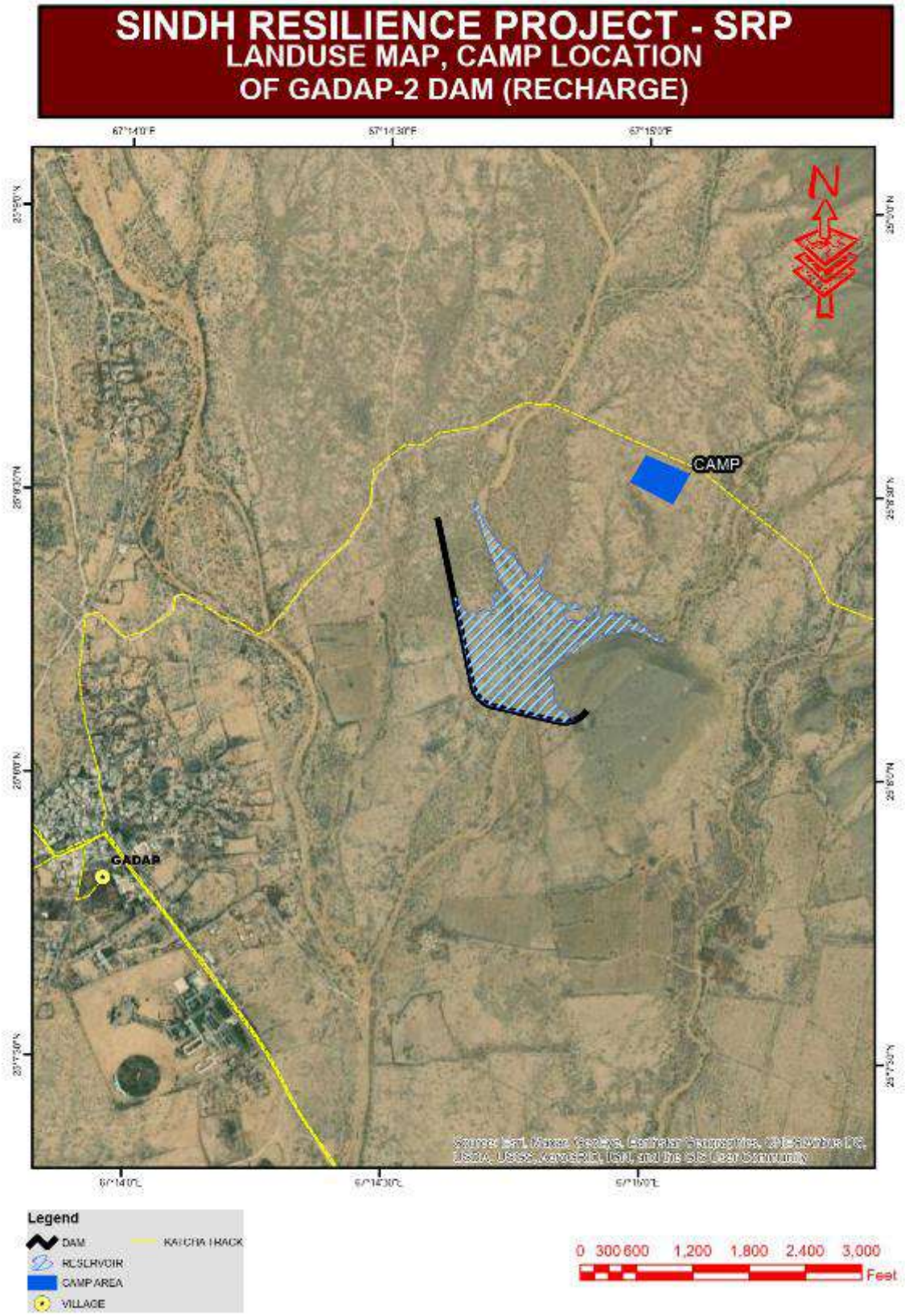


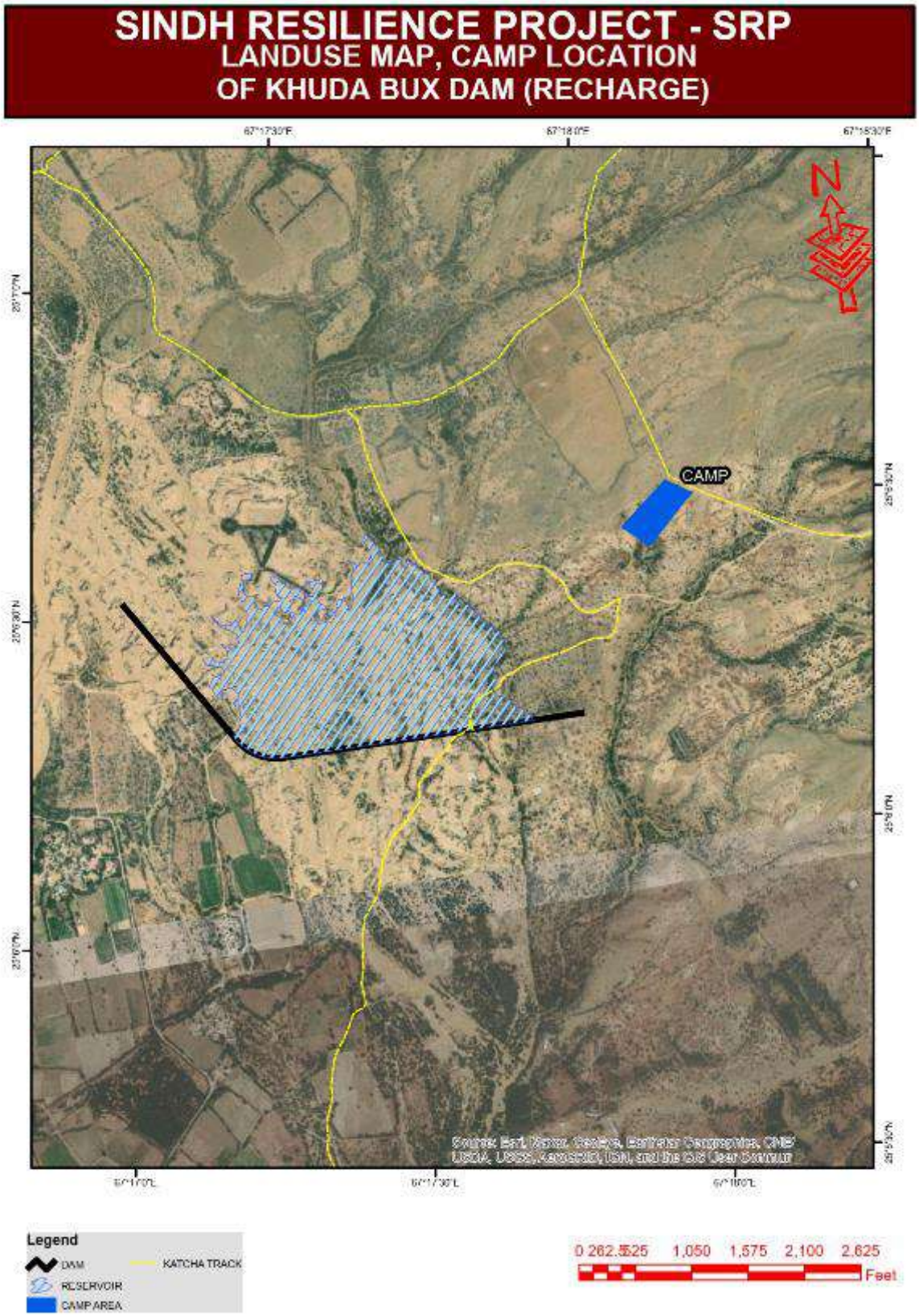

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF BAARO DAM (RECHARGE)
N
CAMP
Legend
DAM
KATCHA TRACK
RESERVOIR
CAMP AREA
0 200 400 800 1,200 1,600 2,000
Feet

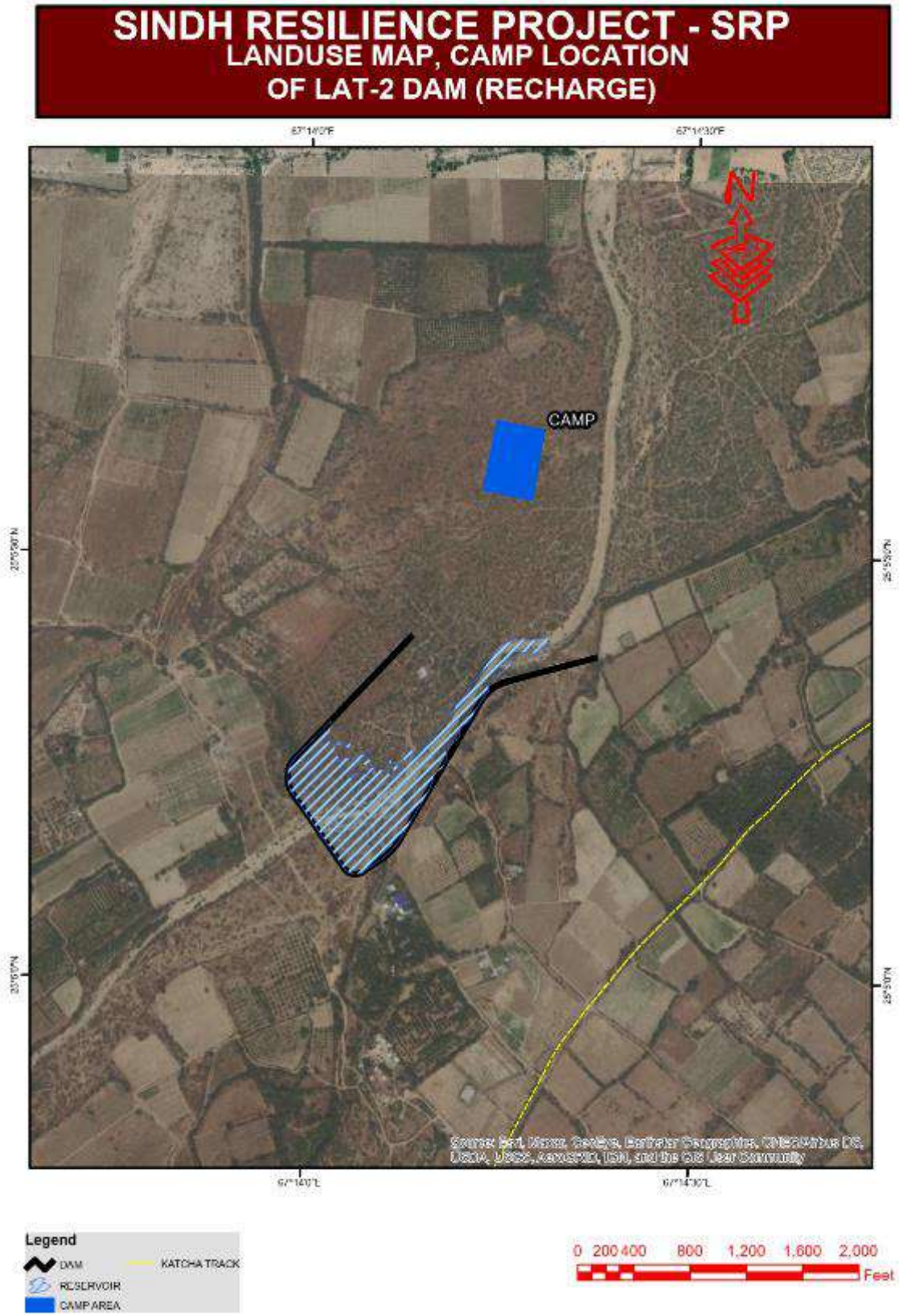

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF CHAKHRI DAM (RECHARGE)
CAMP
Legend
DAM
KATCHA TRACK
RESERVOIR
CAMP AREA
0 120 240 480 720 960 1,200
Feet

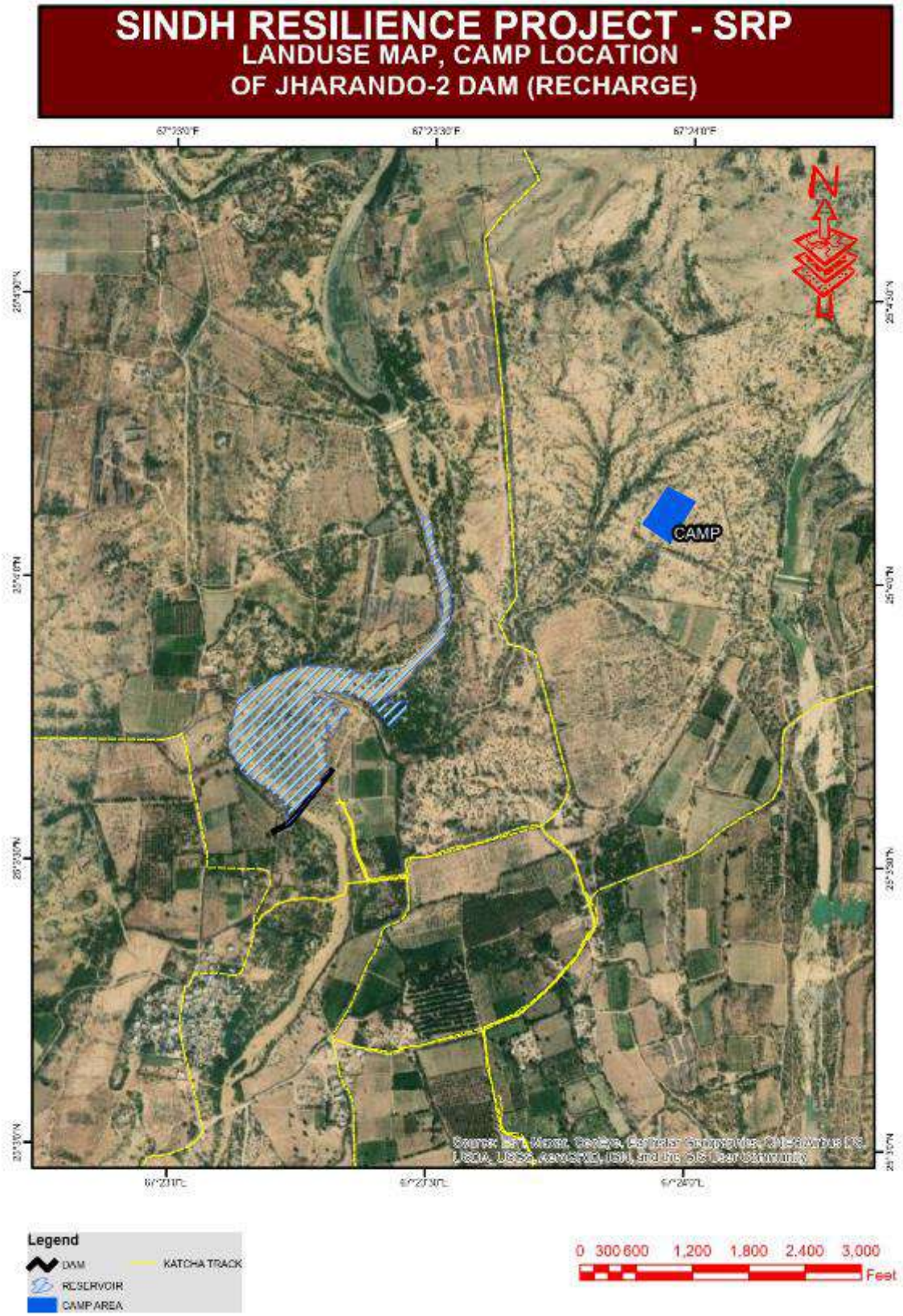

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF CHURLO DAM (RECHARGE)
CAMP
N
Legend
DAM
KATCHA TRACK
RESERVOIR
CAMP AREA
0 250 500 1,000 1,500 2,000 2,500
Feet

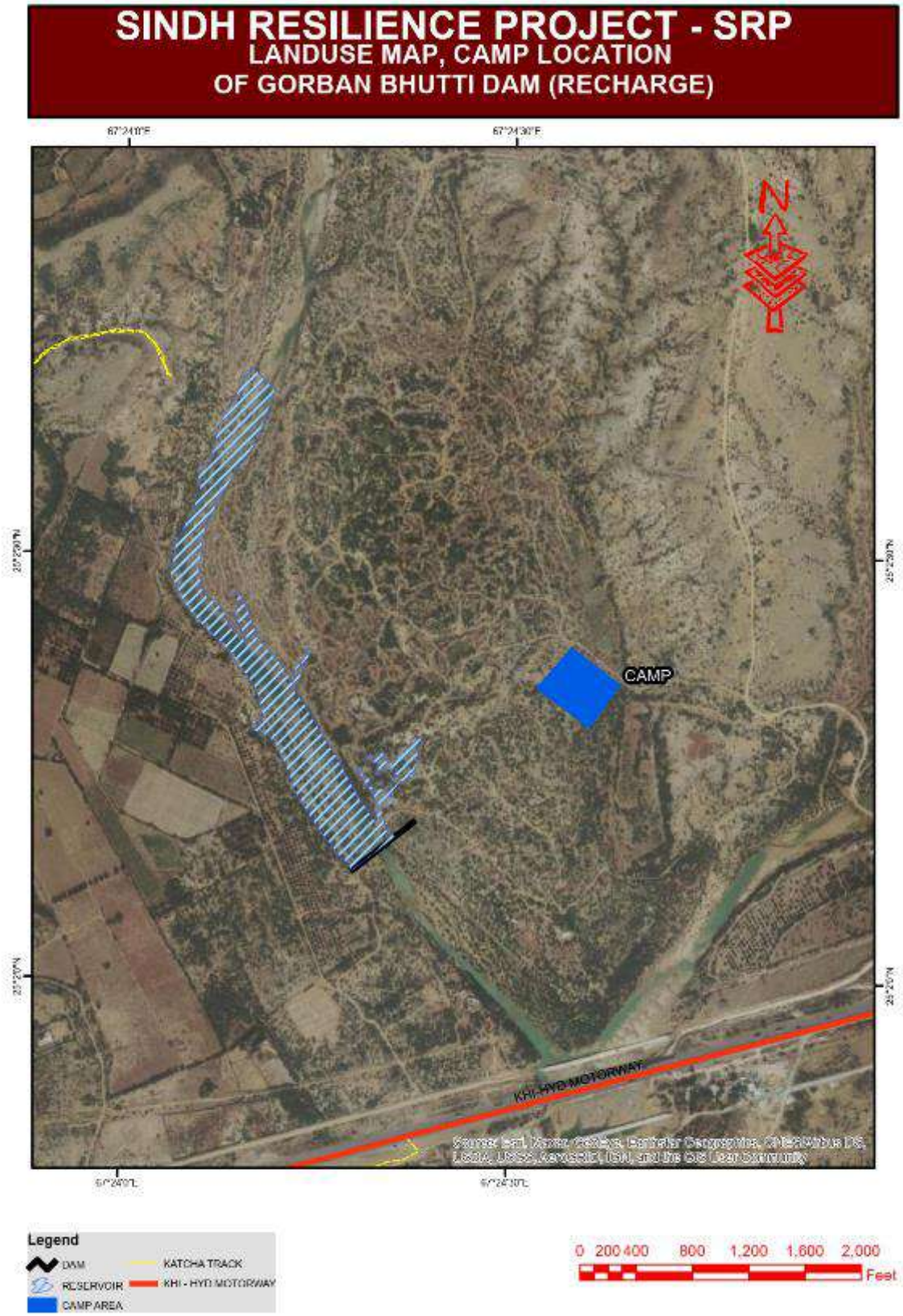

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF SUNN-2 DAM (RECHARGE)
CAMP
N
Legend
DAM
KATCHA TRACK
RESERVOIR
CAMP AREA
0 400 800 1,600 2,400 3,200 4,000
Feet

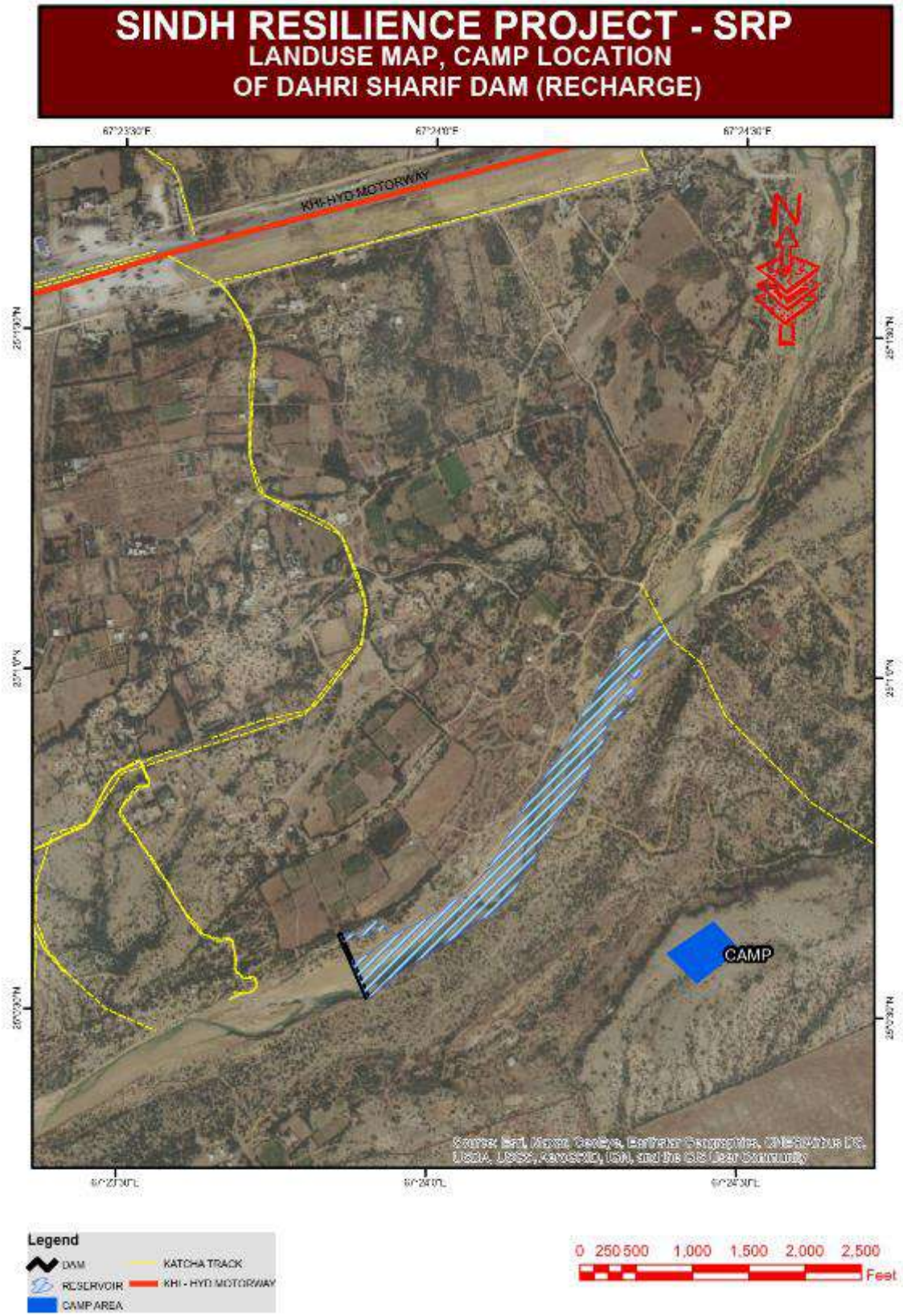

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF GADAP-2 DAM (RECHARGE)
67°14'0"E
67°14'30"E
67°15'0"E
25°3'0"N
25°2'30"N
25°2'0"N
N
CAMP
GADAP
Legend
DAM
KACCHA TRACK
RESERVOIR
CAMP AREA
VILLAGE
0 300 600 1,200 1,800 2,400 3,000
Feet

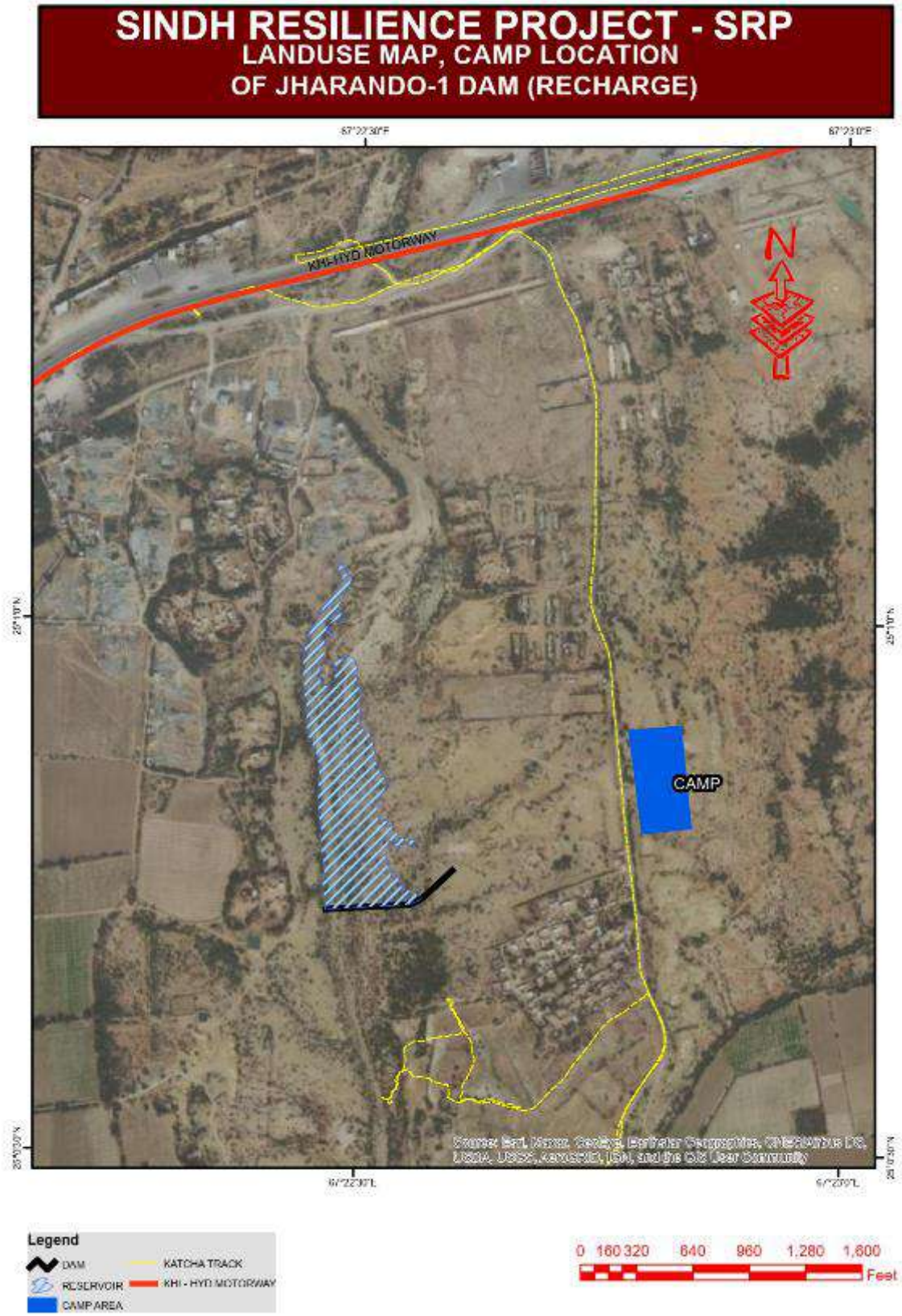

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF KHUDA BUX DAM (RECHARGE)
CAMP
N
Legend
DAM
KATCHA TRACK
RESERVOIR
CAMP AREA
0 262.525 1,050 1,575 2,100 2,625
Feet

