



GOVERNMENT OF SINDH

Irrigation Department

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA) FOR – 12 SMALL DAMS IN LOWER KOHISTAN REGION

Tikho-III, Pipre Baricha, Ghulam Mustafa, Kamal Shodo , Moosa Shoro, Purkhani, Kand Nai, Asabo, Janai, Hub 1, 2 & 3



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

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**PROJECT MANAGEMENT TEAM
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(IRRIGATION COMPONENT)
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This document and its contents have been prepared and 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
Col	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
KPAC	Kirthar Protected Area Complex
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
VECs	Valued Ecosystem Components
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 the twelve small dams (Tikho-III, Pipe Baricha, Ghulam Mustafa, Kamal Shodo, Moosa Shoro, Purkhani) in Tehsil Thano Bola Khan, District Jamshoro (Kand Nai, Asabo, Janai) in Tehsil Gadap, and (Hub 1, 2 & 3) in Tehsil Shah Mureed, District Malir of Sindh.

All proposed sites are fall in or near the Kirthar Protected Area Complex (KPAC)¹. Tikho-III, Pipe Baricha, Kand Nai & Asabo sites are in Kirthar National Park (KNP) while Ghulam Mustafa, Kamal Shodo and Janai sites have been proposed in Mahal & Hub Dam Wildlife Sanctuaries. Whereas, Moosa Shoro, Purkhani, and Hub 1, 2 & 3 sites have been proposed in the buffer zone of the KPAC.

Environmental categorization of the subprojects was done using the environmental and social assessment checklist provided in the ESMF prepared for the Project under World Bank safeguard policies. Since the storage volume of the proposed dams is less than 25 million cubic meters (1.86 mcm) and the surface area of the reservoir is also less than 4 sq. km (1.12 sq.km), therefore, all sub-project dams are within limits given in Schedule-I of IEE and EIA Regulations, 2014. These sub-projects fall under Schedule "I" so technically it will require an IEE. However, as the proposed project falls in a protected area, thus, an ESIA has been prepared in compliance to the requirements of the World Bank for such types of projects.

This Environmental Social Impact Assessment (ESIA) covers information on the prevailing physical, biological, socio-economic, and environmental aspects of the subproject 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.

¹ The Kirthar Protected Areas Complex (KPAC) stretches over 4,350 km², encompassing the protected areas (PAs) that lie in Kohistan in the southwest of Sindh. The KPAC comprises of Kirthar National Park (KNP), the Mahal Kohistan Wildlife Sanctuary (MKS), Hub Dam Wildlife Sanctuary (HDS), the Surjan, Sumbak, Eri, and Hothiano Game Reserves (SGR).





The sub-project areas are located in Kohistan region. Kohistan is a hilly area of the Kirthar Range comprises of both plain landforms and hilly terrain surrounded by mountains. The surface of the surrounding mountains and hill slopes is bare rock without soil cover and vegetation. The valleys between mountains and hills become green with grass when it rains in summers (June-August) and shows their capability to be used for crop cultivation. There are hundreds of small catchments and streams originating from Kohistan hills and drain water to the piedmont areas, where local farmers intercept. The rivers and small catchment runoff capture the moisture to grow the dryland crops.

The local settlements in project areas are also using subsurface and groundwater for irrigation. The groundwater depth varies from 150 to 350 ft. in different parts of the Kohistan region. If the rains are absent for more than 2 years, the subsurface water is dried making the local population get zero harvests. The proposed initiative by building groundwater recharge dams in the lower Kohistan region would sustain the groundwater availability for a longer time. Water collected in the dams would also serve the local livestock drinking water facility closer to the rangeland. 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 poles, and local human settlements.

This ESIA 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 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 closer to the rangeland. 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 poles, and local human settlements.

Due to the absence of water, agriculture in the area is affected. As a result, rain-fed crop 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 distance travelled by women to fetch water varies from area to area for instance, in Kohistan, they travel about two to three kilometres distance per trip.

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 small dams' total number of 1,965 households with 13,485 population will be benefited from project interventions.

No acquisition of any private land is required for these subprojects because nais and nalas (Rainwater Rivers) are state-owned properties. In addition, no demolition of structures will be involved and no one will be required to resettle as subproject 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 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 ESIA has been prepared. Existing tracks will be used for the transportation of the material, and it is capable for the transportation of material.

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 12 dam sites out of 45 most feasible sites have been selected considering findings of the reconnaissance survey & recommendations of the previous studies. Furthermore, after the construction of other dams such as Upper Mole, Aripir, Sureshi and Tikho-II in Kohistan region, the local community has requested to construct more dams in the area. Moreover, these sites have been evaluated and endorsed by the Sindh EPA, Sindh Wildlife Department, WWF and local communities, for their need and justification. Sindh EPA has conducted public hearing on project site, while Sindh EPA constituted an expert committee consisting on ten experts. The committee has already evaluated ESIA report and has issued NOC on same document. In addition to this, Sindh Wildlife department has also issued NOC after visiting these sites, Moreover some of the dam sites were also proposed by the Sindh Wildlife department.

The small dam sub-projects involve the construction of 22ft high earthen embankments and concrete structures of spillways. 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. It has been observed that after the construction



of first phase dams in the Kirthar National Park, the groundwater table has been changed from 150 feet to 200 feet, which have also attracted migratory birds and other wildlife provided drinking water in nearby community's wells, livestock, and other domestic use. Moreover, the construction of dam sub-projects is not going to impact the ecological conditions of flora and fauna in the sub-project areas significantly. Due to the availability of water during the drought period, the construction of dams will provide the water for flora and fauna; the entire biodiversity will nourish and flourish. The negative impact could only be anticipated during the construction phase, which will last for this very small period only. However, mitigation measures recommended in the report would need to be strictly ensured by the contractor during the construction period. Furthermore, all of the proposed dams of sub-project areas will be constructed on existing clearing or barren land to minimize the impacts on habitat. During the construction stage, the clearing of vegetation or land-use changes will only be anticipated at dam axis points and the camp areas. Moreover, no Permanent or temporary road will be constructed existing alignment will be used. Additionally, during the operational stage no machinery, equipment, etc. needs to be operated during the operation stage, as these are recharge dams on non-perennial streams of the area.

The samples were tested for 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 natural strata of the region) and microbiological contaminations (due to unavailability of sewerage system or open defecation in the area), as sets in the SEQS. Presence of Total Coliform is the source of concern, which will be mitigated by providing the water filtration system for the construction crew and will elaborate in the mitigation section. Groundwater analysis further confirms that, as there is no or in very meagre trace amount (far below the SEQS limits) of toxic metal detected.

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 detailed in this ESMP, prepared as part of this ESIA will not have any significant and irreversible negative impact on the physical, biological or socio-economic environment of the area; rather it will



have significant positive impacts that will ultimately result in sustainable development in the area.

Water retention against the mean annual flow of the small dams with respect to each nais/streams have been calculated. There are six dams namely Pipe Baricha (SRP-AF), Sangchat Jo Tar (Phase III), Aripir (Phase I), Upper Mole - II (Phase II), Moosa Shoro (SRP-AF), Purkhani (SRP-AF) having combine reservoir capacity is 1501 acre-ft falls in same catchment area on Mole river, while, the rest of the other proposed dam have their separate catchment areas. The combined reservoir storage capacity of six dams namely Pipe Baricha (SRP-AF), Sangchat Jo Tar (Phase I), Aripir (Phase I), Upper Mole - II (Phase I), Moosa Shoro (SRP-AF), Purkhani (SRP-AF) is 1501 acre-ft. As an average year, these small dams will be reducing flows of Mole River and water availability in Catchment Area of Mole River is 16497 (Acre-ft) hence only 9.1 % of water will be retained for the ground water recharge. The proposed twelve dams in addition to other small dams in the area will not impact adversely lower riparian, as there is enough potential to construct the other dams as well.

It has been concluded from the dam break study, the reservoir area of all twelve (12) dams is small and not exceeding 1.12 sq. Kilometers. Thus, the area inundated in a worst-case scenario (Combined dam breach + 100-year flood) 283 sq. km at Moosa Choro and the number of a person affected in the worst-case scenario is a 749,808 person. While the rest have low incremental impact of dam breach on a 100-year design flood which is not appreciable. In the case of Moosa Choro Dam, an appreciable population may be affected in event of high flood. An emergency preparedness plan will be prepared for all dams.

The corridor of impact area in case of Dam failure, 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 a few days (most probably 4-8 weeks) and temporary as the water will percolate to the aquifer. There are 12 Kacha tracks and 111 trees will be impacted due to the construction of 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.

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 ESIA, consultations with the stakeholders particularly the local communities and Government departments, NGOs were carried out.



E&S Safeguard monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be carried out at three levels. At the PMT 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, the relevant staff of Project Implementation Consultants (PISSC) will carry out more frequent safeguard monitoring. At the third level, PISSC and ESMU of PMT will produce monthly, quarterly and annual reports for ESMP implementation prepared as part of this ESIA.

The overall responsibility for implementing the SRP project as well as the present ESIA 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 ESMP. 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 is estimated that 111 trees will be felled for the construction of the above-mentioned twelve small dams none of them is endangered as per IUCN list. The replanting of 5 times trees against the number of cuts down trees would cost Rs 555,000/- considering the rate of Rs 1,000/- per tree. A separate budget of Rs 173,578,950/- has been allocated for the implementation of the ESIA including the management of COVID-19. For general community support an amount of Rs. 7,000,000/ has been allocated for each small dam site. This has been incorporated as a provisional sum item in the ESMP bill of each dam and BOQ.



2. INTRODUCTION

The Government of Sindh through World Bank financing successfully implemented the Sindh Resilience Project (SRP) with its focus on improving system at the provincial Government and key agencies for managing disaster risk. Moreover, 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). This ESIA document is focused on twelve small dams in KPAC.

In compliance with the national/provincial regulatory requirements and World Bank safeguard policies, and environmental and social assessment has been carried out to address the potentially negative impacts of the proposed interventions under SRP. As an outcome of this assessment, the present Environmental and Social Impact Assessment Report (ESIA) has been prepared for the works to be carried out. Besides, an Environmental and Social Management Framework and Resettlement Policy Framework (ESMF/RPF) – provided separately.

All proposed small dams are located in Kohistan area. The height of these dams 22 ft. each. The small dams in Lower Kohistan region will 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. Existing tracks will be used for the transportation of the material, and it is capable for the transportation of material.

The major components of each sub-project are 22ft high earthen embankments, concrete structures of spillways, and construction of a one-room building for dam supervision staff. Main activities involved in the construction works include concrete works, obtaining soil from borrow areas and transporting it to the dam site, soil compaction, stone pitching on slopes of embankments, and stone riprap apron upstream and downstream of spillways. The Contractor will also need to establish some temporary facilities as well, including material yard and construction camp for the workforce.

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-year period 2021-2025. The funding for Sindh Irrigation Department (SID) is 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.

2.2 Objective of ESIA

The primary objectives of the ESIA 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 ESIA.

2.3 Justification for construction of Dams in Project Area

Pakistan has experienced an increase in the frequency and severity of drought due to a rise in temperatures, adverse effects of El Nino, and a decrease in rainfall during the monsoon season. As per the Pakistan Meteorological Department (PMD) 2018-2019, severe drought-like conditions have emerged over much of southern Pakistan, with an expectation for further deterioration over the next 4 years.²

Sindh province faces drought in the northern and eastern regions repeatedly. 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 drought situation in 2013 had affected 4.9 million heads of cattle and 0.5 million people, resulting in the death of 750 persons³. 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 parts of Sindh, and a strong heatwave in June-July 2015, which caused more than 1200 fatalities from heatstroke and dehydration,

² <https://reliefweb.int/disaster/dr-2018-000428-pak>

³ <http://documents.worldbank.org/curated/en/121421468098388242/pdf/PIDISDS-APR-Print-P155350-05-26-2016-1464278669422.pdf>



mostly in Karachi (the provincial capital).⁴ In 2018 Pakistan received reduced rainfall during the monsoon season (May to August), with Sindh 69.5 percent below the average.

In a drought situation, people migrate 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. 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 many positive effects of the proposed sub-project, which in general will improve the socio-economic and environmental conditions of the sub-project areas, including:

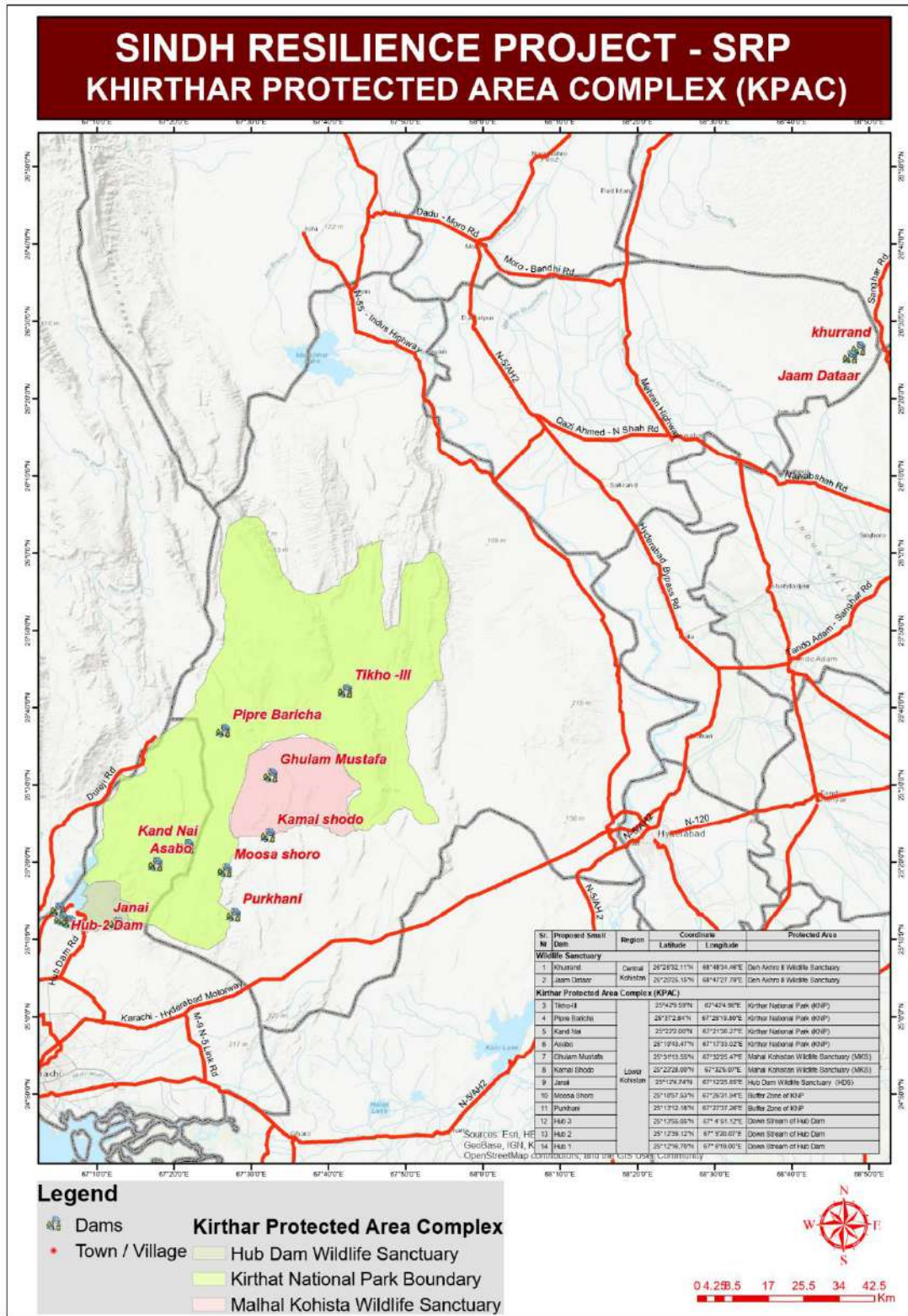
- Since, the project sites are located within the protected area that is the habitat of various flora and fauna, in drought season; these are at risk due to unavailability of water. The construction of dams will ensure the availability of water.
- Sub-project also contribute expansion of habitat for wildlife found in the area, it also provides feeding ground for birds and associated fauna.
- The project will help in recharging the groundwater and provide water in the areas where it is crucial for drinking, domestic use, and livestock.
- The project will help in the improvement of the domestic water supply.
- With the availability of water, more people and more livestock will sustain, thus helping in the social uplift of the local population.
- Due to the project, intervention water will be available for a longer period, which will augment to uplift socio-economic activities.

All proposed sites falling in or near the Kirthar Protected Area Complex (KPAC)⁵. Tikho-III, Pipe Baricha, Kand Nai & Asabo sites are in Kirthar National Park (KNP) while Ghulam Mustafa, Kamal Shodo and Janai sites have been proposed in Mahal & Hub Dam Wildlife Sanctuaries. Whereas, Moosa Shoro, Purkhani, and Hub 1, 2 & 3 sites have been proposed in the buffer zone of the KPAC as given in Figure – 1. Since, the project sites are located within or near (buffer zone) the KPAC that is the habitat of various flora and fauna, in drought season, these are at risk due to unavailability of water. The construction of dams will ensure the availability of water.

Apart from these proposed dams, Sindh Wildlife department has also planned various check dams to ensure the availability of water for wildlife in KNP. Deputy Director, Wildlife Department during the meeting at his office, also supported these projects. Therefore, Kohistan region is one of the potential sites in Sindh Province, to construct, small dams, delay action dams, and weirs to retain the runoff generated from storm rainfall.

4 PAD for SRP, Report No: PAD 1684

⁵ The Kirthar Protected Areas Complex (KPAC) stretches over 4,350 km², encompassing the protected areas (PAs) that lie in Kohistan in the southwest of Sindh. The KPAC comprises of Kirthar National Park (KNP), the Mahal Kohistan Wildlife Sanctuary (MKS), Hub Dam Wildlife Sanctuary (HDS), the Surjan, Sumbak, Eri, and Hothiano Game Reserves (SGR).





2.4 Sub-Project Categorization

The ESMF 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 degradation of forests of sensitive areas, requiring land acquisition or dam height more than 15m; ii) an ESMP (and an 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 subprojects resulting in low/negligible impacts.

The initial screening carried out as per the criteria defined above suggests that the proposed sub-project of construction of small storage/recharge dams is likely to cause moderate to significant environmental and social impacts, therefore, this sub-project falls under category B under characterization criteria described above. However, as the proposed twelve dams are located within or near the KPAC, ESIA has been prepared in consultation with the World Bank safeguards team accordingly, to meet the Category A sub-project requirements.

2.5 Sub-project 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 twelve proposed small dams are attached as Annexure – I.

- A total 111 number of trees would be felled due to the construction of twelve dams.
- Only four dams are to be constructed in Kirthar National Park. None of the proposed dam in or near (minimum distance is 7 Km) the hotspot area.
- No archaeological site observed near (within 500 meters) the 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 the dam sites. The nearest settlement is about an average of 1km away from proposed small dam sites.
- During construction phase few habitats might be disturb but this impact is temporary and reversible in nature having short duration with low significance (by adopting the mitigation measures). Because proposed dams and campsites will occupy small areas and will be located in existing clearings.
- No resettlement is expected due to the construction of small dams.
- No protected forests were observed near proposed small dam sites. 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 for the TDS, Chlorides, and Total coliform; the values of these parameters are slightly high as limits set in SEQS.

2.6 Construction Time

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.

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, which is available on www.srp Irrigation.gos.pk.

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, sub-section-I "Dams and Reservoirs with Storage volume less than 25 million cubic meters of surface area less than 4 sq.-km". Since the storage volume of the proposed dams are 1.86 million cubic meters having reservoir area 1.12 sq. km, therefore, all sub-project dams are within limits given in Schedule-I of IEE and EIA Regulations, 2014. These sub-projects fall under Schedule "I" so technically it will require an IEE. However, as the proposed project falls in or near KPAC, which is a protected area, thus, an ESIA has been prepared to satisfy the requirements of the World Bank for such type of projects. Moreover, No Objection Certificate (NOC) will be 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. As proposed dam sites are located within Kirthar Protected Area complex (Kirthar National Park, Mahal Kohistan Wildlife Sanctuary, Hub Dam Wildlife Sanctuary) for which correspondence has been made by PMT-SRP with Sindh Wildlife Department regarding NOC. Copy of Letter is attached as Annexure – II. During the survey of small dams, it is observed that, no proposed dam is planned to be constructed within hotspot areas.



Sindh Forest Act, 2012

The Forest Act will execute the sub-projects, 2012 and no unauthorized tree cutting will be allowed to workers or labour. Additional plantation will be made and for that, purpose funds have been allocated in the contract under the Environmental, Social and COVID-19 Management and Monitoring Plan (ESMP) implementation cost bill.

During the Survey of Small dams, it was observed that no proposed small dam site falls within any protected forest. Additional plantation will be made and for that, purpose funds have been allocated in the contract under the Environmental, Social and COVID-19 Management and Monitoring Plan (ESMP) implementation cost bill.

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

Sindh Cultural Heritage (Preservation) Act, 1994

It is the provincial law for the protection of cultural assets. Its objective are similar to those of Antiquity Act.

No known areas of cultural heritage will be impacted by the sub-project. Procedures will be in place to deal appropriately with any chance finds.

National Resettlement Policy, March - 2002 (Draft)

It has addressed to those areas, which are not looked after in LAA and will be applicable wherever the people, families or communities are affected by any public sector or private development project, even when there is no displacement. The Policy also aims to compensate for the loss of income to those who suffer due to loss of communal property including common assets, productive assets, structures, other fixed assets, income and employment, loss of community networks and services, pasture, water rights, public infrastructure like mosques, shrines, schools, graveyards etc.

It is not relevant since there is no resettlement.

Land Acquisition Act 1894

Empowers the government to acquire private land for projects of national importance and lays down the acquisition procedure.

If the land for the project is acquired through the government, the acquisition process shall comply with this law.





The Sindh Occupational Safety and Health Act, 2017

The clauses relevant to the project are those, which concern health, safety and welfare of workers, disposal of solid wastes and effluents, and damage to private and public property. The Act also provides regulations for Compulsory vaccination, inoculation, and Precautions against contagious or infectious disease at workplaces. All these regulations will be applicable to the project construction's contractor.

The Sindh Prohibition of Employment of Children Act, 2017

The Sindh Prohibition of Employment of Children Act, 2017 prohibits the employment of children and to regulate employment of adolescents in certain occupations and work. Whereas it is expedient to prohibit the employment of children and to regulate employment of adolescents in certain occupations and work and to provide for matters connected therewith.

The minimum age for starting work is 14 years under Sindh Prohibition of Employment of Children Act, 2017.

The Bonded Labor System (Abolition) Act, 1992

This Act abolishes the bonded labour system in Pakistan, and discharges all bonded laborers from any obligation to render such labour.

Proponent and its contractors will be bound by the act to disallow any bonded labour at the subproject sites or campsites.

Workmen's Compensation Act, 1923

The workmen's compensation act, 1923, is a type of social security legislation. The compensation is paid in event of an accident or injury (including some occupational disease) that arises out of or during the employment and that results in total or partial disablement or demise of the worker. Every employee (including those employed through a contractor but excluding casual employees), who is engaged for the purposes of employer's business and who suffers an injury in any accident arising out of and in the course of his employment, shall be entitled for compensation under the Act.

The contractor of the sub-project areas have to comply with this act.