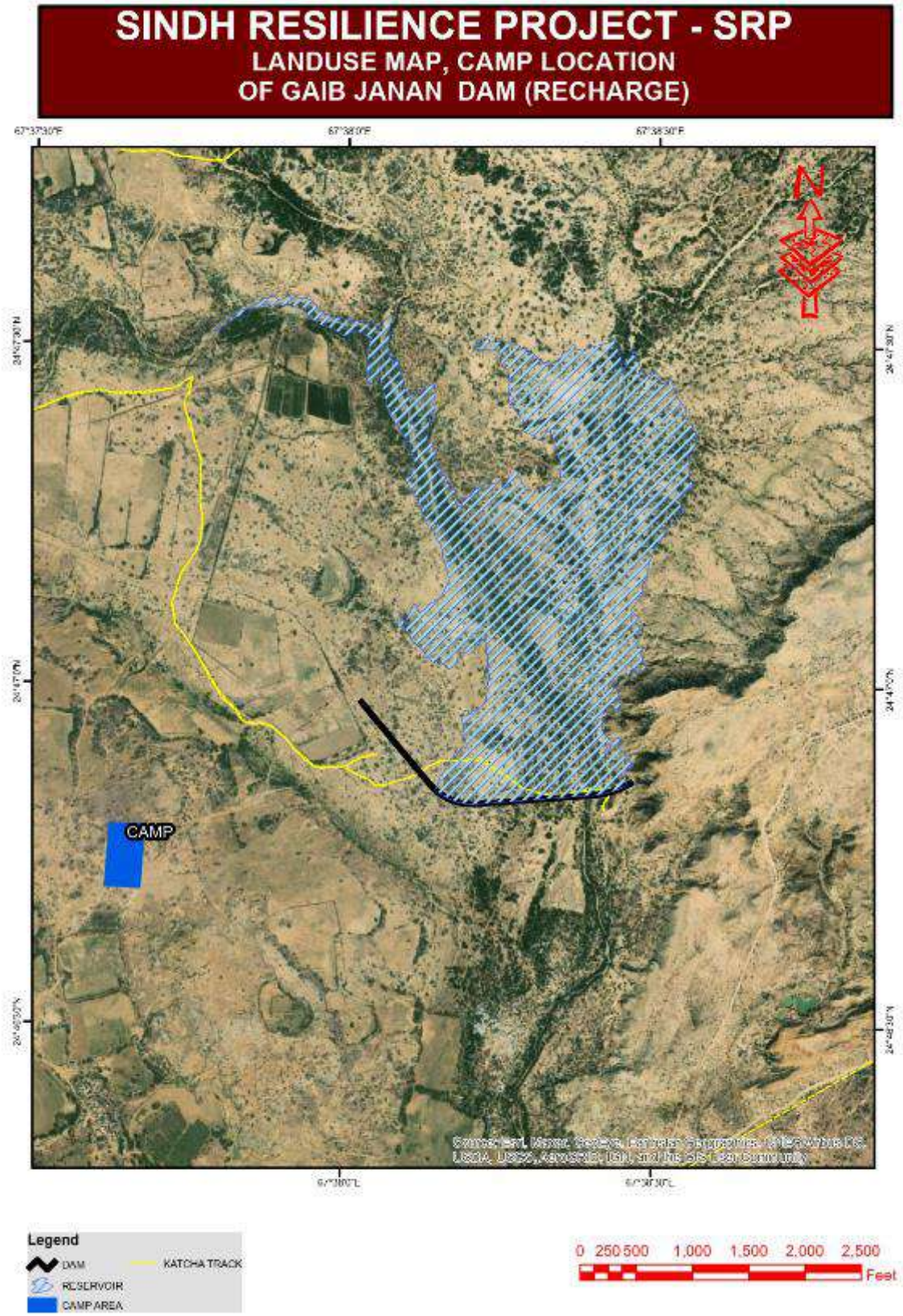

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF LAT-2 DAM (RECHARGE)
CAMP
N
Legend
DAM
KATCHA TRACK
RESERVOIR
CAMP AREA
0 200 400 800 1,200 1,600 2,000
Feet


SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF JHARANDO-2 DAM (RECHARGE)
CAMP
N
Legend
DAM
KATCHA TRACK
RESERVOIR
CAMP AREA
0 300 600 1,200 1,800 2,400 3,000
Feet

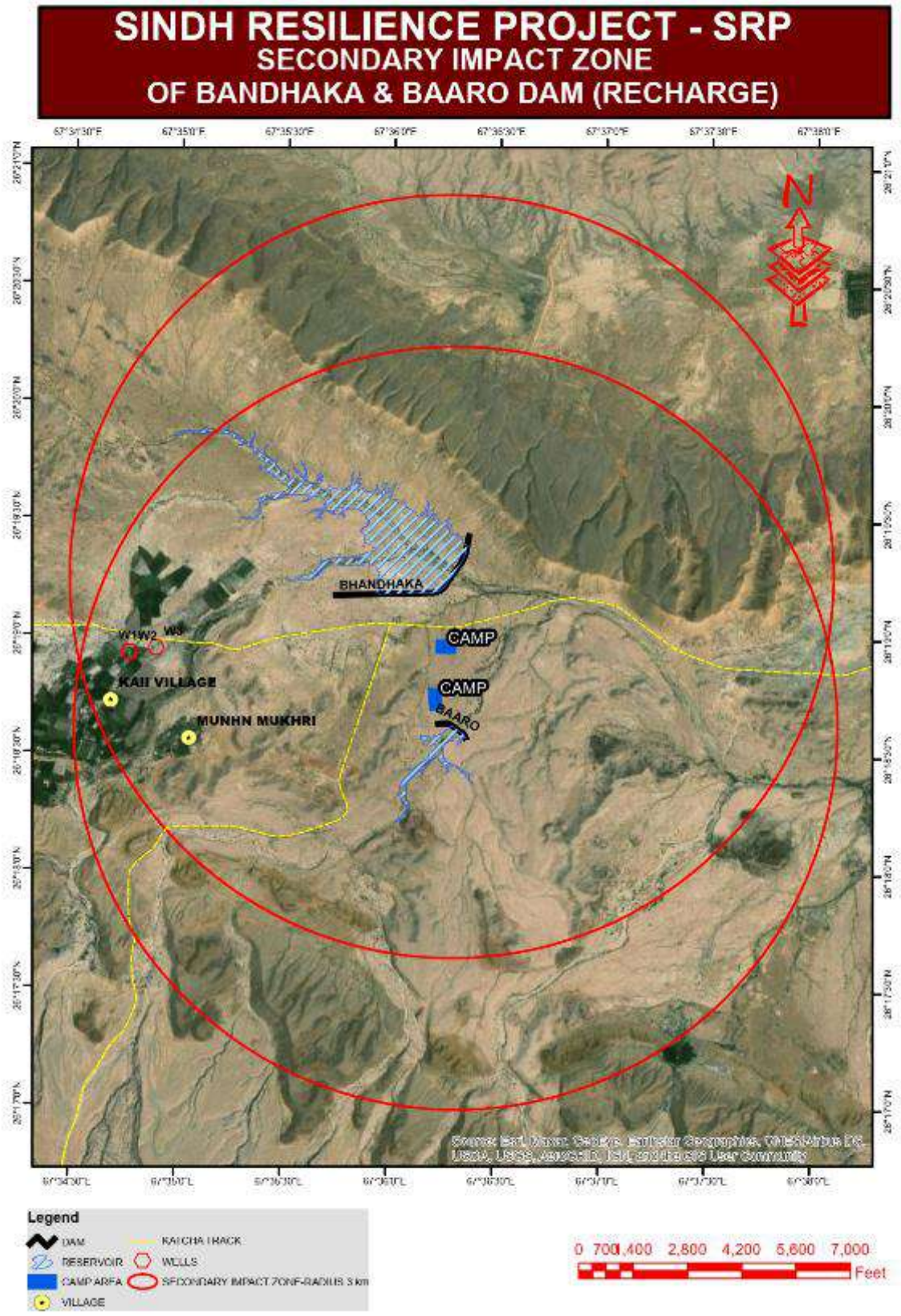

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF GORBAN BHUTTI DAM (RECHARGE)
67°24'0"E
67°24'30"E
N
CAMP
KHI-HYD MOTORWAY
Legend
DAM
RESERVOIR
CAMP AREA
KATCHA TRACK
KHI - HYD MOTORWAY
0 200 400 800 1,200 1,600 2,000
Feet

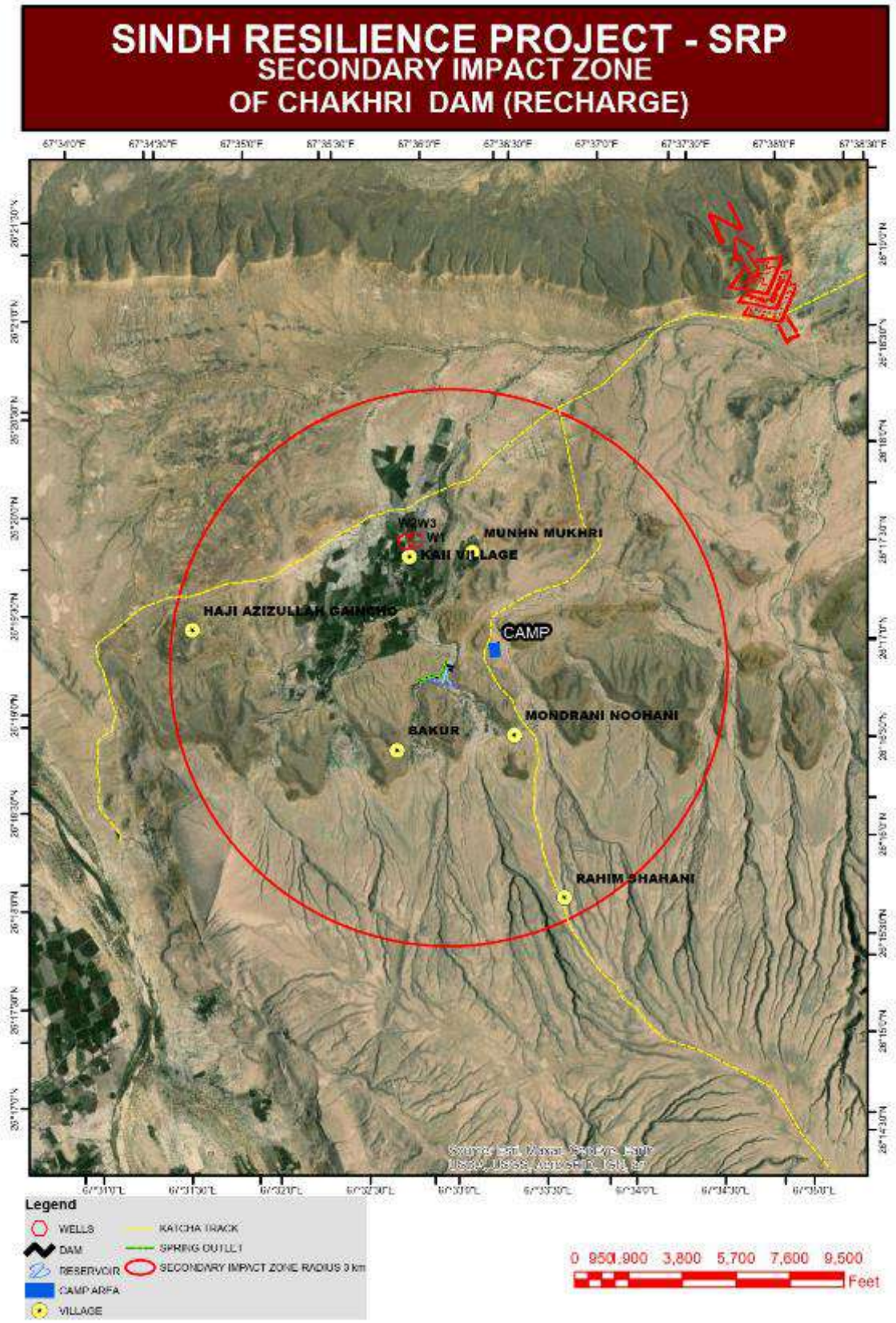

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF DAHRI SHARIF DAM (RECHARGE)
KHI-HYD MOTORWAY
N
CAMP
Legend
DAM
RESERVOIR
CAMP AREA
KATCHA TRACK
KHI - HYD MOTORWAY
0 250 500 1,000 1,500 2,000 2,500
Feet

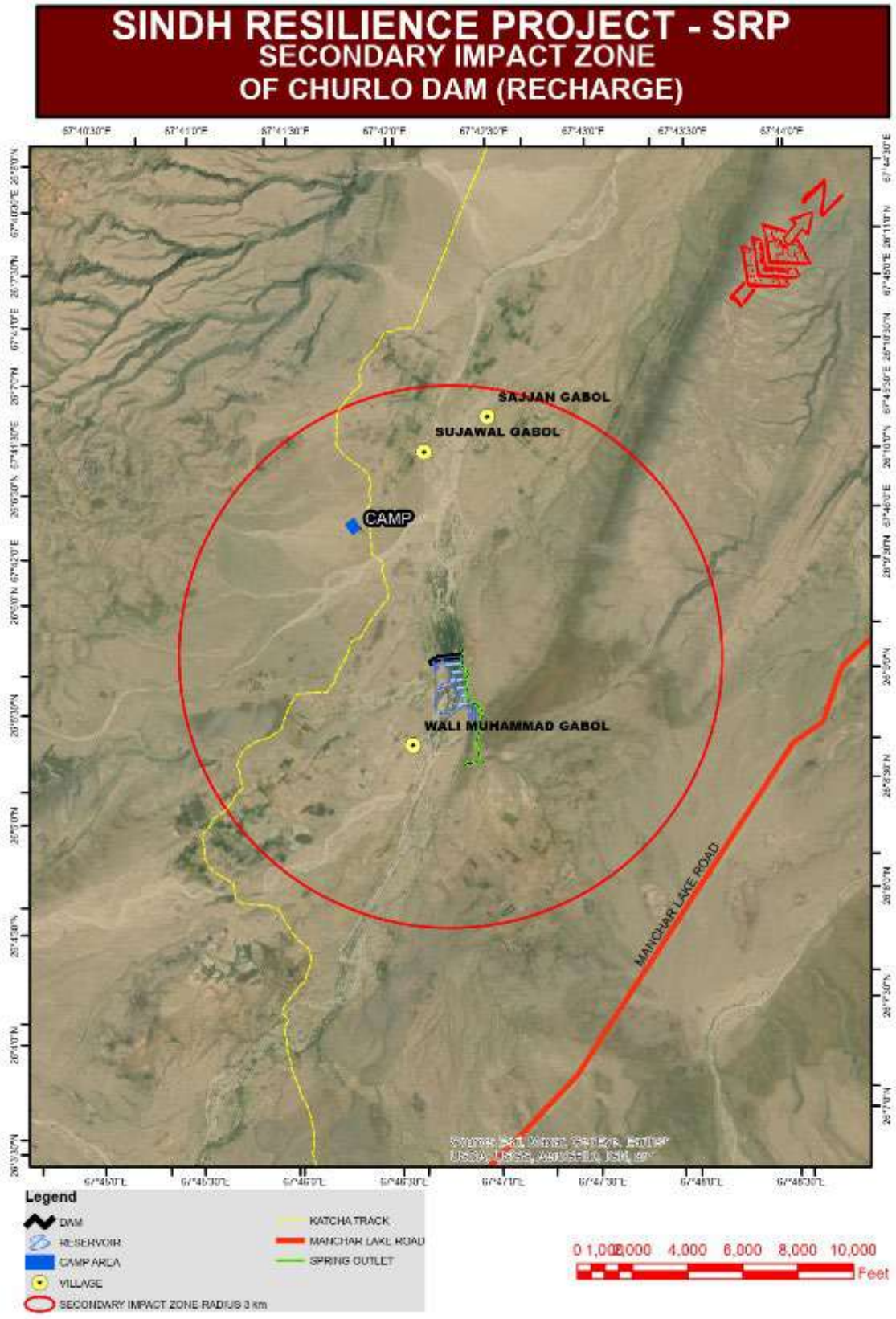

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF JHARANDO-1 DAM (RECHARGE)
KHI-HYD MOTORWAY
N
CAMP
Legend
DAM
RESERVOIR
CAMP AREA
KATCHA TRACK
KHI - HYD MOTORWAY
0 160 320 640 960 1,280 1,600
Feet

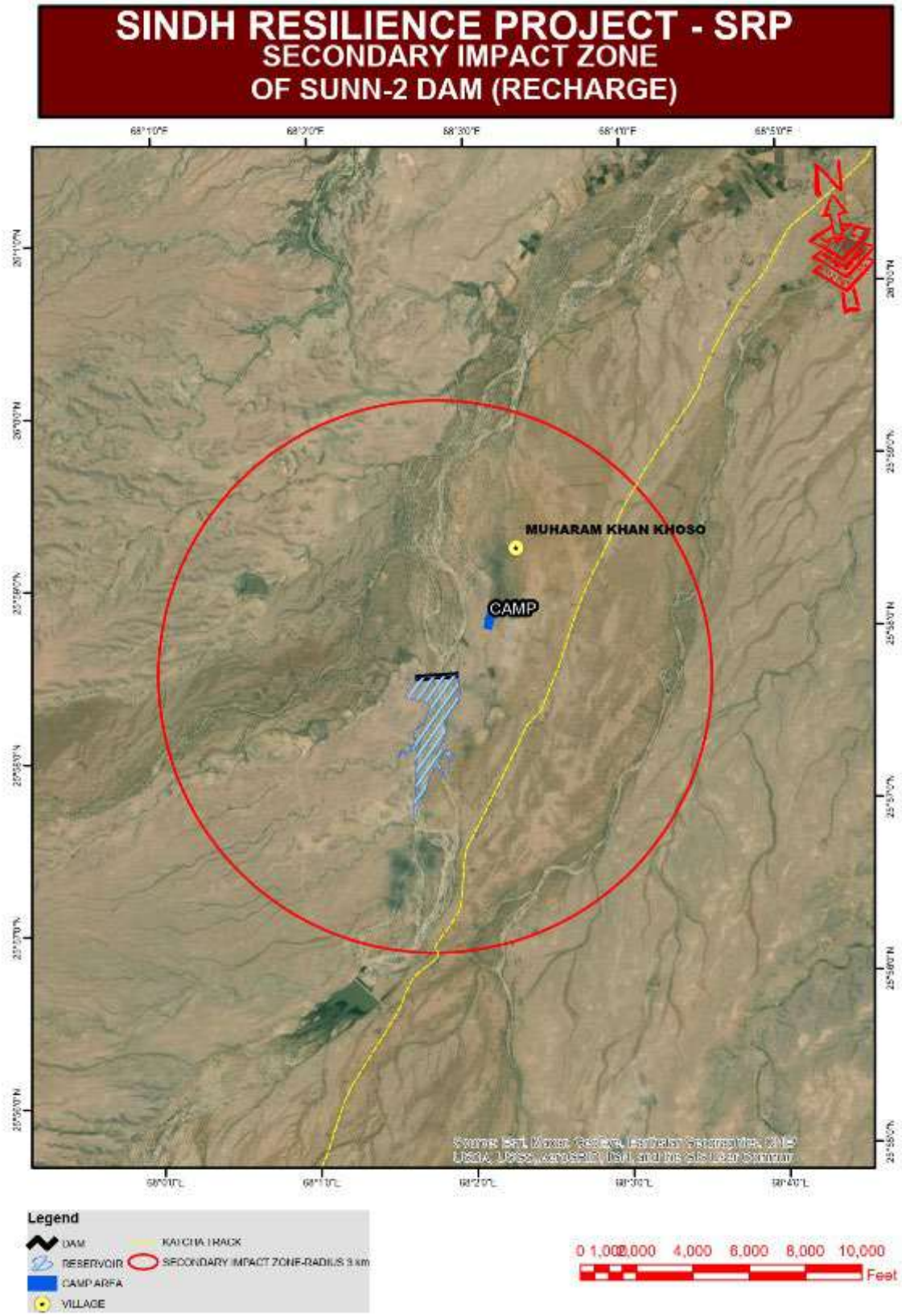

SINDH RESILIENCE PROJECT - SRP
LANDUSE MAP, CAMP LOCATION
OF GAIB JANAN DAM (RECHARGE)
N
CAMP
Legend
DAM
KATCHA TRACK
RESERVOIR
CAMP AREA
0 250 500 1,000 1,500 2,000 2,500
Feet

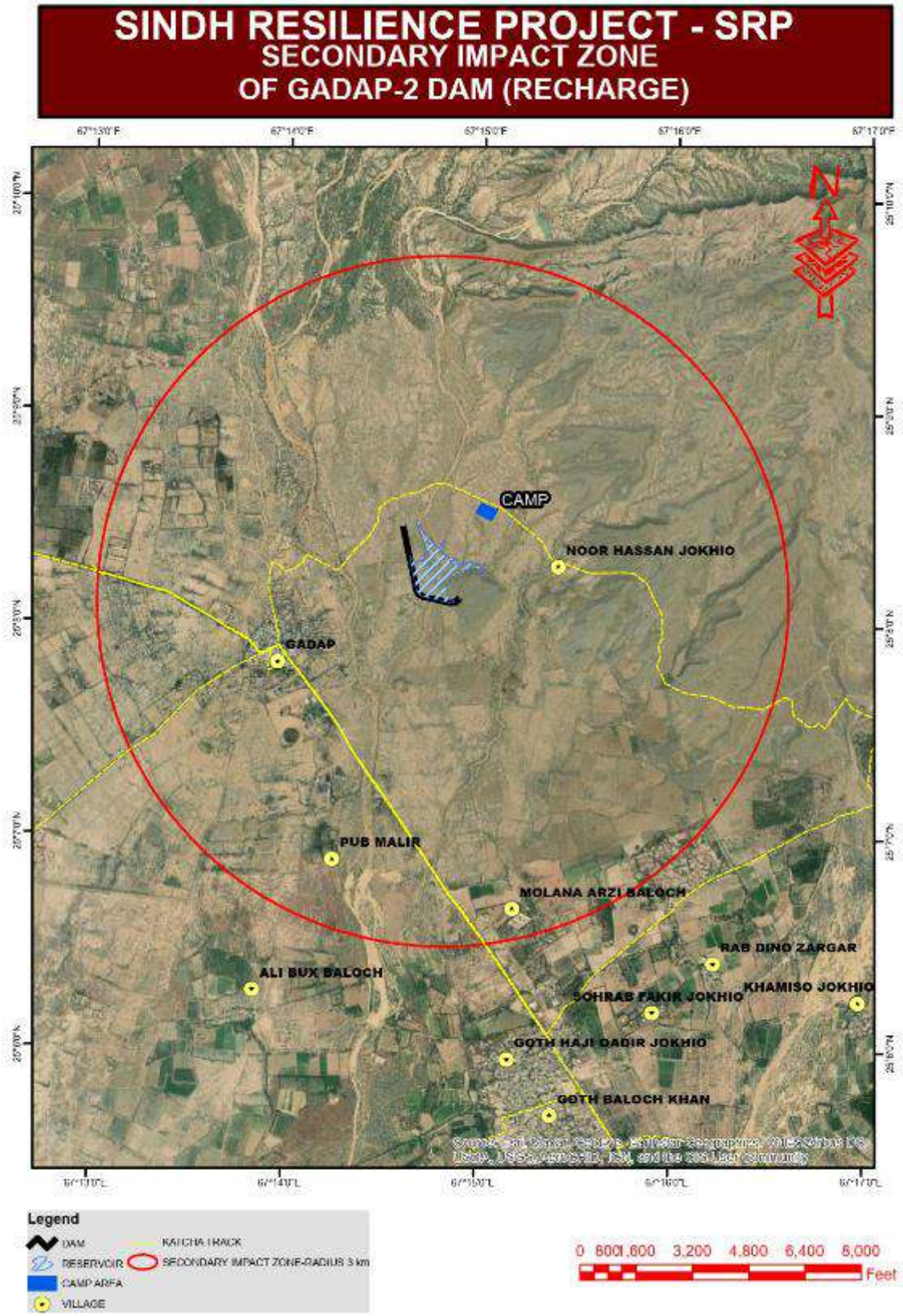
Annexure IV: Primary & Secondar Imapct Zone

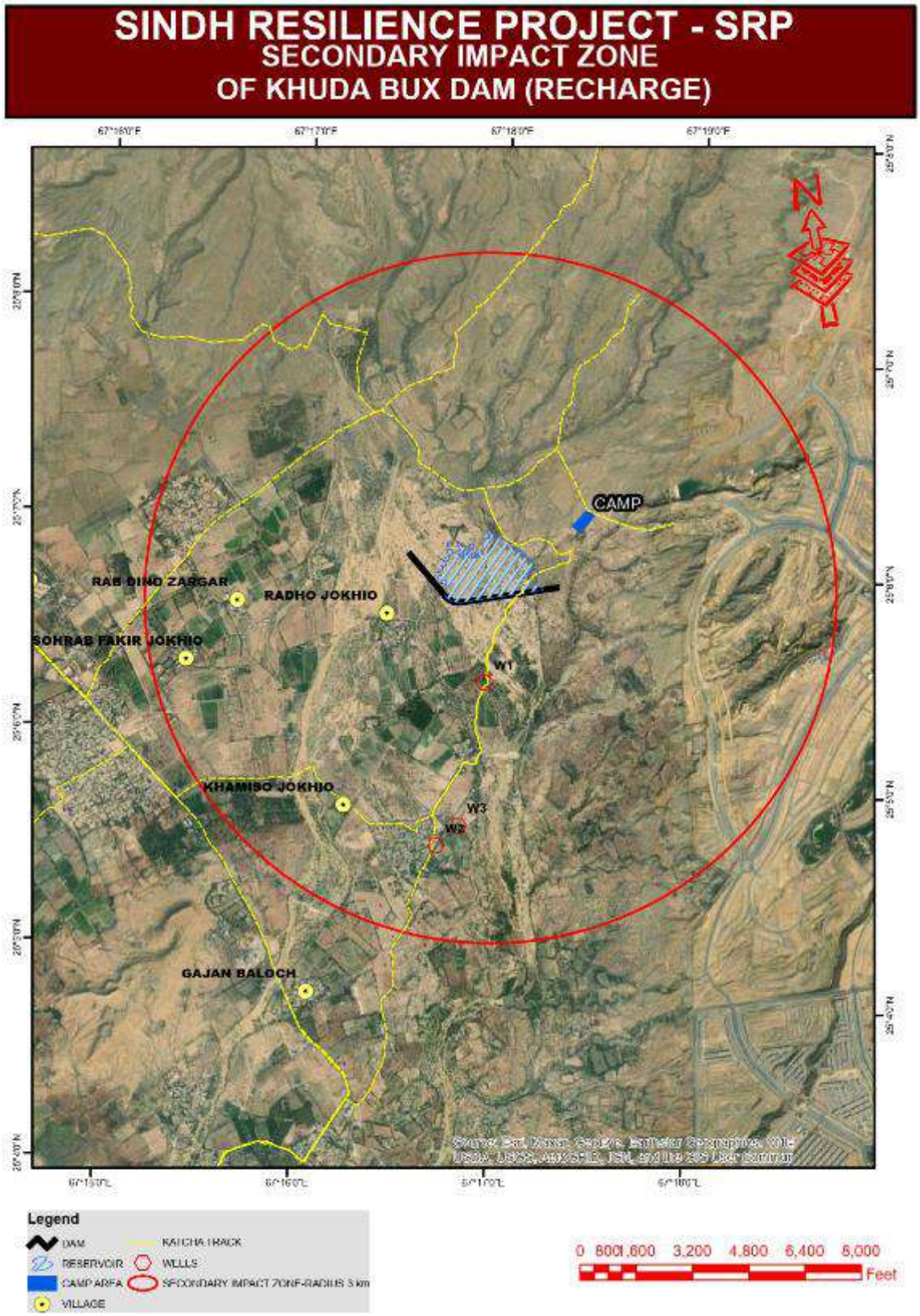


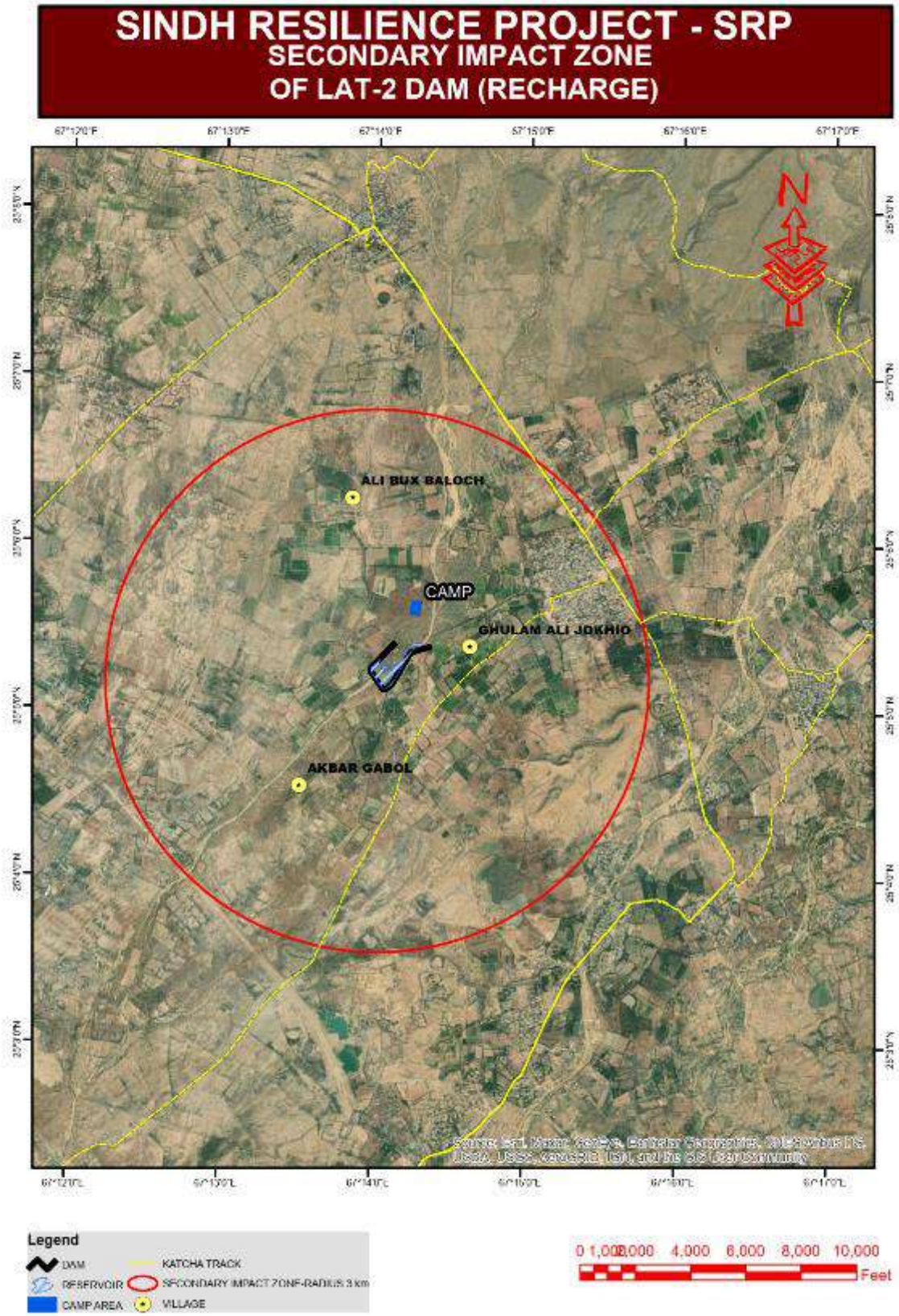

SINDH RESILIENCE PROJECT - SRP
SECONDARY IMPACT ZONE
OF CHAKHRI DAM (RECHARGE)
MUNHN MUKHRI
KAII VILLAGE
HAJI AZIZULLAH GAINCHO
CAMP
MONDRANI NOOHANI
BAKUR
RAHIM SHAHANI
Legend
WELLS
DAM
RESERVOIR
CAMP AREA
VILLAGE
KATCHA TRACK
SPRING OUTLET
SECONDARY IMPACT ZONE RADIUS 3 km
0 950 1,900 3,800 5,700 7,600 9,500
Feet

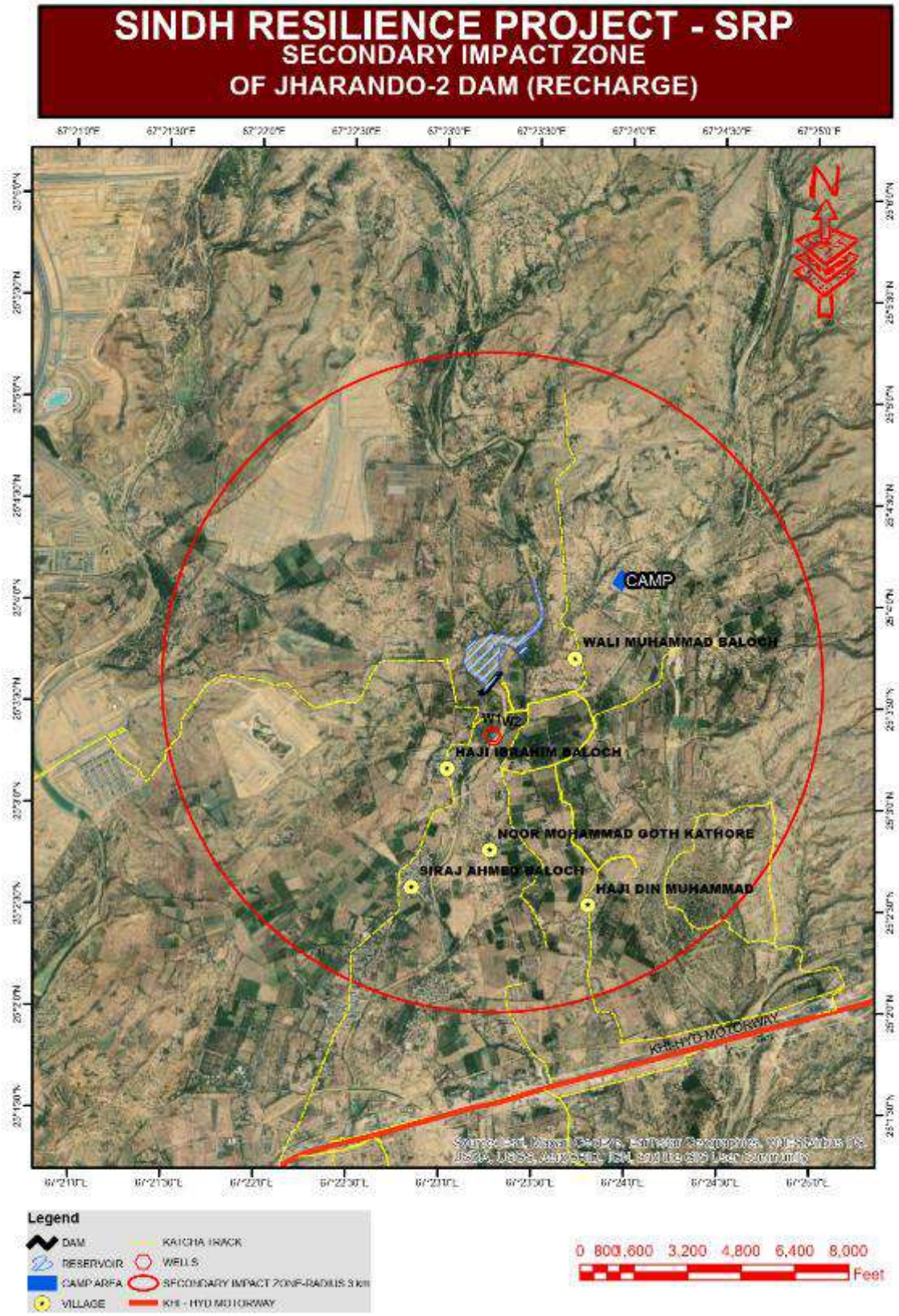

SINDH RESILIENCE PROJECT - SRP
SECONDARY IMPACT ZONE
OF CHURLO DAM (RECHARGE)
SAJJAN GABOL
SUJAWAL GABOL
CAMP
WALI MUHAMMAD GABOL
MANCHAR LAKE ROAD
N
Legend
DAM
RESERVOIR
CAMP AREA
VILLAGE
SECONDARY IMPACT ZONE RADIUS 3 km
KATCHA TRACK
MANCHAR LAKE ROAD
SPRING OUTLET
0 1,000 2,000 4,000 6,000 8,000 10,000
Feet

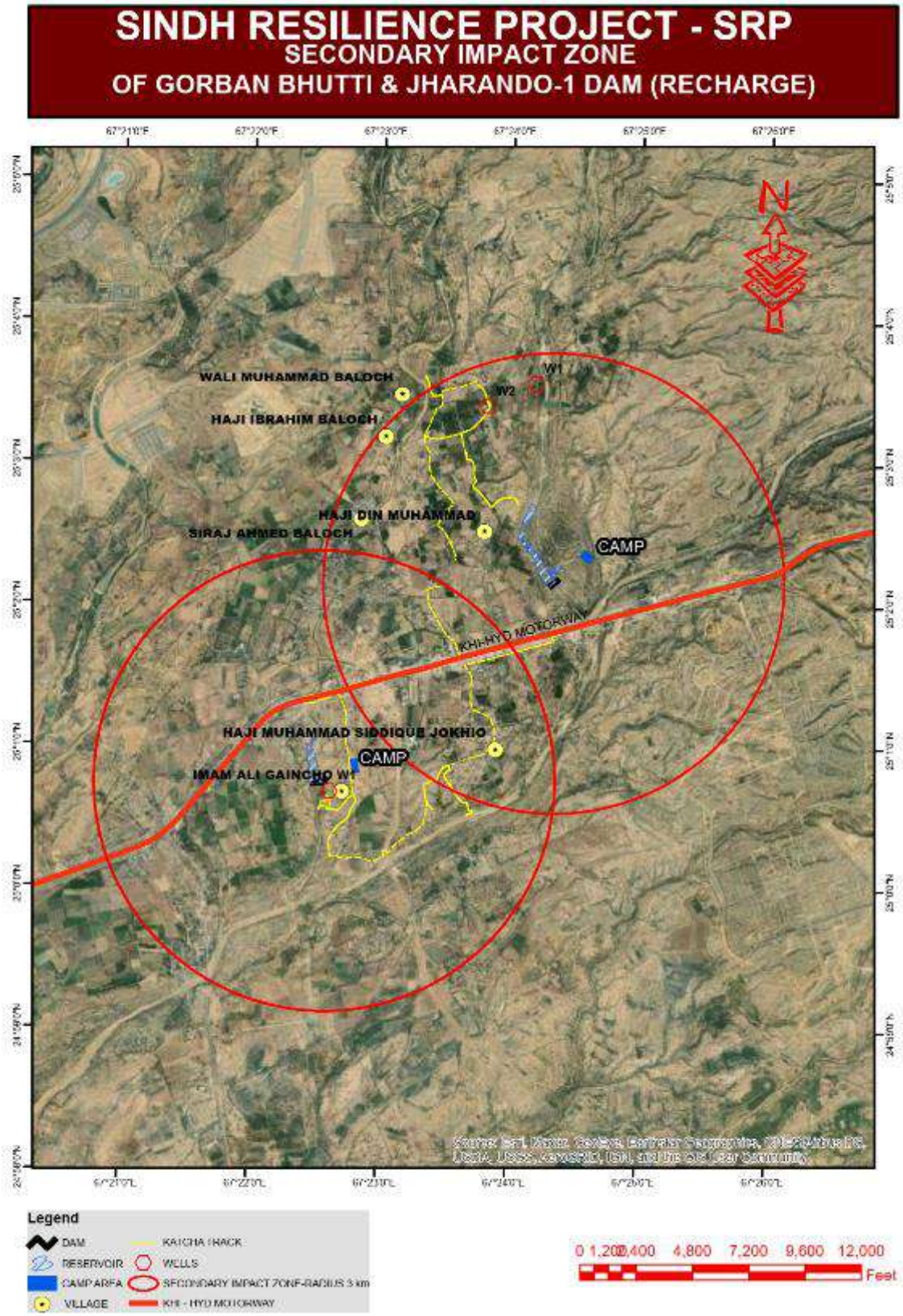

SINDH RESILIENCE PROJECT - SRP
SECONDARY IMPACT ZONE
OF SUNN-2 DAM (RECHARGE)
MUHARAM KHAN KHOSO
CAMP
N
Legend
DAM
RESERVOIR
CAMP AREA
VILLAGE
KACCHA TRACK
SECONDARY IMPACT ZONE-RADIUS 3 km
0 1,000 2,000 4,000 6,000 8,000 10,000
Feet

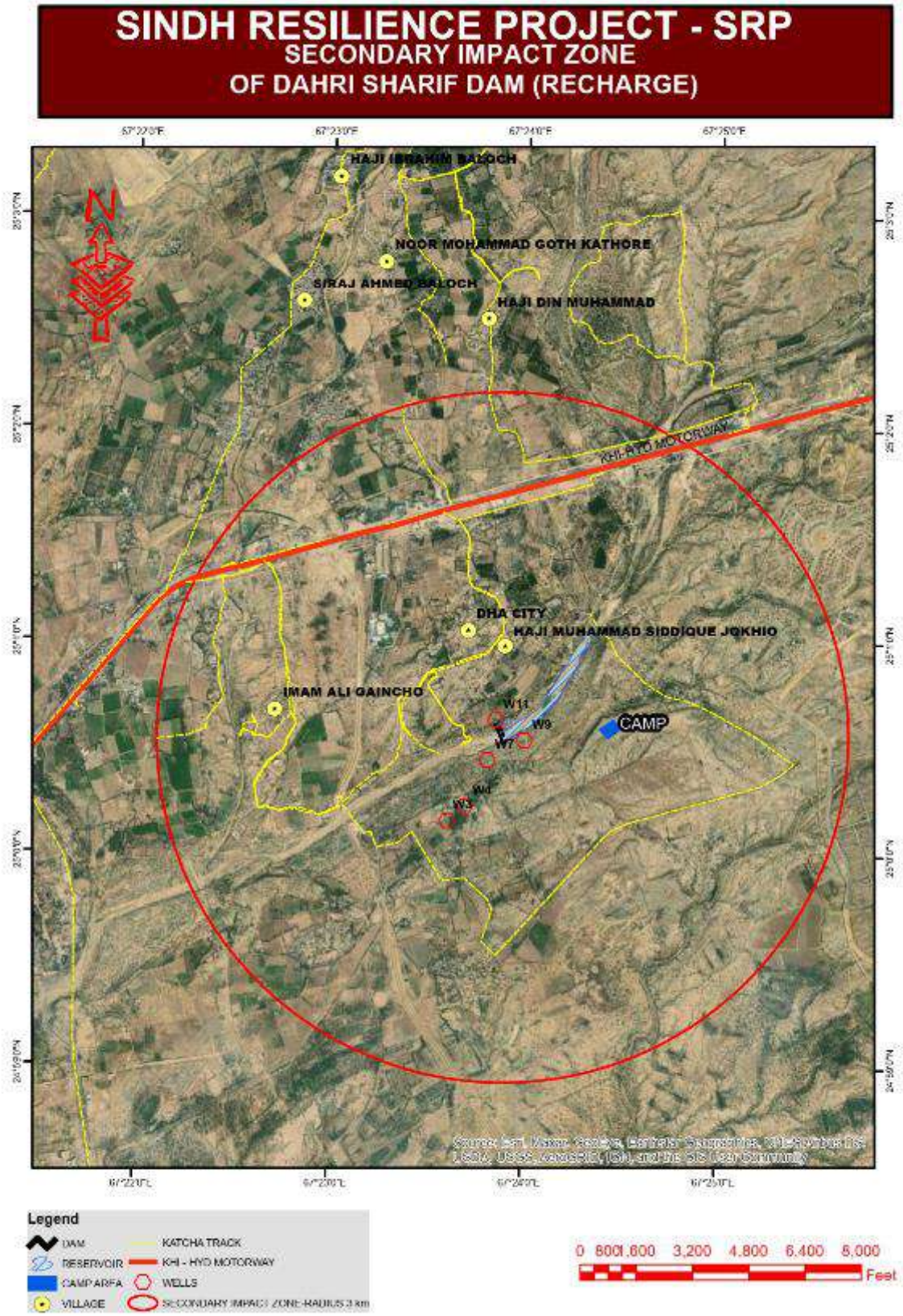

SINDH RESILIENCE PROJECT - SRP
SECONDARY IMPACT ZONE
OF GADAP-2 DAM (RECHARGE)
CAMP
NOOR HASSAN JOKHIO
GADAP
PUB MALIR
MOLANA ARZI BALOCH
RAB DINO ZARGAR
ALI BUX BALOCH
KHAMISO JOKHIO
SOHRAB FAKIR JOKHIO
GOTH HAJI QADIR JOKHIO
GOTH BALOCH KHAN
Legend
DAM
RESERVOIR
CAMP AREA
VILLAGE
KATCHA TRACK
SECONDARY IMPACT ZONE-RADIUS 3 km
0 800 1,600 3,200 4,800 6,400 8,000
Feet

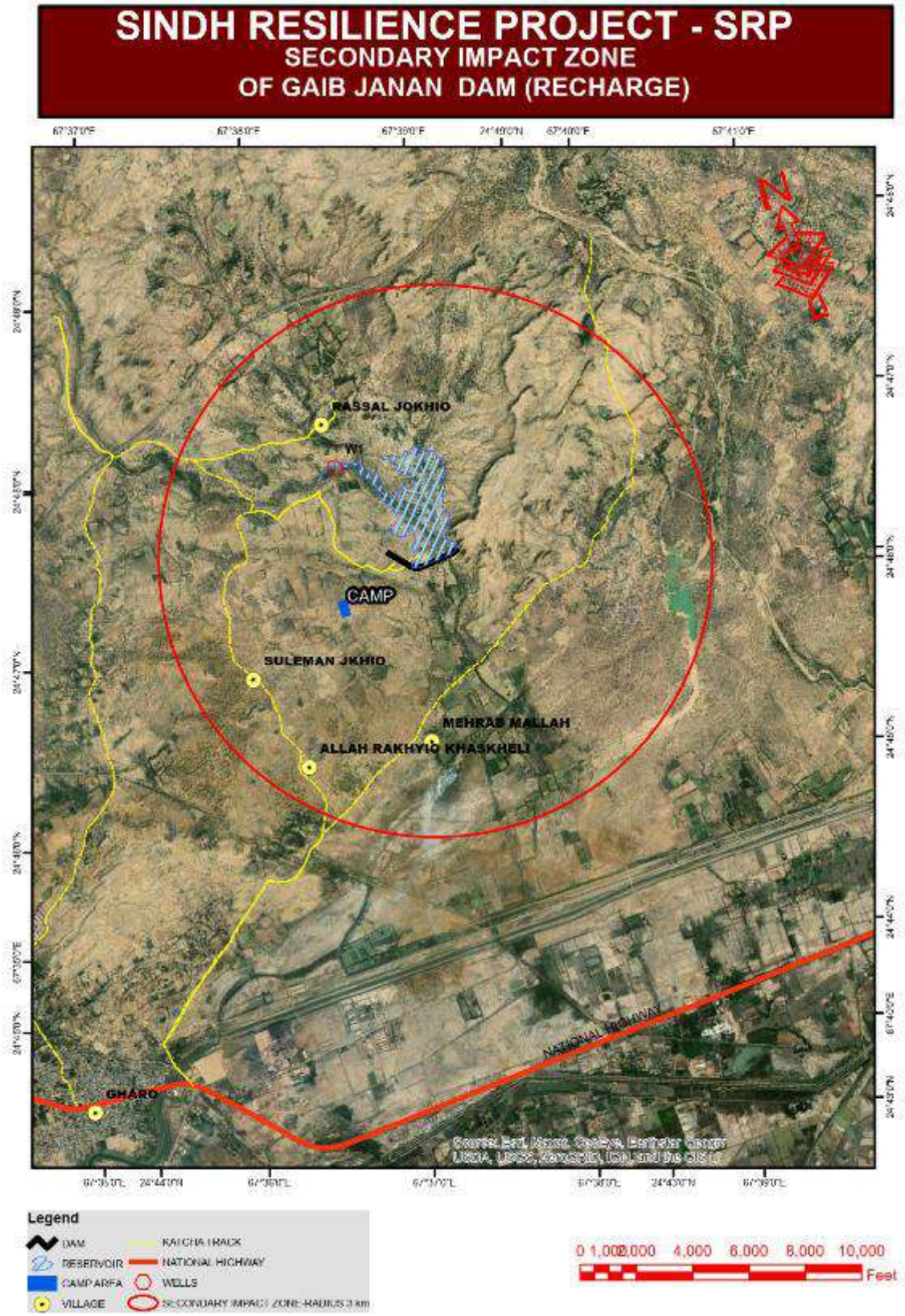

SINDH RESILIENCE PROJECT - SRP
SECONDARY IMPACT ZONE
OF KHUDA BUX DAM (RECHARGE)
CAMP
RAB DINO ZARGAR
RADHO JOKHIO
SOHRAB FAKIR JOKHIO
KHAMISO JOKHIO
GAJAN BALOCH
W1
W2
W3
N
Legend
DAM
RESERVOIR
CAMP AREA
VILLAGE
KATCHA TRACK
WELLS
SECONDARY IMPACT ZONE-RADIUS 3 km
0 800 1,600 3,200 4,800 6,400 8,000
Feet


SINDH RESILIENCE PROJECT - SRP
SECONDARY IMPACT ZONE
OF LAT-2 DAM (RECHARGE)
N
ALI BUX BALOCH
CAMP
GHULAM ALI JOKHIO
AKBAR GABOL
Legend
DAM
RESERVOIR
CAMP AREA
KATCHA TRACK
SECONDARY IMPACT ZONE-RADIUS 3 km
VILLAGE
0 1,000 2,000 4,000 6,000 8,000 10,000
Feet


SINDH RESILIENCE PROJECT - SRP
SECONDARY IMPACT ZONE
OF JHARANDO-2 DAM (RECHARGE)
CAMP
WALI MUHAMMAD BALOCH
HAJI IBRAHIM BALOCH
NOOR MOHAMMAD GOTH KATHORE
SIRAJ AHMED BALOCH
HAJI DIN MUHAMMAD
KHI-HYD MOTORWAY
Legend
DAM
RESERVOIR
CAMP AREA
VILLAGE
KACHA TRACK
WELLS
SECONDARY IMPACT ZONE-RADIUS 3 KM
KHI - HYD MOTORWAY
0 800 1,600 3,200 4,800 6,400 8,000
Feet


SINDH RESILIENCE PROJECT - SRP
SECONDARY IMPACT ZONE
OF GORBAN BHUTTI & JHARANDO-1 DAM (RECHARGE)
N
WALI MUHAMMAD BALOCH
W1
W2
HAJI IBRAHIM BALOCH
HAJI DIN MUHAMMAD
SIRAJ AHMED BALOCH
CAMP
KHI-HYD MOTORWAY
HAJI MUHAMMAD SIDDIQUE JOKHIO
CAMP
IMAM ALI GAINCHO W1
Legend
DAM
RESERVOIR
CAMP AREA
VILLAGE
KACHA TRACK
WELLS
SECONDARY IMPACT ZONE-RADIUS 3 km
KHI - HYD MOTORWAY
0 1,200 2,400 4,800 7,200 9,600 12,000
Feet

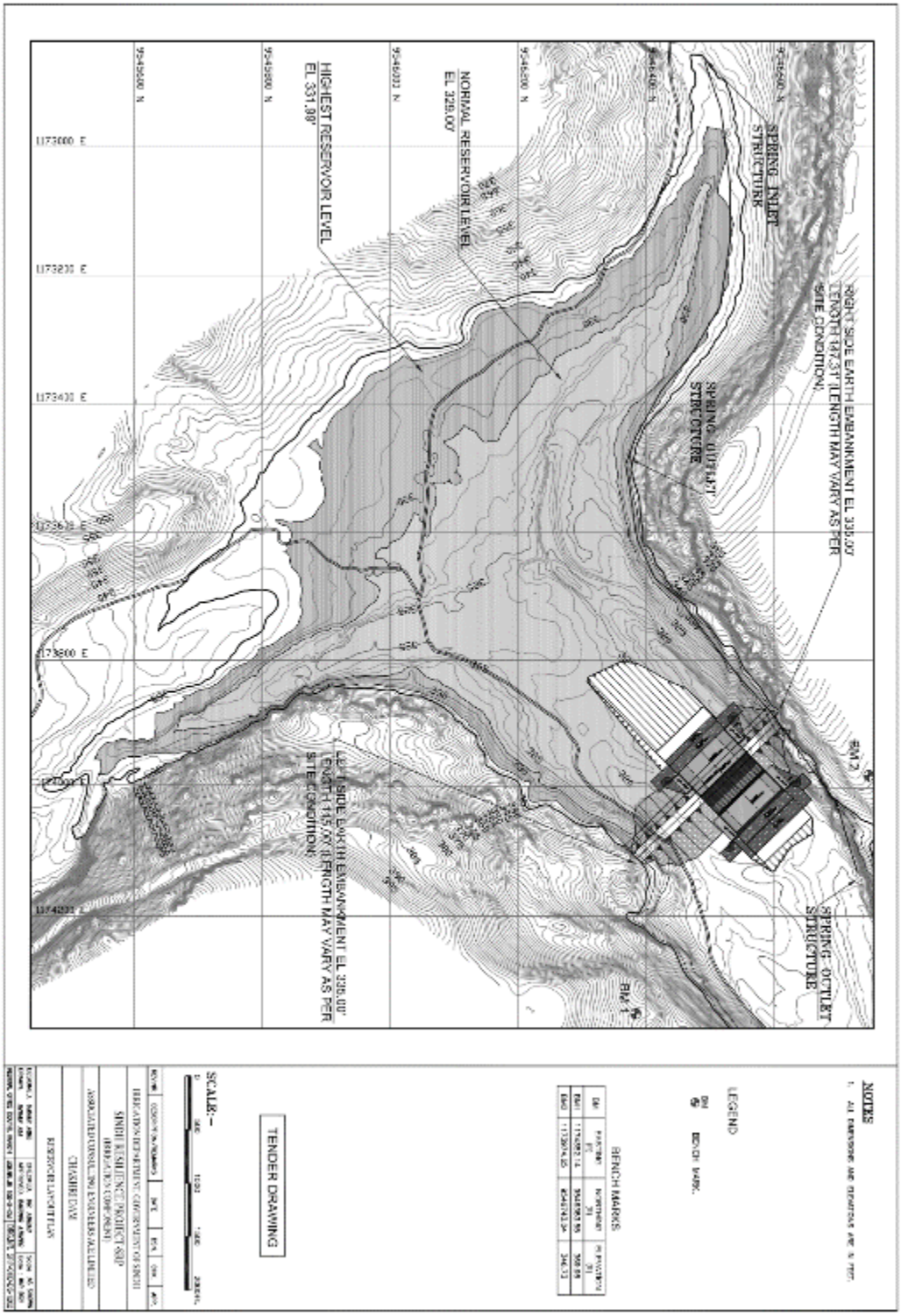

SINDH RESILIENCE PROJECT - SRP
SECONDARY IMPACT ZONE
OF DAHRI SHARIF DAM (RECHARGE)
HAJI IBRAHIM BALOCH
NOOR MOHAMMAD GOTH KATHORE
S/RAJ AHMED BALOCH
HAJI DIN MUHAMMAD
KHI-HYD MOTORWAY
DHA CITY
HAJI MUHAMMAD SIDDIQUE JOKHIO
IMAM ALI GAINCHO
W11
W9
W7
W1
W3
CAMP
N
Legend
DAM
RESERVOIR
CAMP AREA
VILLAGE
KATCHA TRACK
KHI - HYD MOTORWAY
WELLS
0 800 1,600 3,200 4,800 6,400 8,000
Feet