ILO Conventions

Pakistan is the signatory of various conventions on the conservation of the environment and wildlife protection. The country is thus obliged to adhere to the commitments specified in these conventions.

ILO Conventions - Ratifications for Pakistan are as follow:

- C029 - Forced Labor Convention, 1930 (No. 29)
- C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111)
- C138 - Minimum Age Convention, 1973 (No. 138)
- C001 - Hours of Work (Industry) Convention, 1919 (No. 1)



2.7.2 The World Bank Operational Policies

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 Relevance

Directive	Policy	Description	Triggered = ✓, Not Triggered= x	Relevance = ✓, Not Relevance= x	Comments
Environmental Assessment	OP 4.01	This OP requires environmental assessment (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.	✓	✓	As the Project falls into Category A, a full assessment has to be carried out.
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 ESIA.
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	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	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	x	x	Not triggered as no Indigenous People or ethnic minorities will be affected by the sub-project.



Directive	Policy	Description	Triggered = ✓, Not Triggered= x	Relevance = ✓, Not Relevance= x	Comments
		and to avoid or mitigate impacts on this potentially vulnerable group.			
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	x	No known areas of cultural heritage will be impacted by the sub-project. Procedures will be in 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.	✓	x	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.	✓	✓	ESIA summary would be available in Sindhi to the public and would be available on SRP website.
The labor influx guideline (2016)		This guideline deals with managing risks of adverse impacts on communities from temporary project induced labour influx/	✓	✓	This guidelines is applicable.



2.7.3 World Bank Environmental, Health and Safety Guidelines

World Bank Group's Environmental, Health, and Safety (EHS) Guidelines are applicable to the proposed project. In particular, contractors will be required to implement the General EHS Guidelines (April 2007)⁶.

2.7.4 Guidance Note regarding the influx of Labor

The project may face an influx of non-local labor and working conditions issues as skilled laborers might not be available in some of the sub-project sites. The project will take concrete measures to mitigate potential labor influx-related risks.⁷ These risks require careful consideration to improve social and environmental sustainability, resilience and social cohesion. Therefore, the project will include mitigation measures such as: (a) assessing living conditions of workers' camps and ensuring appropriate living conditions; (b) establishing and enforcing a mandatory Code of Conduct for the workers, (c) ensuring appropriate location for these camps; (d) taking counter measures as indicated in the ESMP to reduce the impact of the labor influx on the public services and, (e) devising and implementing a strategy for maximizing employment opportunities for local population, including women.

2.7.5 World Bank Group Gender Strategy (2016-2023)

The World Bank Group's Gender Strategy (fiscal year [2016–23]) presents gender equality as integral to smart development policy and posits that successful implementation of the strategy will help achieve the Bank Group's Goals. The strategy focuses on four objectives: human endowments, jobs, asset control and ownership, and voice and agency. To implement the strategy, capacity building for local law enforcement and Information and awareness raising campaigns for community members, specifically women and girls have been proposed in the ESIA. Mobilizing rural communities with a view to maximizing the benefits of the project.

2.8 Compliance with Environmental, Social and COVID-19 Management and Monitoring Plan (ESMP)

The ESMP section of ESIA report will be part of the bidding documents and its compliance is mandatory. Furthermore, all condition that will depict in the NOC have to be comply with and this will be part of bid document. The contractor may request amendments in Environmental, Social and COVID-19 Management and Monitoring Plan (ESMP) for aligning it with ground realities and requirements for each subproject/sites mentioned. 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 E&SS team of PMT. If acceptable, the amendments would be communicated to the contractor by PISSC.

⁶ World Bank Group EHS Guidelines are available at:
<http://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

⁷ <https://pubdocs.worldbank.org/en/497851495202591233/Managing-Risk-of-Adverse-impact-from-project-labor-influx.pdf>



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 ESIA Methodology

2.9.1 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. The following activities were performed for data collection.

- Site Reconnaissance
- Detailed site visits
- Analysis of Maps and Plans
- Literature Review
- Desk Research
- Public consultations and interviews
- Field observations and studies
- Laboratory Analysis

2.9.2 Reconnaissance Survey of Project Area

Reconnaissance visit of the area was made during September – October 2020. It is just a bird's eye view of the proposed small dam sites. In this visit, experts in various disciplines including environmental and social fields accompanied the members of Panel of Experts. During this visit the environmental and social experts got acquaintance with project area in consideration of various alternative scenarios of dam axis and collected information from the locals about contact persons/notable of the area to facilitate the consultants for environmental and social surveys. During visit contacts were made with local notables, local administration and elected public representatives for making arrangements for calling people of the concerned villages for scoping sessions. Visit was also aimed to familiarizing with physical and socioeconomic environment of the sub-project area as well as surrounding areas and to identify the critical areas of environmental and social concerns.



2.9.3 Field surveys

Surveys were carried out in order to investigate physical, biological, and socioeconomic conditions of the area, were carried out during the November – December 2020. Primary data collection included the following:

Environmental Survey: In compliance to TOR, the consultants have carried out environmental survey / field investigation of various parameters, particularly with reference to the aspects described below:

- Investigation/survey of the affected ecosystem, flora and fauna of the project affected areas, including dam site, access road, probable spoil dumping sites, camping areas, etc.
- Asset survey for trees likely to be cut or submerged by the development of the project. This also includes census of farmland and other natural resources that will be inundated or otherwise degraded, either temporarily or permanently.
- Ambient air quality, noise level monitoring and water sampling was carried as per SEQS.

Socioeconomic Survey: Socio-Economic field surveys were work convene at IB HPP project site. Following aspects have been covered in these field surveys:

- Socio-economic data of all the households has been collected through pre design questionnaires.
- Gender survey; It has been done by deploying the female field staff. It covers whole project area.

2.9.4 Public Consultations

Besides consultation with knowledgeable people during the reconnaissance visit of the project area, consultation with local communities through three scoping sessions was carried out during the field surveys. The purpose of the scoping sessions was to disseminate information on the scope of the Project, assess stakeholders' views and about the Project and get first-hand information on the concerns of the population in relation to environmental and social effects and likely mitigation options.



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 22ft each. In addition to recharging groundwater aquifers, these proposed small dams 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 while location Map of proposed dam site is shown in Figure-2 & 3.

i. Tikho-III

The proposed dam site is located at 25°42'9.59"N 67°42'4.96"E in Union Council Toung of Taluka Thano Bola Khan District Jamshoro. The site is approachable through Karachi-Hyderabad M-9 via Nooriabad on Kirthar Park Road. The proposed small dam site is about 80 km from Nooriabad City and 40 km away from Tano Bola Khan Town via Kirthar National Park Road.

ii. Pipe Baricha

Pipe Baricha site is found at 25°37'2.84"N 67°26'19.80"E in Union Council Mole of Taluka Tano Bola Khan, District Jamshoro. The site is approachable by Tano Bola Khan through Kirthar Park Road via Mole Town. The proposed small dam site is about 65 km from Tano Bola Khan and about 35 km from Mole on the dirt road. No temporary/permanent road would be constructed for an approach to the small dam site. A nearby settlement is Piper Khan Barecho, which is about 2 km away (downstream).

iii. Ghulam Mustafa

The proposed site is located at 25°31'13.55"N 67°32'25.47"E in Union Council Mole Taluka/Tehsil Tano Bola Khan of District Jamshoro. The site is approachable by Tano Bola Khan through Kirthar Park Road via Mole Town. The proposed small dam site is about 55 km from Tano Bola Khan and about 38 km from Mole on the dirt road. A nearby settlement is Muhammad Rahim Burfat, which is about 3 km away (downstream).

iv. Kamal Shodo

Kamal Shodo small dam site is located at 25°23'28.00"N 67°32'6.07"E near Kamal Khan Shodo village (1 km upstream) on Sai Sung - Mole dirt road, Union Council Sari. The site is approachable through Karachi - Hyderabad Motorway M-9 via Manchar Lake Road to Sari Town. The proposed small dam site is about 30 km from Sari Town.





v. Moosa Shoro

Moosa Shoro small dam site is located at 25°18'57.53"N67°26'31.94"E near (about 2km upstream) to Goth/village Moosa Shoro in Union Council Mole, Tehsil Tano Bola Khan. The site is approachable through Karachi -Hyderabad Motorway M-9 via Manchar Lake Road to Sari Town. The proposed small dam site is about 25 km from Sari Town towards the west side.

vi. Purkhani

Purkhani site is located at 25°13'12.18"N67°27'37.26"E in Union Council Mole of Taluka Tano Bola Khan District Jamshoro. The site is approachable by M. Usman Choro Goth through Manchar Lake Road via dirt road/village road. The proposed small dam site is about 30 km from Noor Muhammad Kathor Goth/village. A nearby settlement is about 3 km away (upstream).

vii. Kand Nai

Kand Nai dam site is at 25°22'2.00"N 67°21'36.27"E in Lower Kohistan region near to Muhammad Qasim Kanro on Kand Nai stream, in Union Council Moidan Taluka/Tehsil Gadap of District Malir. The site is approachable through Karachi - Hyderabad Motorway M-9 via Gadap Road. The proposed small dam site is about 80 km from Karachi and 35 km from Gadap town on Kirthar Park Road. A nearby settlement is about 1 km downstream from the proposed site.

viii. Asabo

The proposed dam site is located at 25°19'43.47"N 67°17'33.02"E near Village Pathan Khan Bhurro (about 2 km away upstream), Union Council Moidan of Taluka/Tehsil Gadap District Malir. The site is approachable by Kirthar park road (dirt road) via Gadap Town. The proposed small dam site is about 45 km from Gadap City.

ix. Janai

The proposed dam is situated at 25°12'4.74"N 67°12'25.65"E in Union Council & Tehsil Gadap, District Malir. The site is approachable through Gadap-Karachi Road via Kirthar Park Road. The proposed small dam site is about 20 km from Gadap Town. A nearby settlement is Haji Rasool Bux Khaskheli, which is about 1 km downstream.

x. Hub-3

The proposed dam site is located at 25°13'55.05"N 67° 4' 51.12"E in Union Council Allha Pai, Tehsil Shah Mureed, District Malir. The site is approachable through Karachi Hub Dam Road. The proposed small dam site is about 45 km from Karachi. A nearby settlement is Ali Muhammad Birohi, which is about 2 km downstream.

xi. Hub-2

The proposed dam site is located at 25°12'39.12"N 67° 5'20.07"E in Union Council Allha Pai, Tehsil Shah Mureed, District Malir. The site is approachable through Karachi Hub Dam Road. The proposed small dam site is about 40 km from Karachi. A nearby settlement is Karim Bux Birohi, which is about 1 km downstream.



xii. Hub-1

The proposed dam site is located at 25°12'16.70"N 67°6'19.00"E in Union Council Allha Pai, Tehsil Shah Mureed, District Malir. The site is approachable through Karachi - Hub Dam Road. The proposed small dam site is about 38 km from Karachi. A nearby settlement is Yar Muhammad Birohi, which is about 2 km downstream.

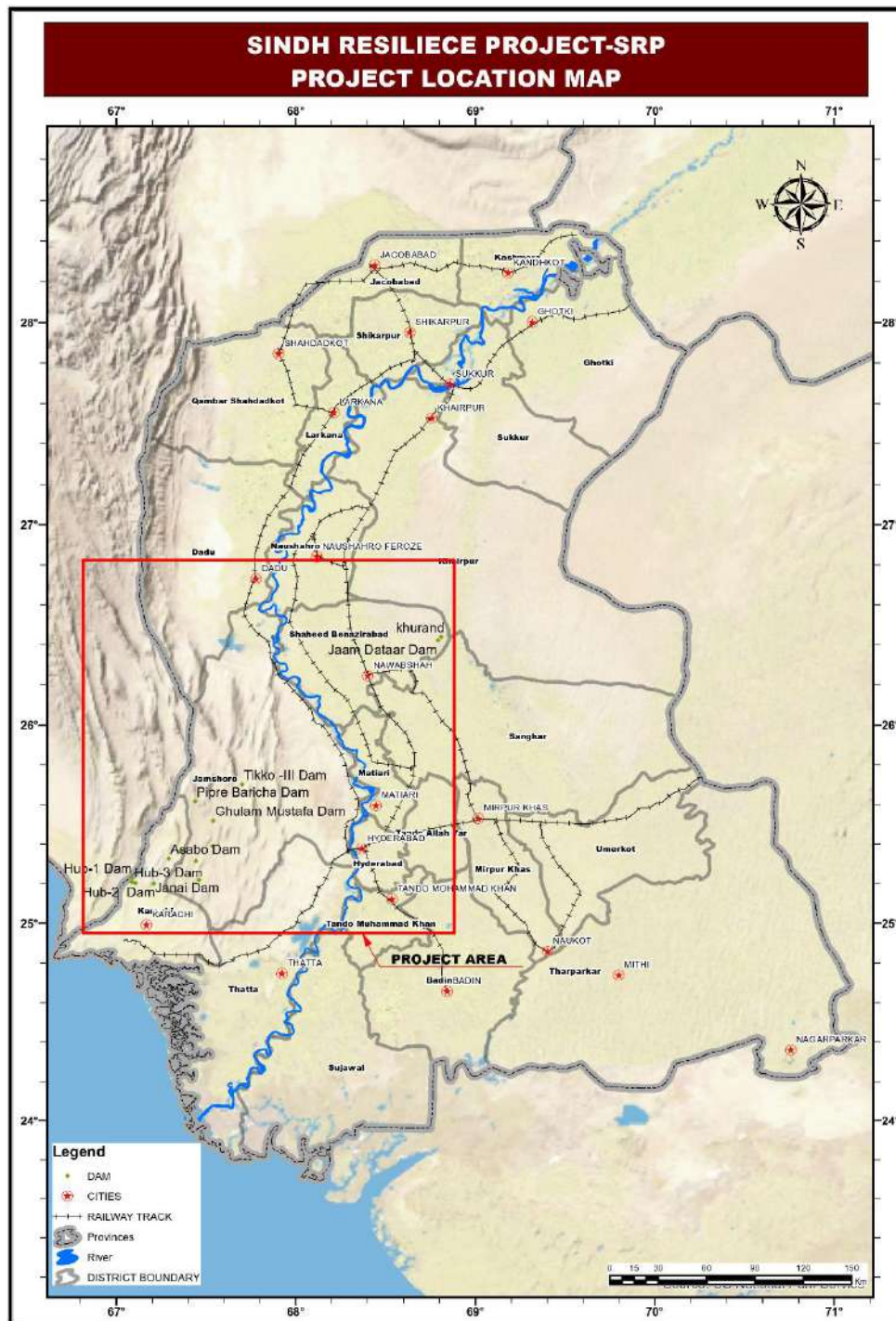


Figure 2: Location of the SRP Sub-Project Area



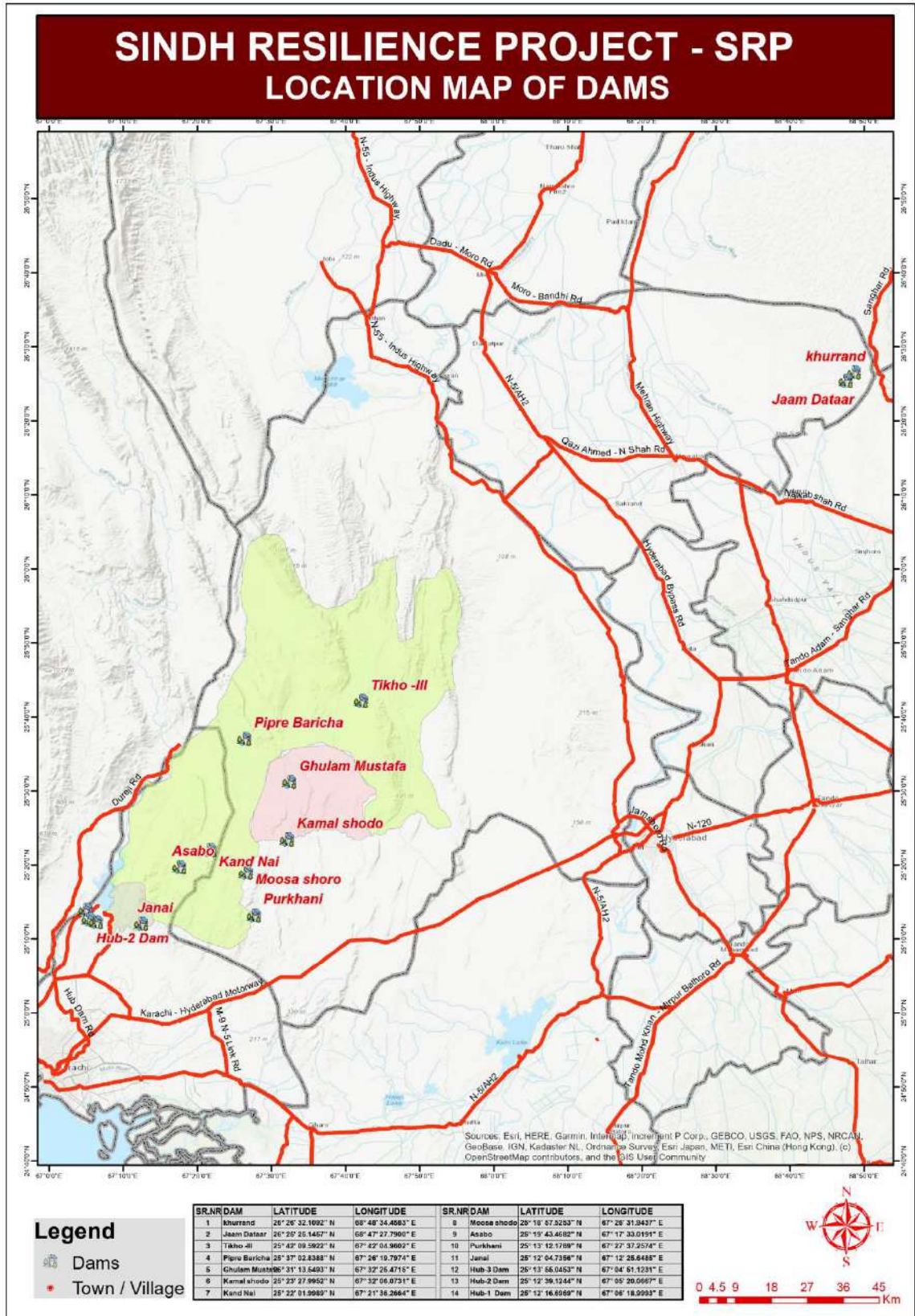


Figure 3: Location Plan of Dams in Lower Kohistan Region



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 is to recharge groundwater water may be used for domestic and livestock purposes. Salient features of sub-projects are given in Table – 2 below.

Table 2: Salient Features of the Sub-Project

Description	Sub Project Name											
	Tikho - 3	Pipe Baricha	Ghulam mustafa	Kamal shodo	Moosa shoro	Purkhani	Kand nai	Asabo	Janai	Hub - 1	Hub - 2	Hub - 3
Catchment Area (sq.mile)	97.2	23.6	13.1	21.5	143.0	193.3	6.3	13.7	1.5	3.9	6.8	11.6
Design Flood (cfs)	11,947	11,994	6,970	10,701	24,589	26,957	6,011	8,983	2,692	4,822	7,034	9,391
El.of Spillway Crest (ft)	661	1,459	1,156	981	922	571	831	1,029	650	312	272	207
Spillway Width (ft)	370	210	220	185	550	330	190	280	130	185	155	160
Head Over Crest (ft)	4.1	5.9	4.0	6.0	5.0	7.5	4.0	4.0	3.0	3.5	5.1	6.0
Highest Flood Level (ft)	664.6	1,464.4	1,159.5	986.5	927.0	578.0	835.0	1,032.5	652.5	315.0	277.1	212.5
El.of Dam Crest (ft)	667.5	1,467.5	1,162.5	989.5	930.0	581.0	838.0	1,035.5	655.5	318.0	280.0	215.5
Dam Height above Riverbed (ft)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Weir height above river bed (ft)	15.0	13.0	15.0	13.0	14.0	11.5	15.0	15.0	16.0	15.5	14.0	13.0
Reservoir area at normal pool level (Acre)	66.2	10.2	29.5	14.3	54.2	24.0	31.0	11.4	13.2	7.1	10.1	5.6
Reservoir Area (Sq.-Km)	0.268	0.041	0.119	0.058	0.219	0.097	0.125	0.046	0.053	0.029	0.041	0.023
Reservoir Capacity (Ac-ft)	295.5	49.0	173.6	66.6	380.4	115.0	161.4	85.6	68.5	28.8	51.9	33.3
Storage Volume (m-c-m)	0.364	0.060	0.214	0.082	0.469	0.142	0.199	0.106	0.085	0.035	0.064	0.041

The proposed small 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, water quantities for construction & Nos of Trips are given in Table – 3, 4 & 5 respectively. The materials used for the construction of the sub-project proposed dams include coarse aggregates, fine aggregates (sand), rock for stone pitching and riprap, earth, water, cement, and steel.

Table 3: Estimated Quantities of Construction Materials

Sr. No	Proposed Small Dams	Earthwork (Cft)		Cement Concrete (Mass)	Cement Concrete (RCC)	Steel	Protection Stones	Filter Media		Waterstop PVC
		Excavation	Fill	Mass (Cft)	RCC (Cft)	(Kg)	(Cft)	Fine (Cft)	Coarse (Cft)	No.
1	Tikko -III	1,329,053	673,194	355,148	226,181	359,181	295,208	133,634	162,742	3,709
2	Pipre Baricha	970,642	106,957	208,803	184,486	292,968	65,147	25,022	35,621	2,124
3	Ghulam Mustafa	805,077	120,587	219,563	176,919	280,952	63,332	26,268	37,758	1,508
4	Kamal shodo	596,916	72,334	142,348	152,218	241,726	54,400	20,414	27,356	4,195
5	Kand Nai	690,315	191,021	179,075	158,868	252,286	77,578	36,141	51,054	4,565
6	Asabo	1,129,517	183,504	265,699	189,109	300,310	114,888	43,557	51,916	3,327
7	Moosa khan shoro	1,918,336	530,851	550,898	290,416	461,187	181,700	86,682	118,801	4,909
8	Purkhani	1,705,125	159,280	344,526	246,554	391,533	91,320	36,427	52,009	4,185
9	Janai	684,213	286,548	115,742	129,987	206,422	138,316	60,272	78,195	3,370
10	Hub-1	873,580	200,081	165,801	157,699	250,429	119,590	52,928	68,246	4,365
11	Hub-2	614,725	71,439	113,501	124,440	197,614	59,369	19,891	24,670	6,002
12	Hub-3	759,913	213,918	159,147	161,936	257,159	74,829	35,352	53,105	3,346
Total		12,077,414	2,809,712	2,820,250	2,198,815	3,491,766	1,335,678	576,587	761,474	45,606

Natural materials such as coarse aggregate, toe drain stones, riprap stones, and coarse filters can be obtained from crush plants of local suppliers. The procurement of these materials cannot be done from illegal crushing plants/ suppliers. Only purchase by those crush plants/ suppliers having approval from relevant department of Sindh Government and this should be part of the contract agreement with contractor. Sindh Mines and Mineral Department, Sindh Environment Protection Department, and Labor Department are regulating the extraction of such materials, with their respective mandate. These departments have their monitoring and mitigation system in place. The fine aggregate and



fine filters will be obtained and transported from approved query areas. Existing tracks will be used for the transportation of the material, and it is capable for the transportation of material.