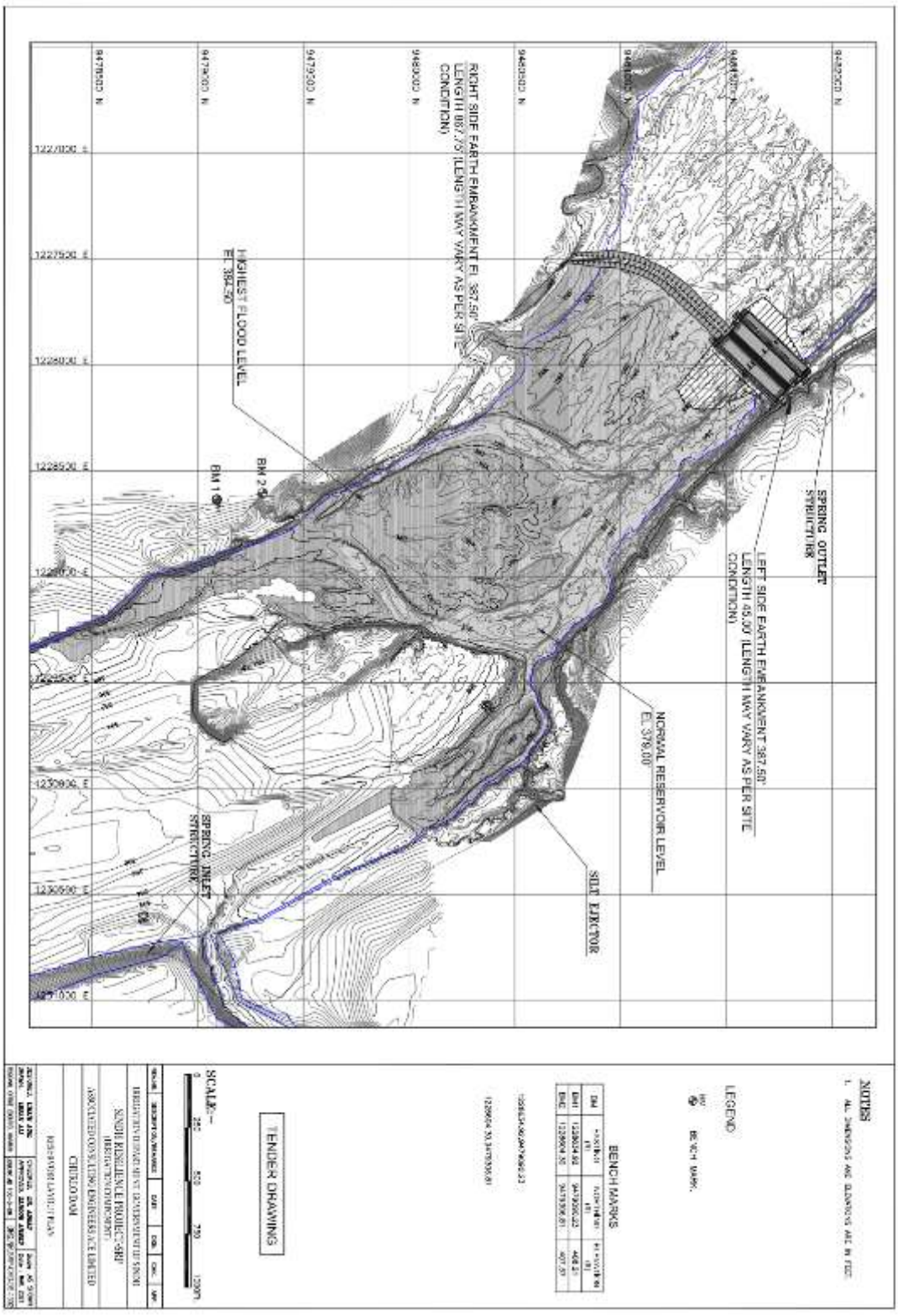

SINDH RESILIENCE PROJECT - SRP
SECONDARY IMPACT ZONE
OF GAIB JANAN DAM (RECHARGE)
RASSAL JOKHIO
W1
CAMP
SULEMAN JKHIO
MEHRAB MALLAH
ALLAH RAKHYO KHASKHELI
NATIONAL HIGHWAY
GHARO
Legend
DAM
RESERVOIR
CAMP AREA
VILLAGE
KACHA TRACK
NATIONAL HIGHWAY
WELLS
0 1,000 2,000 4,000 6,000 8,000 10,000
Feet

Annexure V: Command Area under Proposed Dam Sites

Sr. No.	Name of Dam Site	Presently Cultivated Area (Acres)	% Cultivated area	Presently Uncultivated Area/Barren (Acres)	% Barren area	Total Area (Acres)
1	Bandhaka	300	7.0	4000	93.0	4300
2	Baaro	370	6.9	5000	93.1	5370
3	Chakhri	230	4.9	4500	95.1	4730
4	Churlo	455	7.0	6000	93.0	6455
5	Sunn-2	780	13.5	5000	86.5	5780
6	Gadap – 2	850	8.2	9500	91.8	10350
7	Khuda Bux	1350	28.7	3360	71.3	4710
8	LAT – 2	300	5.8	4900	94.2	5200
9	Jharando – 2	700	5.9	11200	94.1	11900
10	Garban Bhutti	1800	15.6	9725	84.4	11525
11	Dahri Sharif	1355	16.8	6721	83.2	8076
12	Jharando – 1	620	5.0	11730	95.0	12350
13	Gaib Janan	1250	6.2	18940	93.8	20190

Annexure VI: Springs Inlet & Outlet Structure




SPRING OUTLET STRUCTURE
LEFT SIDE EARTH EMBANKMENT 387.50' LENGTH 45.00' (LENGTH MAY VARY AS PER SITE CONDITION)
NORMAL RESERVOIR LEVEL EL 378.00'
SILT EJECTOR
RIGHT SIDE EARTH EMBANKMENT EL 387.50' LENGTH 887.75' (LENGTH MAY VARY AS PER SITE CONDITION)
HIGHEST FLOOD LEVEL RL 384.50
BM 2
BM 1
SPRING INLET STRUCTURE
NOTES
LEGEND
BENCH MARKS
TENDER DRAWING
SCALE:-

Annexure VII: Baseline Environmental Monitoring Report

Sr. No	Proposed Dam	Ambient Air		Drinking /Ground Water		Surface Water		Noise 1		Noise 2		Noise 3	
		Coordinates	Remarks	Coordinates	Remarks	Coordinates	Remarks	Coordinates	Remarks	Coordinates	Remarks	Coordinates	Remarks
1	Bandhaka Dam	26°19'17.89"N 67°36'16.55"E	Dam Axis	26°19'4.86"N 67°36'1.06"E	DW 250 Ft			26°19'18.85"N 67°36'14.63"E	Dam Axis	26°19'4.23"N 67°36'2.62"E	Mosque		
2	Baaro Dam	26°18'22.49"N 67°36'4.92"E	Dam Axis	26°18'26.01"N 67°36'16.35"E	DW 250 Ft			26°18'23.65"N 67°36'4.45"E	Dam Axis	26°18'28.82"N 67°36'16.18"E	Village		
3	Chakhri Dam	26°18'5.22"N 67°34'36.86"E	Dam Axis	26°18'3.69"N 67°34'37.02"E	Spring			26°18'5.22"N 67°34'36.86"E	Dam Axis	26°18'15.20"N 67°34'27.67"E	Mosque		
4	Churlo	26° 7'51.89"N 67°43'59.16"E	Dam Axis	26° 7'45.60"N 67°44'5.19"E	Spring			26° 7'51.89"N 67°43'59.16"E	Dam Axis	26° 7'46.26"N 67°44'7.38"E	Village	26° 7'53.66"N 67°43'28.30"E	Mosque
5	Sunn Dam-2	25°59'44.01"N 68° 3'12.85"E	Dam Axis	26° 0'8.67"N 68° 4'41.90"E	DW 150 Ft			25°59'54.61"N 68° 3'16.79"E	Dam Axis	26° 0'5.93"N 68° 4'36.39"E	Mosque	26° 0'15.70"N 68° 4'39.88"E	Village
6	Gadap-2	25° 7'38.32"N 67°14'28.29"E	Dam Axis	25° 7'42.28"N 67°14'34.59"E	DW 200 ft	25° 7'43.66"N 67°14'33.49"E	SW	25° 7'36.27"N 67°14'29.51"E	Dam Axis	25° 7'44.95"N 67°14'13.28"E	School	25° 7'42.23"N 67°14'16.44"E	Mosque
7	Khuda bux	25° 5'37.91"N 67°16'25.24"E	Dam Axis	25° 5'31.05"N 67°16'18.90"E	DW 180 ft			25° 5'36.80"N 67°16'24.19"E	Dam Axis	25° 5'32.87"N 67°16'16.74"E	Village		
8	Lat-2	25° 5'7.08"N 67°13'55.62"E	Dam Axis	25° 4'53.59"N 67°14'3.16"E	DW 150 Ft			25° 5'7.08"N 67°13'55.62"E	Dam Axis	25° 4'52.14"N 67°14'8.31"E	Mosque	25° 4'46.38"N 67°14'14.61"E	Road
9	Jharando-2	25° 3'2.81"N 67°23'6.43"E	Dam Axis	25° 3'08.26"N 67°23'2.63"E	DW 220 ft			25° 3'2.81"N 67°23'6.43"E	Dam Axis	25° 3'9.42"N 67°23'0.51"E	School	25° 3'11.80"N 67°23'1.29"E	Mosque
10	Gorban Bhutti (Mol Nai)	25° 2'40.57"N 67°24'9.78"E	Dam Axis	25° 2'24.66"N 67°23'47.88"E	DW 120 ft	25° 2'23.57"N 67°23'45.54"E	WW	25° 2'40.57"N 67°24'9.78"E	Dam Axis	25° 2'26.65"N 67°23'43.28"E	School	25° 2'24.30"N 67°23'45.58"E	Mosque
11	Dahri Sharif Dam (Malir Nai)	25° 0'31.93"N 67°23'38.44"E	Dam Axis	25°0.8640'N 67°23.5400'E	DW 150 ft			25° 0'32.97"N 67°23'43.20"E	Dam Axis	25° 0'50.87"N 67°23'11.82"E	Road	25° 0'47.22"N 67°23'33.59"E	Village
12	Jharando-1	25°0.5600'N 67°22.4610'E	Dam Axis	25°0.7920'N 67°21.9190'E	DW 120 ft			25° 0'38.26"N 67°22'29.36"E	Dam Axis	25° 0'45.94"N 67°21'58.23"E	School	25° 0'41.54"N 67°22'1.40"E	Mosque
13	Gaib Janan	24°46'20.03"N 67°37'45.70"E	Dam Axis	24°46'20.03"N 67°37'45.70"E	DW 180 ft			24°46'20.03"N 67°37'45.70"E	Dam Axis	24°46'22.27"N 67°37'36.85"E	Village	24°46'24.96"N 67°37'35.87"E	Mosque

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Evergreen Environments

Evergreen Environmental Laboratory

Drinking WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	05-12-2020
Grab/Composite	Grab	Analysis Completion Date	05-12- 2020
Source	250 Ft		
Sampling Date	29-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/18	Sample Receiving Date	30-11-2020
Sampling Coordinates	26°19'4.86"N 67°36'1.06"E	Sampling Location	Bandhaka Dam

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Non-Objectionable
Odor	SMWW 2150 B	Non- Objectionable	Non-Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	0.8
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	166
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	732
pH	SMWW 4500 H^+ B	6.5- 8.5	7.15
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.005
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.009
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.04
Boron (B)	SMWW 3113 B	0.3 mg/l	0.022
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl^-)	SMWW 4500 Cl^- B	< 250 mg/L	266.2
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.005
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.165
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.0
Fluoride (F^-)	SMWW 4500 F^- C	≤ 1.5 mg/L	0.0
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.016
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.02
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.11
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.005
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl_2)	SMWW 4500 Cl^- B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.058
	Microbiological Analysis		
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	3
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

SEQS= Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2014

Note:

- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client.
- The left over samples (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.

Evergreen Environmental S.E.P.A Certified Karachi Laboratory

Analyzed By | Reviewed By (TM) | Approved By (QM)

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EPA/LAB/Certificate-14/2020

Evergreen Environments

Evergreen Environmental Laboratory

Drinking WATER ANALYSIS REPORT

Sample Detail			
Nature of Sample	Drinking Water	Reporting Date	05-12-2020
Grab/Composite	Grab	Analysis Completion Date	05-12- 2020
Source	250 Ft		
Sampling Date	29-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/19	Sample Receiving Date	30-11-2020
Sampling Coordinates	26°18'26.01"N 67°36'16.35"E	Sampling Location	Baaro Dam

Drinking Water Analysis Results			
Parameter	**Analysis Method**	**SEQS**	**Results**
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non-Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	0.00
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	488
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1720
pH	SMWW 4500 H^+ B	6.5- 8.5	7.57
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.005
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.01
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.03
Boron (B)	SMWW 3113 B	0.3 mg/l	0.015
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl)	SMWW 4500 Cl B	< 250 mg/L	602
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.022
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.171
Cyanide (CN)	SMWW 4500 CN F	≤ 0.05 mg/L	0.0
Fluoride (F)	SMWW 4500 F C	≤ 1.5 mg/L	0.01
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.006
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.017
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	0.002
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.026
Nitrate (NO_3)	SMWW 4500 NO B	≤ 50 mg/L	0.14
Nitrite (NO_2)	SMWW 4500 NO B	≤ 3.0 mg/L	0.006
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl_2)	SMWW 4500 Cl B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.054
	Microbiological Analysis		
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	5
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

SEQS= Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2014

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Evergreen Environmental Laboratory * S.E.P.A Certified Karachi *

Analyzed By | **Reviewed By (TM)** | **Approved By (QM)**

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DRINKING WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	05-12-2020
Grab/Composite	Grab	Analysis Completion Date	05-12- 2020
Source	Spring		
Sampling Date	29-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/20	Sample Receiving Date	30-11-2020
Sampling Coordinates	26°18'3.69"N 67°34'37.02"E	Sampling Location	Chakhri Dam

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non-Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	7.35
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	768
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1920
pH	SMWW 4500 H^+ B	6.5- 8.5	7.82
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.005
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.009
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.04
Boron (B)	SMWW 3113 B	0.3 mg/l	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.007
Chloride (Cl)	SMWW 4500 Cl^- B	< 250 mg/L	672
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.006
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.164
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.0
Fluoride (F^-)	SMWW 4500 F^- C	≤ 1.5 mg/L	0.03
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.006
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.016
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	0.002
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.02
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.13
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.006
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl_2)	SMWW 4500 Cl G	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.063
	Microbiological Analysis		
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	4
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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DRINKING WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	06-12-2020
Grab/Composite	Grab	Analysis Completion Date	06-12- 2020
Source	Spring		
Sampling Date	30-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/21	Sample Receiving Date	01-12-2020
Sampling Coordinates	26° 7'45.60"N 67°44'5.19"E	Sampling Location	Churlo

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Slightly Salty
Odor	SMWW 2150 B	Non- Objectionable	Non-Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	7.49
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	384.4
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	961
pH	SMWW 4500 H+ B	6.5- 8.5	7.92
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.005
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.02
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.03
Boron (B)	SMWW 3113 B	0.3 mg/l	0.014
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.02
Chloride (Cl^-)	SMWW 4500 Cl^- B	< 250 mg/L	336.4
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.005
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.166
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.0
Fluoride (F^-)	SMWW 4500 F^- C	≤ 1.5 mg/L	0.0
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.016
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	0.002
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.003
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.13
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.005
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl_2)	SMWW 4500 Cl B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.062
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	3
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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DRINKING WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	06-12-2020
Grab/Composite	Grab	Analysis Completion Date	06-12- 2020
Source	150 Ft		
Sampling Date	30-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/22	Sample Receiving Date	01-12-2020
Sampling Coordinates	26° 0'8.67"N 68° 4'41.90"E	Sampling Location	Sunn Dam-2

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non-Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	0.00
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	589
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1472
pH	SMWW 4500 H^+ B	6.5- 8.5	7.47
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.006
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.01
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.004
Boron (B)	SMWW 3113 B	0.3 mg/l	0.04
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.007
Chloride (Cl^-)	SMWW 4500 Cl^- B	< 250 mg/L I	515.2
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.02
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.165
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.0
Fluoride (F^-)	SMWW 4500 F^- C	≤ 1.5 mg/L	0.01
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.02
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.02
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.13
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.007
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl_2)	SMWW 4500 Cl^- B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.072
	Microbiological Analysis		
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	0
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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DRINKING WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	06-12-2020
Grab/Composite	Grab	Analysis Completion Date	06-12- 2020
Sampling Date	30-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/23	Sample Receiving Date	01-12-2020
Sampling Coordinates	25° 7'42.28"N 67°14'34.59"E	Sampling Location	Gadap-2

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non-Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	0.00
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	875
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	2188
pH	SMWW 4500 H^+ B	6.5- 8.5	7.51
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.006
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.03
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.02
Boron (B)	SMWW 3113 B	0.3 mg/l	0.03
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.007
Chloride (Cl^-)	SMWW 4500 Cl^- B	< 250 mg/L	765.8
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.03
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.168
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.0
Fluoride (F^-)	SMWW 4500 F^- C	≤ 1.5 mg/L	0.06
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.006
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.017
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	0.002
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.022
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.13
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.003
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl_2)	SMWW 4500 Cl^- B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.073
	Microbiological Analysis		
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	1
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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DRINKING WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	05-12-2020
Grab/Composite	Grab	Analysis Completion Date	05-12- 2020
Source	160 Ft		
Sampling Date	29-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/24	Sample Receiving Date	30-11-2020
Sampling Coordinates	25° 5'31.05"N 67°16'18.90"E	Sampling Location	Khuda bux

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non-Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	11.25
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	628
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1570
pH	SMWW 4500 H^+ B	6.5- 8.5	7.19
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.006
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.03
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0038
Boron (B)	SMWW 3113 B	0.3 mg/l	0.028
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl^-)	SMWW 4500 Cl B	< 250 mg/L I	549.5
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.02
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.166
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.0
Fluoride (F^-)	SMWW 4500 F C	≤ 1.5 mg/L	0.01
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.04
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.02
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	0.002
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.03
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.14
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.008
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl_2)	SMWW 4500 Cl B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.059
	Microbiological Analysis		
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	2
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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DRINKING WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	05-12-2020
Grab/Composite	Grab	Analysis Completion Date	05-12- 2020
Source	150 Ft		
Sampling Date	29-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/25	Sample Receiving Date	30-11-2020
Sampling Coordinates	25° 4'53.59"N 67°14'6.16"E	Sampling Location	Lar-2

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non-Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	8.26
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	816.4
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	2041
pH	SMWW 4500 H^+ B	6.5- 8.5	7.98
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.005
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.04
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.03
Boron (B)	SMWW 3113 B	0.3 mg/l	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.007
Chloride (Cl^-)	SMWW 4500 Cl^- B	< 250 mg/L	714.3
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.005
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.169
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.01
Fluoride (F^-)	SMWW 4500 F^- C	≤ 1.5 mg/L	0.05
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.01
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.017
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.023
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.13
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.004
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl_2)	SMWW 4500 Cl^- B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.001
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.075
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	0
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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DRINKING WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	05-12-2020
Grab/Composite	Grab	Analysis Completion Date	05-12-2020
Source	220 Ft		
Sampling Date	29-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/26	Sample Receiving Date	30-11-2020
Sampling Coordinates	25° 3'08.26"N 67°23'2.63"E	Sampling Location	Jharando-2

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non-Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	9.82
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	640
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1600
pH	SMWW 4500 H^+ B	6.5- 8.5	7.71
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.006
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.02
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.04
Boron (B)	SMWW 3113 B	0.3 mg/l	0.021
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl^-)	SMWW 4500 Cl^- B	< 250 mg/L	560
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.020
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.166
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.001
Fluoride (F^-)	SMWW 4500 F^- C	≤ 1.5 mg/L	0.03
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.021
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.016
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.02
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.13
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.005
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl_2)	SMWW 4500 Cl^- B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.02
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.073
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	3
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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DRINKING WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	04-12-2020
Grab/Composite	Grab	Analysis Completion Date	04-12- 2020
Source	120 Ft		
Sampling Date	28-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/27	Sample Receiving Date	29-11-2020
Sampling Coordinates	25° 2'24.66"N 67°23'47.88"E	Sampling Location	Gorban Bhutti (Mol Nai)

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non- Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	0.00
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	736
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1840
pH	SMWW 4500 H+ B	6.5- 8.5	7.42
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.006
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.02
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.05
Boron (B)	SMWW 3113 B	0.3 mg/l	0.03
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl^-)	SMWW 4500 Cl- B	< 250 mg/L	644
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.01
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.169
Cyanide (CN^-)	SMWW 4500 CN- F	≤ 0.05 mg/L	0.001
Fluoride (F^-)	SMWW 4500 F- C	≤ 1.5 mg/L	0.03
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.008
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.016
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	0.002
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.023
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.17
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.005
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl_2)	SMWW 4500 Cl- B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.002
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.071
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	2
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

SEQS= Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2014

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Drinking WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	04-12-2020
Grab/Composite	Grab	Analysis Completion Date	04-12- 2020
Source	150 Ft		
Sampling Date	28-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/28	Sample Receiving Date	29-11-2020
Sampling Coordinates	25°0.8640'N 67°23.5400'E	Sampling Location	Dahri Sharif Dam (Malir Nai)

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non- Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	10.29
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	681.8
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1704
pH	SMWW 4500 H^+ B	6.5- 8.5	7.37
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.006
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.02
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.005
Boron (B)	SMWW 3113 B	0.3 mg/l	0.09
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.007
Chloride (Cl^-)	SMWW 4500 Cl^- B	< 250 mg/L	596.4
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.027
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.168
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.002
Fluoride (F^-)	SMWW 4500 F^- C	≤ 1.5 mg/L	0.04
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.009
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.073
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.017
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.13
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.004
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.02
Residual Chlorine (Cl_2)	SMWW 4500 Cl^- B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.062
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	1
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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Drinking WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	04-12-2020
Grab/Composite	Grab	Analysis Completion Date	04-12- 2020
Source	120 Ft		
Sampling Date	28-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/29	Sample Receiving Date	29-11-2020
Sampling Coordinates	25°0.7920'N 67°21.9190'E	Sampling Location	Jhandu-I

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non- Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	0.00
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	598.8
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1497
pH	SMWW 4500 H^+ B	6.5- 8.5	7.72
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.006
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.03
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.02
Boron (B)	SMWW 3113 B	0.3 mg/l	0.023
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.007
Chloride (Cl^-)	SMWW 4500 Cl^- B	< 250 mg/L	209.6
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.006
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.166
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.0
Fluoride (F^-)	SMWW 4500 F^- C	≤ 1.5 mg/L	0.03
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.009
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.016
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.025
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.13
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.004
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.03
Residual Chlorine (Cl_2)	SMWW 4500 Cl B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.053
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	2
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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Drinking WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	04-12-2020
Grab/Composite	Grab	Analysis Completion Date	04-12-2020
Source	120 Ft		
Sampling Date	27-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/30	Sample Receiving Date	28-11-2020
Sampling Coordinates	24°46'20.03"N 67°37'45.70"E	Sampling Location	Gaib Jaman

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non- Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	7.19
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	437.6
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1094
pH	SMWW 4500 H+ B	6.5- 8.5	7.28
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.005
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.02
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.03
Boron (B)	SMWW 3113 B	0.3 mg/l	0.03
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.008
Chloride (Cl)	SMWW 4500 Cl B	< 250 mg/L	382.2
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.005
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.168
Cyanide (CN^-)	SMWW 4500 CN F	≤ 0.05 mg/L	0.0
Fluoride (F^-)	SMWW 4500 F C	≤ 1.5 mg/L	0.01
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.007
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.017
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.024
Nitrate (NO_3)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.13
Nitrite (NO_2)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.004
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.03
Residual Chlorine (Cl_2)	SMWW 4500 Cl B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.069
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	4
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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Drinking WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Drinking Water	Reporting Date	04-12-2020
Grab/Composite	Grab	Analysis Completion Date	04-12- 2020
Source	150 Ft		
Sampling Date	28-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/27	Sample Receiving Date	29-11-2020
Sampling Coordinates	25°0.8640'N 67°23.5400'E	Sampling Location	Dahri Sharif Dam (Malir Nai)

Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	0.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non- Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	10.29
Total Hardness (as $CaCO_3$)	SMWW 2340 C	< 500 mg/L	681.8
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1704
pH	SMWW 4500 H+ B	6.5- 8.5	7.37
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.006
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.02
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.005
Boron (B)	SMWW 3113 B	0.3 mg/l	0.09
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.007
Chloride (Cl-)	SMWW 4500 Cl- B	< 250 mg/L	596.4
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.027
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.168
Cyanide (CN^-)	SMWW 4500 CN^- F	≤ 0.05 mg/L	0.002
Fluoride (F^-)	SMWW 4500 F^- C	≤ 1.5 mg/L	0.04
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.009
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/l	0.073
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	0.017
Nitrate (NO_3^-)	SMWW 4500 NO_3^- B	≤ 50 mg/L	0.13
Nitrite (NO_2^-)	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.004
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.02
Residual Chlorine (Cl_2)	SMWW 4500 Cl- B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.0
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.062
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	1
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	0

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SURFACE WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Surface Water	Reporting Date	05-12-2020
Grab/Composite	Grab	Analysis Completion Date	05-12- 2020
Sampling Date	30-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/31	Sample Receiving Date	01-12-2020
Sampling Coordinates	25° 7'43.68"N 67°14'33.49"E	Sampling Location	Godap-2