Table 4: Estimated Quantities of Water for Construction Work

Sr. No	Proposed Small Dams	Earthwork (Cft)	Water required for Compaction	Cement Concrete (Mass)	Water required	Cement Concrete (RCC)	Water required	Water required for construction (Total)	
		cft	cft	cft	cft	cft	cft	cft	Cusec
1	Tikko -III	673,194	80,783	355,148	32,286	226,181	16,156	129,225	0.004
2	Pipre Baricha	106,957	12,835	208,803	18,982	184,486	13,178	44,994	0.001
3	Ghulam Mustafa	120,587	14,470	219,563	19,960	176,919	12,637	47,068	0.001
4	Kamal shodo	72,334	8,680	142,348	12,941	152,218	10,873	32,493	0.001
5	Kand Nai	191,021	22,923	179,075	16,280	158,868	11,348	50,550	0.002
6	Asabo	183,504	22,020	265,699	24,154	189,109	13,508	59,683	0.002
7	Moosa khan shoro	530,851	63,702	550,898	50,082	290,416	20,744	134,528	0.004
8	Purkhani	159,280	19,114	344,526	31,321	246,554	17,611	68,045	0.002
9	Janai	286,548	34,386	115,742	10,522	129,987	9,285	54,192	0.002
10	Hub-1	200,081	24,010	165,801	15,073	157,699	11,264	50,347	0.002
11	Hub-2	71,439	8,573	113,501	10,318	124,440	8,889	27,779	0.001
12	Hub-3	213,918	25,670	159,147	14,468	161,936	11,567	51,705	0.002
Total		2,809,712	337,165	2,820,250	256,386	2,198,815	157,058	750,610	0.02

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.

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



Table 5: Nos. of Trips for transportation of Construction Material

Sr. No	Proposed Small Dams	Dumper required. (1000cft)	Dumper required. (1000cft)	Trucks required for cement (600 bags capacity)	Dumper (1000cft) required for Sand	Dumper (1000cft) required for Coarse aggregates	Trucks req. for cement	Dumper (1000cft) required for Sand	Dumper (1000cft) required for Coarse aggregates	Trailer required of 60 ton capacity	Truck required of 28 ton capacity	Dumper req. (Fine + Coarse) (1000cft)	Total trips
		No.	No.	No. of trips	No. of trips	No. of trips	No. of trips	No. of trips	No. of trips	No. of trips	No. of trips	No.	No.
1	Tikko -III	1,329	673	86	97	194	43	65	129	6	694	296	3,612
2	Pipre Baricha	971	107	51	57	114	35	53	105	5	153	61	1,711
3	Ghulam Mustafa	805	121	53	60	120	34	51	101	5	149	64	1,561
4	Kamal shodo	597	72	35	39	78	29	43	87	4	128	48	1,159
5	Kand Nai	690	191	43	49	98	30	45	91	4	182	87	1,511
6	Asabo	1,130	184	64	72	145	36	54	108	5	270	95	2,163
7	Moosashoro	1,918	531	134	150	300	55	83	166	8	427	205	3,978
8	Purkhani	1,705	159	84	94	188	47	70	141	7	215	88	2,798
9	Janai	684	287	28	32	63	25	37	74	3	325	138	1,697
10	Hub-1	874	200	40	45	90	30	45	90	4	281	121	1,821
11	Hub-2	615	71	28	31	62	24	36	71	3	139	45	1,124
12	Hub-3	760	214	39	43	87	31	46	93	4	176	88	1,581
Total		12,077	2,810	684	769	1,538	419	628	1,256	58	3,138	1,338	24,716

3.6 Contractor's Camps

For the construction of dams and appurtenant works, camps will be established on the government land near the dam sites a minimum of 500 m away from settlements. As construction works are confined only to the dam's site, therefore, camps will be placed as per designated sites. During consultations, the major demand of community was provision of jobs during construction phase. Moreover, based on experience of previous phase, it would be safe to say that sufficient number of labor particularly unskilled is available in the sub-project area. The sub-project contractors will hire the unskilled labour. The contractor will bound to provide jobs to local people for unskilled labor from the communities and this should be 100% if not available in the project area then may hire from outside the project area. All of this process would be initiated with the consultation of elders of different communities in an equitable manner and there would be no need of setting up a large-scale camp.

Only 25 to 30 workers will be accommodated in each camp. Most of the laborers will go back to their nearby homes after completion of the daily work, including drivers/operators (tractor trolley, loader. etc.) and some semi-skilled labour. 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. COVID vaccination should be mandatory for all workers, and to present or submit their vaccination proof/ certificate to contractor. The government of Sindh, has provided the COVID19 vaccine at all district and tehsil Civil



Hospitals and nominated private hospitals free of cost. Contractors staff without COVID Vaccination card/certificate are not allowed on site. 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 in Table – 6.

Table 6: Details of the Camps Site for Sub-Project

Sr. No.	Sub project Name	Coordinates		Away from the Dam site (m)	Away from the Settlement (m)	Land Required (Acres)
		Northing	Easting			
1	Asabo	25°19'26.78"N	67°17'36.40"E	537	1615	4
2	Kand Nai	25°21'44.90"N	67°21'14.90"E	797	1116	4
3	Pipre Baricha	25°36'50.35"N	67°26'2.43"E	689	584	4
4	Moosa Chhoro	25°19'4.02"N	67°26'9.65"E	625	1152	4
5	Janai	25°12'25.77"N	67°12'39.89"E	762	1783	4
6	Ghulam Mustafa	25°30'56.53"N	67°32'38.42"E	680	2141	4
7	Tikho-3	25°41'29.16"N	67°41'25.98"E	1615	1265	4
8	Purkhani	25°13'33.37"N	67°27'20.92"E	728	1798	4
9	Kamal Shodo	25°23'16.55"N	67°31'51.83"E	672	2432	4
10	Hub-1	25°12'22.26"N	67° 5'59.45"E	607	786	4
11	Hub-2	25°12'21.45"N	67° 5'10.47"E	655	658	4
12	Hub-3	25°14'12.75"N	67° 5'18.17"E	933	658	4

Proposed campsites location map and vehicle route maps are attached as Annexure – III and photo log as Annexure - IV.

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 identify their borrow areas as per their arrangement and get the approval from PMT/PISS. The contractor will be bound to procure the material from authorized quarries. Before start of the work contractor will get approval.

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. The contractors will directly manage all equipment. The estimated machinery and equipment required are given in Table – 7. However, the actual number of equipment required on the site will be determined by the contractor to carry out the strengthening work.



Table 7: List of Machinery and Equipment to be used on all Sub-Projects

Machinery/ Equipment	Sub Project Name												Total
	Tikho-III	Pipe Baricha	Ghulam Mustafa	Kamal Shodo	Moosa Shoro	Purkhani	Kand Nai	Asabo	Janai	Hub-3	Hub-2	Hub-1	
Loader	3	3	3	4	3	3	4	4	3	3	3	3	39
Tractor Trolley dumper	8	8	7	6	8	8	7	8	8	10	8	6	92
Earth leveler machine	2	2	2	2	2	2	2	2	2	2	2	2	24
Excavator	3	3	3	4	3	3	4	3	3	3	3	3	38
Transit Mixtures	4	4	4	5	4	4	5	5	4	4	3	3	49
Batch Plant	1	1	1	1	1	1	1	1	1	1	1	1	12
Total	21	21	20	22	21	21	23	23	21	23	20	18	254

3.9 Manpower Requirement

The manpower required by the contractor during the execution of the sub-projects is given in Table – 8.

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 8: Estimation of Required Manpower

Sr. No.	Type of Manpower	Sub Project Name												Total
		Tikho-III	Pipe Baricha	Ghulam Mustafa	Kamal Shodo	Moosa Shoro	Purkhani	Kand Nai	Asabo	Janai	Hub-3	Hub-2	Hub-1	
1	Construction Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	12
2	Environment and Social Safeguard Staff	4	4	4	4	4	4	4	4	4	4	4	4	48
3	Surveyor	3	3	3	3	3	3	3	3	3	3	3	3	36
4	Skilled laborer	4	4	4	5	4	4	5	5	4	4	4	4	51
5	Semi-skilled laborer	4	4	4	5	4	4	5	5	4	4	4	4	51
6	Unskilled laborer	13	12	12	13	13	12	12	13	13	14	12	12	151
7	Drivers/operators	21	21	20	22	21	21	23	23	21	23	20	18	254
	Total	50	49	48	53	50	49	53	54	50	53	48	46	603

Work force 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 ESIA 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 impact zone is considered as the area that will be impacted positively/negatively in the form of dam construction, development of access routes near dams sites, contractor's camps including material storage areas & main pond areas.

While for incase of dam break the 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 – 9, show the expected loss in terms of Tree cut, disturbance to track routes, agricultural land, archeological sites, and hand pumps. Since all proposed dams are recharge dams except Hub 1, 2 & 3 which are storage 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 an aquifer. There are 12 kacha tracks and 111 trees will be impacted due to the construction of proposed dams. Appropriate mitigation measures have been suggested in the relevant section for estimated loss, and cost has been built in BOQ amount of contracts. For each site land, use maps have been developed which are attached as Annexure-III. The maps cleared that there is minor impact on the agricultural land in the area just in case of Tikho-III which is temporary in nature.

Table 9: Primary Impact Zone

Sr. No	Name of sub Project	Dam Type	Road Type	Trees	Agriculture Land Area	Archeological Site (if any)
1	Tikho-III	Recharge	3 (kacha tracks)	13	12 acres	-
2	Pipre Baricha	Recharge	1 (kacha tracks)	12	-	-
3	Ghulam Mustafa	Recharge	-	13	-	-
4	Kamal Shodo	Recharge	1 (Dirt Road)	13	-	-
5	Moosa Shoro	Recharge	2 (kacha tracks)	2	-	-
6	Purkhani	Recharge	2 (kacha tracks)	18	-	-
7	Kand Nai	Recharge	1 (Dirt Road)	5	-	-
8	Asabo	Recharge	1 (Dirt Road)	5	-	-
9	Janai	Recharge	1 (Dirt Road)	4	-	-
10	Hub-3	Storage	-	14	-	-
11	Hub-2	Storage	-	7	-	-
12	Hub-1	Storage	-	5	-	-
Total			12	111	12	0

3.10.2 Secondary Impact Zone

The secondary impact zone, which 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 – V. Following areas may be considered as areas of ecological influence;

- Upstream areas up to the originating point of a natural stream. (Secondary Impact Zone)
- Downstream areas where fewer food particles (biotic matter) and sediments will reach with water in comparison to natural conditions. (Secondary Impact Zone).



These areas are mostly expected to be impacted positively in the medium and long term through the availability of the water groundwater for domestic use as well as for livestock consumption. Seven 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 elaborated on in subsequent chapters.

All streams are non-perennial and water is available mostly during the monsoon season. The present agriculture is low by all standards and below subsistence level mainly due to constraint of irrigation water and its dependence on scanty rains and sporadic floods (same for Kandi Nai & Jani). 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 the selected dam command area is only rain and bore water. 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 or subsistence level. They said that small dams would recharge the aquifers in the downstream area and would bring positive impacts on water availability in their villages.

During the baseline survey of the sub-project area, no endemic or rare species were observed in the primary impact zone as well as secondary impact zone. All species recorded during the field survey have a wide range of distribution. Since the proposed dam and campsite 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. Additionally, during the operational stage no machinery, equipment, etc. needs to be operated during the operation stage, as these are recharge dams on non-perennial streams of the area.



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 the most feasible 45 sites. Subsequently, rapid Socio-Environmental and Ecological Assessment of these sites has been also carried out before final selection.

Since, the project sites are located within the protected area that is the habitat of various flora and fauna, in drought season; these are at risk due to unavailability of water. The construction of dams will ensure the availability of water. The construction of small dams in this area will supplement the habitat, which ultimately supports food and shelter for fauna and flora. The freshwater reservoir will provide support to primary producers like free-floating algae (phytoplankton), which is the source of food for primary consumers (Zooplanktons) and secondary consumers. This food chain provides the ultimate feeding source for associated fauna as well as water birds in terms of habitat expansion in the area.

The operation phase of proposed dams will create a positive impact on land use and ecology in terms of enhanced vegetation cover & habitat restoration due to the 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). A study conducted by Small Dam Organization (Sindh Irrigation Department) named performance evaluation of small dams in Sindh province April 2020 also endorsed this aspect.

Furthermore, all of the proposed dams of sub-project areas will be constructed on existing clearing or barren land to minimize the impacts on habitat. During the construction stage, the clearing of vegetation or land-use changes will only be anticipated at dam axis points and the camp areas. Moreover, no Permanent or temporary road will be constructed existing alignment will be used. Additionally, during the operational stage no machinery, equipment, etc. needs to be operated during the operation stage, as these are recharge dams on non-perennial streams of the area.”

Moreover, these sites have been evaluated and endorsed by the Sindh EPA, Sindh Wildlife department, WWF and local communities, for their need and justification. Sindh EPA has conducted public hearing on project site, while Sindh EPA constituted an expert committee consisting on ten experts. The committee has already evaluated ESIA report and has issued NOC on same document. In addition to this, Sindh Wildlife department has also issued NOC after visiting these sites, Moreover some of the dam sites were also proposed by the Sindh Wildlife department.



The present 12 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 a water-scarce area that solely depends for water on groundwater and rain runoff for drinking and agriculture purposes.	(i) All twelve proposed dams are located in highly water-scarce areas of Sindh Province.
(ii) Dam can either: a) Effectively recharge groundwater or b) Create a storage pond that will supply water for a longer period	(ii) Nine proposed dams are recharge while 3 are storage.
(iii) The topographical and geotechnical conditions at the dam site provide a suitable condition for a safe and economical structure.	(iii) The topographical and geological conditions at all 12 dams are such that they provide the most economic and safe dams.
(iv) The negative effect of the dam on lower riparian's is negligible.	(iv) Average 9.6% 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 shows the total estimated inflow and proposed retention volume for each site. On the other hand, 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, there must be a positive long-term positive impact on environmental and social conditions.	(v) This is true for all sub-projects.
(vi) No or small land acquisition or resettlement is involved due to the construction of the dam.	(vi) In all 12 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 that 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



Selection Criteria	Status
	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 – 10.

Table 10: 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 lower Kohistan region Sindh. The geographical location of these regions is such that the source of water is rainwater, which normally falls for few days of a year and the groundwater. The proposed small dams will primarily contribute to the provision of water to communities during a dry period by recharging underground aquifers and the 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 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 get 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 is 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 15 to 20 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.

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



Figure 4: Gabion Dam/Weir

4.2.3 Option 2: Construction of Diversion Dams

The small diversion dams can be constructed to Access Rivers / nallas to divert river flows to adjoining lands for spate irrigation. There are the 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 nals / nallas are very high but occur for a period of 7 to 15 days 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 a shortage of water in the downstream area.

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

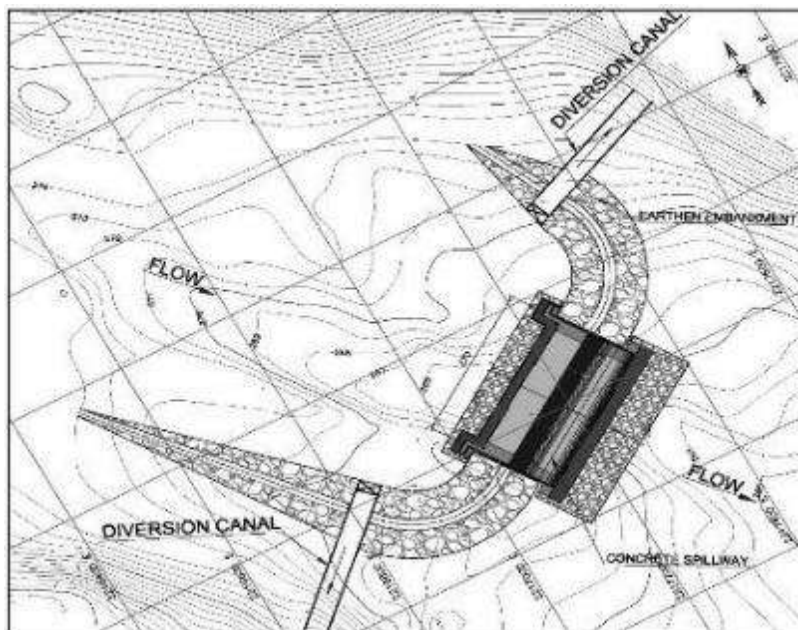


Figure 5: Diversion Dam

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

3: Construction of

The best options for Kohistan Hills are the construction of a recharge dam on Nais, where the dam will cause recharge of groundwater through the 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 22 ft each in height. Normally water remains in these reservoirs for a period of 2 to 3 weeks. The recharged groundwater is also safe from the loss by evaporation and impurities. In streams where the recharge dam are proposed,



there will be some loss in evaporation, still surface water will be available for a period of 5 - 6 months. Communities and their livestock may 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.

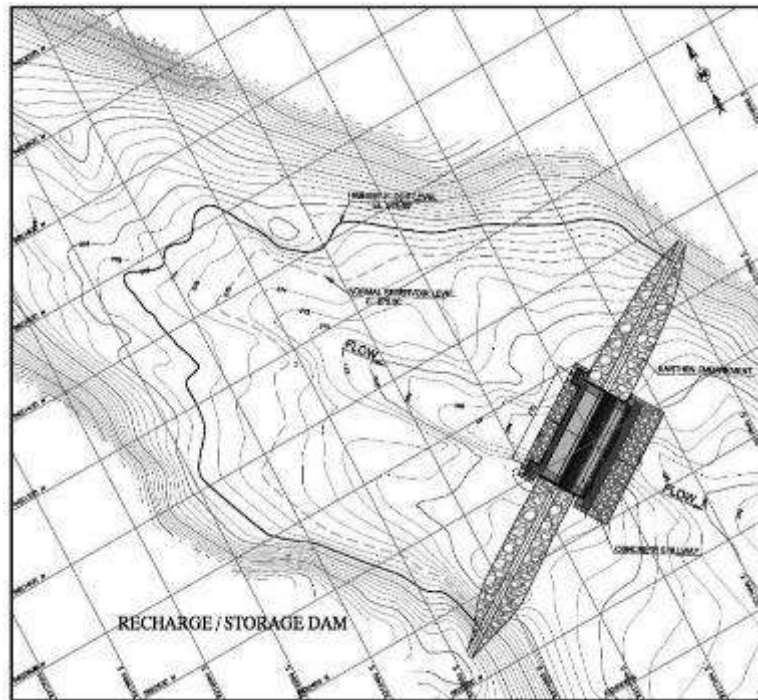


Figure 6: Recharge/Storage Dam with Earth Embankment and Concrete Spillway

Table – 11 reviews the alternative interventions considered to improve resilience against droughts in the subproject area.



Table 11: Analysis of Alternatives: Construction of Small Dams

Option No.	Action	Economic Impacts		Environmental Impacts		Social Impacts	
		Positive	Negative	Positive	Negative	Positive	Negative
0	Without project	None	<ul style="list-style-type: none"> • Cost of relief to be provided during draughts (major, long term) • Loss of agriculture production and livestock (major, long term) 	<ul style="list-style-type: none"> • No disturbance to the environment (neutral) 	<ul style="list-style-type: none"> • Loss of trees, crops, and livestock (major, long term) 	None	<ul style="list-style-type: none"> • Hardships to people and livestock during draughts (major, long term) • Migration of population from drought-affected areas, increase in hardships especially in the 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	<ul style="list-style-type: none"> • Employment during construction (Moderate, short term) • Increase in crop production and livestock (Moderate, short term as compared to Options 2 and 3) 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • Felling trees in construction area (Moderate short term); • Quarrying of stone (Minor long term) • Greenhouse gas emissions from machinery during construction (Minor short term) 	<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • 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 Options No. 1	<ul style="list-style-type: none"> • Moderate capital cost to implement – higher than alternative 	As for Options No. 1	<ul style="list-style-type: none"> • Felling trees on new alignment (Moderate short term); 	As for Options No. 1	<ul style="list-style-type: none"> • Borrow areas and construction of structures (Major, long term);



			<p>#3(Moderate short term);</p> <ul style="list-style-type: none"> 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 		<ul style="list-style-type: none"> 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 		<ul style="list-style-type: none"> Construction stage disturbance (Moderate, short term) Downstream populations may face series of shortage of water supply resources for their livelihood
3	Construction of Recharge / Storage Dam of Earthen Dam with Concrete Spillway	<ul style="list-style-type: none"> Increased economic activities Prolonged availability of water 	<p>Same as Option 2</p> <ul style="list-style-type: none"> High capital cost to implement – higher than alternative #2 (Major, long term); Moderate on-going maintenance costs(Moderate, long term) 	<ul style="list-style-type: none"> Increase in greenery and plantation (after implementation) Due to groundwater recharging water will be available for a 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 overflow. No or negligible impact on lower riparian. 	<ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> As for Option No. 2 but more than Option 2 and 3. 	<ul style="list-style-type: none"> 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 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

Sindh can be divided into four distinct parts topographically: Kirthar range on the west, a central alluvial plain bisected by the Indus River in the middle, a desert belt in the east and south-east, and the Indus delta in the south Figure – 7. Proposed dams are located in the Kohistan region. The geographical features of these areas are described below.

Kohistan Region

Proposed sub-projects are lying in Southern Sindh, 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 the South Eastern loop, which extends up to the river Indus. The foothill of lower part mountain fans slopes southward and eastward. Lakhi Range is also situated in the lower part of the Central Zone, 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.



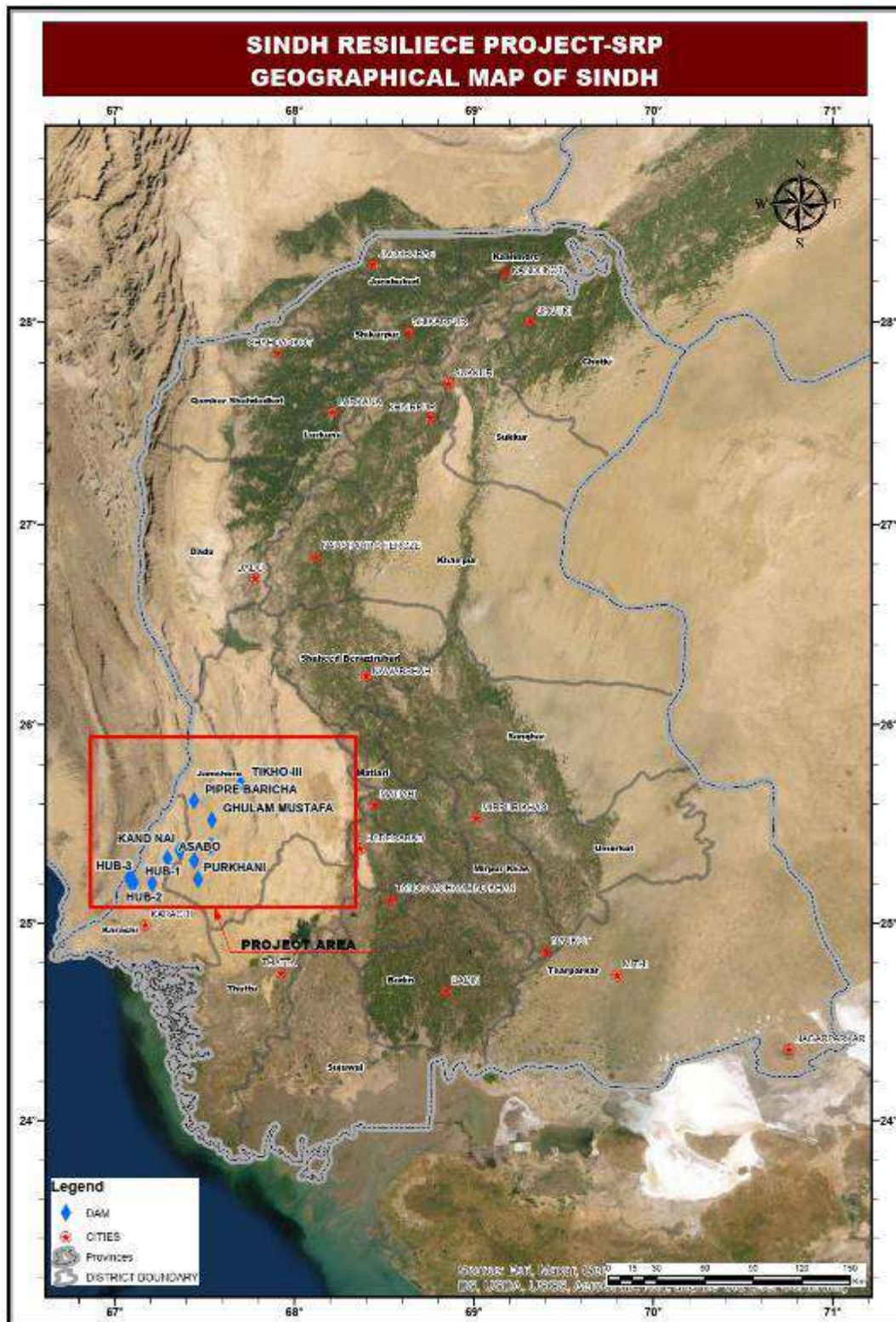


Figure 7: Geographical Map of Lower Kohistan

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 – 8). 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 limestones. Gaj formation is dominated by brackish limestone, sandstone, and shales of variegated gray and gypsiferous.