Surface Water Analysis Results

Sr. No.	Parameter	Analysis Method	Result	SEQS Limits
	Field Analysis			
1	Temperature	SMWW 2550 B	24.0	≤ 3°C
	Lab Analysis			
2	pH	SMWW 4500 H^+ B	7.85	6-9
3	Biochemical Oxygen Demand (BOD_5)	SMWW 5210-B	18	250
4	Chemical Oxygen Demand (COD)	SMWW 5220 B	38	400
5	Total Suspended Solids (TSS)	SMWW 2540 D	56	400
6	Total Dissolved Solids (TDS)	SMWW 2540 C	188	3500
7	Phenolic Compounds (as Phenols)	SMWW 5530 D	0.0	0.3
8	Grease and Oil	USEPA 1664 B	0.0	10
9	Chloride (Cl^-)	SMWW 4500 Cl- B	15	1000
10	Fluoride (F^-)	SMWW 4500 F- C	0.0	10
11	Cyanide (CN^-)	SMWW 4500 CN- F	0.0	1.0
12	An-ionic Detergents (as MBAs)	SMWW 5540-C	0.0	20
13	Sulfate (SO_4^{--})	SMWW 4500 SO_4^{--} C	7	600
14	Sulfide (S^-)	SMWW 4500 S^- F	0.0	1.0
15	Ammonia (NH_3)	SMWW 4500-NH_3 D	0.0	40
16	Cadmium (Cd)	SMWW 3113 B	<0.006	0.1
17	Chromium (Cr)	SMWW 3113 B	0.004	1.0
18	Copper (Cu)	SMWW 3113 B	0.165	1.0
19	Lead (Pb)	SMWW 3113 B	0.006	0.5
20	Mercury (Hg)	SMWW 3112 B	0.002	0.01
21	Selenium (Se)	SMWW 3114 B	<0.01	0.5
22	Nickel (Ni)	SMWW 3113 B	0.02	1.0
23	Silver (Ag)	SMWW 3113 B	0.009	1.0
24	Total Toxic Metals	Calculated Value	0.267	2.0
25	Zinc (Zn)	SMWW 3111 B	0.052	5.0
26	Arsenic (As)	SMWW 3114 B	0.007	1.0
27	Barium (Ba)	SMWW 3113 B	0.008	1.5
28	Iron (Fe)	SMWW 3113 B	0.720	8.0
29	Manganese (Mn)	SMWW 3111 B	0.022	1.5
30	Boron (B)	SMWW 3113 B	0.03	6.0
31	Residual Chlorine (Cl_2)	SMWW 4500 Cl- B	0.0	1.0

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WASTE WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Waste Water	Reporting Date	04-12-2020
Grab/Composite	Grab	Analysis Completion Date	04-12- 2020
Sampling Date	28-11-2020	Sample Collected by/Sent By	EGEL
Sample ID	10405/EGEL-DW-20/32	Sample Receiving Date	29-12-2020
Sampling Coordinates	25° 2'23.57"N 67°23'45.54"E	Sampling Location	Gorban Bhutti (Mol Nai)

Waste Water Analysis Results

Sr. No.	Parameter	Analysis Method	Result	SEQS Limits
	Field Analysis			
1	Temperature	SMWW 2550 B	22.0	≤ 3°C
	Lab Analysis			
2	pH	SMWW 4500 H+ B	7.62	6-9
3	Biochemical Oxygen Demand (BOD_5)	SMWW 5210-B	16	250
4	Chemical Oxygen Demand (COD)	SMWW 5220 B	34	400
5	Total Suspended Solids (TSS)	SMWW 2540 D	39	400
6	Total Dissolved Solids (TDS)	SMWW 2540 C	172	3500
7	Phenolic Compounds (as Phenols)	SMWW 5530 D	0.0	0.3
8	Grease and Oil	USEPA 1664 B	0.0	10
9	Chloride (Cl^-)	SMWW 4500 Cl- B	14	1000
10	Fluoride (F^-)	SMWW 4500 F- C	0.0	10
11	Cyanide (CN^-)	SMWW 4500 CN- F	0.0	1.0
12	An-ionic Detergents (as MBAs)	SMWW 5540-C	0.0	20
13	Sulfate (SO_4^{2-})	SMWW 4500 SO_4^{2-} C	9	600
14	Sulfide (S^-)	SMWW 4500 S^- F	0.0	1.0
15	Ammonia (NH_3)	SMWW 4500-NH_3 D	0.0	40
16	Cadmium (Cd)	SMWW 3113 B	<0.006	0.1
17	Chromium (Cr)	SMWW 3113 B	0.004	1.0
18	Copper (Cu)	SMWW 3113 B	0.164	1.0
19	Lead (Pb)	SMWW 3113 B	0.006	0.5
20	Mercury (Hg)	SMWW 3112 B	0.002	0.01
21	Selenium (Se)	SMWW 3114 B	<0.01	0.5
22	Nickel (Ni)	SMWW 3113 B	0.02	1.0
23	Silver (Ag)	SMWW 3113 B	0.009	1.0
24	Total Toxic Metals	Calculated Value	0.266	2.0
25	Zinc (Zn)	SMWW 3111 B	0.052	5.0
26	Arsenic (As)	SMWW 3114 B	0.007	1.0
27	Barium (Ba)	SMWW 3113 B	0.008	1.5
28	Iron (Fe)	SMWW 3113 B	0.620	8.0
29	Manganese (Mn)	SMWW 3111 B	0.022	1.5
30	Boron (B)	SMWW 3113 B	0.03	6.0
31	Residual Chlorine (Cl_2)	SMWW 4500 Cl- B	0.0	1.0

SEQS= Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2014

Note:

- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client.
- The left over samples (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laborator

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Analyzed By | Reviewed By (TM) | Approved By (QM)

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Evergreen Environments

Evergreen Environmental Laboratory

Customer's Ref: 10452/ACE/SRP/AW-002R **Date: 09-12-2020**

Report to: **M/s ACE (Pvt) Ltd**
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan. .

Project ID: **SRP- Sindh Resilience Project.**
Site ID: Baaro Dam Sr # 11
Sampling Coordinates: **26°18'22.49"N**
67°36'4.92"E

Sampling Date: ***29-11-2020***
Sample type: ***Ambient air Monitoring***

Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/49**

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.79	0.85	0.82	5
2	Sulfur Dioxide (SO_2)		8.7	9.1	8.9	120
3	Nitrogen Monoxide (NO)		3.5	4.1	3.8	40
4	Nitrogen Dioxide (NO_2)		9.5	10.1	9.8	80
5	Particulate Matter (PM_{10})	µg/Nm3	121	125	123	150
6	Particulate Matter ($PM_{2.5}$)		27	32	29.5	75

* *SEQS - Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/729/2016*

Note:

- Selected measurement units were µg/m^3 otherwise stated.
- Quality was assured through self-calibration of the instrument.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report is not valid for any negotiations.

Evergreen Environmental S.E.P.A Certified Karachi Laboratory

Remarks: The Ambient Air & Noise Sampling results are well within guideline values set by SEQS.

Prepared By	Section In charge (EGEL)

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Customer's Ref: 10452/ACE/SRP/AW-002R

Date: 09-12-2020

Report to: **M/s ACE (Pvt) Ltd**
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan.

Project ID: **SRP- Sindh Resilience Project.**
Site ID: Chakhri Dam Sr # 12
Sampling Coordinates: **26°18'5.22"N**
67°34'36.86"E
Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/50**

Sampling Date: ***29-11-2020***
Sample type: ***Ambient air Monitoring***

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.81	0.89	0.85	5
2	Sulfur Dioxide (SO_2)	µg/Nm3	9.3	9.6	9.45	120
3	Nitrogen Monoxide (NO)		3.1	3.5	3.3	40
4	Nitrogen Dioxide (NO_2)		8.5	8.9	8.7	80
5	Particulate Matter (PM_{10})		129	135	132	150
6	Particulate Matter ($PM_{2.5}$)		21	29	25	75

❖ *SEQS = Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2016.*

Note:

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Customer's Ref: 10452/ACE/SRP/AW-002R

Date: 09-12-2020

Report to: **M/s ACE (Pvt) Ltd**
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan. .

Project ID: **SRP- Sindh Resilience Project.**
Site ID: Churio Sr # 13
Sampling Coordinates: **26°7'51.89"N**
67°43'59.16"E

Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/51**

Sampling Date: ***30-11-2020***
Sample type: ***Ambient air Monitoring***

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.75	0.83	0.79	5
2	Sulfur Dioxide (SO_2)	µg/Nm3	6.1	7.0	6.55	120
3	Nitrogen Monoxide (NO)		2.8	3.1	2.95	40
4	Nitrogen Dioxide (NO_2)		8.1	9.5	8.8	80
5	Particulate Matter (PM_{10})		111	117	114	150
6	Particulate Matter ($PM_{2.5}$)		31	34	32.5	75

❖ *SEQS= Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2016*

Note:

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Remarks: The Ambient Air & Noise Sampling results are well within guideline values set by SEQS.

Prepared By	Section In charge (EGEL)

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Customer's Ref: 10452/ACE/SRP/AW-002R **Date: 09-12-2020**

Report to: **M/s ACE (Pvt) Ltd**
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan.

Project ID: **SRP- Sindh Resilience Project.**
Site ID: Sunn Dam-2 Sr # 14
Sampling Coordinates: **25°59'44.01"N**
68° 3'12.85"E

Sampling Date: ***30-11-2020***
Sample type: ***Ambient air Monitoring***

Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/52**

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.63	0.69	0.66	5
2	Sulfur Dioxide (SO_2)	µg/Nm3	7.1	7.3	7.2	120
3	Nitrogen Monoxide (NO)		2.3	2.8	2.55	40
4	Nitrogen Dioxide (NO_2)		8.1	8.8	8.45	80
5	Particulate Matter (PM_{10})		118	121	119.5	150
6	Particulate Matter ($PM_{2.5}$)		25	29	27	75

❖ *SEQS - Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2016.*

Note:

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Remarks: The Ambient Air & Noise Sampling results are well within guideline values set by SEQS

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Customer's Ref: 10452/ACE/SRP/AW-002R

Date: 09-12-2020

Report to: **M/s ACE (Pvt) Ltd**
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan. .

Project ID: **SRP- Sindh Resilience Project.**
Site ID: Gadap-2 Sr # 27
Sampling Coordinates: **25°7'38.32"N**
67°14'28.29"E
Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/53**

Sampling Date: ***30-10-2020***
Sample type: ***Ambient air Monitoring***

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.69	0.71	0.7	5
2	Sulfur Dioxide (SO_2)	µg/Nm3	7.1	7.5	7.3	120
3	Nitrogen Monoxide (NO)		3.1	3.4	3.25	40
4	Nitrogen Dioxide (NO_2)		6.2	7.1	6.65	80
5	Particulate Matter (PM_{10})		101	105	103	150
6	Particulate Matter ($PM_{2.5}$)		28	31	29.5	75

✧ *SEQS – Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/770/2018*

Note:

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Remarks: The Ambient Air & Noise Sampling results are well within guideline values set by SEQS

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Customer's Ref: 10452/ACE/SRP/AW-002R **Date: 09-12-2020**

Report to: **M/s ACE (Pvt) Ltd**
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan. .

Project ID: **SRP- Sindh Resilience Project.**
Site ID: Lat-2 Sr # 29
Sampling Coordinates: **25° 5'7.08"N**
67°13'55.62"E

Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/55**

Sampling Date: ***29-10-2020***
Sample type: ***Ambient air Monitoring***

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.81	0.85	0.83	5
2	Sulfur Dioxide (SO_2)	µg/Nm3	9.1	9.5	9.3	120
3	Nitrogen Monoxide (NO)		3.3	3.9	3.6	40
4	Nitrogen Dioxide (NO_2)		6.1	6.9	6.5	80
5	Particulate Matter (PM_{10})		105	109	107	150
6	Particulate Matter ($PM_{2.5}$)		33	34	33.5	75

* *SEQS - Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA TECH 739-2018.*

Note:

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Remarks: The Ambient Air & Noise Sampling results are well within guideline values set by SEQS.

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Customer's Ref: 10452/ACE/SRP/AW-002R **Date: 09-12-2020**

Report to: **M/s ACE (Pvt) Ltd**
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan. .

Project ID: **SRP- Sindh Resilience Project.**
Site ID Jharando-2 Sr # 30
Sampling Coordinates: **25° 3'2.81"N**
67°23'6.43"E

Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/56**

Sampling Date: ***29-10-2020***
Sample type: ***Ambient air Monitoring***

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.85	0.97	0.91	5
2	Sulfur Dioxide (SO_2)	µg/Nm3	7.8	8.1	7.95	120
3	Nitrogen Monoxide (NO)		4.3	4.9	4.6	40
4	Nitrogen Dioxide (NO_2)		10.1	11.5	10.8	80
5	Particulate Matter (PM_{10})		95	99	97	150
6	Particulate Matter ($PM_{2.5}$)		32	36	34	75

❖ *SEQS - Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2016.*

Note:

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Remarks: The Ambient Air & Noise Sampling results are well within guideline values set by SEQS.

Prepared By	Section In charge (EGEL)

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Customer's Ref: 10452/ACE/SRP/AW-002R

Date: 09-12-2020

Report to: M/s ACE (Pvt) Ltd
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan. .

Project ID: SRP- Sindh Resilience Project.
Site ID: Gorban Bhutti (Mol Nai) Sr# 31
Sampling Coordinates: 25° 2'40.57"N
67°24'9.78"E
Lab. Rpt. Rf. No.: 28371/EGEL/ACE/AE/2020/57

Sampling Date: ***28-10-2020***
Sample type: ***Ambient air Monitoring***

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.72	0.77	0.74	5
2	Sulfur Dioxide (SO_2)	µg/Nm3	7.1	7.5	7.3	120
3	Nitrogen Monoxide (NO)		4.1	4.5	4.3	40
4	Nitrogen Dioxide (NO_2)		8.1	8.5	8.3	80
5	Particulate Matter (PM_{10})		86	91	88.5	150
6	Particulate Matter ($PM_{2.5}$)		29	35	32	75

❖ *SEQS - Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA TECH 739/2016*

Note:

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Prepared By	Section In charge (EGEL)

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Customer's Ref: 10452/ACE/SRP/AW-002R

Date: 09-12-2020

Report to: M/s ACE (Pvt) Ltd
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan. .

Project ID: SRP- Sindh Resilience Project.
Site ID: Dahri Sharif Dam (Malir Nai) Sr #32
Sampling Coordinates: 25° 0'31.93"N
67°23'38.44"E

Lab. Rpt. Ref. No.: 28371/EGEL/ACE/AE/2020/58

Sampling Date: 28-10-2020
Sample type: Ambient air Monitoring

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.91	0.97	0.94	5
2	Sulfur Dioxide (SO_2)	µg/Nm3	9.5	9.9	9.7	120
3	Nitrogen Monoxide (NO)		5.1	5.4	5.25	40
4	Nitrogen Dioxide (NO_2)		9.1	9.7	9.4	80
5	Particulate Matter (PM_{10})		125	135	130	150
6	Particulate Matter ($PM_{2.5}$)		35	39	37	75

❖ *SEQS = Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2016.*

Note:

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Evergreen Environmental Laboratory S.E.P.A Certified Karachi

Remarks: The Ambient Air & Noise Sampling results are well within guideline values set by SEQS

Prepared By

Section In charge
(EGEL)

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Customer's Ref: 10452/ACE/SRP/AW-002R

Date: 09-12-2020

Report to: M/s ACE (Pvt) Ltd
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan. .

Project ID: SRP- Sindh Resilience Project.
Site ID: Jharando-1 Sr # 33
Sampling Coordinates: 25°0.5600'N
67°22.4610'E

Lab. Rpt. Rf. No.: 28371/EGEL/ACE/AE/2020/59

Sampling Date: ***28-10-2020***
Sample type: ***Ambient air Monitoring***

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.79	0.81	0.8	5
2	Sulfur Dioxide (SO_2)	µg/Nm3	6.1	7.5	6.8	120
3	Nitrogen Monoxide (NO)		3.2	3.4	3.3	40
4	Nitrogen Dioxide (NO_2)		7.2	8.1	7.65	80
5	Particulate Matter (PM_{10})		89	91	90	150
6	Particulate Matter ($PM_{2.5}$)		27	32	29.5	75

◊ *SEQS= Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA TECH 739 2016*

Note:

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Evergreen Environmental S.E.P.A Certified Karachi Laboratory

Remarks: The Ambient Air & Noise Sampling results are well within guideline values set by SEQS

Prepared By	Section In charge (EGEL)

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Customer's Ref: 10452/ACE/SRP/AW-002R

Date: 09-12-2020

Report to: **M/s ACE (Pvt) Ltd**
Project Office Bungalow # D-37,
Miran Mohammad Shah Road,
Mohammad Ali Society,
KDA-Scheme-1, Karachi, Sindh, Pakistan. .

Project ID: **SRP- Sindh Resilience Project.**
Site ID. Gaib Janan Sr # 34
Sampling Coordinates: **24°46'20.03"N**
67°37'45.70"E

Sampling Date: ***27-10-2020***
Sample type: ***Ambient air Monitoring***

Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/60**

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm^3	0.65	0.71	0.68	5
2	Sulfur Dioxide (SO_2)	µg/Nm3	6.5	7.2	6.85	120
3	Nitrogen Monoxide (NO)		3.1	3.5	3.3	40
4	Nitrogen Dioxide (NO_2)		7.1	8.2	7.65	80
5	Particulate Matter (PM_{10})		93	96	94.5	150
6	Particulate Matter ($PM_{2.5}$)		29	24	26.5	75

❖ *SEQS= Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2016.*

Note:

- Selected measurement units were $\mu g/m^3$ otherwise stated.
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Remarks: The Ambient Air & Noise Sampling results are well within guideline values set by SEQS

Prepared By	Section In charge (EGEL)

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EPA Certified Lab
EPA/LAB/Certificate-14/2020

Evergreen Environments

Evergreen Environmental Laboratory

Noise Level Monitoring Report

Monitoring Detail

Reference No. 10452/ACE/SRP/N-002R **Reporting Date** 09-12-2020

Monitoring Date 27 Oct to 30 Nov. 2020 **Instrument** BSWA Noise Meter

Sr. No.	Proposed Small Dam Site	Location of Noise Monitoring	Coordinates	80 dBA (SEQS) Noise Levels		
				Min	Max	Average
1	Bandhaka	Dam Axis	26°19'18.85"N 67°36'14.63"E	41.1	42.3	41.7
		Mosque	26°19'4.23"N 67°36'2.62"E	33.4	34.5	34.0
2	Baaro	Dam Axis	26°18'23.65"N 67°36'4.45"E	41.4	43.5	42.5
		Village	26°18'28.82"N 67°36'16.18"E	44.2	45.2	44.7
3	Chakhri	Mosque	26°18'15.20"N 67°34'27.67"E	44.2	46.8	45.5
		Dam Axis	26°18'5.22"N 67°34'36.86"E	46.4	48.2	47.3
4	Churlo	Dam Axis	26° 7'51.89"N 67°43'59.16"E	32.5	34.8	33.7
		Village	26° 7'46.26"N 67°44'7.38"E	44.7	46.7	45.7
		Mosque	26° 7'53.66"N 67°43'28.30"E	39.1	40.8	40.0
5	Sunn-2	Dam Axis	25°59'54.61"N 68° 3'16.79"E	35.2	37.8	36.5
		Village	26° 0'15.70"N 68° 4'39.88"E	36.3	39.5	37.9
		Mosque	26° 0'5.93"N 68° 4'36.39"E	39.4	41.8	40.6
6	Gadap-2	Dam Axis	25° 7'36.27"N 67°14'28.51"E	44.7	46.8	45.8
		School	25° 7'44.95"N 67°14'13.28"E	41.9	42.5	42.2
		Mosque	25° 7'42.23"N 67°14'16.44"E	43.1	44.5	43.8
7	Khuda bux	Dam Axis	25° 5'36.80"N 67°16'24.19"E	34.3	35.8	35.1
		Village	25° 5'32.87"N 67°16'16.74"E	40.4	41.5	41.0
8	Lat-2	Dam Axis	25° 5'7.08"N 67°13'55.62"E	33.7	35.5	34.6
		Mosque	25° 4'52.14"N 67°14'8.31"E	41.2	45.8	43.5
		Village	25° 4'46.38"N 67°14'14.61"E	42.5	44.9	43.7
9	Jharando-2	Dam Axis	25° 3'2.81"N 67°23'6.43"E	32.3	35.2	33.8
		Mosque	25° 3'11.80"N 67°23'1.29"E	42.8	43.5	43.2
		School	25° 3'9.42"N 67°23'0.51"E	39.4	40.8	40.1
10	Gorban Bhutti	Dam Axis	25° 2'40.57"N 67°24'9.78"E	43.2	44.8	44.0
		School	25° 2'26.65"N 67°23'43.28"E	42.9	43.8	43.4
		Mosque	25° 2'24.30"N 67°23'45.58"E	43.4	43.4	43.4
11	Dahri Sharif	Dam Axis	25° 0'32.97"N 67°23'43.20"E	44.5	43.3	43.9
		Village	25° 0'47.22"N 67°23'33.59"E	39.5	40.8	40.2
		Main Track	25° 0'50.87"N 67°23'11.82"E	43.8	44.8	44.3
12	Jharando-1	Dam Axis	25° 0'38.26"N 67°22'29.36"E	38.5	42.6	40.6
		School	25° 0'45.94"N 67°21'58.23"E	35.8	39.8	37.8
		Mosque	25° 0'41.54"N 67°22'1.40"E	40.8	43.8	42.3
13	Ghaib Jahnan	Dam Axis	24°46'20.03"N 67°37'45.70"E	43.8	44.5	44.2
		Village	24°46'22.27"N 67°37'36.85"E	42.7	43.9	43.3
		Village	24°46'24.96"N 67°37'35.87"E	38.7	39.9	39.3

* SEQS= Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/739/2016

Remarks: The Noise Sampling results are well within guideline values set by SEQS.

Prepared By

Section In charge (EGEL)

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Annexure VIII: Environmental & Social Questionnaires

SINDH RESILIENCE PROJECT (SRP) IRRIGATION COMPONENT
FEASIBILITY STUDY OF 30 NOS SMALL DAMS IN WATER SCARCE AREAS OF SINDH PROVINCE

Scope of Guidelines

These guidelines are applicable to all dams and reservoirs with a storage volume of less than 25 million cubic meters or surface area of less than 4 square kilometers.

How to use these Guidelines?

The following steps are to be taken in this regard:

Step 1: Provide information on project [use Section I]

Step 2: Determine Applicability (Are you sure that IEE or EIA is not required?) [use Section II]

Step 3: Describe the physical, biological and social environment [use Section III]

Step 4: Assess potential impacts and applicable mitigation measures [use Section IV]

Section I: Project Description

File No _____ Date _____

1. General Information

1.1 Project Name or Title_____

1.2 Name of the person who conducted this assessment _____

1.3 Designation _____

2. Project Information

2.1 Project location _____

2.2 Cost of the project _____ 2.3 Purpose of the reservoir _____

2.4 Name of the river or stream_____2.5 Is the stream seasonal or perennial ____

2.6 Total area of the reservoir _____ m^2 2.7 Total storage capacity _____ m^3

2.8 Total volume of the embankment _____ m³

2.9 Brief Project Description

Please attach a map of the proposed project site showing the location of the key structures, access, etc.

3. Construction

3.1 Who owns the proposed land for the project? _____

3.2 What is the present use of the land? _____

3.3 Are there any structures on the proposed site now? ____Yes ___ No

If yes, will any structure be demolished? ___ Yes ___ No

If yes, where the demolition waste will be disposed? _____

3.4 Are there any trees on the proposed site? ___ Yes ___ No

3.5 Will any tree be removed? ___ Yes ___ No

If yes, how many? _____

3.6 Period of construction (start and end dates) _____

3.7 What major construction equipment (dozer, grader, crane, etc.) will be used? _____

3.8 Will any land be acquired? _____

If yes, please specify the total area: _____ Present ownership of land _____

What is the present use of the land? _____

How the land will be acquired (Through Land Acquisition Act or Direct Purchase)? _____

When the compensation will be paid? _____

3.9 In case of state land, are there any squatter settlements on the land? ____

If yes, please specify Number of settlements _____Will any compensation be paid? _____ When the compensation will be paid? _____

Section II: Screening

Is the proposed project or part of the project in an ecologically sensitive area?

Is the total storage capacity more than 25 million cubic meter? ___ Yes ___ No

Is the total area of the reservoir more than 4 square kilometers? ___ Yes __ No

If the answer to any of the above questions is yes, then the project would require an initial environmental examination or an environment impact assessment. Refer to the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environment Impact Assessment Regulations, 2000 for appropriate category.

Section III: Environmental Profile

1. Describe the terrain of the project area:

Flat or Level (Slope < 3%) Level to moderately steep (Slope 3%-30%)

Moderately steep to mountainous (Slope > 30%)

2. Are there signs of soil erosion or landslide anywhere within 2,000 m of the proposed site? Yes No

If yes, please describe (where, nature) _____

3. Please describe the hydrological conditions of the stream or river, run-off characteristics, rainfall, rainfall variability, groundwater, and drought patterns.

_____

_____

4. Is the stream polluted? Is domestic or other wastewater discharged to it?

_____

5. What are the present uses of the stream, e.g., agriculture, domestic, industrial, washing, fishery. _____

6. Is there any groundwater well on the proposed site or within 500 m of the proposed site? Yes No

If yes, describe each well:

Type (Dug well, tube well, hand pump)	**Location** (Village, road, mohalla, etc. and distance from the site)	**Depth and Yield**	**Uses** (Drinking, agriculture, domestic, industrial, washing, livestock)

7. Based on the interview of the surrounding population or a wildlife expert, is any form of wildlife found on, or around the proposed site of the project? ___Yes ___No
If yes, please describe _____

_____

8. Are there any existing trees or vegetation on the proposed site? ___ Yes ___ No
If yes, how many? _____

9. Are there any community forest, reserved forest or protected area within 2,000 m of the proposed site? _____ Yes _____ No
If yes, please describe? _____

10. What is the present land use of the proposed dam site and its vicinity (roughly a radius of 500 m) of the proposed site?