The Manchhar formation contains brownish sandstone and shale with the conglomerate. At places in foothill regions where the 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 the west at about 15 to 25 degrees.



5.2.3 Soils

According to a reconnaissance soil survey carried out by the Soil Survey of Pakistan, generally, the area likely to be occupied by the proposed subproject comprises the hilly sandy soil of the Aeolian desert. Specifically, at places, rock outcrop is covered with gravel and rock land and valley soil is mainly loamy soil.

The soils in the plain near the subproject sites have a 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, gravelly, 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.

5.2.4 Seismicity

The map shown in Figure – 9 indicates that all of the sub-project areas are 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 MSK VIII. Moreover, the World Bank dam expert will review all structure designs.

5.3 Climate & Rainfall

The climate of Sindh is arid and hot. According to the classification made by UNESCO, the region has been divided into three zones: Coastal- South of Thatta; Southern- from Thatta through Hyderabad to Nawabshah; and Northern-from Nawabshah to Jacobabad. In an average year, sub-project sites receive a maximum rainfall of 0.03 – 3.04 inch (Figure – 10). The climatological conditions of proposed dam sites are represented by the following meteorological station (Table-12).

Table 12: Nearest Meteorological Stations

Name of Proposed Small Dams	Meteorological Station
Tikho-III, Pipre Baricha, Ghulam Mustafa, Kamal Shodo, Moosa Shoro, Purkhani, Kand Nai, Asabo, Janai, Hub-3, Hub-2, Hub-1	Karachi

The mean monthly temperatures, rainfall, and evaporation at these stations are shown in Figures 11 to 13. The mean monthly maximum and minimum limits of climatological data are given in Table - 13.

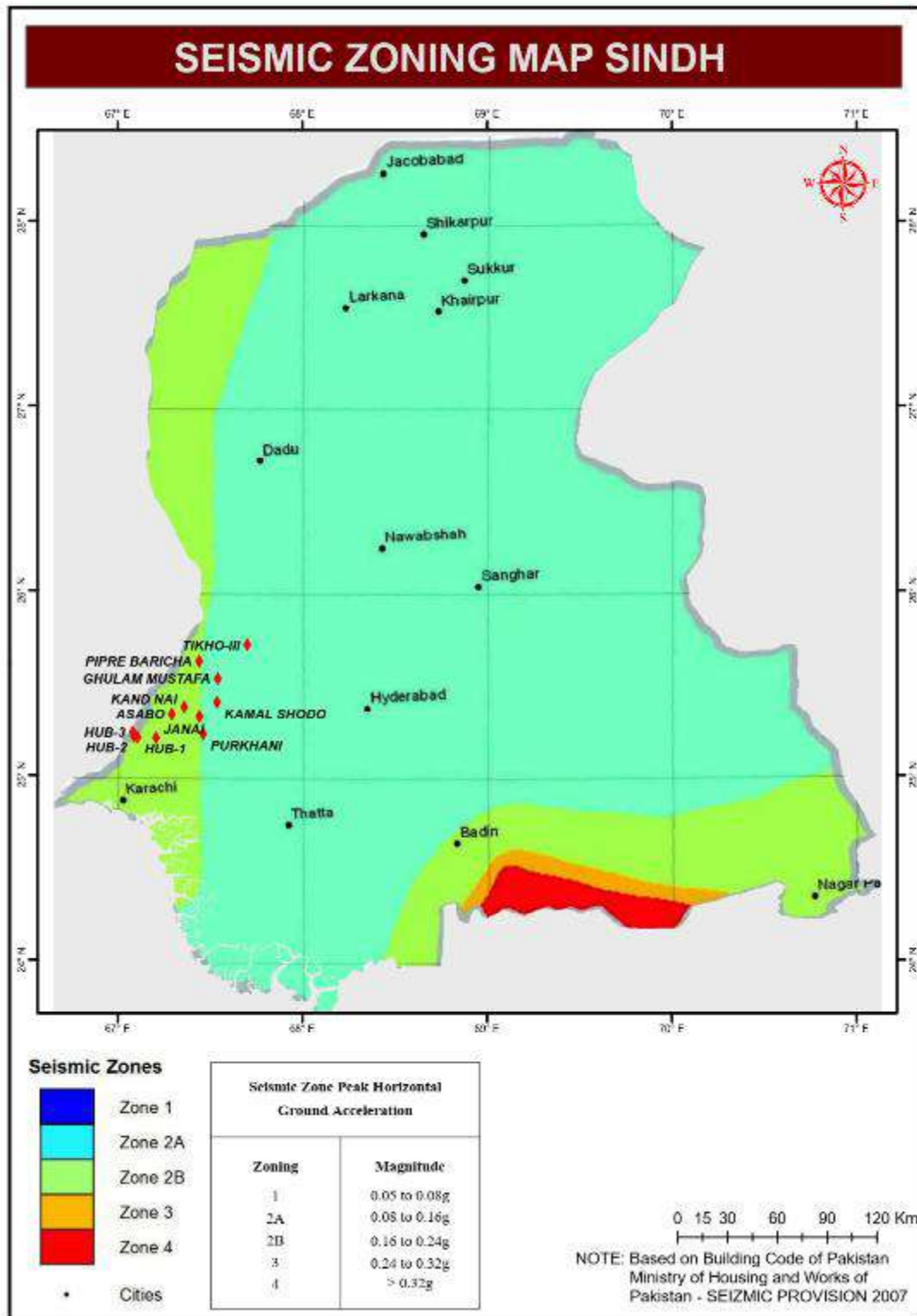


Figure 9: Seismic Zones of the Sub Project Area

Figure 10: Annual Rainfall in Sub-Project Area

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



Table 13: Climatological Data of Sub-Project Areas

Meteorological Stations	Rainfall (inch)		Temperature (°C)		Evaporation (inch)	
	Min.	Max.	Min.	Max.	Min.	Max.
Karachi	0.03	3.04	4.5	37.6	6.82	15.82

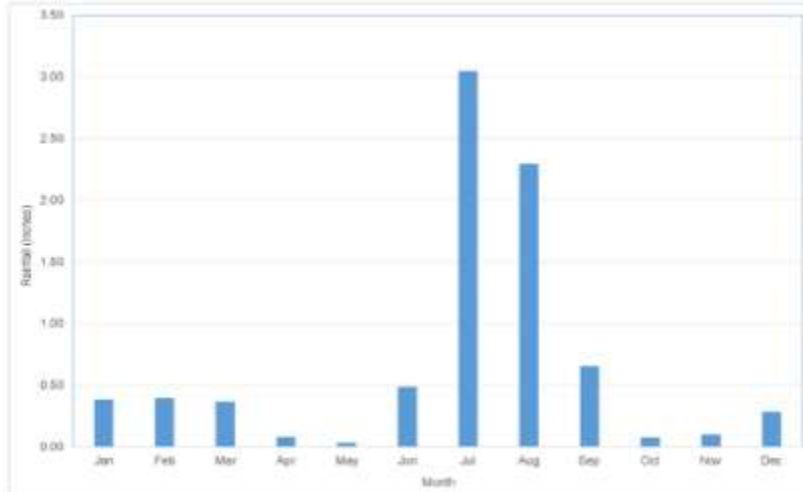


Figure 11: Monthly Average Rainfall at Karachi

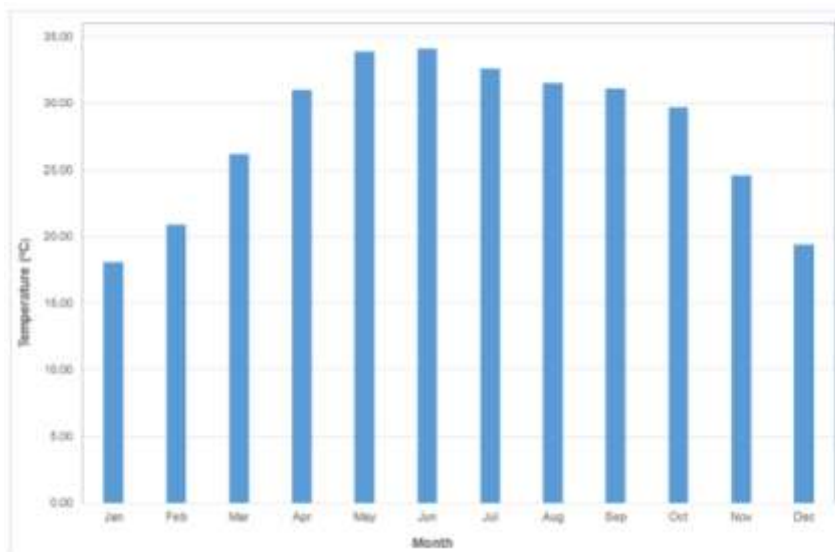


Figure 12: Monthly Average Temperature at Karachi

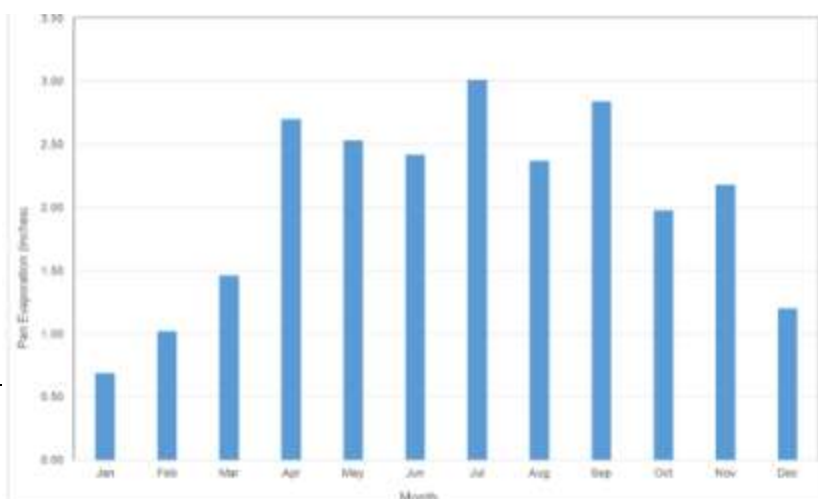




Figure 13: Monthly Average Evaporation at Karachi

5.4 Water Resources and Quality

i. Surface Hydrology

Wetlands nearest to the sub-project area are Manchhar, Keenjhar and Hub Dam. The details are provided in Table – 14 and map showing ariel distance from dam sites to wetland is attached as Annexure-VI.

Table 14: Nearest Wetlands in Sub-Project Area

Sr. No.	Sub-Project Area	Tehsil-	District	Average Distance (Km)	Wetland
1	Tikho-III	Thano Bola Khan	Jamshoro	90	Manchar Lake
2	Pipre Baricha	Thano Bola Khan	Jamshoro	125	Manchar Lake
3	Ghulam Mustafa	Thano Bola Khan	Jamshoro	135	Manchar Lake
4	Kamal Shodo	Thano Bola Khan	Jamshoro	90	Keenjhar Lake
5	Moosa Shoro	Thano Bola Khan	Jamshoro	80	Keenjhar Lake
6	Purkhani	Thano Bola Khan	Jamshoro	85	Keenjhar Lake
7	Kand Nai	Gadap	Malir	45	Hub Dam
8	Asabo	Gadap	Malir	40	Hub Dam
9	Janai	Gadap	Malir	30	Hub Dam
10	Hub-3	Shah Mureed	Malir	7	Hub Dam
11	Hub-2	Shah Mureed	Malir	6	Hub Dam
12	Hub-1	Shah Mureed	Malir	5	Hub Dam

Sindh is one of the primary beneficiaries of the Indus Basin Irrigation System (IBIS). It has three major barrages on the Indus River that divert approximately 48 MAF of water annually to the 14 main canal commands in Sindh. These canal systems have an aggregate length of 13,325 miles, which serve a gross command area of 14.391 million acres. There are about 42,000 watercourses, which have an aggregate length of about 75,000 miles

The only perennial surface water channel in the area is the Nara Canal. The Nara Canal is one of the fourteen main canal systems in Sindh with the largest Cultivated Command Area (CCA) of all. It originates from Sukkur Barrage and was built in 1932 as part of the establishment of the Lower Indus Irrigation System. The canal system comprises the upper Nara Canal, which lies between the Sukkur Barrage and Jamrao head-works (the first



diversion structure at the canal) and the Jamrao, Mithrao, Khipro, and Thar Canal systems that lie south of the Jamrao head-works.

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 areas, 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 the surrounding areas. Table – 15 depicted the rationale for the sampling locations. These results are given in Table – 16 & 17, Surface & Drinking Water analysis results respectively.

The samples were tested for 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 natural strata of the region) and microbiological contaminations (due to unavailability of sewerage system or open defecation in the area), as sets in the SEQS. Presence of Total Coliform is the source of concern, which will be mitigated by providing the water filtration system for the construction crew and will elaborate in the mitigation section. Groundwater analysis further confirms that, as there is no or in very meagre trace amount (far below the SEQS limits) of toxic metal detected. The baseline monitoring locations and detail results has been appended as Annexure – VII.

Table 15: Rationale for the Baseline Environmental Monitoring

Sr. No	Monitoring Parameters	No. of samples	Rationale
1	Ambient Air	11	Taken from the area having nearby population or near the sensitive receptor
2	Drinking-Water/Ground Water	12	at every proposed Dam site from a nearby well or potable water source



3	Surface Water	2	Canal water
4	Noise	32	1 from the Proposed Dam site, 2 from nearby sensitive receptors



Table 16: Surface Water Analysis Results

Sr. No.	Parameter (mg/l unless otherwise defined)	Analysis Method	SEQS Limit	Hub-3	Hub-2
1	Temperature	SMWW 2550 B	≤ 3°C	22	23
2	pH	SMWW 4500 H+ B	6.0-9.0	6.78	6.74
3	Biochemical Oxygen Demand (BOD5)	SMWW 5210-B	250	12	10
4	Chemical Oxygen Demand (COD)	SMWW 5220 B	400	20	17
5	Total Suspended Solids (TSS)	SMWW 2540 D	400	29	34
6	Total Dissolved Solids (TDS)	SMWW 2540 C	3500	181	176
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	27	32
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	22	27
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	0.007
17	Chromium (Cr)	SMWW 3113 B	1.0	0.006	0.005
18	Copper (Cu)	SMWW 3113 B	1.0	0.166	0.168
19	Lead (Pb)	SMWW 3113 B	0.5	<0.005	0.006
20	Mercury (Hg)	SMWW 3112 B	0.01	<0.001	<0.001
21	Selenium (Se)	SMWW 3114 B	0.5	0.02	0.02
22	Nickel (Ni)	SMWW 3113 B	1.0	0.031	0.029
23	Silver (Ag)	SMWW 3113 B	1.0	0.003	0.003
24	Total Toxic Metals	Calculated Value	2.0	0.26	0.269
25	Zinc (Zn)	SMWW 3111 B	5.0	0.06	0.091
26	Arsenic (As)	SMWW 3114 B	1.0	0.008	0.007
27	Barium (Ba)	SMWW 3113 B	1.5	0.004	0.0039
28	Iron (Fe)	SMWW 3113 B	8.0	0.984	0.611
29	Manganese (Mn)	SMWW 3111 B	1.5	0.039	0.02
30	Boron (B)	SMWW 3113 B	6.0	0.02	0.02
31	Residual Chlorine (Cl2)	SMWW 4500 Cl- B	1.0	0	0



Table 17: Drinking Water Analysis

Parameter	Analysis Method	SEQS	Tikho-III	Pipre Baricha	Ghulam Mustata	Kamal Shodo	Moosa Shoro	Purkhani	Kand Nai	Asabo	Janai	Hub-3	Hub-1
Color	SMMWW 2120 C	≤ 15 TCU	0	0	0	2	0	0	1	0	3	0	1
Taste (Non-Objectionable)	SMMWW 2160 C	N-O	Salty	Salty	Salty	Salty	Salty	Salty	Salty	Salty	Salty	Salty	Salty
Odor	SMMWW 2150 B	N-O	Non-Objectionable	Non-Objectionable	Non-Objectionable	Non-Objectionable	Non-Objectionable	Non-Objectionable	Non-Objectionable	Non-Objectionable	Non-Objectionable	Non-Objectionable	Non-Objectionable
Turbidity	SMMWW 2130 B	≤ 5 NTU	0.92	2	0.88	2.92	1.1	0.8	1.06	1.02	4.2	2.2	1.09
Total Hardness (as CaCO ₃)	SMMWW 2340 C	≤ 500 mg/L	222	188	196	410	264	306	342	228	422	468	368
Total Dissolved Solids (TDS)	SMMWW 2540 C	≤ 1000 mg/L	1556	1360	1290	1860	1480	1608	1642	1192	1920	1812	1768
pH	SMMWW 4500 H+ B	6.5- 8.5	7.46	7.4	7.56	7.26	7.49	7.77	7.66	7.42	7.21	7.88	7.64
Aluminum (Al)	SMMWW 3111 B	≤ 0.2 mg/L	0.007	0.006	0.006	0.007	0.007	0.006	0.006	0.006	0.008	0.006	0.006
Antimony (Sb)	SMMWW 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
Arsenic (As)	SMMWW 3114 B	≤ 0.05 mg/L	0.009	0.007	0.007	0.007	0.008	0.006	0.008	0.006	0.01	0.006	0.012
Barium (Ba)	SMMWW 3113 B	0.7 mg/L	0.0036	0.004	0.0039	0.0035	0.0038	0.0035	0.0038	0.0034	0.0046	0.0039	0.004
Boron (B)	SMMWW 3113 B	0.3 mg/L	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Cadmium (Cd)	SMMWW 3113 B	0.01 mg/L	0.006	0.008	0.006	0.006	0.006	0.007	0.006	0.006	0.009	0.007	0.007
Chloride (Cl-)	SMMWW 4500 Cl- B	≤ 250 mg/L	176	112	116	320	212	248	248	108	360	380	240
Chromium (Cr)	SMMWW 3113 B	≤ 0.05 mg/L	0.006	0.008	0.005	0.007	0.006	0.007	0.008	0.005	0.005	0.006	<0.004
Copper (Cu)	SMMWW 3111 B	2.0 mg/L	0.184	0.165	0.166	0.167	0.19	0.192	0.168	0.166	0.174	0.188	0.168
Cyanide (CN-)	SMMWW 4500 CN- F	≤ 0.05 mg/L	0	0	0	0	0	0	0	0	0	0	0
Fluoride (F-)	SMMWW 4500 F- C	≤ 1.5 mg/L	0.05	0.05	0.01	0.06	0.02	0.04	0.03	0.01	0.06	0.03	0.05
Lead (Pb)	SMMWW 3114 B	≤ 0.05 mg/L	0.005	0.006	0.006	0.005	0.005	0.005	0.006	0.005	0.005	0.005	0.002
Manganese (Mn)	SMMWW 3113 B	≤ 0.5 mg/l	0.018	0.026	0.016	0.022	0.018	0.023	0.017	0.016	0.026	0.022	0.024
Mercury (Hg)	SMMWW 3114 B	≤ 0.001 mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (Ni)	SMMWW 3113 B	≤ 0.02 mg/L	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01
Nitrate (NO3-)	SMMWW 4500 NO3- B	≤ 50 mg/L	2.6	1.8	1.1	5.2	3	4.4	3.2	1.03	8.2	7.2	4.1
Nitrite (NO2-)	SMMWW 4500 NO2- B	≤ 3.0 mg/L	0.08	0.03	0.02	0.3	0.06	0.06	0.2	0.02	0.9	0.9	0.6
Selenium (Se)	SMMWW 3114 B	0.01 mg/L	0.01	0.01	<0.01	0.007	0.02	0.02	0.01	<0.01	0.03	0.02	0.01
Residual Chlorine (Cl ₂)	SMMWW 4500 Cl- B	0.5 mg/L	0	0	0	0	0	0	0	0	0	0	0
Phenolic Compounds	SMMWW 5530 D	NG/VS	0.04	0.09	0.02	0.08	0.04	0.04	0.04	0.02	0.04	0.09	0.08
Zinc (Zn)	SMMWW 3113 B	5.0 mg/L	0.078	0.068	0.069	0.068	0.065	0.059	0.071	0.058	0.078	0.074	0.069
Microbiological Analysis													
Total Coliforms	SMMWW 9222 B	0/100 mL CFU	0	0	0	1	1	0	2	0	4	1	1
Fecal Coliforms	SMMWW 9222 D	0/100 mL CFU	0	0	0	0	0	0	0	0	0	0	0

5.4.1 Air Quality





The sub-project areas of Kohistan are located in a sparsely populated region with no industrial or commercial activity. Vehicular traffic on dirt roads causes some dust emissions whose effect is fairly localized. The main pollutants emitted by vehicle exhaust pipes are particulate matter, carbon monoxide, sulfur 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 Nov & Dec 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 – 18. Laboratory results of ambient air quality are attached as Annexure –VIII.

Table 18: 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/m ³	120 ug/m ³	40 ug/m ³	80 ug/m ³	150ug/m ³	75 ug/m ³
1	Tikho-III	0.9	7.4	3.1	9.4	136.5	27.5
2	Pipre Baricha	0.9	7.8	4.3	9.8	116.5	31.5
3	Ghulam Mustafa	0.8	8.9	4.6	9.4	139.0	39.0
4	Kamal Shodo	0.9	8.5	5.0	9.5	144.5	42.0
5	Moosa Shoro	0.9	9.6	4.9	12.9	137.0	35.0
6	Purkhani	0.8	9.8	3.6	9.9	122.0	31.0
7	Kand Nai	0.9	9.6	4.9	12.9	137.0	35.0
8	Asabo	1.1	10.9	5.5	12.3	142.0	39.0
9	Janai	1.3	6.6	4.8	11.1	141.5	45.5
10	Hub-3	0.9	8.4	3.6	9.4	127.5	31.0
11	Hub-1	0.7	9.8	4.7	8.3	133.0	31.0

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 – 19. Laboratory results of ambient air quality are attached as Annexure –IX.



Table 19: 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	Tikho-III	Dam Axis	25°42'56.52"N 67°44'2.57"E	38.7	39.2	38.9
		Darbar	25°43'14.15"N 67°42'34.52"E	34.5	35.1	34.8
		Murad Brohi Settlement	25°42'58.41"N 67°42'55.59"E	40.2	43.2	83.4
2	Pipe Baricha	Dam Axis	25°37'4.76"N 67°26'16.28"E	39.5	41.8	40.6
		Mosque	25°36'52.25"N 67°26'14.37"E	35.2	37.8	36.5
		Village Piper Barecho	25°36'59.98"N 67°26'15.93"E	42.3	43.7	43.0
3	Ghulam Mustafa	Dam Axis	25°31'6.57"N 67°32'23.17"E	40.8	42.5	41.6
		Mosque	25°30'59.08"N 67°32'21.44"E	34.7	35.3	35.1
		Village Rahim Burfat	25°31'36.90"N 67°31'37.02"E	44.7	46.5	45.6
4	Kamal Shodo	Dam Axis	25°23'30.73"N 67°32'2.78"E	42.8	43.1	42.9
		Mosque	25°23'21.29"N 67°31'58.44"E	35.8	39.2	37.5
		Kirthar Park Road	25°23'22.09"N 67°32'5.04"E	46.7	49.2	47.9
5	Kand Nai	Dam Axis	25°22'7.38"N 67°21'31.71"E	35.2	37.2	36.2
		Village Mian Warayo	25°22'18.24"N 67°21'14.43"E	40.7	41.2	40.9
		Kirthar Park Road	25°22'3.64"N 67°21'45.74"E	47.5	48.2	47.9
6	Asabo	Dam Axis	25°19'42.52"N 67°17'30.78"E	33.2	34.2	33.7
		Village Pathan Burfat	25°20'22.88"N 67°18'48.23"E	43.5	44.7	44.1
7	Moosa Shoro	Dam Axis	25°18'50.27"N 67°26'27.53"E	39.2	40.5	39.8
		Village Mian Warayo Kanro	25°18'45.08"N 67°26'35.33"E	50.2	52.4	51.3
		Mosque	25°18'42.55"N 67°26'35.22"E	34.3	39.2	36.7
8	Purkhani	Dam Axis	25°13'17.73"N 67°27'47.25"E	40.9	43.1	42
		Mosque	25°13'36.98"N 67°28'0.45"E	38.5	40.8	39.6
		Village Track	25°13'40.80"N 67°28'1.96"E	54.2	55.8	55
9	Janai	Dam Axis	25°12'0.52"N 67°12'29.41"E	37.5	39.2	38.3
		Village Haji Rasool Bux Khaskheli	25°11'0.41"N 67°12'29.29"E	44	46.8	45.4
		School	25°11.1310"N 67°12.5140"E	42.3	47.2	43.4
10	Hub-3	Dam Axis	25°13'58.37"N 67°4'46.07"E	42.9	44.7	43.8
		Dureji Road	25°13'39.85"N 67° 4'36.08"E	50.7	53.2	51.9
11	Hub-2	Dam Axis	25°12'38.74"N 67° 5'21.88"E	39.5	43.9	41.7
		Dureji Road	25°12'46.55"N 67° 5'11.86"E	47.3	49.1	48.2
12	Hub-1	Dam Axis	25°12'16.74"N 67° 6'13.65"E	33.8	38.2	36
		Hub Dam Road	25°12'12.40"N 67° 6'37.99"E	57.3	60.7	59



5.5 BIOLOGICAL ENVIRONMENT

The sub project area 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. 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 dams eight (8) large mammal species were observed including Asiatic Jackal, Indian Fox, Red fox, Honey Badger, Grey Mongoose, Small Indian Mongoose, Jungle Cat and Indian wild boar recorded from different locations near the proposed small dam area. All mammalian species-area common and listed as Least Concern (LC) in IUCN red list. 13 small mammals recorded from microhabitats of the same site are common and least concern in IUCN list. Two amphibians and 21 species of reptiles were recorded from the study area. These include one Buffo toad, one Skittering frog, six lizards, three geckos, two agamas and four snakes. Out of four snake species, two are poisonous and two non-poisonous. The recorded species belong to 11 Genre 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 specimen of saw scale viper and the Black cobra was observed from the sub-project Kohistan area. 64 bird species were recorded from the dam site and its surrounding area, among them crested lark, Common many, grey shrike, Black redstart, Indian roller, Indian house crow, Bush babbler and Red-wattled lapwing were the most common through the study area. All recorded avian species are Least Concern (LC) by IUCN red list 2020. Detail of the Fauna of Kohistan sub-project areas is given in Table – 20.

Table 20 Fauna in Lower Kohistan - Sub Project Area

Sr. No.	Common Name	Scientific Name	Conservation status by IUCN
Large mammals			
1	Asiatic Jackal	<i>Canis aureus</i>	LC
2	Indian Fox	<i>Vulpes bengalensis</i>	LC
3	Red fox	<i>Vulpes vulpes</i>	LC
4	Honey Badger	<i>Mellivora capensis</i>	LC
5	Grey Mongoose	<i>Herpestes edwardsi</i>	LC
6	Small Indian Mongoose	<i>Herpestes javanicus</i>	LC
7	Jungle Cat	<i>Felis chaus</i>	LC
8	Indian wild boar	<i>Sus scrofa</i>	LC
Small mammals			
1	Indian Hare	<i>Lepus nigricollis</i>	LC
2	Longeared Desert Hedgehog	<i>Hemiechinus collaris</i>	LC
3	Indian Hedgehog	<i>Paraechinus micropus</i>	LC



Sr. No.	Common Name	Scientific Name	Conservation status by IUCN
4	Five Striped Palm Squirrel	<i>Funambulus pennantii</i>	LC
5	Indian Porcupine	<i>Hystrix indica</i>	LC
6	Roof Rat / House Rat	<i>Rattus rattus</i>	LC
7	House mouse	<i>Mus musculus</i>	LC
8	Little Indian Field Mouse	<i>Mus booduga</i>	LC
9	Balochistan Gerbil	<i>Gerbillus nanus</i>	LC
10	Indian Gerbil	<i>Tatera indica</i>	LC
11	Indian Desert Jird	<i>Meriones hurrianae</i>	LC
12	House Shrew	<i>Suncus murinus</i>	LC
13	Kuhl's Pipistrelle	<i>Pipistrellus kuhlii</i>	LC
Herpeto-fauna			
1	Indian Garden Lizard	<i>Calotes versicolor</i>	LC
2	Yellow-headed Rock Agama	<i>Laudakia lirata</i>	LC
3	Black Rock Agama	<i>Laudakia melanura</i>	LC
4	Rock Agama	<i>Laudakia nupta</i>	LC
5	Brilliant Agama	<i>Trapelus agilis</i>	LC
6	Indian Fat-tailed Gecko	<i>Eublepharis macularius</i>	LC
7	Keeled Rock Gecko	<i>Cyrtopodion scabrum</i>	LC
8	Spotted Indian House Gecko	<i>Hemidactylus brookii</i>	LC
9	Yellow bellied House Gecko	<i>Hemidactylus laviviridis</i>	LC
10	Indian Fringe-toed Lizard	<i>Acanthodactylus antoris</i>	LC
11	Orange tail Skink	<i>Novoeumeces blythianus</i>	LC
12	Indian Sand Swimmer	<i>Ophiomorus tridactylus</i>	LC
13	Indian Spiny tailed Lizard	<i>Saara hardwickii</i>	LC
14	Desert Monitor	<i>Varanus griseus</i>	LC
15	Common Sand Boa	<i>Eryx johnii</i>	LC
16	Cliff Racer	<i>Platyceps rhodorachis</i>	LC
17	Sindh Ribbon Snake	<i>Psammophis leithii</i>	LC
18	Royal Snake	<i>Spalerosophis diadema</i>	LC
19	Common Krait	<i>Bungarus caeruleus</i>	LC
20	Black Cobra	<i>Naja naja</i>	LC
21	Saw scaled Viper	<i>Echis carinatus</i>	LC
22	Bufo toad	<i>Bufo stomaticus</i>	LC
23	Kettering frog	<i>Euphlyctis cyanophlyctis</i>	LC
EN = Endangered, CR = critically endangered, VU = vulnerable, L C = least concern, N T = near threatened. R = Resident WV = Winter Visitor M = Migratory PM = Passage Migrant SV= Summer Visitor			

Table 21: Avifauna in Lower Kohistan - Sub Project Area

Sr. No.	Common Name	Scientific Name	Conservation status by IUCN
Birds			
Seasonal Status			
1.	Black Kite	<i>Milvus migrans</i>	R
2.	Shikra	<i>Accipiter badius</i>	R
3.	Asiatic Sparrow-Hawk	<i>Accipiter nisus</i>	WV
4.	Common Buzzard	<i>Buteo buteo</i>	WV
5.	White-eyed Buzzard Eagle	<i>Butastur teesa</i>	R
6.	Imperial Eagle	<i>Aquila heliacal</i>	WV
7.	Tawny Eagle	<i>Aquila rapax</i>	R
8.	Egyptian Vulture	<i>Neophron percnopterus</i>	R
9.	Laggar Falcon	<i>Falco jugger</i>	R
10.	Peregrine Falcon	<i>Falco peregrinus</i>	WV
11.	Pallid Merlin	<i>Falco columbarius</i>	WV



Sr. No.	Common Name	Scientific Name	Conservation status by IUCN
12.	Common Kestrel	<i>Falco tinnunculus</i>	WV/r
13.	Grey Partridge	<i>Francolinus Pondicerianus</i>	R
14.	Red Wattled Lapwing	<i>Vanellus indicus</i>	R
15.	Chestnut-Indian Sandgrouse	<i>Pterocles exustus</i>	R
16.	Blue Rock Pigeon	<i>Columba livia</i>	R
17.	Ring Dove	<i>Streptopelia decaocto</i>	R
18.	Red Turtle Dove	<i>Streptopelia Tranquebarica</i>	R
19.	Little Brown / Senegal Dove	<i>Streptopelia senegalensis</i>	R
20.	Rose ringed Parakeet	<i>Psittacula krameri</i>	R
21.	Common Crow-Pheasant	<i>Centropus sinensis</i>	R
22.	Spotted Owlet	<i>Athene brama</i>	R
23.	Longeared Owl	<i>Asio otus</i>	WV
24.	Syke's or Sind Nightjar	<i>Caprimulgus Mahrattensis</i>	R
25.	House Swift	<i>Apus affinis</i>	R
26.	Indian Pied Kingfisher	<i>Ceryle rudis</i>	R
27.	White breasted Kingfisher	<i>Halcyon smyrnensis</i>	R
28.	Sind Small Green Bee- eater	<i>Merops orientalis</i>	R
29.	Roller or Blue Jay	<i>Coracias benghalensis</i>	R
30.	Hoopoe	<i>Upupa epops</i>	WV
31.	Sind Woodpecker	<i>Picoides assimilis</i>	R
32.	Ashycrowned Finch-Lark	<i>Eremopterix grisea</i>	R
33.	Indian Desert Finch-Lark	<i>Ammomanes deserti</i>	R
34.	Crested Lark	<i>Galerida cristata</i>	R
35.	Indian Bush Lark	<i>Mirafra erythroptera</i>	R
36.	Common Swallow	<i>Hirundo rustica</i>	WV
37.	Rufous-tailed or Isabelline Shrike	<i>Lanius isabellinus</i>	WV
38.	Grey Shrike	<i>Lanius excubitor</i>	R
39.	Rufous-backed Shrike	<i>Lanius schach</i>	R
40.	Black Drongo or King Crow	<i>Dicrurus adsimilis</i>	R
41.	Rosy Starling or Rosy Pastor	<i>Sturnus roseus</i>	PM
42.	Bank Myna	<i>Acridotheres ginginianus</i>	R
43.	Indian Myna	<i>Acridotheres tristis</i>	R
44.	Tree Pie	<i>Dendrocitta vagabunda</i>	R
45.	Sind House Crow	<i>Corvus splendens</i>	R
46.	Common Raven	<i>Corvus corax</i>	R
47.	White-cheeked Bulbul	<i>Pycnonotus leucogenys</i>	R
48.	Red-vented Bulbul	<i>Pycnonotus cafer</i>	R
49.	Common Babbler	<i>Turdoides caudatus</i>	R
50.	Sind Jungle Babbler	<i>Turdoides striatus</i>	R
51.	Long tailed Warbler	<i>Prinia gracilis</i>	R
52.	Long tailed Grass Warbler	<i>Prinia burnesii</i>	R
53.	Orphean Warbler	<i>Sylvia hortensis</i>	PM/ WV
54.	Common White throat	<i>Sylvia communis</i>	M
55.	Chiffchaff	<i>Phylloscopus collybita</i>	WV
56.	Black Redstart	<i>Phoenicurus ochruros</i>	WV
57.	Pied Bush Chat	<i>Saxicola caprata</i>	R
58.	Indian Robin	<i>Saxicoloides fulicata</i>	R
59.	Blue Rock Thrush	<i>Monticola olitarius</i>	WV
60.	Long-billed Rock Pipit	<i>Anthus similis</i>	R
61.	Yellow or Citrine Wagtail	<i>Motacilla flava</i>	PM
62.	White or Pied Wagtail	<i>Motacilla alba</i>	WV
63.	Purple Sunbird	<i>Nectarinia asiatica</i>	R
64.	House Sparrow	<i>Passer domesticus</i>	R
65.	Sind Jungle Sparrow	<i>Passer pyrrhonotus</i>	R



Sr. No.	Common Name	Scientific Name	Conservation status by IUCN
66	Black-headed Bunting	<i>Emberiza melanocephala</i>	PM
67	Striped or House Bunting	<i>Emberiza striolata</i>	R

EN = Endangered, CR = critically endangered, VU = vulnerable, L C = least concern, N T = near threatened. R = Resident WV = Winter Visitor M = Migratory PM = Passage Migrant SV= Summer Visitor



Asiatic Jackal



Sus sacrofa



Jungle cat



Red Fox



Grey mongoose



Blanford fox



Funambulus Palmarum



Balochistan gerbil



Suncus murinus



Indian Hedgehog



House mouse



Indian desert jird



Black rock agama



Indian firing toed lizard



Indian Skittering frog



Bufo toad

Figure 14: Mammals Observed at Study Area



Jungr Babbler



Buzzard eagle



Indian roller



Grey shrike



Common Kingfisher



Hond heron



Collared Dove



White cheek bulbul



Common Kingfisher



Cattle egret



Pied Kingfisher



Green bee eater



Indian Roller



Robin

Figure 15: Birds in the Sub-Project Areas



5.5.2 Flora of Kohistan Sub-Project Area

The vegetation of the study area can be classified as 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 the 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 perennial 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 the Kohistan sub-project area are (*Euphorbia caducifolia*), Phog (*Calligonum polygonoides*), and (*Calotropis gigantea*). In irrigated tracts, Babul (or Babur), *Acacia nilotica*, Talhi (*Dalbergia sissoo*) Nim (*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. There is no previous report available on the vegetation of this area. Details of flora found in lower Kohistan sub-projects areas are given in Table - 22 and a photo gallery of flora and their habitats are given in Figure - 16.

Table 22: Flora of Lower Kohistan Sub-Project Area

Sr. No.	Common Name	Scientific Name	Plant type	IUCN status
1	Sindhi Babur	<i>Acacia nilotica</i>	Tree	LC
2	Kumbat	<i>Acacia senegal</i>	Tree	NA
3	Lamb gaah	<i>Aristida funiculata</i>	Grass	NA
4	Neem	<i>Azadirachta indica</i>	Tree	LC
5	Ak	<i>Calotropis procera</i>	Shrub	NA
6	Kirar	<i>Capparis decidua</i>	Shrub	LC
7	Dhaman	<i>Cenchrus ciliaris</i>	Grass	LC
8	Trooh	<i>Citrullus colocynthis</i>	Climber	NA
9	Gugur	<i>Commiphora wightii</i>	Tree	CR
10	Sussai	<i>Convolvulus spinosus</i>	Herb	NA
11	Chag	<i>Crotalaria burhia</i>	Shrub	NA
12	Drabh	<i>Desmostachya bipinnata</i>	Grass	LC
13	Thohar	<i>Euphorbia caducifolia</i>	Shrub	NA
14	Khip	<i>Leptadenia pyrotechnica</i>	Shrub	LC
15	Pesh	<i>Nannorrhops ritchiana</i>	Tree	NA
16	Ghander	<i>Ochthochloa compressa</i>	Grass	NA
17	Dhaman	<i>Panicum turgidum</i>	Grass	NA
18	Nar khip	<i>Periploca aphylla</i>	Shrub	LC

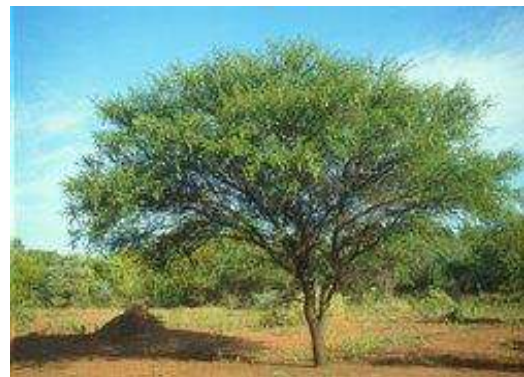


Sr. No.	Common Name	Scientific Name	Plant type	IUCN status
19	Kandi	<i>Prosopis cineraria</i>	Tree	NA
20	Kikar	<i>Prosopis juliflora</i>	Tree	NA
21	Wekho	<i>Pteropryum aucheri</i>	Shrub	NA
22	Sar	<i>Saccharum spontaneum</i>	Grass	LC
23	Jar/Peroon	<i>Salvadora oleoides</i>	Tree	NA
24	Rohiro	<i>Tecomella undulata</i>	Tree	NA
25	Lawo	<i>Tamarix aphylla</i>	Tree	NA
26	Lawo	<i>Tamarix dioica</i>	Shrub	NA
27	Lai	<i>Tamarix indica</i>	Shrub	NA
28	Paneer	<i>Withania coagulans</i>	Shrub	NA
29	Ber	<i>Ziziphus mauritiana</i>	Tree	LC
30	Ber	<i>Ziziphus nummularia</i>	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 16: Key Floral Species of the Study Area

5.5.3 Endemic and Endangered Species

Sindh Ibex (*Capra agagrusblathii*) 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 has been recorded from sub-project sites nor is even the habitat for these species the part of proposed project area.



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 counted during the field survey as shown in Table – 23.

Table 23: 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	Tikho-III	Sindhi babur	<i>Acacia nilotica</i>	Tree	LC	10	2	10	4
		Lai	<i>Tamarix indica</i>	Shrub	NA	8	5	0	0
		Kandi	<i>Prosopis cineraria</i>	Tree	NA	5	0	5	2
2	Pipre Baricha	Lai	<i>Tamarix indica</i>	Shrub	NA	10	5	8	5
		Jar/Peroon	<i>Salvadora oleoides</i>	Tree	NA	5	2	5	0
3	Ghulam Mustafa	Kandi	<i>Prosopis cineraria</i>	Tree	NA	10	4	6	2
		Sindhi babur	<i>Acacia nilotica</i>	Tree	LC	2	0	0	0
		Lai	<i>Tamarix indica</i>	Shrub	NA	10	2	15	5
4	Kamal Shodo	Kandi	<i>Prosopis cineraria</i>	Tree	NA	8	3	0	0
		Kikar	<i>Prosopis juliflora</i>	Tree	NA	10	0	10	5
		Ber	<i>Ziziphus mauritiana</i>	Tree	NA	10	5	5	0
5	Moosa Shoro	Kikar	<i>Prosopis juliflora</i>	Tree	NA	8	2	5	0
		Kandi	<i>Prosopis cineraria</i>	Tree	NA	5	0	0	0
6	Purkhani	Kikar	<i>Prosopis juliflora</i>	Tree	NA	15	5	5	0
		Lai	<i>Tamarix indica</i>	Shrub	NA	5	0	10	3
		Sindhi babur	<i>Acacia nilotica</i>	Tree	LC	8	0	10	5
		Kandi	<i>Prosopis cineraria</i>	Tree	NA	10	0	5	5
7	Kand Nai	Kikar	<i>Prosopis juliflora</i>	Tree	NA	15	5	5	0
		Kandi	<i>Prosopis cineraria</i>	Tree	NA	5	0	0	0
8	Asabo	Kikar	<i>Prosopis juliflora</i>	Tree	NA	8	0	10	5
9	Janai	Kandi	<i>Prosopis cineraria</i>	Tree	NA	5	2	0	0
		Kikar	<i>Prosopis juliflora</i>	Tree	NA	10	0	5	2
10	Hub-3	Kikar	<i>Prosopis juliflora</i>	Tree	NA	10	2	5	2
		Sindhi babur	<i>Acacia nilotica</i>	Tree	LC	5	0	10	5
		Kandi	<i>Prosopis cineraria</i>	Tree	NA	5	0	10	5
11	Hub-2	Jar/Peroon	<i>Salvadora oleoides</i>	Tree	NA	5	2	5	0
		Ber	<i>Ziziphus mauritiana</i>	Tree	NA	10	5	10	0
12	Hub-1	Kandi	<i>Prosopis cineraria</i>	Tree	NA	10	3	5	0
		Jar/Peroon	<i>Salvadora oleoides</i>	Tree	NA	8	2	5	0
Sub Total						235	56	169	55
Total Number of Existing Trees						404			
Total Number of Cut Down Trees						111			

	Kirthar National Park (KNP)								
	Mahal Kohistan Wildlife Sanctuary (MKS)								
	Hub Dam Wildlife Sanctuary (HDS)								
	Buffer zone								

LC= Least Concern, NA= Not Assessed

5.5.5 Characteristics of Kirthar National Park

Kirthar National Park is Pakistan's second-biggest National Park. It is also the first National Park from Pakistan to be included in the 1975 United Nation's list of National Parks around the world. Kirthar is an area of outstanding beauty and cultural heritage that provides important habitat for a variety of mammals, birds, and reptile's characteristic of the arid



subtropics. Approximately one-third of the park lies in the north of Karachi district and two-thirds in the south-west of Dadu district. The park is part of a 447,161ha protected areas complex, being contiguous with Mahal Kohistan Wildlife Sanctuary (70,577ha) to the south and Hab Dam Wildlife Sanctuary (27,219ha) to the south-west. Surjan, Sumbak, Eri and Hothiano Game Reserve (40,632ha) lies just to the east of the park. Both these protected areas (KNP & MKS) and others protected areas are habitat for threatened and endangered species. The livestock and wildlife are living in harmony since ages. There are two tourist centers in the Park managed by Sind Wildlife Management Board, namely Khar and Karchat. The centers offer cottage and dormitory accommodation and guides are available. There is some 671km of non-metallic/ dirt roads within the park, mostly are motor able only by 4X4-vehicle.