	Residential (Thick, Moderate, Sparse)	**Commercial** (Office, Shops, Fuel Stations)	**Open Land** (Parks, Farmlands, unutilized plots, barren land	**Industrial**	**Other**
Description					

11. For any agricultural farmland on the proposed site and a radius of 500 m around it, provide the following information: Main crop(s) and average yield _____

Source of irrigation water_____

Area affected by salinity or water logging _____

12. Please describe all the sensitive receptors within 500 m of the proposed site:

Type (schools, colleges, hospitals, and clinics)	**Name**	**Size** (Number of students or number of beds)	**Location** (Village, road, mohalla, etc.)	**Distance from Site**

13. What is the total population of the area? _____

14. What proportion of the houses in the area are *pukka, semi-pukka, and* kutcha?

_____

15. How are the general hygienic conditions of the project area?

_____ Generally clean _____Fair ____Poor

16. Is there any bad odor in the project area? ____Yes _____ No

What is the source of the odor? _____

17. What are the main sources of income of the surrounding community? _____

_____

18. Is there any site of cultural importance (graveyard, shrine, mosque, archeological site) within 1,000 m of the proposed scheme? _____Yes _____No

If yes, please describe? _____

_____

19. Will the reservoir submerge any:

Village or house_____ Wetland _____Forest _____

Sensitive vegetation _____ Wildlife habitat_____

Tomb or graveyard _____ Archeologically important site _____

Section IV: Impact Assessment

Potential Negative Environmental Impacts	*Tick, if relevant*	*Mitigation Measures*	*Tick, if proposed*	*Monitoring Plan*
Socioeconomic Impact	☐	To the extent possible, local labor will be used for unskilled, semi skilled and skilled jobs	☐	
		A formal resettlement plan will be prepared	☐	
Water-related diseases	☐	Sanitation and health-care programs will be initiated for the population around the reservoir	☐	
		As far as possible, the reservoir water level will be fluctuated to discourage growth of disease carrying insects.	☐	
Wildlife and vegetation	☐	Minimum flow required to maintain vegetation will be determined and it will be ensured that the flow is maintained	☐	
		Operational rules will be defined for regulating downstream flows at critical times to protect habitat for reproduction or migratory routes.	☐	
		Provisions for the migration of fish and other aquatic organisms will be provided, if needed	☐	
Safety Concerns	☐	The surrounding communities will be informed about the construction schedule and will be briefed about the safety procedures	☐	
		A comprehensive plan for operation, maintenance and rehabilitation will be prepared. This should include inspections, evaluations, modifications and upgrades of the dams to ensure that they meet safety standards.	☐	
		Emergency action plans will be prepared. Training will be provided to dam operators.	☐	
		Safety exercises will also involve the local government officials and community.	☐	
		A periodic and thorough review of the rainfall and runoff characteristics as well as the identification of other changes in the hydrology of the basin will be undertaken to monitor the changes in the hydrologic characteristics of the stream basin	☐	
Risk of erosion and landslide	☐	Stabilization measures will be undertaken	☐	
Construction	☐	Construction waste (excess rock and soil, demolition waste, etc.) will be disposed at _____ (location)	☐	
		All properties, utility lines and other structures damaged during the construction will be restored	☐	

SINDH RESILIENCE PROJECT (SRP)

SOCIO-ECONOMIC BASELINE CONDITIONS

Household Profile (Sample Survey)

District		Tehsil	
UC Name			
Village			
Urban		Rural	

Interviewer's Name _____

Name of the Respondent _____

Father's Name of the Respondent _____

NIC No. of the Respondent _____

Name of the Head of Household _____

CNIC No. of Head of Household _____

Date of Interview | | | - | | | - | | | | |
DD/MM/YYYY

Section 1: Basic Information of the Household

Sr. No.	Details	Answers
1.	Gender of Respondent	1. Male 2. Female
2.	What is your approximate age? (Write in figures only)	
3.	Relation with Head of Household	1. Self 2. Father 3. Brother 4. Son Others (Please specify)_____
4.	Gender of the Head of Household	1. Male 2. Female
5.	Tribe	
6.	What is the highest level of education you have reached or completed?	1. No education 2. Primary (up to 5 Years) 3. Secondary (up to 10 years) 4. High School (up to 12 Years) 5. University Other (Please specify)_____
7.	What is your Religion?	
8.	Settlement Status	1. Local 2. Migrated Settler Others (Please specify)_____
9.	If Migrated/Settler, Years of Settlement?	
10.	Reasons of Migration	

Section 2: Awareness Regarding the Project

Sr. No.	Details	Answers
1.	Are you aware of the upcoming Water Resources Management and Development Project? (if respondent is not aware of the project, brief him about the project)	1. Yes 2. No
2.	If "Yes" to question 1, do you know when the project will be implemented? (if respondent is not aware of the project, brief him about the project implementation)	1. Yes 2. No

Section 3: Demographic Details

Sr. No.	Name of Head of Household	No. of Family Members	Gender		CNIC No.	Education Level	Occu -pation	Any Special Person (Yes/No)
			M	F				
1.					-			
2.					-			
3.					-			
4.					-			
5.					-			
6.					-			
7.					-			
8.					-			
9.					-			
10.					-			

Gender: a. Male b. Female

Education Level: a. Literate, b. Upto Primary, c. Upto Matric, d. Graduate, e. Higher Education/Masters

Occupation: a. Farming, b. Business, c. Handicraft, d. Artisan, e. Skilled Works, f. Govt. Service, g. Private Service, h. Agriculture Labor, i. Livestock Grazing, j. Labor, k. Others (Specify)

- 3 -

Section 4 Available Facilities in the House

Sr. No.	Details	Answers
1.	Do you have Telephone Connection (landline)?	1. Yes 2. No
2.	If "Yes" to question 1, when connected?	
3.	Is your house electrified?	1. Yes 2. No
4.	When connected: (Give dates as mm/dd/yyyyy)	
5.	Do you have sewerage System?	1. Yes 2. No

Section 5: Fuel Consumption in the House for illumination, cooking & heating

Type	Units	Average Quantity Consumed (unit/ month)		Price per Unit (Rs)	Monthly Expenditure (Rs.)	Source (e.g. forest, market)
		Winter	Summer			
1. Fuel wood						
2. Electricity						
3. LPG						
4. Kerosene						
Other (Please specify)---------- ----------						

Section 6: Social Issues

Sr. No.	Details	Answers
1.	Do married family members live with you in the same house?	1. Yes 2. No
2.	Do you marry children outside your tribe?	1. Yes 2. No
3.	Number of child births in your family during last year	
4.	Were there any illnesses during the past 12 months?	
5.	For how long treatment continued (Months)	
6.	Place of treatment	

7.	Distance from village/hamlet (km)	
8.	Expenses incurred (Rs.)	
9.	Number of deaths in the family during last year	
10.	Cause/s of Death	1. _____ 2. _____ 3. _____ 4. _____

11. Did you borrow money during the last year? 1. Yes ☐ 2. No ☐

12. If "Yes" to question 11, provide details as below:

Sr. No.	Source	Amount Borrowed (Rs.)	Purpose	Amount Yet to Return (Rs.)	Sources 1. Relative/friends 2. NGO 3. Bank 4. Others (specify) Purpose 1. Marriage 2. Purchase of land 3. Purchase of built-up prpoerty 4. Establishment of business 5. Others (Please specify) _____
1.					
2.					
3.					

13.	Do you have to go to the city for fulfillment of various needs?	1. Yes 2. No
14.	If "Yes" to question 13, then how offenly?	1. Daily 2. Weekly 3. Monthly 4. Occasionally 5. Others (Specify) _____
16.	Social issues of the community	_____ _____ _____ _____ _____

Section 7: Livestock (Domestic Animals)

1. Number of Livestock heads of each type owned by you?

Type	Buffalo	Cow	Goat	Sheep	Oxen	Calve	Donkey	Horse	Chicken	Others (Please specify)
Number										
Value Rs./ Unit										

2. From where do you get fodder for livestock? _____

3. Estimated cost for purchasing feed / fodder for your animals (Rs./Month) ? _____

Section 8: Livelihood

1.	What is your occupation?	1. Primary 2. Secondary
2.	What is your place of work?	1. Same village 2. Nearby Town 3. Nearby city 4. Others (Please specify) _____

4. Involvement of household members in income earning activities.

Sr. No.	Activity	Number of Persons Involved					
		Men (between 16-65)	Women (between 16-65)	Old Men (65 years and above)	Old Women (65 years and above)	Children (below 16 years)	Average Monthly Income (Rs.)
1.	Farming						
2.	Small Business						
3.	Handicraft						
4.	Artisan Services*						
5.	Skilled Works**						
6.	Govt. Service						
7.	Pvt.Service						
8.	Agri. Labor Permanent						
9.	Fisherman						
10.	Livestock Rearing						

11.	Labour						
12.	Other (Pls. specify)----------						
Total							

*Artisans: Carpenter, Black-Smith, Barber, Potter, Shoe Menders/Maker, etc.
**Skilled Workers: Tailor, Carpet Weaver, Stone Masonry, Plumber, Mechanic, Driver, Electrician, Furnisher, etc.

5. Average monthly expenditures?

Sr. No.	Detail	Expenditures (Rs./Month)
1.	Food Items	
2.	Firewood/ Energy Source	
3.	Education	
4.	Health	
5.	Social/Recreation Activities	
6.	Others (Please specify)	

Section 9: Housing

1.	Type of the ownership	1. Owned 2. Rented 3. Free 4. Others _____
2.	Nature of the construction of the house	1. Pucca (Bricks/blocks/stones) 2. Semi Pucca 3. Katcha 4. Wood/Bamboo 5. Others (Pls. specify)_____
3.	Number of rooms in the house	
4.	Availability of bathroom in the house?	1. Yes 2. No
5.	Aproximate Plot size of the house	Marla _____
6.	Covered area (sq.ft)	_____
7.	Year of construction of the house	_____
8.	Do you have separate room/rooms for animals in your house?	1. Yes 2. No
9.	If "Yes" to question 8, then number of rooms	_____

10.	Construction Type	1. Pucca (Bricks/blocks/stones) 2. Semi Pucca 3. Katcha 4. Wood/Bamboo 5. Others (Pls. specify)_____
11.	Is your house being affected by the project?	1. Yes 2. No
12.	If "Yes" to question 11, then do you have any other place of residence to move	1. Yes 2. No
13.	If "Yes" to question 12 please specify	

Section 10: Land holding and land use by the household

1. Size of land holding with its approximate price?

Sr. No.	Land Use	Overall Land (Kanals)	Approximate Size of Land Perceived to be Affected (Kanals)	Perceived Approx. Unit Price (Rs./Kanal)
1.	Cultivated			
2.	Un-cultivated			
3.	Banjar jaded			
4.	Banjar qadeem			
5.	Ghair mumkin/pahar			
6.	Fruit orchard area			
7.	Other (Please specify) _____			
	Total			

8.	Nature of farming	1. Owner 2. Contract 3. Owner cum tenant 4. Tenant 5. Share cropping 6. Others (Pls. specify)_____
11.	Which of the following agricultural implements do you have	1. Plough for oxen 2. Plough for tractor

		3. Tractor 4. Spray machine 5. Trolley for tractor 6. Thresher 7. Other (Please specify)_____

12. What do you grow mostly in your agricultural land?

Sr. No.	Crop	Area under Cultivation (Kanals)	Yield / Kanal
1.	Wheat		
2.	Maize		
3.	Vegetables		
4.	Fodder		
5.	Other (Pls. specify) _____		

13. What are the expenditures to grow crops in your agricultural land?

Sr. No.	Inputs	Unit	Unit Price (Rs.)	Quantity/ Season	Seasonal Cost
1.	Seeds	Kgs/Kanal			
2.	Fertilizers	Kgs/Kanal			
3.	Pesticides	Liter/Kanal			
4.	Plowing	No.			
5.	Harvesting	days			
6.	Other (Please specify)				
Total					

14. What is your average seasonal earning(Rs./Season)?

a. Rabi [ ] b. Kharif [ ]

1. If your agricultural land /commercial asset are to be acquired for Project, do you have any other sources of income?

   a. Yes ☐ b. No ☐

1.1 If "Yes" specify the source. _____

2. In case of relocation, where will you prefer to resettle?

   a. Shifting to other village/UC ☐ b. Project developed resettlement site ☐

   c. Within the tehsil ☐ d. Within the district ☐

   e. Out of province ☐ f. Don't know ☐

   g. Any other place (Please specify) _____

3. What mode of compensation for land will be your choice?

   a. Cash ☐ b. Alternate Land ☐ c. Other (Please specify) _____

4. If cash payments are made, then expected utilization of the money?

   a. Business ☐ b. Property ☐

   c. Agricultural Land ☐ d. Others (Please specify) ☐

15. What do you suggest for livelihood restoration?

_____

_____

_____

Signature:	_____	Signature:	_____
Name:	_____	Name:	_____
CNIC No.	_____	CNIC No.	_____
	(Respondent)		**(Community Representative)**
Signature:	_____	Signature:	_____
Name:	_____	Name:	_____
CNIC No.	_____	CNIC No.	_____
	(Interviewer)		**(SID Representative)**
Dated:	_____		

Annexure IX: Photo Log

Vegetation at Bandaka project area

Vegetation at Bandaka small dam Site

Topography of Baaro small dam site

Livestock near Baaro

Pond near Baaro site

Toography of Chakri small dam site

Vegetation near Chakri site

Topography of Churlo samll dam site

Topography at Sunn 2 dam site

Mosque at Sunn 2 Study area

Water storage pot near Sunn 2 dam site

Ecologcial expoloration at Sunn 2 small dam site

Mode of transporataion at Sunn 2 Dam site area

Type of construction at proposed dam site

General view of proposed small dam site of Gadap 2

Topograpgy of proposed Khuda Buskh dam site

Public Consultation at Khuda Buskh dam site

Bird eye view of proposed dam site of Lat 2

Topography of Jharando 2 proposed Dam site

Effects of Flood at Dhari Shrief Dam site area

Public Participation at Dhari Shrief dam site area

Topography of proposed small dam at Dhari shrief

Topography of proposed small dam at Jharando 1

Agricultural Farm near Jharando 1 Dam site

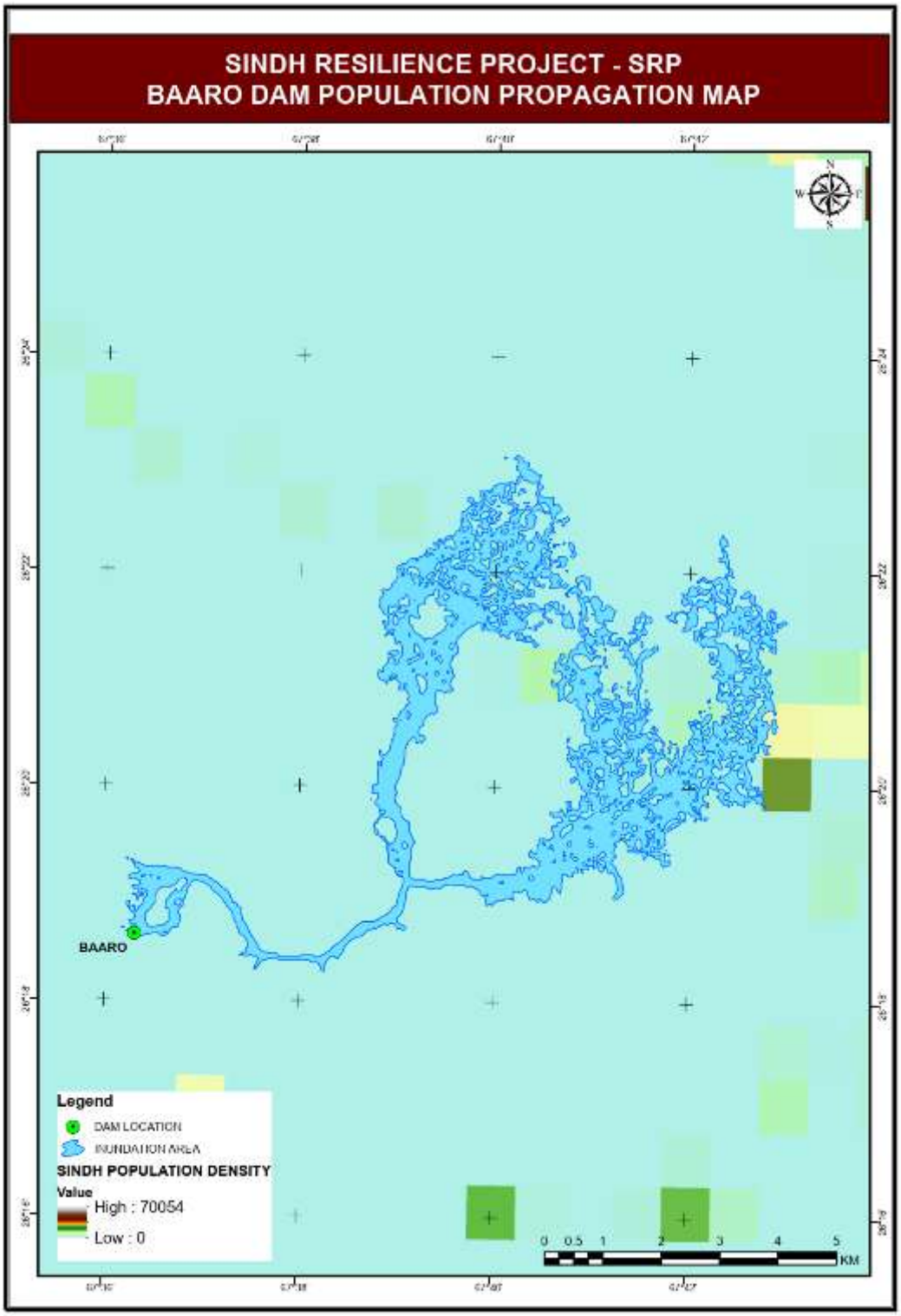
Type of construction near Jhanrando Dam site

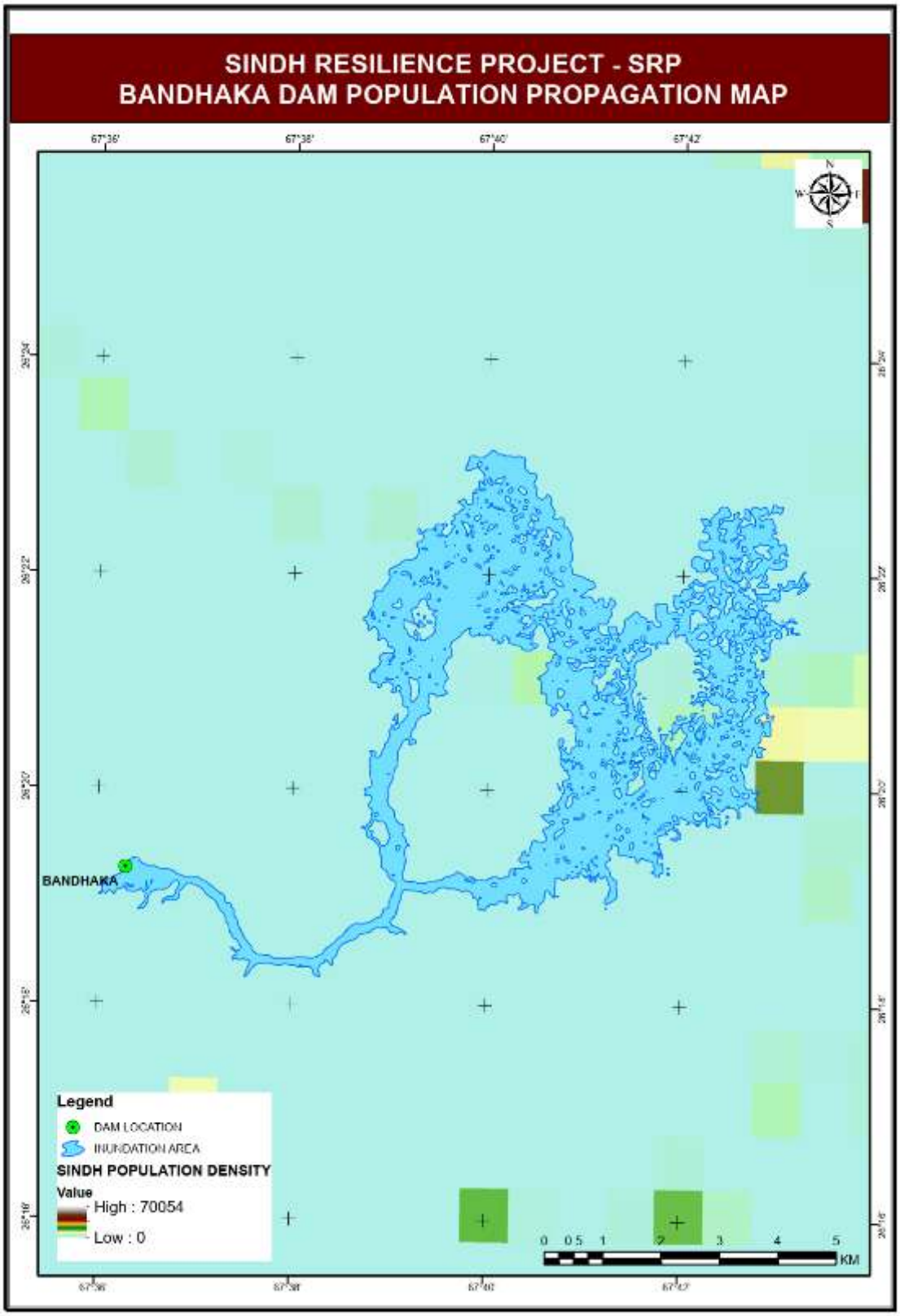
Bird eye view of prposed small dam at Ghaib Jahan

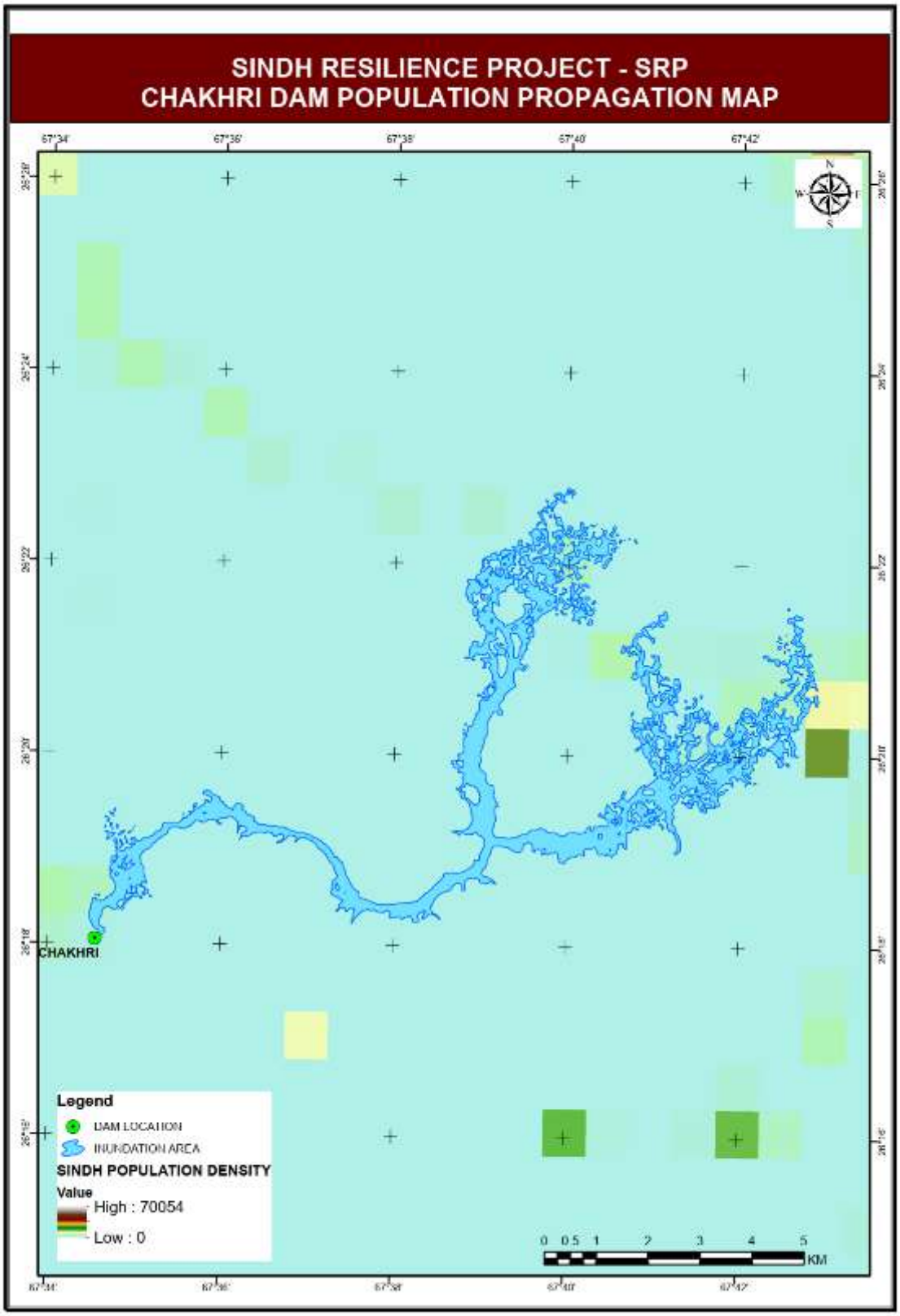
Eagle spoted near the proposed small dam site

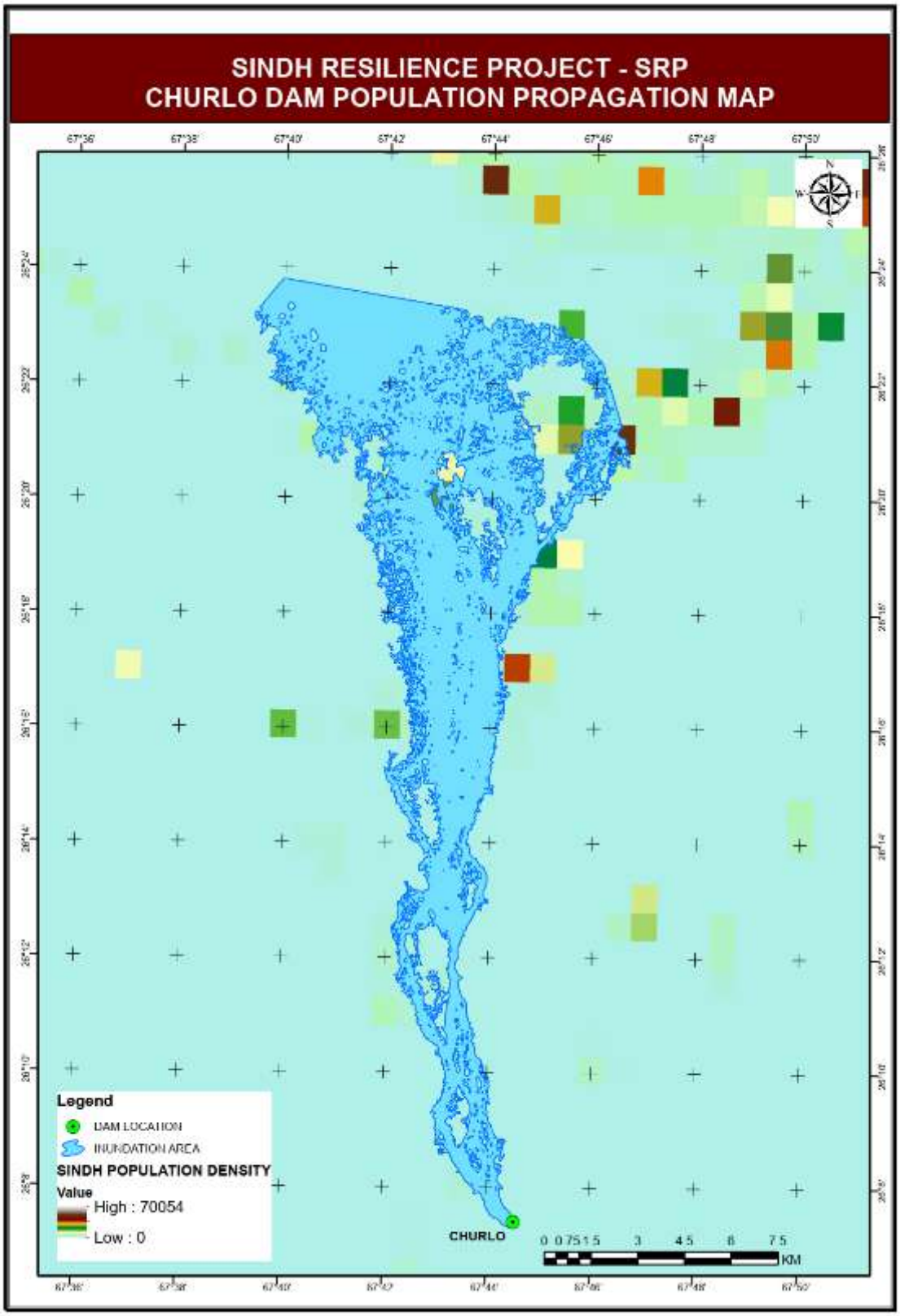
Ghaib Jahan shire near proposed site

Annexure X: Map showing Area Inundated due to 100+Floods and Dams Break




SINDH RESILIENCE PROJECT - SRP
BANDHAKA DAM POPULATION PROPAGATION MAP
67°36'
67°38'
67°40'
67°42'
N
W
E
S
BANDHAKA
Legend
DAM LOCATION
INUNDATION AREA
SINDH POPULATION DENSITY
Value
High : 70054
Low : 0
0 0.5 1 2 3 4 5
KM