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

6.1 Methodology

This section describes the socio economic condition of the subproject area. The socio-economic survey and social impacts assessment was carried out during the month of November and December 2020. The team used a questionnaire and checklist for Focus Group Discussions (FGDs) (Attached at Annexure-X). In order to have comprehensive detailed information, consultation meetings were 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 rainwater 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 12 villages namely, M Usman Choro, Piper Khan Barecho, Muhammad Rahim Burfat, M.Murad Brohi, M.Moosa Choro, Kamal Khan Shodo, Haji Rasool Bux Khaskheli, Pathan Khan Burfat, Mian Wasayo Kanro, Molvi Abdul Qadir Brohi, Karim Bux Brohi, Ali Muhammad Birohi. All of these villages were within primary impact zone. This survey was conducted in the month of November and 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-24.

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 24: Villages 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	Purkhani	M.Usman Choro	2.5	Mole	Thano Bola Khan	Jamshoro	25° 13' 18.45" N	67° 27' 41.28" E
2	Pipre Baricha	Piper Khan Barecho	2	Mole	Thano Bola Khan	Jamshoro	25° 37' 05.09" N	67° 26' 12.53" E
3	Ghulam Mustafa	Muhammad Rahim Burfat	2	Mole	Thano Bola Khan	Jamshoro	25° 31' 03.31" N	67° 32' 18.62" E
4	Tikho-III	Muhammad Murad Birohi	1.5	Taung	Thano Bola Khan	Jamshoro	25° 42' 57.01" N	67° 43' 58.09" E
5	Moosa Chhoro	Moossa Chhoro	2	Mole	Thano Bola Khan	Jamshoro	67° 26' 25.23" N	25° 18' 49.67" E
6	Kamal Shodo	Kamal Khan Shodo	2	Sari	Thano Bola Khan	Jamshoro	25° 23' 31.55" N	67° 32' 02.56" E
7	Janai	Haji Rasool Bux Khaskheli	2	Gadap	Gadap	Malir Karachi	25° 12' 04.11" N	67° 12' 25.80" E
8	Asabo	Pathan Khan Burfat	2	Moidan	Gadap	Malir Karachi	25° 19' 54.98" N	67° 17' 35.07" E
9	Kand Nai	Muhammad Qasim Kanro	1.5	Moidan one	Gadap	Malir Karachi	25° 22' 01.86" N	67° 21' 36.42" E
10	Hub 1	Yar Muhammad Birohi	1	Allah Pai	Shah Mureed	Malir Karachi	25° 08' 28.90" N	67° 02' 45.77" E
11	Hub 2	Karim Bux	1	Allah	Shah	Malir	25° 10' 12.65" N	67° 02' 57.00" E



Sr. No	Name of Sub-Project	Village	Distance from proposed site (km)	Union Council	Taluka	District	Coordinates	
							Northing	Easting
		Birohi		Pai	Mureed	Karachi		
12	Hub 3	Ali Muhammad Birohi	2	Allah Pai	Shah Mureed	Malir Karachi	25° 11' 37.00" N	67° 03' 19.29" E

6.4 Population

The population in surveyed villages is homogeneous, as the inhabitants, living in the villages belongs to Muslims religions. The population represents different casts groups including Chhora, Burfat, Barecha, Khaskheli, Hamlani, Brohi, Gabol, Rind, Khosa, Shoda, Jokhia, Kanra, Mengal, Qalandrani.

The social harmony is prevalent in the area 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 laborers. 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-25.

Table 25: Population and Tribes on Sub-Projects

Name of Sub-Project	Village	Tribes	Religion	House Holds	Population	Average Family size
Purkhani	M.Usman Choro	Chhora,	Islam	55	421	7.6
Pipre Baricha	Piper Khan Barecho	Barecha,	Islam	50	362	7.2
Ghulam Mustafa	Muhammad Rahim Burfat	Burfat,	Islam	25	202	8.1
Tikho-III	Muhammad Murad Birohi	Brohi	Islam	50	361	7.2
Moosa Chhoro	Moossa Chhoro	Chhora,	Islam	350	2417	6.9
Kamal Shodo	Kamal Khan Shodo	Shoda	Islam	30	243	8.1
Janai	Haji Rasool Bux Khaskheli	Khaskheli, Jokhya, Burfat	Islam	200	1596	7.9
Asabo	Pathan Khan Burfat	Burfat	Islam	350	2423	6.9
Kand Nai	Muhammad Qasim Kanro	Kanra	Islam	70	527	7.5
Hub 1	Yar Muhammad Brohi	Brohi	Islam	150	591	3.9
Hub 2	Karim Bux Brohi	Brohi	Islam	130	1016	7.8
Hub 3	Ali Muhammad Brohi	Brohi	Islam	150	1196	7.9
Total				1610	11355	

6.5 Languages

Sindhi is the dominant language spoken in the project areas, as 100% of the population speaks Sindhi. Moreover, people of the area also speak Sindhi, Balochi, and Sraiki,

languages. National language 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 sub-project area only Muslim population lives within the same villages, 100-percent population belongs to Muslim religion. There are the several mosques in the sub-project area.



Figure 17: Mosque 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. The community have been practicing agriculture through rainwater harvesting at a small scale. Major crops of the area, which is at subsistence level includes wheat (40 Maunds/acre) and vegetables. The area is famous for onion crop (50 Maunds/acre).



The proposed small dams would recharge the aquifers in the area and would bring positive change on ground water availability, crop type and yield.

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 10, while average landholding per household is less than 1 acre. 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 deplorable 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 average minimum monthly household income level in the surveyed villages is Rs.10, 000, while maximum monthly household income level is Rs.25, 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 by the community in FGDs 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 – 26.

Table 26: Village wise losses due to drought in 2018-2019

Sub-Project Name	Village	Total livestock population	Livestock mortality	Total agriculture area (Acre)	Reduction in ground water
Purkhani	M.Usman Choro	440	31	100	15%
Pipre Baricha	Piper Khan Barecho	377	27	130	17%
Ghulam Mustafa	Muhammad Rahim Burfat	145	13	50	16%
Tikho-III	Muhammad Murad Birohi	1475	154	121	17%
Moosa Chhoro	Moossa Chhoro	6150	369	150	19%
Kamal Shodo	Kamal Khan Shodo	660	41	150	17%
Janai	Haji Rasool Bux Khaskheli	349	33	50	16%
Asabo	Pathan Khan Burfat	761	46	200	18%
Kand Nai	Muhammad Qasim Kanro	2563	153	201	19%



Hub 1	Yar Muhammad Brohi	875	52	100	20%
Hub 2	Karim Bux Brohi	849	51	70	17%
Hub 3	Ali Muhammad Birohi	946	57	100	19%
Total		15590	1027	1422	

Source of data is FGDs with community

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 twelve surveyed villages, one village is mono tribal. While the eleven villages are bi tribal, the village leader resolves the minor scale conflicts

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. The conflicts such as 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 50 to 150 houses. Some of the houses usually have a boundary wall enclosing enough space for cattle and storage. Houses consist of huts called *kotho* with thatched roofs of grasses, which, are built on mud-plastered platforms. It was observed that all the people were living in self-owned houses.



Figure 18: Housing pattern in the Sub-Project Area

6.14 Literacy and Education Facilities

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 592 boys and 14 teachers, in addition there are 3 girls schools in the sub-project area in which 113 girls' are enrolled with 4 teachers. Moreover, there is a one Boys Middle School in the Sub-project area with 67 students and 4 teachers. In three villages namely Janai, Asabo, and Kand Nai girls are getting education in boys schools, as the girls' schools are dysfunctional according to the community members. The education facilities in the sub-project areas are given in Table-27.

Table 27: Education Facilities in the Sub Project Area

Name of sub-project	Boys Primary School	Teachers	Enrollment	Girls Primary School	Teachers	Enrollment	Boys Middle School	Teachers	Enrollment	Girls Middles School	Teachers	Enrollment
Purkhani	1	1	51	0	0	0	0	0	0	0	0	0
Pipre Baricha	1	1	33	0	0	0	0	0	0	0	0	0
Ghulam Mustafa	1	1	47	0	0	0	0	0	0	0	0	0
Tikho-III	1	1	55	0	0	0	0	0	0	0	0	0
Moosa Chhoro	1	1	49	0	0	0	0	0	0	0	0	0
Kamal Shodo	1	1	37	0	0	0	0	0	0	0	0	0
Janai	1	1	53	1	1	31	0	0	0	0	0	0
Asabo	1	2	59	1	2	43	1	4	67	0	0	0
Kand Nai	1	1	56	0	0	0	0	0	0	0	0	0
Hub 1	1	1	47	0	0	0	0	0	0	0	0	0
Hub 2	1	2	63	1	1	39	0	0	0	0	0	0
Hub 3	1	1	42	0	0	0	0	0	0	0	0	0
Total	12	14	592	3	4	113	1	4	67	0	0	0



Figure 19: Boys Middle & Girls Primary School at Sub-Project Area

6.15 Health Facilities

It was found that in sub- project area many of the people have suffered from hepatitis, typhoid, malaria, eye problems, diarrhoea 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 Thano Bola Khan, Hyderabad, and Karachi. However, in some villages quacks 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 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 M-9 Motorway

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 Karachi by trucks. The firewood is also transported through trucks and trolleys. Transport facility of sub-project area is given in Table-28.

Table 28: Transport Facilities in the Sub Project Area

Name of sub-project	Van/Pickup	Bus/ Truck	Car	Motor Bike	Distance from Village to Main Road(km)
Purkhani	0	2	2	5	45
Pipre Baricha	2	2	1	7	55

Ghulam Mustafa	1	3	3	10	61
Tikho-III	2	2	5	12	67
Moosa Chhoro	3	4	2	15	55
Kamal Shodo	0	5	3	21	44
Janai	7	3	5	19	35
Asabo	4	5	7	25	49
Kand Nai	0	3	2	13	51
Hub 1	4	7	5	23	53
Hub 2	2	5	3	17	51
Hub 3	3	4	5	12	49
Total	28	45	43	179	



Figure 20: Transportation Facilities in the Sub-Project Area

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. 600 per 40 kg. Moreover use of solar system and diesel



for irrigation purpose was also witnessed in some villages of sub-project area. 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 sources within and outside the village.

The underground water is not safe for consumptive purposes. The underground water results sheet Table 17 reveals that all groundwater quality parameters are within SEQs permissible limits, except TDS and total coliforms, which were exceeding permissible limits in some sub-project areas. The reason for exceeding coliform might be due to the unavailability of the sewerage system or open defecation in the area.

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 a small segment of the population uses 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 the sources of drinking water are provided in the Table 29

Table 29: Drinking Water Source in the Sub-Project Areas

Sr. No.	Name of the Dam	Hand pumps	Dug wells	Water Table (Min- Max) ft	Number of Tube-Wells and Use			Piped water
					Number	Drinking	Irrigation	
1	Purkhani	0	1	200-250	1	0	0	0
2	Pipre Baricha	0	1	150-250	1	0	0	0
3	Ghulam Mustafa	0	1	350-400	1	0	0	0
4	Tikho-III	0	2	350-400	2	0	0	0
5	Moosa Chhoro	0	1	300-350	1	0	0	0
6	Kamal Shodo	0	2	300-350	2	0	0	0
7	Janai	0	1	300-350	1	0	0	0
8	Asabo	0	2	250-300	1	0	0	0
9	Kand Nai	0	1	150-250	1	0	0	0
10	Hub 1	0	1	120-150	1	0	0	0
11	Hub 2	0	1	120-150	1	0	0	0
12	Hub 3	0	1	120-150	1	0	0	0
			15		14	0	0	0



Figure 21: The main sources of the water in 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 consultation meetings in the sub-project area different types of problems, (The community faces number of problems. During the consultation process, the community highlighted their needs and this section documents priority needs of the community, which may not be relevant to the project).were identified and priorities for each village are summarized as follows;

- Provision of Women vocational center in the village
- Provision of the sui gas facility in the village
- Provision of the potable drinking water in the village
- Provision of the maternity health center in the village
- Demanded male 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

Saint and shrines are highly respected by the local communities during baseline survey no any archaeological sites observed in the impact zone of dam sites and no any 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 sites. However, these are not situated within the primary impact zone of the sub-project area. Annexure-XI show the location and distance of nearest archaeological sites from proposed project dam sites.



7. STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

The objective of conducting stakeholder consultations during the ESIA process was to inform all the stakeholders about the project, record, 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 ESIA. 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 meeting 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 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

Public Hearing

The public hearing of the ESIA study of twelve dams held at Upper Mole, Taluka Tanano Bola Khan District Jamshoro on Thursday, July 15, 2021. In this regard, Public Notice for public hearing was published 15 days in advance in national and local newspapers to invite general public, concerned citizens, civil society organizations and other stakeholders to participate in the public hearing. The Sindh EPA also uploaded the ESIA document on its official website. Minute of meeting of the Public hearing has been annexed as Annexure – XVII.



Public Hearing at Project Area

7.2 Community Consultation for Sub-Projects

The consultation was carried out during field visits conducted from October 2020 to 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. Moreover, public consultation for SEPA was carried out in strict compliance with SOPs for COVID 19 on 15 July 2021. Please see photo above. 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. Detailed consultation has been conducted with these villages as

these are within the primary impact zone (refer Table - 30) while the villages of the secondary impact zone have also been consulted through their village elders/leaders. (The list of the villages provided in Table - 38)

Table 30: List of Villages Visited During the Consultation

Name of the Sub-Project	Name of the village	Date of Consultation	No of Participants
Purkhani	M.Usman Choro	29/10/2020	10
Pipre Baricha	Piper Khan Barecho	29/10/2020	12
Ghulam Mustafa	Muhammad Rahim Burfat	28/10/2020	14
Tikho-III	Muhammad Murad Birohi	11/12/2020	17
Moosa Chhoro	Moossa Chhoro	21/10/2020	14
Kamal Shodo	Kamal Khan Shodo	20/10/2020	17
Janai	Haji Rasool Bux Khaskheli	21/10/2020	15
Asabo	Pathan Khan Burfat	20/10/2020	12
Kand Nai	Mian Wasayo Kanro	18/12/2020	20
Hub 1	Yar Muhammad Birohi	10/12/2020	14
Hub 2	Karim Bux Birohi	10/12/2020	13
Hub 3	Ali Muhammad Birohi	10/12/2020	14
Total			172



Figure 22: Public Consultations with male community members 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 12 sub-project areas, while total attendees were 106. 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, these 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. Moreover, they do not express any concerns regarding these sub-projects.

Table 31: List of villages visited during the women consultation

Sr. No	Name of the Sub-Project	Name of Village	Date of consultation	No of Participants
1	Purkhani	M.Usman Choro	29/10/2020	8
2	Pipre Baricha	Piper Khan Barecho	29/10/2020	9
3	Ghulam Mustafa	Muhammad Rahim Burfat	28/10/2020	10
4	Tikho-III	Muhammad Murad Birohi	11/12/2020	6
5	Moosa Chhoro	Moossa Chhoro	21/10/2020	8
6	Kamal Shodo	Kamal Khan Shodo	20/10/2020	7
7	Janai	Haji Rasool Bux Khaskheli	21/10/2020	12
8	Asabo	Pathan Khan Burfat	20/10/2020	10
9	Kand Nai	Mian Wasayo Kanro	18/12/2020	9
10	Hub 1	Yar Muhammad Birohi	10/12/2020	10
11	Hub 2	Karim Bux Birohi	10/12/2020	8
12	Hub 3	Ali Muhammad Birohi	10/12/2020	9
Total				106





Figure 23: 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
The participants shared that they are the people of far-flung areas and they face acute shortage of the water scarcity and have to fetch water from very long distance. They said that small dams would help recharge the ground water in the area and this was the major need of the area.	Noted.
The participants were of the view that their areas are very backward, and poverty level is high as compared to the other areas, so local people should be provided employment during the construction work of the small dams	The participants were told that first preference for employment would be given to the local people.
The participants further shared that they are basically follower of the tribal system, and they have lot of values of their tribal system. Hence during the implementation phase of project, this sort of traditions needs to be considered.	Noted. It was assured that the same would be ensured during the course of project implementation.
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 strongly demanded that unskilled labour should be hired from local area, as there is availability of unemployed young men.	Participants were told that local community people would be employed through coordinator and this is strictly mentioned in monitoring plan.



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 ESIA. 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 emersion and 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, NGOs working in the area 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 opinions about the sub projects were requested. The list of identified institutional stakeholders and date of consultation with their representatives is given in Table 32.

Table 32: List of Institutional Stakeholders

<i>Stakeholder</i>	<i>Date of Consultation</i>
International Union for Conservation of Nature (IUCN)	April 07,2021
HANDS	April 14, 2021
Sindh Graduates Association	April 14, 2021
Thardeep Rural Development Programme	March 15, 2021
World Wide Fund for Nature (WWF)	March 30, 2021
Sindh Environmental Protection Agency (SEPA)	March 29, 2021
Sindh Wildlife Department	November 24, 2020



Summary of concerns raised by institutional stakeholders

<i>Comments/Observations</i>	<i>Actions Responses</i>
The majority of All the stakeholders expressed their positive view related to the construction of small dams.	The construction of small dams will ensure the availability of water. Construction of small dam projects in this area will supplement and further enhance the wild habitat, which ultimately supports food and shelter for particularly aquatic fauna and flora.
The stakeholders suggested that strict monitoring of ecological resources (Flora & fauna) should be carried out during the construction phase. Wildlife Expert must be engaged to monitor the impacts on the ecology of the area and provide the training to the staff regarding the wildlife conservation and protection and TOR must be annexed with the ESIA as guiding tool for the contractor for developing its CESMP.	KNP Management Plan (Table 37) has been proposed in the ESIA which will be implemented by Project through Ecologist of supervision consultants . Specific training of the staff related to wildlife aspects (conservation & Protection) has been incorporated in the training plan (Table - 39) and budget has been allocated ensure. refer section 8.1.19. Construction activities will be strictly monitored by the ecologist refer to section 10.2.3. Term of reference for the Ecologist has been annexed as Annexure-XII
The stakeholders suggested that the construction of small dams would lead to improvement in overall socioeconomic conditions in the sub-project areas.	Noted
The stakeholders suggested that the construction camp must be outside the hotspot areas with the fence to avoid wildlife encounters.	Barricated camps has been proposed for both all small dams, camp activities will be kept confined within the boundary area, activities will not be allowed during dawn to dusk timing.
The stakeholders suggested that care must be given to protect fauna and flora during the construction phase.	Development of new tracks will be avoided existing tracks will be used and campsite will occupy small areas and will be located in existing clearings. Use of local vegetation as fuel by labor will be strictly prohibited. Furthermore, adequate measures to protect fauna and flora have been provided in section 8.1.
The stakeholders recommended that the project proponent shall help the local communities' plant fruit and palatable tree species in the nearby surroundings that would not only help in the greening of the area.	The plantation would be undertaken with the preference of local species no exotic species will be promoted. The fruit plants will be provided to locals to plant in their villages only.



Summary of concerns raised by NGOs working in the area

<i>Comments/Observations</i>	<i>Actions Responses</i>
The stakeholders were of the view that water scarcity is a major problem of the sub-project areas, and these dams will bring positive change in the area. They appreciated 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 organizations and department to cover these areas through their project interventions.
It was suggested by the stakeholders that during the construction phase, local traditions and customs need to be valued and respected. The camp office should be established away from the villages/settlements.	It was assured that local cultural values and traditions will be given full consideration and site camps will be established away from the villages.
The stakeholders suggested that, constructions of the local road pavements for the local communities as they can easily move.	Though this is not in purview of the project. However, the communities may approach relevant departments.



Meeting with HANDS



Meeting with Sindh Graduate Association (SGA)



Meeting with Thardeep Rural Development Program (TRDP)

Photographs of consultation with NGOs working in the area



Consultation with World Wide Fund for Nature (WWF)



Consultation with SEPA



Consultation with IUCN



Consultation with Wildlife Expert Mr. Rafiul Haq

Figure 24: Photographs of Institutional Consultation

7.4. Consultations in villages located in downstream

The consultation was undertaken with the communities of downstream villages from August 31 to September 1, 2021. During the consultation, the communities were keen to have small dams in their area. According to the community, these small dams would serve water requirements for human population, agriculture and livestock. They further shared that frequency of drought is increasing and if dams were constructed earlier, the area would have positively benefited. However, they hoped that with the construction of dams in the area, the water would be available for subsistence agriculture, livestock and other wildlife species besides human consumption.

Table 33: List of downstream villages visited during consultations

Name of Sub-Project	Name of Village	Date of Consultation	No of Participants
Purkhani	Meeran Khan Choro	August 31, 2021	11
Kamal Shodo	Saleh Shodo	August 31, 2021	13
Asabo	Sanyasi	August 31, 2021	12
	Haji Noor Muhammad	August 31, 2021	10
Kand Nain	Ilyass Kanro	September 01, 2021	11
	Ibrahim Kanro	September 01, 2021	9
Hub-II	Rahim Brohi	September 01, 2021	15
Total			81





Figure: Public Consultations in Villages located in downstream

Comments /Observations	Action /Response
The participants shared that these dams should be constructed as soon as possible because the people of sub-project area are facing acute problems regarding the fetching water from the far flung areas.	The participants were informed that these sub-projects, work will be commenced after the completion of necessary requirements, as it goes through different process of approval and awarding of contracts.
During the consultation meeting, the community demanded that employment of local people may be provided to unemployed people of the area during construction phase.	The participants were informed this has already been taken care and maximum employment would be given to the area people by the contractor.
The community highlighted that the privacy of women may be affected during construction phase. As women currently collect water, fuel wood and tend to livestock etc. and they are concerned about their safety.	Cultural emersion and 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 labour with and children".

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 ESIA of the reported sub-projects will be translated into Sindhi after approval from the World Bank same will also be uploaded on the website of SRP irrigation department. In addition to this ESIA document will 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 that 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 ESIA. The minor impacts can be resolved through the best management practices. Social impacts such as getting borrow pit area, hiring of laborers and setting up of labour camp will be mitigated according to applicable policies and procedures. The sub-projects will be highly beneficial for the inhabitants of water-scarce areas of lower 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 is expected.

The possible negative impacts of the construction of proposed dams on air, water, land, and 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 environmentally 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. Many 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 the proposed small dams, there shall 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 must prepare Job Hazard Analysis (JHA) and institution of a Permit to Work system and get its approval before start of the work.



- The contractor will ensure the use of Personal Protective Equipment (PPEs) for his labours 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 worker's hygienic conditions in labour camps.
- The Contractor shall make available the first aid kit and bandages at all times and at all the sites. Moreover, paramedic staff will be available on site and cost of hiring will be a part of BOQ item. The location of these kits shall be marked and shall be easy to access by all.
- No private property without permission of the owner will be used for transportation;
- Drivers will fix net on containers while transporting stones and sand 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.

8.1.5.1 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 have been given in SOPs attached in Annexure - XIII.



8.1.6 Noise Pollution

During the Construction stage, Noise will generate due to the civil 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.

8.1.7 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, the affected communities will also carry out On-demand noise monitoring in case of any complaint or request. Noise level of machines to be used during the construction will be controlled and measured will be taken to limit the levels as per 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 is far away from the population so, excavation noises for weir 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 operational stage as there would be no machinery movement and other noise related activities.

8.1.8 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 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. The exhaust of noxious gases from the 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

Impact of dust is restricted only to the few villages, which is very closely located on the route to the dam sites. The dust problem is expected to be minimal. During operation stage, the area would be dust free as there would be no construction activities and heavy vehicular movement. Dust generated due to vehicle movement may affect photosynthesis, respiration, transpiration and allow the penetration of phyto-toxic gaseous pollutants, which may reduce the productivity of the plants.