SINDH RESILIENCE PROJECT - SRP
CHAKHRI DAM POPULATION PROPAGATION MAP
67°34'
67°36'
67°38'
67°40'
67°42'
N
W
E
S
CHAKHRI
Legend
DAM LOCATION
INUNDATION AREA
SINDH POPULATION DENSITY
Value
High : 70054
Low : 0
0 0.5 1 2 3 4 5
KM


SINDH RESILIENCE PROJECT - SRP
CHURLO DAM POPULATION PROPAGATION MAP
Legend
DAM LOCATION
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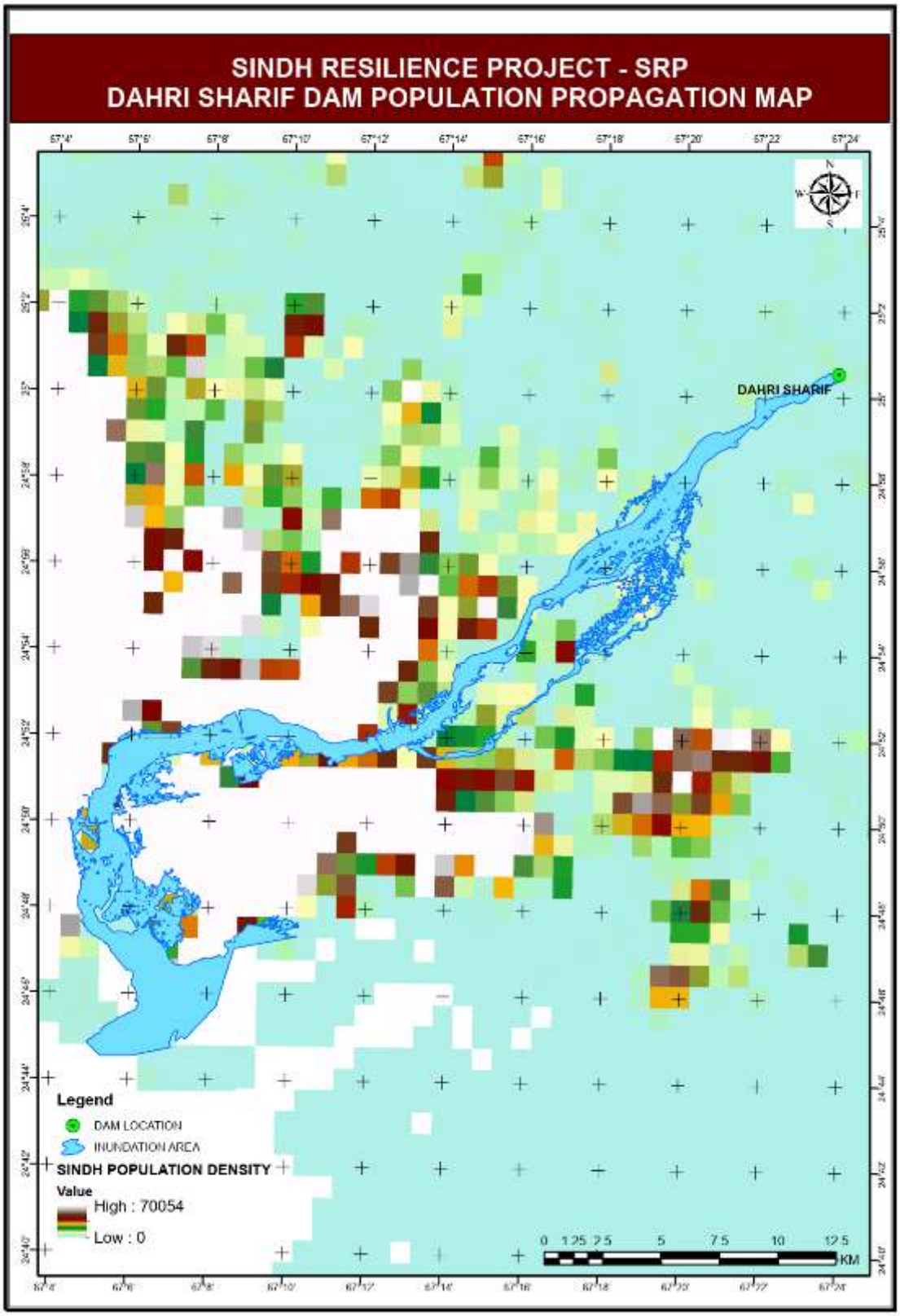
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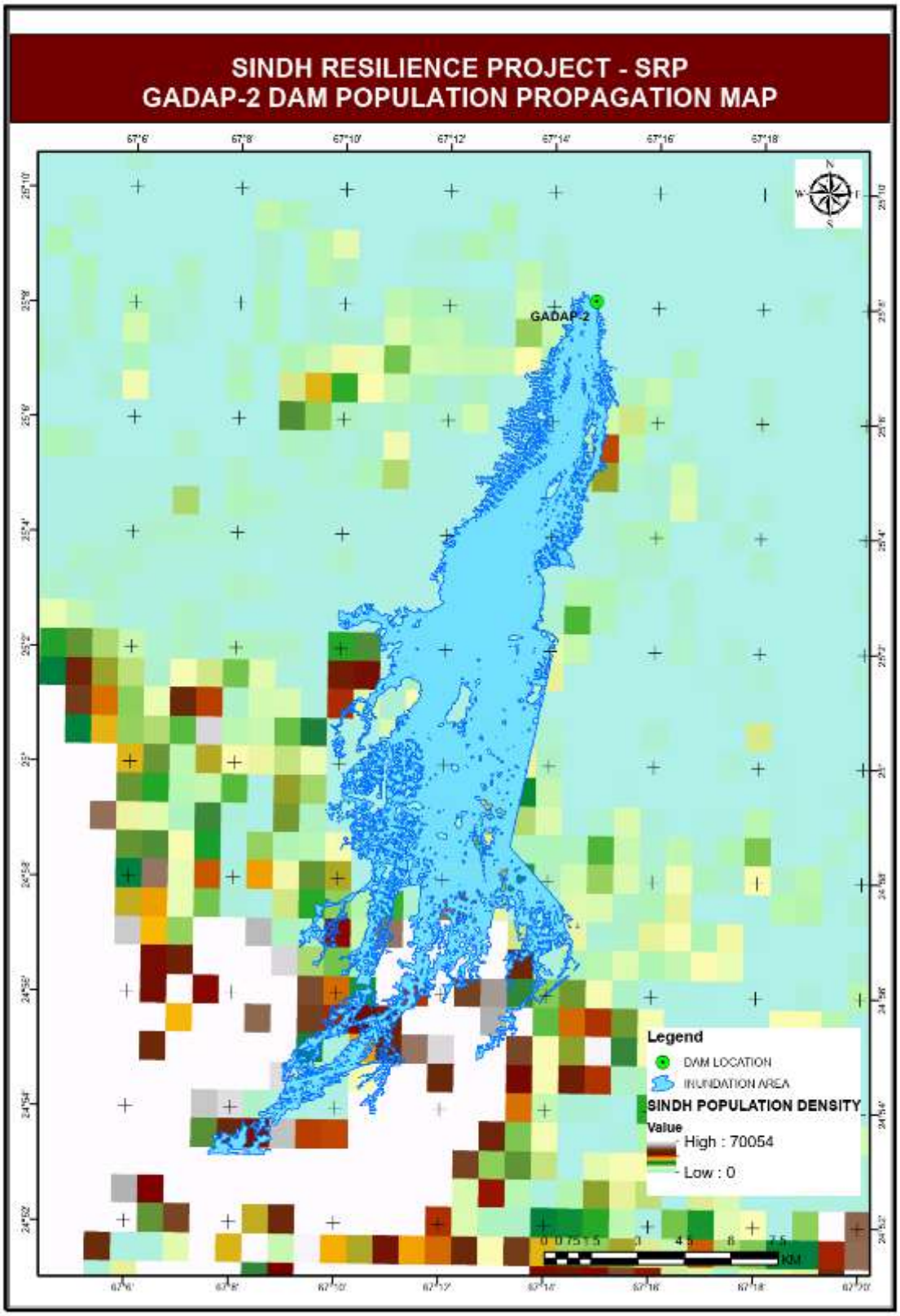
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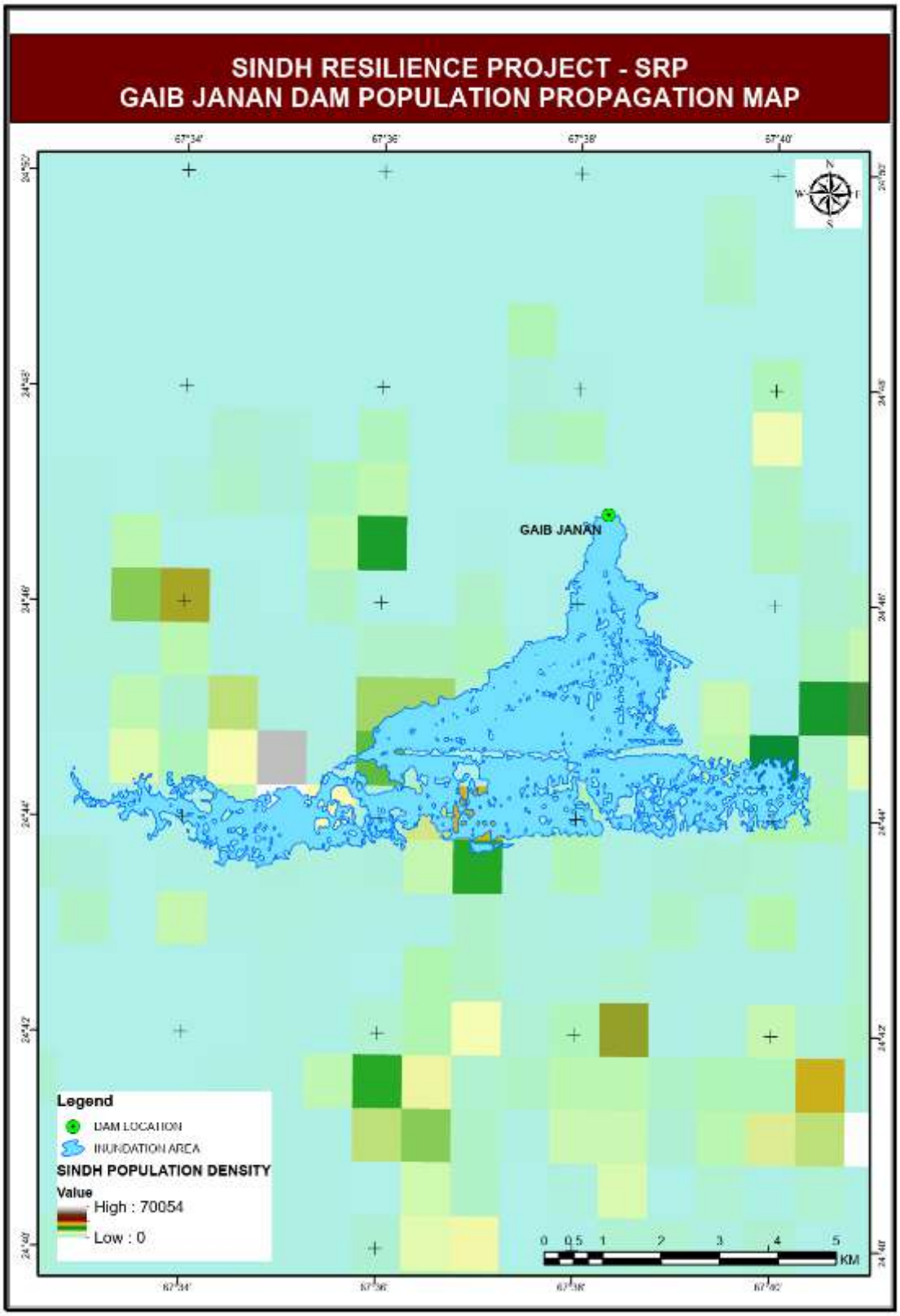
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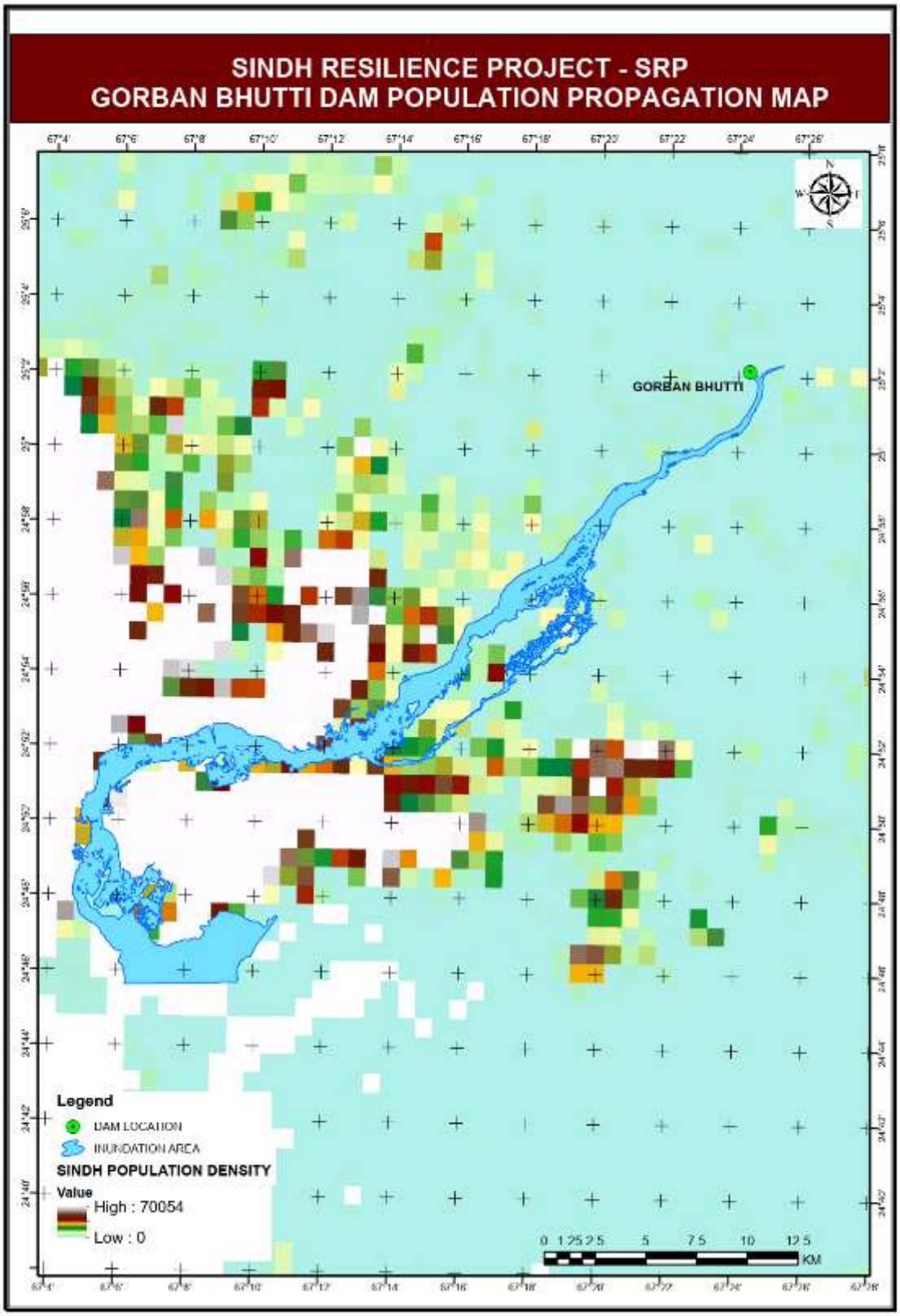
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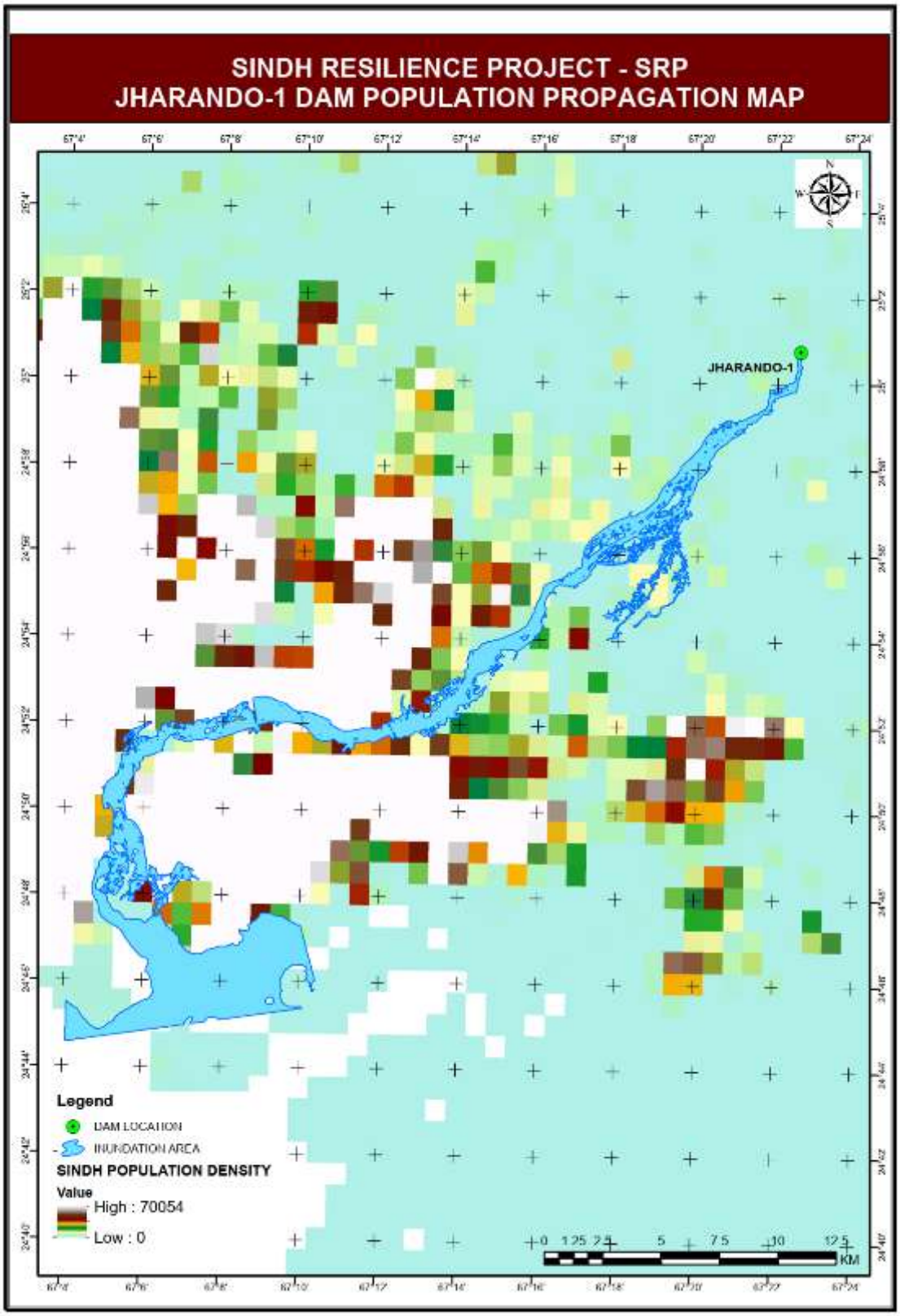
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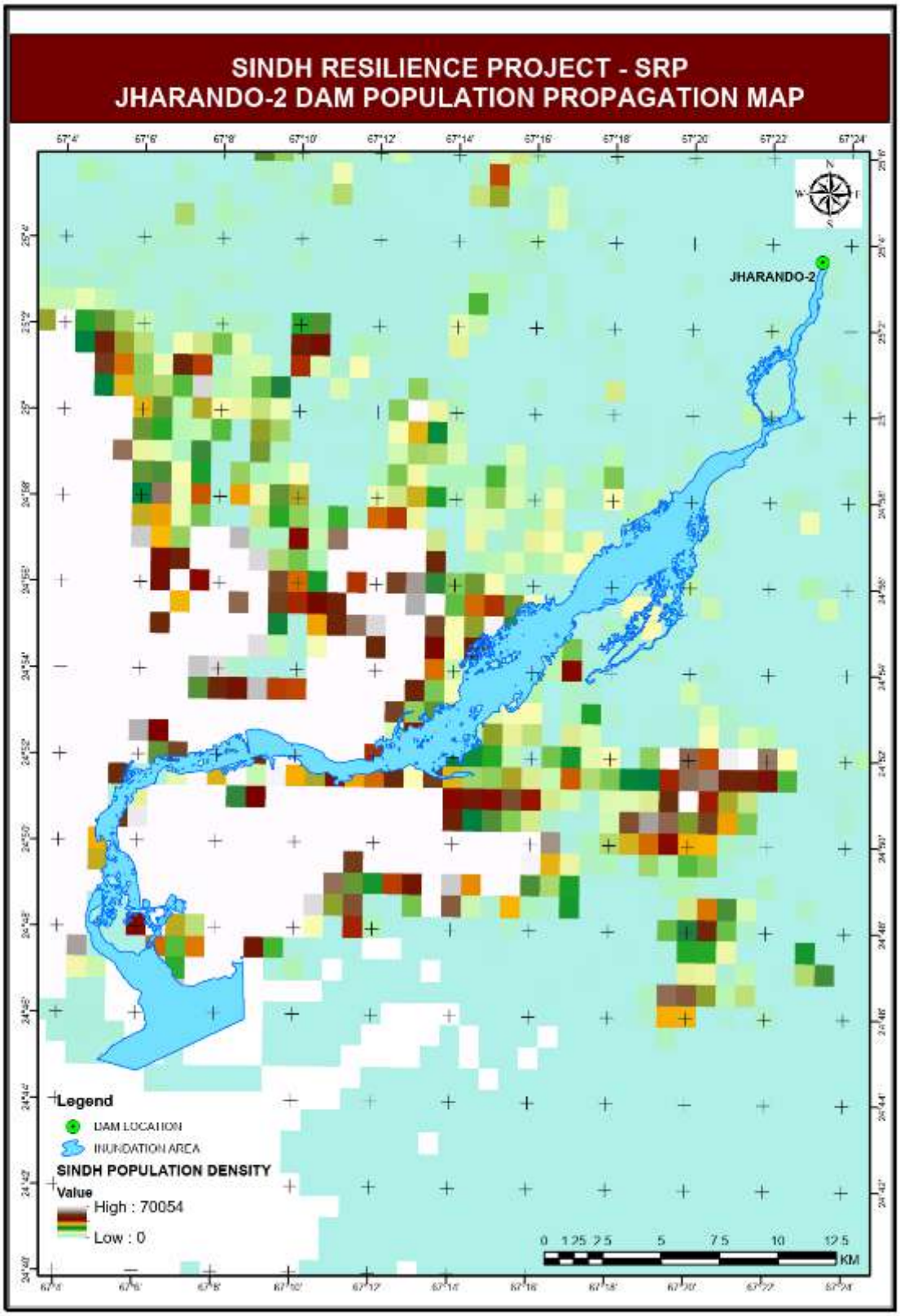
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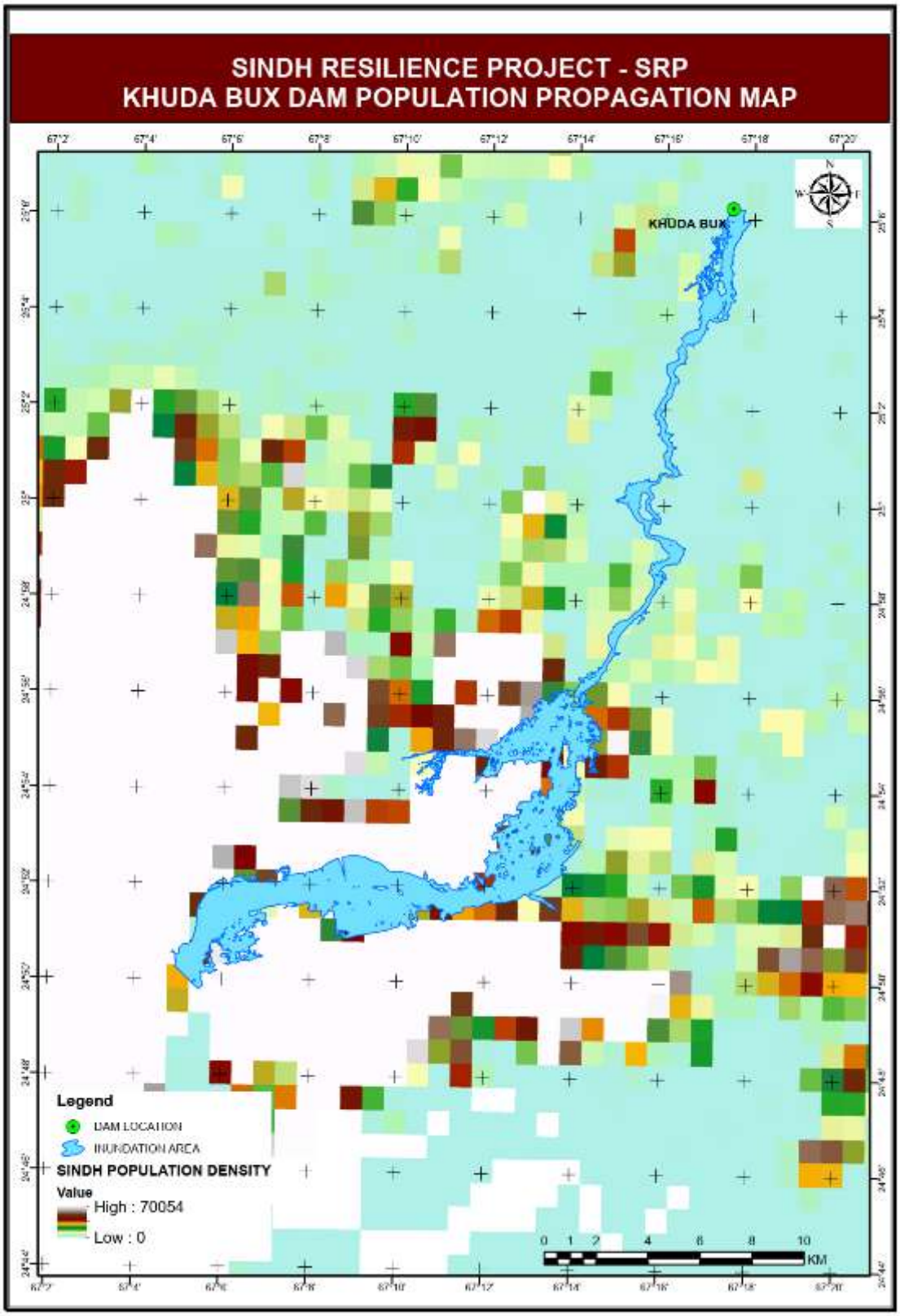
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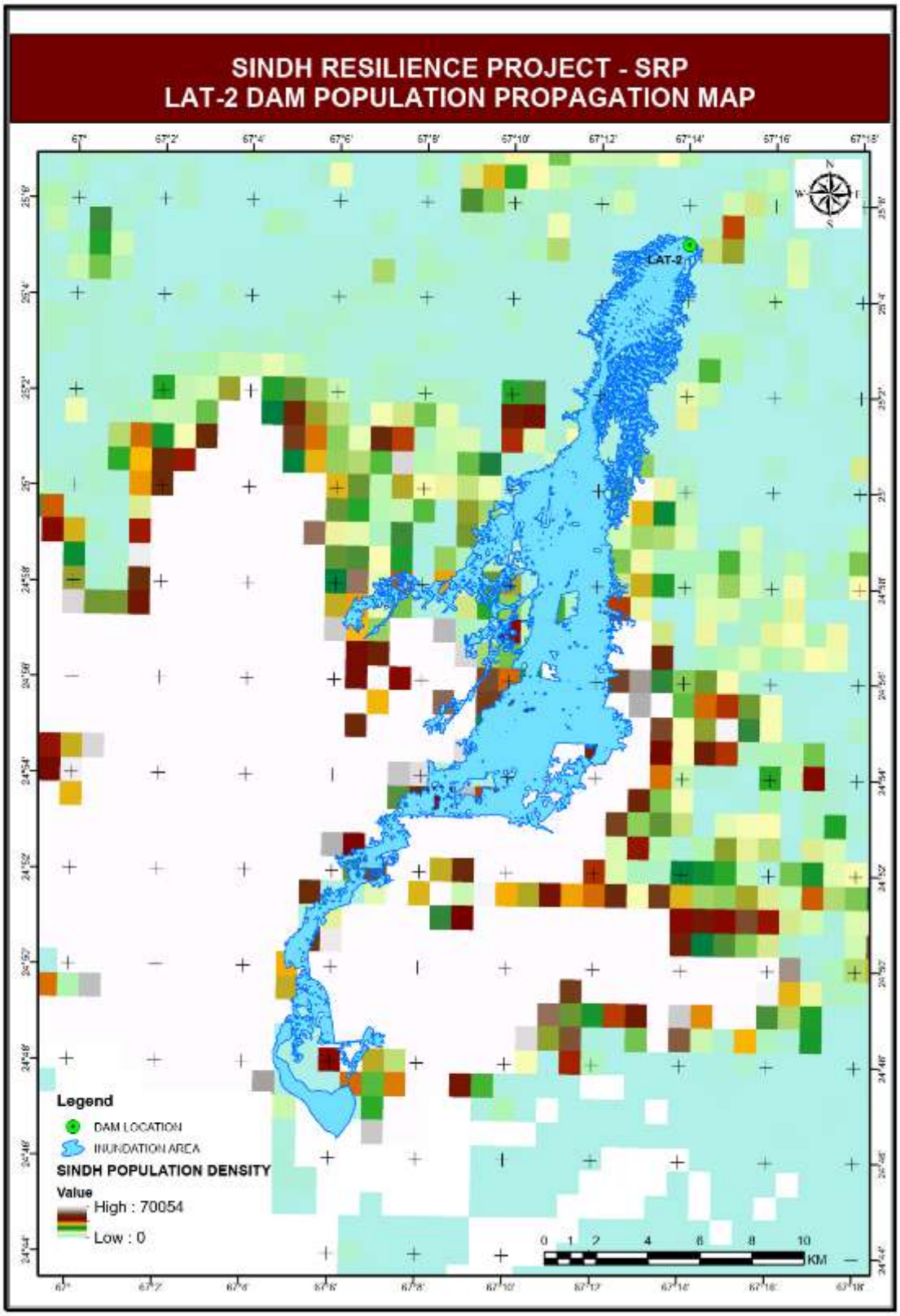
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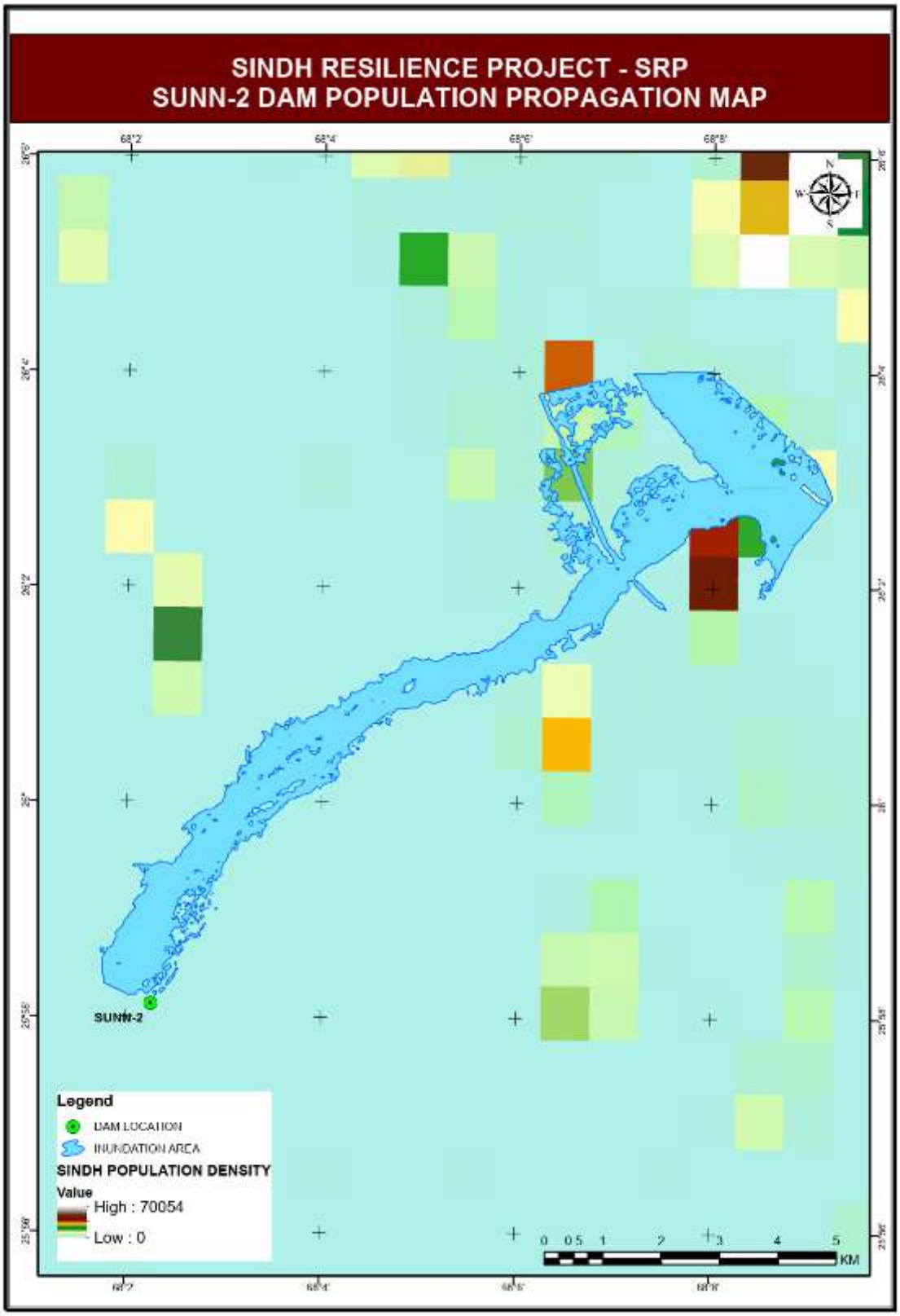
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Annexure XI: Environmental Code of Practices (ECoPS)