Water sprinkling will be done by contractor at traffic routes, two to three time a day (as per site and weather conditions) near human settlements and areas of flora and fauna exist. Movement of traffic will be limited to designated routes, identified in the map attached as Annexure - III.

iii) Smoke and Vehicular Emission

Smoke emission from the vehicular movement and heavy machinery would slightly cause smoke problem in the nearby villages, which are located on the way of dam sites. While no smoke and emission issue is anticipated during operational stage as, there would be no heavy machinery movement and other related activities.

8.1.9 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 and noise 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 may be grey water 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 10km/h for vehicles to reduce the dust emission.
- Native species trees shall be planted, no rapidly growing trees, shrubs and grasses in the project area shall be allowed during operation stage of the sub project with the collaboration of Forest department.

8.1.10 Water Related Impacts

i. Water Quality





The water samples were collected from the dug wells near the proposed small 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 - 34.

Table 34: Site Waste

Type of Waste	Description
The 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, maybe 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, have been given below.

- **Impact on Reservoir Area**

The Reservoir area houses a low population of plants, animal habitats, and reptile animals except for fish fauna due to the non-perennial system in the reservoir. Reservoir areas of proposed dams are located in KPAC are not exceeding 1.12 Sq.km; however, KPAC is widespread over 3087 sq. km. Keeping in view the small/negligible area involved in construction it may be inferred that wildlife of KPAC would migrate naturally. In addition to



that, it will be ensured that construction activities will be confined in the designated area. Therefore, there would be no major effect on them during the construction stage. After the construction of the dams, a positive impact on plants, animal habitats, fish fauna, and reptile animals in the reservoir area is anticipated. It is expected that reservoirs would retain water for four to eight weeks.

- **Impact on Command/Lower Riparian**

Table 35 reveals that the ratio of reservoir capacity against the mean annual flow of twelve small dams varies. These dams recharge the groundwater on the way and sometimes spread on banks. The combined reservoir storage capacity of six dams namely Pipre Baricha (SRP-AF), Sangchat Jo Tar (Phase III), Aripir (Phase I), Upper Mole - II (Phase II), Moosa Shoro (SRP-AF), Purkhani (SRP-AF) is 1501 acre-ft. As an average year, these small dams will be reducing flows of Mole River and water availability in Catchment Area of Mole River is 16497 (Acre-ft) hence only 9.1 % of water will be retained for the ground water recharge. Furthermore, since these dams are recharge dams, the groundwater will ultimately join mole River and no significant impact on lower riparian is envisaged.

Water retention against the mean annual flow of the small dams with respect to each dams/streams have been given in the Table 34. The table depicts that highest value is the 54 % at Janai Dam and lowest at Pipre Baricha which is 0.3%. Whereas, the remaining non-perennial streams will retain 3 to 15 % of water, except for Kand nai where 30% will be retained 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 availability in Catchment Area (Acre-ft)	Water to be retained for groundwater recharge by the Dams (Reservoir Capacity in Ac-ft)	The ratio of Water to be retained by the dams against Water Availability in the catchment (%)
1	Asabo (SRP-AF)	1,168.3	85.7	7.3
2	Pipre Baricha (SRP-AF)	16,497.1	49.0	0.3
3	Sangchat Jo Tar (Phase II)		600.0	3.6
4	Aripir (Phase I)		218.0	1.3
5	Upper Mole - II (Phase I)		139.0	0.8
6	Moosa Shoro (SRP-AF)		380.4	2.3
7	Purkhani (SRP-AF)		115.0	0.7
8	Kand Nai (SRP-AF)		534.6	161.4
9	Ghulam Mustafa (SRP-AF)	1,114.2	173.6	15.6
10	Hub-1 (SRP-AF)	328.7	28.8	8.7
11	Hub-2 (SRP-AF)	578.2	51.9	9.0
12	Hub-3 (SRP-AF)	992.4	33.3	3.4
13	Janai (SRP-AF)	126.3	68.5	54.3
14	Kamal Shodo (SRP-AF)	1,834.3	66.6	3.6



15	Tikho-III (SRP-AF)	8,934.5	295.5	3.3
Three dams namely Sangchat Jo Tar (Phase II), Aripir (Phase I) Upper Mole - II (Phase I) are being proposed on the same river or shared same watershed as of Pipre Baricha (SRP-AF), Moosa Shoro (SRP-AF) & Purkhani (SRP-AF).				

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 next confluence point due to the construction of these dams. Thus, there will be a negligible impact of the sub-projects on the eco-system. 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. It has been confirmed that there is no settlement downstream of the proposed dam until the water goes into the next convergence point. 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.

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.

It has been concluded from the dam break study, the reservoir area of all twelve (12) dams is small and not exceeding 1.12 sq. Kilometers. Thus, the area inundated in a worst-case scenario (Combined dam breach + 100-year flood) 283 sq. km at Moosa Choro and the number of a person affected in the worst-case scenario is a 749,808 person. While the rest have low incremental impact of dam breach on a 100-year design flood which is not appreciable. In the case of Moosa Choro Dam, an appreciable population may be affected in event of high flood. Maps of area inundated and population affected are attached as Annexure - XIV. An emergency preparedness plan will be prepared for all dams.



Kohistan Region

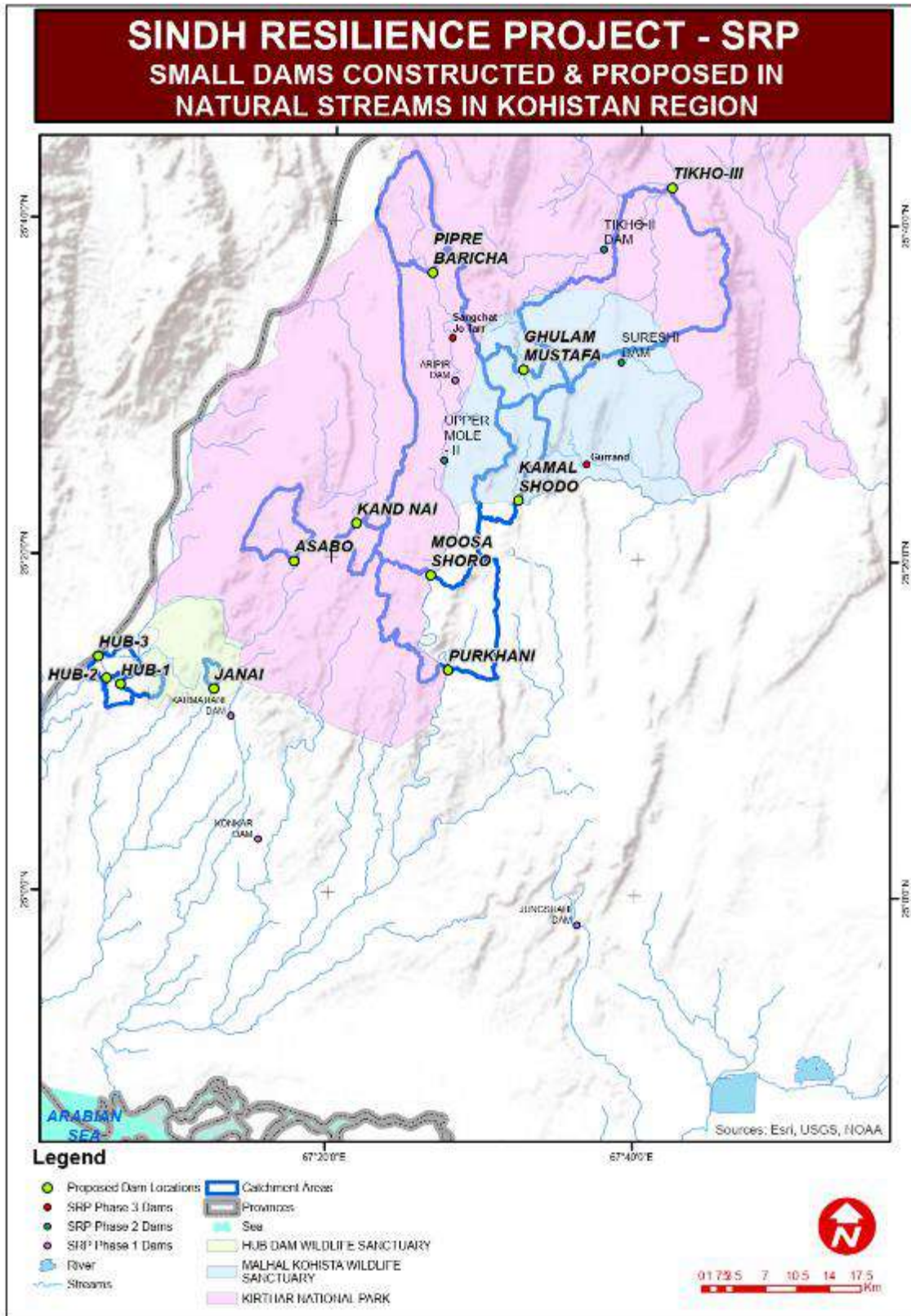




Table 36: Summary of Dam Break Study

S.NO	Parameters	ASABO	KAND NAI	PIPRE BARICHA	MOOSA CHHORO	JANAI	GHULAM MUSTAFA	TIKHO-III	PURKHANI	KAMAL SHODO	HUB-1	HUB-2	HUB-3
1	Flood Volumes:												
1.1	Reservoir Volume at Normal Reservoir Level (Acre-ft)	91	161	49	380	69	174	297	115	67	46	52	33
1.2	Design (100-year) Flood Hydrograph Volume (Acre-ft)	4,969	2,504	7,069	68,348	81	4,157	21,472	92,419	10,276	814	1,686	5,529
1.3	Combined volume: Dam Breach+100-year Flood (Acre-ft)	5,060	2,665	7,118	68,728	150	4,331	21,769	92,534	10,343	860	1,738	5,562
2	Discharge Peaks:												
2.1	Case 1: Breach Hydrograph Peak (cfs)	12,555	19,788	8,866	19,622	10,354	17,214	19,771	19,788	18,458	7,265	10,567	8,118
2.2	Case 2: Design (100 year) Flood Peak (cfs)	8,984	6,043	11,994	24,589	2,690	6,970	11,946	26,957	10,701	4,822	7,034	9,391
2.3	Case 3: Combined : Dam Breach + 100 year Flood (cfs)	21,539	25,831	20,860	44,211	13,044	24,184	31,717	46,745	29,159	12,087	17,601	17,509
3	Inundated Area (Sq.Miles):												
3.1	Case 1: Dam Breach only	3.28	4.95	1.39	6.75	5.06	3.19	7.46	3.37	3.86	0.59	0.68	0.26
3.2	Case 2: Design (100-year) Flood only	30.50	11.78	47.39	108.26	7.58	40.88	69.07	63.45	48.25	2.52	4.40	7.80
3.3	Case 3: Combined : Dam Breach + 100 year Flood	33.76	12.82	50.36	109.39	11.29	42.99	72.71	64.73	50.41	2.96	4.80	8.21
4	Estimated population affected according to Land Scan Population Grid:												
4.1	Case 1: Dam Breach only	189	175	1,207	1,622	8,281	550	1,871	974	260	166	236	110
4.2	Case 2: Design (100-year) Flood only	6,489	726	6,780	702,314	12,476	2,993	7,828	395,855	5,358	2,952	3,840	7,927
4.3	Case 3: Combined : Dam Breach + 100 year Flood	8,739	775	8,599	749,808	15,844	3,094	8,091	400,841	5,473	2,997	3,999	8,059



8.1.11 Water-Related Mitigations

A contractor will make his arrangement, 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 the local water resource in dry season when water table decline. The contractor will conduct Electrical resistivity surveying test along with pump-out test to assessing the groundwater potential required for the construction activities before 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 operated domestic water filter/150GDP with Ultraviolet (UV) to ensure safe and healthy drinking water for the workforce. (As stated by Matsumoto 2019⁸: UV system is effective for the control bacterial contamination). Moreover, Contractor also provide bottled drinking water to staff, which is part of contract.
- Proper collection and disposal of water used for construction (to be the contractor's responsibility).
- Collection drains and oil interceptors.
- The PISSC and ESMU of PMT. shall carry out regular monitoring of water quality.
- The contractor will be bound to transport the water from already constructed nearby areas, where groundwater is already available and tube-wells are already installed.
- Sewage generated at the campsites will be disposed of in septic systems comprising of septic tanks and soak pits.
- Wastewater from laundry, kitchen washings and showers will be disposed of into separate soak pits.

⁸ <https://www.mdpi.com/2073-4441/11/5/968/pdf>



- Soak pits will be built in absorbent soil and located 300 m away from a surface water source or groundwater well.
- Soak pits will be constructed such that surface runoff cannot enter into the pits.
- Soak pits will be designed to accommodate wastewater generated during the total duration of the operation.
- In case the soak pits are filled during the operation, greywater will be sprinkled over access tracks.
- A sprinkling of greywater will be done in a manner such that ponding of water is avoided.
- Water consumption will be monitored during the construction stage and records will be maintained to avoid any wastages.
- Diesel, oil, and lubricants should be properly stored following 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.

8.1.12 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.

Proper management of solid waste is also important because of the risk that improper solid waste handling and disposal poses to human health and the environmental degradation. Careless and indiscriminate open dumping of wastes can create unsightly and unsanitary conditions within the project area.

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 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. 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.

8.1.13 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).

8.1.14 Access to local Communities during operation

- During the operation period, some patches of Kacha tracks/ dirt roads (see Table-9) will be temporarily inundated due to the damming activity.

Access to local community-related Mitigation Measures

- An alternative access route will be provided for all temporary blockage locations, and adequate cost has been incorporated in BOQ documents.

8.1.15 Income and Employment

The employment opportunities generated by the growth in the local agricultural sector by enhanced availability of ground water both in quantity and quality and some other sectors such as livestock and poultry, the economy that stems from the agriculture improvement and livestock will increase significantly. Currently, the sub-project areas are dependent on local rainfall for crop and livestock production. Lack of rainfall thus meant extremely low harvests and high livestock deaths. Households responds to the shock mainly by reducing their non-essential expenses and look for additional casual work or seek gifts or loans. These strategies help reduce the initial food and income gap that they face when their harvest fails but serious gaps remains. In the extreme drought situation, the area people move to barrage areas along with their livestock as a major coping strategy.

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 are anticipated.



8.1.18 Reclamation of Land

During the operational stage no waterlogging, 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. Kirthar Park Road and Manchar lake road will also be used for access purposes. No permanent or temporary roads are 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, etc. 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 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 as well as secondary 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. Major project activities will be completed before the arrival of migratory birds on wetlands and other sensitive areas. No clearing of bushes will be allowed during nesting/breeding season of birds. Maximum effort will be made to save rodent colonies during construction.

However, the proposed dam sites are located in Kirthar National Park for which Sindh Wildlife Department has issued NOC vide letter no. CW/GEN/NOC/2019 and dated 7 January 2019 Copy is attached as Annexure - II. Since, all proposed sites are not exceeding 1.12 sq. km however Kirthar National Park is widespread over 3087 sq-km, keeping in-view a small area of dams, it is envisaged that the biodiversity of Kirthar National park will not be affected.

Moreover, the Wildlife hotspot for large endangered species (Sindh Ibex Chinkara, and Urial) are reported at Karchat & Khar Centers. The endangered wildlife hotspots Khar & Karchat are located outside of primary and secondary impact zones of proposed dam sites; at the distance of minimum 7 km. Details of distances have been depicted in the Table- 37. (Map of wildlife hotspots is attached as Annexure - XV).

Table 37: Distance of Wildlife Hot Spot Area from Proposed Dam Sites

Sr. No.	Proposed Sub Project	Khar (km)	Karchat (km)
1	Asabo	11	64
2	Kand Nai	19	58
3	Pipre Baricha	43	34
4	Moosa Chhoro	25	57
5	Janai	11	82
6	Ghulam Mustafa	43	33
7	Tikho-3	68	7
8	Purkhani	29	66
9	Kamal Shodo	36	46
10	Hub-1	14	88
11	Hub-2	14	89
12	Hub-3	13	88



However, mitigation measures mentioned in Table - 38 have been suggested are also integrated with the ESMP Table - 42, which will be dovetailed and implemented with the Kirthar National Park management plan. After the creation of reservoirs diverse wildlife including migratory birds may be attracted.

Table 38: Mitigation & Monitoring Measure for Kirthar National Park

Area	Mitigation & Monitoring Measure	Responsibility
Construction Mitigation Measures	Construction activities will be confined in the designated areas like where dam weir will be constructed and barricaded camp area.	Contractor, PISSC and PMT
	Before entry into the park, heavy equipment will be cleaned to prevent the importation of non-native plant species, hydraulic fittings will be tightened, and it will be ensured that hydraulic hoses are in good condition and shall be replaced and repaired if petroleum leaks observed.	
	Prior to entry into the park, all major Environmental parameters will be checked and ensured that impacts stay within the parameters of the project area and do not escalate beyond the scope of the environmental assessment.	Contractor, PISSC and PMT
	Major project activities will be completed before the arrival of migratory birds. No clearing of bushes will be allowed during the nesting/breeding season of birds	Contractor, PISSC and PMT
	It will be ensured and implemented that the project remains within the parameters of Sindh Environmental Quality Standards.	Contractor, PISSC and PMT
	The orientation of the project activities in the form of Tool Box Talk (TBT) will be provided regularly to all construction workers to increase their understanding and sensitivity to the challenges of the special environment in which they will be working.	Contractor, PISSC and PMT
	Proper and timely maintenance will be provided for vehicles and equipment used during construction to reduce the potential for mechanical breakdowns	Contractor, PISSC and PMT
	It will be ensured that all construction equipment has functional exhaust/muffler systems.	Contractor, PISSC and PMT
	Truck and related construction equipment speeds will be limit in active construction areas to a maximum of 15 KM/hr and strictly adhering to park regulations and posted speed limits in other areas while inside park boundaries.	Contractor, PISSC and PMT
	Water bowsers will be used to control excess airborne particulates at staging areas, active construction zones, and	Contractor, PISSC



Area	Mitigation & Monitoring Measure	Responsibility
	unpaved roads leading to/from active construction areas.	and PMT
Near Wildlife Habitats	Effects of light and noise on adjacent habitats shall be limited through controls on construction equipment.	Contractor, PISSC and PMT
	Adequate education will be provided and enforcement to limit construction worker activities that are destructive to wildlife and habitats.	Contractor, PISSC and PMT
	Firing any gun or doing any other activities which may disturb any animal or bird shall be prohibited which interferes with the breeding places.	Contractor, PISSC and PMT
	Noisy work shall be performed (such as the operation of heavy equipment) between the hours of 8:00 a.m. and 6:00 p.m. to minimize disruption to the nearby community.	Contractor, PISSC and PMT
Waste Management Measures	<p>Trash will be properly secured during the workday and all trash shall be removed from the site at the end of each workday.</p> <p>The waste will be disposed of according to its nature such as non-hazardous waste shall be buried in a deep pit away from the campsite, wildlife, and settlements whereas the contractor through a third-party waste management contractor approved by Sindh EPA shall dispose of hazardous waste.</p>	Contractor, PISSC and PMT
Breaking up of Land for Cultivation or mining purpose	It will be ensured that project activities will remain isolated as per design excavations; no other activities will be permitted.	Contractor, PISSC and PMT
Polluting water flowing in and through the National Park	Potential impacts related to water pollution sources will be identified and their mitigation measures proposed in the Contractor's CESMP.	Contractor, PISSC and PMT
Operation Phase disturbance to Wildlife	<p>Potential impacts related to hunting and poaching of wildlife during the operation phase have been identified, and their mitigation measure has been proposed in ESMP and will be updated in the Contractor's CESMP.</p> <p>During the operation phase, flora and fauna will flourish, and this has been observed on other dams completed so far in the first phase. National Park is well protected by Sindh Wildlife department in collaboration with local community. Hunting is prohibited, which is ensured through community and surveillance staff of Sindh Wildlife Department</p>	Sindh Wildlife Department / Local Community



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 from being eaten 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 the operation stage watershed erosion may result in the accumulation of silt in the reservoir resulting in 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 of water-borne diseases. Water utilization would be minimal as the distance of the dams to the nearest settlements is significant that would prevent the use of water daily.

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, a contractor based on occupancy in the camp will do the design of septic tanks during the construction stage and it 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



the provision of considerable job opportunities. Employment, health, lifestyle, 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 contractor while hiring labor i.e. 70% local and 30% non-local will apply the standard ratio. 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, the local population would get jobs in the form of semi and unskilled labor. The contractor would ensure that unskilled and skilled labour is paid wages as notified by the Government of Sindh on 9 July 2021. (Copy of Notification is attached as Annexure - XVIII). 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 Exploitation and Abuse (SEA) & 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.

The level of risks of child labor and Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH) is anticipated on lower side. This has been concluded in the light of Implementation of Phase –I. This is all due to the strict monitoring and implementation of management plan as approved by the WB.

As part of mitigation strategy, training/orientation session will be conducted to sensitize PMT, PISSC and Contractor's staff/workers on importance of addressing GBV/SEA/SH risks at the project level.

Furthermore, the child labour is not allowed on the project. The work is only offered to the person having CNIC. The Computerized National Identity Card (CNIC) is an identity card issued to any citizen of Pakistan that is 18 years of age or older.



Moreover, for child labour in hazardous work, minimum age is 18 years and above as specified by the Sindh Prohibition of Employment of Children Act 217.

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 counseling 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.

As part of the mitigation process, the contractors shall locate/ construct camps for their staff at least 500 meters away from communities to avoid social conflict as well as to avoid the possible adverse impacts of the construction camps on the surrounding communities. Fencing will be provided around the campsite and the Contractor will provide security. The camp layout plan and workers' code of conduct will be prepared by the contractor and will be submitted for review and approval of the Engineer.

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/AIDS/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. Contractor on site and camp areas will also provide first aid and medical facilities.

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

The 12 proposed dams of lower Kohistan region will be constructed on well-defined nais (rivers). The natural drainage pattern of surrounding areas are towards the lower riparian and after the overspill the remaining water will flows to downstream area. Thus, construction of these 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. In the primary impact –zone 12 villages are located while; seven villages are located in the downstream of dam sites the details are mentioned in Table – 39.

Table 39: Consulted Villages Located at Lower Riparian and Secondary Impact Zone

Sr. No.	Name of the Sub-Project	Name of the Village	Distance from The Sub-Project (KM)	Households	Population
1	Purkhani	Meeran Khan Choro	4	10	63
2	Piper Barcha	0	0	0	0
3	Ghulam Mustafa	0	0	0	0
4	Tiko -3	0	0	0	0
5	Moossa Choro	0	0	0	0
6	Kamal Shodo	Saleh Shodo	4	15	91
7	Janai	0	0	0	0
8	Asabo	Sanyassi	3.5	200	1200
		Haji Noor Muhammad	3	40	236
9	Kand Nain	Ilyass Kanro	3	30	180
		Ibrahim Kanro	3.5	45	270
10	Hub-I	0	0	0	0
11	Hub-II	Rahim Brohi	4	15	89
12	Hub-III	0	0	0	0
Total No of villages		7		355	2130

8.1.26 Cumulative Impacts of the Project

The proposed eleven dams under SRP-AF, Planned under SRP and already constructed dam in the sub project area will have mostly positive and slightly negative impacts in the subproject area. The cumulative impacts have been evaluated for construction and operation phases. Cumulative Impacts are focused on Valued Ecosystem Components (VECs) which include the Biodiversity component i.e., valued fauna and flora, Ecological component i.e., Ecosystem's flow regulation ability, Social Component i.e. Project affected People (PAP), Economic component i.e., Government and private/local Revenues.