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: Borrow Areas Development and Operation
ECoP 5: Air Quality Management
ECoP 6: Noise and Vibration Management
ECoP 7: Protection of Flora
ECoP 8: Protection of Fauna
ECoP 9: Road Transport and Road Traffic Management
ECoP 10: Construction Camp Management
ECoP 11: Cultural and Religious Issues
ECoP 12: Workers Health and Safety

The Contractor shall prepare a 'Contractor's Environmental and Social Management Plan' (CESMP) demonstrating the manner in which the Contractor will comply with the requirements of ECoPs and the mitigation measures proposed in the ESMP Report. The CESMP 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 CESMP 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.

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 ESMU PMT 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 liter 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 bonded 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

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: o Prepare spill control procedures and submit the plan for PISSC and SID for approval. o Train the relevant construction personnel in handling of fuels and spill control procedures. o Store dangerous goods in bonded areas on a top of a sealed plastic sheet away from water course. Refueling should occur only within bonded areas. o Make available MSDS for chemicals and dangerous goods on-site. o Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by Sindh EPA. o Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored and personnel trained in the correct use. o Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use. o 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. o Store hazardous materials above flood plain level. o 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. o 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. o Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. o Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials.

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: o Follow the management guidelines proposed in ECoPs 1 and 2. o 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 and groundwater contamination.	The Contractor shall: o Divert runoff from undisturbed areas around the construction site o Stockpile materials away from drainage lines o 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 o Wash out transit mixture 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.
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: o 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 o Ensure that roads used by construction vehicles are swept regularly to remove sediment. o 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)

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
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: • 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. • 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.
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
	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

ECOP 4: SOIL QUALITY MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Storage of fuel and toxic chemicals	Spillage of fuel 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

ECOP 5: 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.

ECOP 6: 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: • 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 • Carryout effects monitoring on monthly basis to control the emissions from construction machinery. • Service all equipment regularly to minimize emissions • Engage all vehicles that are physical fit for the work. • Obtain fitness certificate of vehicles/equipment from third party certification.
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.

ECoP 7: 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. • Make sure that all operator are trained and are having third party operator certificates.
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.

ECOP 8: 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: • Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation. • Make selective and careful pruning of trees where possible to reduce need of tree removal. • 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. • 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

ECOP 9: 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.

ECOP 10: 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 • Drinking water should be checked on monthly basis through monthly effects monitoring. • 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 silt retention pond to natural drainage via a grassed swale at least 20 meters in length with suitable longitudinal gradient.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
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. • Contractor should made an agreement / got a NOC from near union council for disposal of solid waste in municipal facility.
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.	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 anti-venom injection at site dispensary to cope any emergency in case of snake bite.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS.	• 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. • 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 firefighting 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.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• 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.

ECOP 11: 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 behavior 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 and deaths. The population in the	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 precautions (like PPEs, barriers, change to design) and make ensure use of the PPEs and other measures during construction time.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	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 behavior (e.g. STD and HIV) and (iii) road accidents from construction traffic.	• 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 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.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• 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 • 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 Fuels and Hazardous Substance Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• ECoP Air Quality Management • ECoP Noise and Vibration Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
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.

ECOP 12: 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 behavior (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.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	Child Labor	The Contractor shall: • Not hire children of less than 14 years of age 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 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: 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

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		• Solid waste collection and disposal system in accordance with ECoP1. • Arrangement for trainings • 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 : Fuels and Hazardous Substance Management • ECoP : Air Quality Management • ECoP : Noise and Vibration Management • ECoP : 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.

Annexure XII: SRP SOPS for Management of COVID-19

SINDH RESILIENCE PROJECT

Standard Operating Procedure for Management of COVID-19

Abstract

This document has been prepared in-line with World Bank Interim Guidance Note on COVID-19. This document provides general guideline for the Contractors to mobilize the team and construction material.

Sindh Resilience Project
Irrigation Department
Government of Sindh

DOCUMENT ISSUE AND REVISION RECORD

This document and its contents have been prepared and are intended solely for the information and use of the Government of Sindh, Irrigation Department concerning the **SINDH RESILIENCE PROJECT (SRP).**

Document History

Project	Sindh Resilience Project (SRP)
Proponent	Irrigation Department, Government of Sindh
Document Ref	SRP-ESMP-COVID-19
Document Title	Standard Operating Procedure for Management of COVID-19 for Bandhaka, Baaro, Chakhri, Churlo, Sunn-2, Gadap-2, Khuda Bux, Lat-2, Jharando-2, Gorban Bhutti, Dahri Sharif, Jharando-1 and Gaib Janan

Revision	Description	Prepared	Checked	Review	Authorized	Date
0	Draft for World Bank Review	Arshad Hussain Memon Nasir Ali Panhwar/	Mohammad Ibrahim Daudpota	Zahid Hussain Shaikh	Jawed Ahmed Memon	18-11-2020

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Hadith of the Prophet (PBUH) that addresses disease outbreaks and how Muslims should deal with it.

The Hadith says:

"If you hear of an outbreak of plague in a land, do not enter it, but if the plague breaks out in a place while you are in it, do not leave that place" (Sahih Bukhari and Muslim)

I. Introduction:

Sindh Resilience Project (SRP) received an ESF/safeguards interim note: COVID-19 considerations in construction/civil works projects on 9 April 2020 from the World Bank. In continuation to this ESMU-SRP team has developed this document. The COVID-19 pandemic has created unprecedented challenges for everyone. Addressing COVID-19 related issues at the construction site starts with recognizing that this is not business as usual and that circumstances require a highly adaptive responsive management design to avoid, minimize and manage what may be a rapidly evolving situation. To use reasonable efforts in the circumstances, recognizing that what may be possible today may be different next week (both positively, because more supplies and guidance may be available, and negatively, because the spread of the virus may have accelerated).

II. Purpose:

This SOP shall provide guidelines to deal with the current situation created due to the epidemic of COVID-19 and to provide preventive measures for prevention from the COVID-19 rampant.

III. Scope:

The scope of this Standard Operating Procedure (SOP) applies to all active work-sites of Sindh Resilience Project (SRP) mentioned below; This is general Standard operating procedure, however, as per guidance note issued on 7th April 2020 by World Bank Section 5, each contractor HSE staff should prepare site-specific COVID Management plan, which needs to be approved by PISSC and PMT team.

IV. Focal Person and their Roles for Management of COVID

Addressing COVID-19 at a project site goes beyond occupational health and safety, and is a broader project issue which requires the involvement of different members of a project management team. Given the project context, a designated team would be established to address COVID-19 issues, at PMT level, PISSC level, and at the contractor level.

Following would be the composition of designated teams at three levels; which are Client.

a) SRP-PMT

Name	Designation	Cell number/ WhatsApp number	Email
Muhammad Ibrahim Daudpota	Deputy Director (EHS)	0335-3865861 0300-3317550	mibrahim.daudpota@yahoo.com
Arshad Hussain Memon	Environment Safeguard Consultant	0333-7045597	arshad.memon@hotmail.com
Nasir Ali Panwhar	Social Safeguard Consultant	0300-3079491	napanhwar@gmail.com

b) SRP-PISSC

Name	Designation	Cell number/ WhatsApp number	Email
TBN	Team Leader		
TBN	Chief Resident Engineer		
TBN	Resident Engineer		
TBN	Environment Specialist		
TBN	Social Safeguard Specialist		

c) Contractor Level

S.NO	Name of Sub-project	Name of Focal Person	Contact Person
1.	Bandhaka	TBN	
2.	Baaro	TBN	
3.	Chakhri	TBN	
4.	Churlo	TBN	
5.	Sunn-2	TBN	
6.	Gadap-2	TBN	
7.	Khuda bux	TBN	
8.	Lat-2	TBN	
9.	Jharando-2	TBN	
10	Gorban Bhutti	TBN	
11	Dahri Sharif	TBN	
12	Jharando-1	TBN	
13	Gaib Janan	TBN	

The overall obligation of the Contractor will be:

- to take all necessary precautions to maintain the health and safety of the Contractor's Personnel

- to appoint a health and safety officer at site, who will have the authority to issue directives to maintain the health and safety of all personnel authorized to enter and or work on the site and to take protective measures to prevent accidents
- to ensure, in collaboration with local health authorities, that medical staff, first aid facilities, sickbay, ambulance services and any other medical services specified are available at all times at the site and at any accommodation
- to ensure suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics

V. Procedures for Working at Camps located at all sub-projects

Following is the general standard operating procedure (SOP) and shall be followed by all Contractors, however, each contractor shall prepare site-specific plans according to local conditions and site-specific needs.

i. Before resuming the work, the contractor should ensure the disinfection of camp premises and this should be done on regular basis subsequently.
ii. Contractor representative (Project Manager) in consultation with HSE Staff and PISSC -HSE team shall arrange sufficient stock of PPE like coverall, face mask N-95, face shield, surgical mask, hand sanitizer, gloves, temperature Guns shall be arranged before the arrival of the workforce on site.
iii. Other items like tissues and hand sanitizer for all office workers. Surgical masks are made available to offer anyone, who develops respiratory symptoms.
iv. The contractor should develop hand-washing areas for all the workers, with the facility of clean water and soap.
v. Wastewater tank should be developed for the disposal of contaminated water.
vi. Minimize face to face meetings, on-site maximize telephonic, video, and conference calls as a replacement of physical meetings (where available).
vii. Maintain physical distance at least 6 feet distance with each other during the meeting.
viii. Use a face mask and latex gloves while maintaining physical distance
ix. Use a digital thermometer to screen all the personnel entering site office, site and camp areas and maintain a logbook for record-keeping of temperature readings of all the workers entering office area/building.
x. DO NOT use a traditional mercury thermometer.
xi. Promote communication with staff to inform if anyone in their contact (such as within their residential area, community, market area, place of visit for work/ meeting/ religious gathering) has developed any symptoms of COVID-19 and restrict their entry to workplace or meeting with staff.
xii. If an individual's temperature is on the higher side and exhibits symptoms of high fever, he should be investigated by a medical doctor for further symptoms of COVID-19.
xiii. If an individual after examination exhibits all the symptoms of COVID-19 immediate attention should be given and contact Pak Corno Helpline (03001111166) for further guidance on an immediate basis.
xiv. Have details of contact numbers of concerned District Health Officer (DHO), Taluka Hospital and local administration i.e Deputy Commissioner and Assistant Commissioner
xv. Install sanitizer dispensers at the workplace in each room. Make sure these dispensers are regularly refilled.

xvi. Ensure that face masks and / or paper tissues are available at workplaces, for those who develop a runny nose or cough at work, along with closed bins for hygienically disposing of them.
xvii. Signages in local language promoting regular handwashing should be displayed at prominent locations, occupational health and safety officer and Social Officer shall make sure this.
xviii. All persons including officers, laborers, etc. should frequently wash hands for more than 20 seconds regularly with soap or hand sanitizer.
xix. All benchtops, door handles, working tables, chairs, etc. should be sanitized by using alcohol-based cleaning liquids or hypochlorite-based chemicals (twice a day).
xx. COVID-19 waste should not dispose in an open area, and it must be contained properly and disposed of properly, through incineration only.
xxi. All staff members should be trained for the COVID-19 waste management.
xxii. All the waste such as face masks, gloves, and other items generated at office and campsites should be stored in a labelled marked container (Hazardous Waste) and should be stored separately in isolation after disinfection. The waste once accumulated should be disposed of via EPA, a certified contractor for Incineration.
xxiii. In case of any worker/staff member develops the symptoms of COVID-19 he should be referred to the nearest Government facility for the testing.
xxiv. In case if any of the worker develops symptoms of COVID-19 he should be thoroughly explained about WHO's guidelines of "Home Care for Patients with COVID-19 presenting with mild symptoms and management of their contact"
xxv. HSE Team shall not allow the overage, person with diabetes, lung infection, cancer, or any other team member having chronic health issues.

VI. Communication with Community

The community may be concerned about the presence of non-local workers, or the risks posed to the community by local workers' presence on the project site. The following actions should be considered by ESMP Staff:

- Other forms of communication should be used; posters, pamphlets, the means used should take into account the ability of different members of the community to access them, to make sure that communication reaches these groups.
- Face to face meetings should be avoided or safe distance should be maintained.
- The community should be made aware of the procedure for entry/exit to the site, the training being given to workers, and the procedure that will be followed by the project if a worker becomes sick.
- Community as well workers should be encouraged to use the existing project grievance mechanism to report concerns relating to COVID-19, preparations being made by the project to address COVID-19 related issues, how procedures are being implemented, and concerns about the health of their co-workers and other staff.

VII. Procedures for Team Traveling, Material Transportation & Work on Site:

a) Team Traveling

i. Before traveling make sure that the latest information on the area where COVID-19 is spreading is readily available, the information may be accessed through www.covid.gov.pk and www.who.int/emergencies/diseases/novel-coronavirus-2019/sutation-reports/.

ii. Based on the latest information, assess the benefits and risks related to upcoming travel plans and avoid sending a large number of team members on field visits also exclude older employees and those with medical conditions such as diabetes, heart and lung disease to areas where COVID-19 is spreading.

iii. Make sure all persons traveling to locations reporting COVID-19 are briefed by a qualified professional.

iv. Employees traveling to sites must-have face mask and hand sanitizer of alcohol-based hand rub. This can facilitate regular hand-washing.

v. Seating arrangement of such vehicles amongst the individuals occupying it shall be such that 3 feet distance is maintained. Individuals occupying such vehicles shall wash hands with soap before entry into site or premises and, subsequently, their hands shall be sanitized

vi. All Vehicles must have the minimum possible number of travelers as per the Guideline of Sindh Government. (2 to 3 person/vehicle)

b) Material Transportation

i. The temperature of the drivers, conductors, loaders, and other staff of the vehicle transporting such materials shall be monitored at entry points along with other indicators of COVID-19 that are flu, cough, and muscular pain, etc. No person(s) associated with such vehicles having any or all symptoms of COVID19 shall be allowed to enter the site or premises.

ii. The material like steel, wood, and cloth, iron, plastic the COVID-19 for days, therefore, all such raw material shall be properly sanitized and disinfected before entry to site or premises is granted.

iii. Seating arrangement of such vehicles amongst the individuals occupying it shall be such that 3 feet distance is maintained. Individuals occupying such vehicles shall wash hands with soap before entry into site or premises and, subsequently, their hands shall be sanitized.

iv. Raw materials, machinery, and any other material required to be processed shall be only allowed to enter the site or premises after the vehicle is completely sanitized and disinfected at the entry point

c) Working on Site

a. HSE Team should check the COVID parameters of each worker before the start of work and record may be shared on the group by 9:00 am every day.
b. If any worker **found suspected should not be allowed on-site** for work and after examination exhibits all the symptoms of COVID-19 immediate attention should be given and contact Pak Corno Helpline (03001111166) for further guidance on immediate basis.
c. Daily toolbox talk should include COVID-19 preventive measures on a regular basis and preventive measures should be made mandatory for the contractors and subcontractors.
d. All the team members conducting inspections should minimize their time on-site to the barest minimum necessary to ensure compliance with the Specification. **DO NOT LINGER** on-site and return as soon as possible to the colony.
e. All staff must be sprayed and cleaned on returning to the camp and a wash facility has been set up at the site gate.

f. The guards may be instructed to enforce these measures. Gloves, masks, shoes and helmet must be left at the gate after spraying.
g. All the workers working on site, should be provided with protective clothing; coverall, face masks, gloves and hand sanitizers for their regular use.

d) Infected Persons/Team Member Isolation:

a. At each camp site at least one room should be declared as quarantine quarter, with appropriate facilities.
b. If an individual after examination exhibits all the symptoms of COVID-19 immediate attention should be given and contact Pak Corno Helpline (03001111166) for further guidance on immediate basis.
c. Allocate quarantine quarters at camp site and keep the infected person isolated from the remaining staff until the doctor decides return to the wider community.
d. No healthy person will be allowed to enter or access the quarantine quarter at all times not even after wearing proper PPEs.
e. Medical doctor handling the infected person for initial first aid; should use following PPEs; medical masks, gown, apron, eye protection goggles or face shield (respirator N95 or FFP2 standard) and boots.
f. Healthcare wastes produced during the care of COVID-19 patients should be collected safely in designated containers and bags, treated and then safely disposed.

VIII. Training of ESMP Security Staff

- Training of the ESMP staff and security staff will be carried out by the ESMU PMT team and PISSC team.

IX. Monitoring & Reporting Mechanism

Keeping in view the aggressive behavior of pandemic, effective and timely reporting will be the key to success; Environment officer of each sub-project will be the focal person, prepare a report on below format a on daily basis and submit to the PISSC through what sup group already working and PISSC Environment Specialist shall compile and submit the report 10:00 am on daily basis. (10:00 am – 10:00 am- 24hrs)

a) <u>Health Status of Workers</u>

- Contractor shall provide the Status in **Daily/Weekly report** of implementation, which includes following;

  - Total number of staff available on site
  - Number of total patients tested
  - Number of patients reported positive
  - Number patients reported negative
  - Number patients reported quarantine at hospital or home

b) <u>Status of Personal Protective Equipment and other supplies at each Sub-project site</u>

  - Temperature guns
  - Number of Gloves available and used

- Number of Mask available and used
- Availability of Hand sanitizer
- Number of Coverall available and used
- Contractor shall also submit the details of items procured and any actions taken for COVID-19 in each IPC and verified by the PISSC.

X. Signages / Communication

All Contractors shall install following signages at prominent locations after translation into Sindhi language. These are given as sample, while more could be developed jointly.

XI. Construction Contract Coverage for COVID 19 under Existing ESMP Budget.

The ESMP of existing contracts are prepared according to FIDIC guidelines, which cover the major resources to deal with conventional requirements. However following resources are available on each site, which are given in below table.

HSE related resources available at sub project sites

S.NO	Name of Sub-project	Name of Contractor	Number of Health & Safety Staff at Site	Ambulance
1.	Bandhaka	TBN		
2.	Baaro	TBN		
3.	Chakhri	TBN		
4.	Churlo	TBN		
5.	Sunn-2	TBN		
6.	Gadap-2	TBN		
7.	Khuda bux	TBN		
8.	Lat-2	TBN		
9.	Jharando-2	TBN		
10	Gorban Bhutti	TBN		
11	Dahri Sharif	TBN		
12	Jharando-1	TBN		
13	Gaib Janan	TBN		

XII. ESMP Budget for COVID Management

Given the unprecedented condition and specialized requirements for the provision of Personal Protective Equipment, like a special face mask, hand gloves, temperatures guns, hand sanitizer etc. can be used from the existing budget of ESMP and contingency amount provided in each contract. In addition to this, any un-utilized amount may also be used for the procurement of PPE and other required arrangements to handle with this pandemic situation.

Following are the amount which may be utilized for the procurement of PPE's and other instruments;

S.NO	Name of Sub-project	Name of Contractor	ESMP Budget	Amount Used till date	Amount remaining
1.	Bandhaka	TBN			
2.	Baaro	TBN			
3.	Chakhri	TBN			
4.	Churlo	TBN			
5.	Sunn-2	TBN			
6.	Gadap-2	TBN			
7.	Khuda bux	TBN			
8.	Lat-2	TBN			
9.	Jharando-2	TBN			
10	Gorban Bhutti	TBN			
11	Dahri Sharif	TBN			
12	Jharando-1	TBN			
13	Gaib Janan	TBN			

Find the latest information from WHO on where COVID-19 is spreading:

https://www.who.int/docs/default-source/coronaviruse/getting-workplace-ready-for-covid-19.pdf?sfvrsn=359a81e7_6