Valued flora and fauna may have temporary and reversible impacts on habitat and wildlife within the subproject area. The first could 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 dam sites.

In terms of valued flora and fauna of VECs, the impacts of small dams will be mitigated through appropriate measures such as the clearing of habitat will only be done at dam axis points moreover, and the camp areas have been proposed at already cleared/barren land. The flora present around the proposed dam structures was counted during the field survey as shown in Table - 23. A total of 111 mature and young trees out of 404 trees, are expected to be damaged/uprooted during the construction phase. All species are common and widespread in the vicinity of the subproject areas furthermore, all of the impacted flora has the Least Concern status as per IUCN.

No permanent or temporary road will be constructed existing alignment will be used. In terms of other terrestrial wildlife species, previous studies have shown the effect of sensory disturbance during construction of 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. The construction activities at the proposed small dams might be completed before the arrival of winter migrants or suggested to be done in phases. KPAC is key feature of the area and impacts on this will be minimized by minimizing the duration of activities in their vicinity and restricting it to the summer season. 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.

During the operation phase of proposed dams in addition to the other already constructed and planned dams may create a positive impact on VECs in terms of habitat restoration and vegetation cover enhancement, which ultimately support the fauna of the area. This was also evaluated in the 'Performance Evaluation Study of Small Dams in Sindh Province' report that after the construction of small recharge dams in the area the biodiversity/habitat (trees and vegetation) is increased. A good number of forest trees including; *Acacia nilotica*, *Prosopis Cinereria*, *Tamarix gallica*, herbs, and shrubs were observed growing in the vicinity of dams. Since all nais/streams are non-perennial hence there is no fish farming practice observed so the impacts on aquatic fauna will be insignificant or negligible.

The VECs will be improved due to the availability of groundwater in a sustainable manner. Regarding 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 needs⁹.

During the operation phase reduction in water flow could be the main cumulative impact on VECs of these two small dams in addition to other already constructed dams and planned dams. VECs regarding the Ecosystem's flow regulation ability, There are six dams namely Pipre Baricha (SRP-AF), Sangchat Jo Tar (Phase III), Aripir (Phase I), Upper Mole - II (Phase II), Moosa Shoro (SRP-AF), Purkhani (SRP-AF) having combine reservoir capacity is 1501 acre-ft falls in same catchment area on and on Mole river, while, the rest of the other proposed dam have their separate catchment areas. (Refer Figure 25). It can be seen from the Figure - 25 that catchment of proposed dams varies, furthermore with the reference of Table 34 there is enough potential for lower riparian and for water harvesting. The proposed twelve dams in addition to other small dams in the area will not impact adversely lower riparian, as there is enough potential to construct the other dams as well.

Previously whenever there were rainfalls, caused flash floods. People confirmed that there were high flash floods in 2019 due to very high rains, low in 2018, and partial in 2017. The floodwater flushes to low-level areas and finally entered into the stream carrier channel (Nai), so the soil is dried up to 5 to 6 hrs. While construction of small dams in the area will reduce the effects of the flood by a control/holding the rainwater at its upstream for 4-8 weeks depending upon soil permeability, The water available upstream of a dam becomes very much beneficial for the drinking of livestock and other domestic needs. Importantly groundwater aquifer is also recharged.

The dams (under SRP & SRP-AF) will have a synergistic impact on overall water conservation and rainwater harvesting during the operation phase. Cumulatively, due to the construction of small dams the groundwater level both in upper and lower riparian will be increased. The recharging of groundwater aquifers will also improve water quality from very poor to good. Currently, the groundwater level near all proposed dams sites ranges 150 to 350 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 groundwater recharge. For the instance in one case, the water table depth before the construction of the dam is 250 feet, which was raised after the construction of the dam 50-65 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.

⁹ Land Covers Change Assessment After Small Dam's Construction Based on the Satellite Data (researchgate.net)



During the construction of the project, social component of the VECs may have some adverse impacts due to the labor influx, transportation of material and machinery movement. The presence of outside construction workers inevitably causes some degree of social disruption with the local community because of social/cultural differences. During the operation phase, human migration influx may be expected due to the availability of water, excessive agriculture activity may also increase.

During the construction of the dams cumulatively about 550 to 600 workers 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. Better management and administrative control as described in section 10.3 & 10.4 Environmental Code of Practices (ECoP) & Contractor's Plans respectively, will supersede the impacts while comparing the benefits of the small dam project on the social component of VECs.

Keeping in view the terrain and topography and available facilities in the project area, there are very few chances of human migration influx (reverse migration) or enhanced agriculture activity due to the unavailability of water. According to the recent study conducted in April 2020 conducted in the project area, shows that, before the construction of small dams, the community of 53% migrated to other areas due to the 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 drought conditions because of groundwater availability. Therefore, the migration ratio has been decreased due to the construction of small dams in the area and the reverse migration ratio has been an increase.

VECs concerning Economic components i.e., Government and private Revenues will increase due to the development activities in the area. Construction of these small dams will invite the entrepreneurs which ultimately brings the much-needed revenue to the country's economy in the broader perspective. Small dams are very important for local economy because the construction of such dams enables the sustainability of livelihood for local communities related to livestock rearing & increase in agriculture yield. The dam holds rainwater at its upstream for few times depending upon soil permeability, from where livestock drinking and other domestic needs of local communities are completed. Most importantly, aquifer is also recharged. Since rearing livestock is the only source of local livelihood and water upstream is also available for the almost whole year so livestock is increased in the sub-project areas.



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. Moreover, the 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 Valued Ecosystem Components (VECs) which include the Biodiversity component, Ecological component, Social Component, Economic component.

8.1.27 Post-Construction Monitoring Plan

Flora

Care should be required for the newly planted trees. The Contractor shall be responsible under the supervision of SID for aftercare of the newly planted trees for the first year, after which trees will be handed over to the client.

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 the burrow without harming them and filling/ compaction of the pit will be the sole responsibility of the 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 the groundwater level will be raised. The sub-projects are expected to provide the 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 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 (preferably) 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 issue 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. Furthermore, the existing project GRM is adequate to cater SEA/SH related grievances.

Managing GBV/SEA/SH Related Risks/Impacts

The complaints related to Gender Based Violence (GBV) Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH) will be recoded through existing Grievance Redressal Mechanism (the mechanism will be followed for such cases on an immediate basis). The GRM would primarily serve to (i) refer complainants to the GBV service provider (it should be noted that here it will be up to the GBV survivors, SEA, HS, to decide if they want their complaints to be referred or not).

Service Providers

The Government of Sindh has established women's protection cell at the district level and the Senior Superintendent of Police (SSP) is the head of this cell. The lady police officer is dedicated to the redressal of such cases related to the GBV/ SEA/SH. It's an unique women friendly complaint mechanism to deal with GBV issues in Sindh. While, some NGOs have also established their complaint desk, which facilitates the victims and provides them safety and protection.

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 consultation with the community. While selecting, preference would be given to literate person with willingness to perform the role. The process of complaint receiving, maintaining records and resolving the complaints would remain same as stated above. The GFP would be responsible to make aware the community about following components:

- Scope of the project, planned construction phases, etc.
- Inform people about their options, depending on the types of complaint, but should not be encouraged to submit false complaints
- Type of GRM available
- Who can access the GRM
- How complaints can be reported to the GRM and to whom, e.g., phone numbers, postal and email addresses, and website and information that should be included in a complaint

Two GFPs (a female and male) will be selected for each sub-project.

9.4 Role and Responsibilities of PCC

The responsibilities of the PCC are:

- The PCC is responsible 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

The purpose of the Environmental and Social Management and Monitoring Plan (ESMMP) for the construction of small dam works is to ensure that all necessary identified measures have been adopted to protect the environment and social situations and to comply with country environmental and social legislation and applicable World Bank operational policies. After the preparation of ESMF, PISSC has outlined site-specific ESMMP for the Contractors and executing agency.

10.2 Institutional Arrangements

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 checklists 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.

Besides, 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 the 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. Additional Director Dams, Additional Director Bunds/Flood Levees, Additional Director Coordination, and Technical Assistant support the PD. Besides, 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 are shown in Figure – 26 and described below.

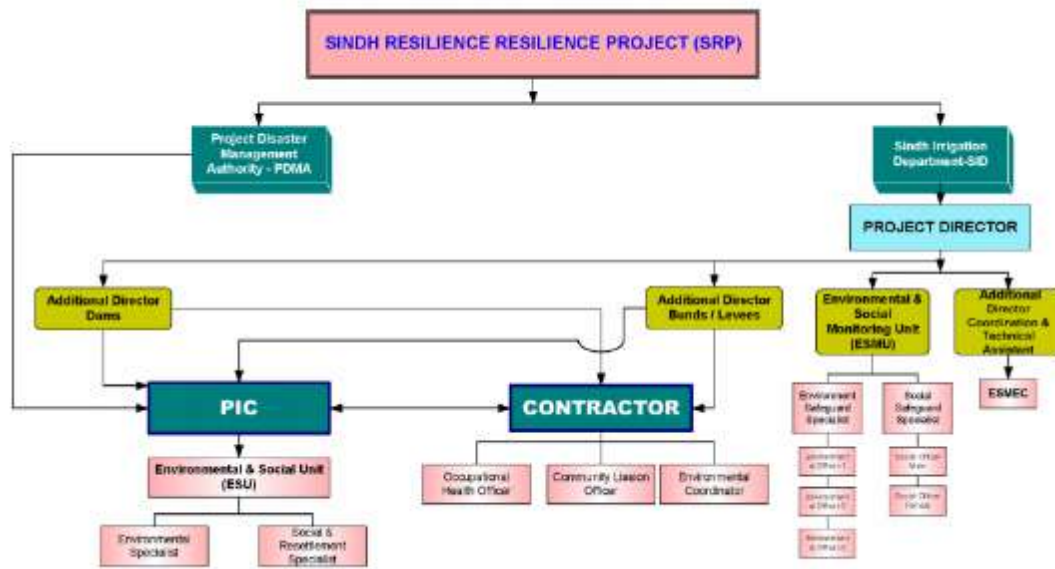


Figure 26: Organizational Chart of Sindh Resilience Project (SRP)

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 the apex body of the project to take care of Social/Gender, Ecological and Environmental issues and to take policy decisions at the project level. An Environmental and Social Management Unit (ESMU) has been established within PMT under the supervision of an 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 the 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 social and environmental management.

10.2.3 Project Implementation Support and Supervision Consultants (PISSC)

The Project Implementation Support and Supervision Consultant (PISSC) has been engaged by the project proponent, is responsible for day-to-day monitoring of the ESMMP on behalf of the Client / PMT during the 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 about the environmental aspects of the project:



- Prepare the required documents, review and update the available documents relevant to the subproject (including ESIA, ESMPs and RAP) and those to be prepared by the Contractor.
- Monitor the implementation of ESMPs and RAP regularly during the 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) Ecologist
 - c) Assistant Environmental Specialist
 - d) Social and Resettlement Specialist
 - e) 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 the 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 has environmental and social experts and shall carry out intermittent monitoring of the project.

10.2.5 Contractor Responsibilities

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 will provide guidelines for best-operating practices and environmental management guidelines to be followed by the contractors for sustainable management of all environmental issues. This ECOP will be annexed in the general conditions of all the contracts to be carried out under the SRP project. Detailed E.CoPs are attached as Annexure-XVI.

10.4 Contractor's Plans

This Environmental and Social Management Plan (ESMP) has been prepared before the 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 campsite 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 Camp Management Plan

The contractor camp management shall provide all details of social facilities, including dormitories, washrooms for labor, cooking areas, dining facilities, prayer areas, septic tank, drinking water, and other necessary facilities.

10.4.2 Corona Virus Management Plan (COVID-19)

The contractor shall provide the details of prevention measures, arrangements planned for the Management of COVID-19. 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 facemask, soap, hand sanitizers, temperature monitoring infrared guns, etc. Disposal of COVID-19 related waste plan should also be prepared. Disposal of COVID-19 related waste plan should also be prepared.

10.4.3 Biodiversity Management Plan

The contractor shall prepare the comprehensive biodiversity management plan and get 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 all



construction-related activities as described in ESMP.BMP will be prepared by the Contractor based on ECPs 8, 9, and 10 and mitigation measures proposed to address impacts.

10.4.4 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. The plan shall also include Environmental effects monitoring.

10.4.5 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 based on 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.

10.4.6 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/worksite 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).

10.4.7 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 included within the Pollution Control Plan).

10.4.8 Occupational Health and Safety

Upon mobilization, and within 15 days of commencement, the Contractor shall prepare an Occupational Health and Safety Plan following 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

10.4.9 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 – 40 given below.

Table 40: Environmental and Social Awareness Training Plan

Areas of Training	Key Aspects to be Covered	Target Group	Frequency	Budget.
Environment, Social Safeguards	<p>a. Environmental and social awareness;</p> <p>b. Key environmental and social issues associated with the project and subprojects ESIA's and findings;</p> <p>c. Subproject monitoring and reporting;</p> <p>d. Occupational Health and Safety Issues associated with Construction.</p> <p>e. Grievance Redress Mechanism implementation</p> <p>f. Gender-Based Violence (GBV)/SEA/SH</p> <p>g. Child Labor</p> <p>h. COVID -19 Management and Monitoring</p> <p>i. Safety measure for COVID-19</p> <p>j. Water conservation and optimal resource use, Awareness regarding open defecation and better WASH practices for relevant community</p> <p>k. Identifications, conservation and precautionary measures of wildlife.</p>	PMU, PIC and Contractor staff as well as relevant communities.	Before project/physical works commencement, during construction and after construction.	Total eleven types of training for proposed dams are to be conducted throughout the life of the subproject. Training will cost about 1,507,500/- rupees.

10.4.10 Emergency Response Plan



The contractor will prepare an emergency plan to address emergencies/events such as fire, floods, earthquakes, accidents, and death/injury. The Plan will include the following details:

- Contacting the relevant agency (e.g., Fire Brigade)
- Procedure for the shutdown of the 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.)

10.4.11 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. 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 saplings/plantation for one year.

10.4.12 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 by 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 the 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 39 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 are 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 40 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.

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.

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, diarrhea, respiratory ailments during construction phase
- Noise levels (in dBA), monitored at fixed locations and planned 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
- Contractor's staff sensitized on Gender base violence (GBV)

(iv) Biodiversity/Ecological Monitoring

- Vegetation cover and flora shall be monitored before start of construction
- Weekly / monthly basis checklist for the monitoring of flora shall be filled
- Weekly / monthly basis checklist for the damage monitoring of fauna shall be filled including small, large animal, reptiles and birds.

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 work 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. Contractor, PISSC, and ESMU-PMT. will take photographs at key locations using a digital camera of the project area in a walkthrough survey 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. A review of this ESMP will be triggered in two scenarios:

- A change to the designs, which deviates from the parameters that 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 Contractor and PISSC to document any change in the project design/operation shall maintain the design change record. The ESMU and ESMEC would supervise the number of design change applications and suggestions received from the local people and their implementation by PISSC and Contractor.

10.9 Environmental and Social Management and Monitoring Cost

It is estimated that 111 trees will be felled for the construction of the proposed dams. The replanting of 5 times trees to this number would cost 555,000 rupees @ the rate of Rs. 1000 per tree. Adding the cost in the budget for the implementation of the ESMP has been allocated. Details are given in Table – 41 below. The cost of Rs. 173,578,950/- budget for the implementation of the ESMMP has been allocated.

Table 41: Cost of Environmental / Social Management and Monitoring

Items	Unit Cost	No of Units	Estimated
A. Tikho-III			
Training	2500	50	125,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards)	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	50	250,000
COVID-19 Test for staff and worker for two rounds	6000	100	600,000
Personal Protective Equipment	3000	50	150,000
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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			13,080,000
Contingency Cost 10%			1,308,000
Total			14,388,000
B. Pipe Baricha			
Training	2500	49	122,500
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	49	245,000
COVID-19 Test for staff and worker for two rounds	6000	98	588,000
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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			13,093,500
Contingency Cost 10%			1,309,350
Total			14,402,850
D. Ghulam Mustafa			
Training	2500	48	120,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	20	840,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	48	240,000
COVID-19 Test for staff and worker for two rounds	6000	96	576,000
Personal Protective Equipment	3000	48	144,000
Fire Fighting Equipment purchase and refilling	3000	20	60,000
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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			12,990,000
Contingency Cost 10%			1,299,000
Total			14,289,000
E. Kamal Shodo			
Training	2500	53	132,500
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	22	924,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	53	265,000
COVID-19 Test for staff and worker for two rounds	6000	106	636,000
Personal Protective Equipment	3000	53	159,000
Fire Fighting Equipment purchase and refilling	3000	22	66,000
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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			13,192,500
Contingency Cost 10%			1,319,250
Total			14,511,750
F. Moosa Shoro			
Training	2500	50	125,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	50	250,000
COVID-19 Test for staff and worker for two rounds	6000	100	600,000
Personal Protective Equipment	3000	50	150,000
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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			13,080,000
Contingency Cost 10%			1,308,000
Total			14,388,000
G. Purkhani			
Training	2500	49	122,500
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	49	245,000
COVID-19 Test for staff and worker for two rounds	6000	98	588,000
Personal Protective Equipment	3000	49	147,000
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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			13,057,500
Contingency Cost 10%			1,305,750
Total			14,363,250
I. Kand Nai			
Training	2500	53	132,500
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	23	966,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	53	265,000
COVID-19 Test for staff and worker for two rounds	6000	106	636,000
Personal Protective Equipment	3000	53	159,000
Fire Fighting Equipment purchase and refilling	3000	23	69,000



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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			13,237,500
Contingency Cost 10%			1,323,750
Total			14,561,250
J. Asabo			
Training	2500	54	135,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	23	966,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	54	270,000
COVID-19 Test for staff and worker for two rounds	6000	108	648,000
Personal Protective Equipment	3000	54	162,000
Fire Fighting Equipment purchase and refilling	3000	23	69,000
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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			13,260,000
Contingency Cost 10%			1,326,000
Total			14,586,000
K. Janai			
Training	2500	50	125,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	21	882,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	50	250,000
COVID-19 Test for staff and worker for two rounds	6000	100	600,000



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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			13,113,000
Contingency Cost 10%			1,311,300
Total			14,424,300
L. Hub-3			
Training	2500	53	132,500
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	23	966,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	53	265,000
COVID-19 Test for staff and worker for two rounds	6000	106	636,000
Personal Protective Equipment	3000	61	183,000
Fire Fighting Equipment purchase and refilling	3000	23	69,000
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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			13,261,500
Contingency Cost 10%			1,326,150
Total			14,587,650
M. Hub-2			
Training	2500	48	120,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	20	840,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000



Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	48	240,000
COVID-19 Test for staff and worker for two rounds	6000	96	576,000
Personal Protective Equipment	3000	61	183,000
Fire Fighting Equipment purchase and refilling	3000	20	60,000
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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			13,029,000
Contingency Cost 10%			1,302,900
Total			14,331,900
N. Hub-1			
Training	2500	46	115,000
Generators & Construction Machinery Stack +Noise Monitoring (for 12 months)	3500	18	756,000
Drinking-Water Quality & Waste water Monitoring (During Cons) (per month)	15000	12	180,000
Soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards	10000	4	40,000
Workers Communicable Disease Screening Test (HIV, HB, HC)	5000	46	230,000
COVID-19 Test for staff and worker for two rounds	6000	92	552,000
Personal Protective Equipment	3000	61	183,000
Fire Fighting Equipment purchase and refilling	3000	18	54,000
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, Ecologist and OHS Officer Salaries (70 thousand for each person) three different persons will be deputed on site)	280000	12	3,360,000
General Community support needs (if any)	Lump sum	--	7,000,000
Subtotal			12,900,000
Contingency Cost 10%			1,290,000
Total			14,190,000
TOTAL			173,023,950
Compensatory tree Plantation			555,000
GRAND TOTAL COST			173,578,950





Table 42: 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 requires mitigation measures	Not required	Nil	Nil	Nil
Construction Phase					
Establishment of camp and machinery/equipment/ stone stacking yard/workshop etc.	Conflict due to the use of privately owned agricultural land for camp construction	Establishment of camp on designated sites or at the 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 the time of the 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 the alternative suitable site within Right of Way of the bund belongs to the irrigation department. Contractor to obtain approval from the Engineer.	The camp shall be established at least 500m away from the nearest community; Local hired workforce; Any complaint from the local community.		Fortnightly for complaint monitoring	Execution by contractor Monitoring by PISSC/PMT
	Child labor	The hiring of the workforce 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 the relevant document.	Fortnightly	Monitoring by PISSC/PMT
	Conflicts arising due to the mixing of local and migratory job seekers.	Preference to provide jobs to local job seekers; Motivation to the workers for good workmanship.	Jobs will be given to locals; Any complaint will be registered in the complaint box.	Fortnightly	Monitoring by PISSC/PMT
Workers safety and hygienic conditions	Health risks due to the unsafe and	Preparation and implementation of OHS Plan. Safety measures are taken by the contractor such as the	Approved OHS Plan. Evidence of OHS pieces of	Fortnightly	Execution by contractor



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	unhygienic living environment	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 pieces of training to construction and camp staff.	training conducted Accident/Incident reported.		Monitoring by PISSC/PMT
Campsite security	Security hazards. Security-related conflicts with the 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 the soil and adjoining area; Appropriate arrangements such as usage of concrete base drip pan 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 to receptors.	Proper tuning and maintenance of generators.	Low smoke emissions; Noise levels within permissible limits (80 dBA at daytime and 65dBA at night time).	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
surface and ground water quality	water contamination due to spillage of liquid wastes	It has been further, proposed that before the start of the construction, the contractor will establish updated baseline environmental monitoring of air, water & noise including the soil analysis (trace metals such as Cd, Zn, Cu, Cr, Pb and Ni as per WHO standards) for comparison during the construction phase.	Permissible limits/standards according to the World Health Organization and the Food, Agriculture Organization of the United Nations (FAO) indicated for soil, (refer annexure XIX) and limits set by SEQs for Air, Water & Noise will be followed as standards for the comparison	Quarterly	Implementation by Contractor Monitoring by PISSC/PMT
Use of water for	Conflict with local	The contractor to make his arrangements for water	Any conflict on the water	Fortnightly	Execution by



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
construction and consumption	water demand.	required for construction ensuring that water availability and supply to nearby communities remain unaffected.	availability.		contractor Monitoring by PISSC/PMT
Water supply to the labor camp	Water-related health risks (Gastroenteritis, Diarrhea, etc.)	Provision of safe drinking water supply at the camp as well as at workplaces by the contractor. Ensuring water quality as per SEQS from a SEPA-certified laboratory.	Any waterborne 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 the adjoining area; Construction of sewage treatment arrangements such as lined septic tank and collection chamber/ soaking pit;	Inspection to ensure that sewage system is operating; Photographic record;	Monthly	Execution by contractor Monitoring by PISSC/PMT
Solid waste generation	Land pollution	Ensure proper collection and disposal of waste generated from camp at designated disposal pit (away from the campsite) approved by the Engineer; Prohibition on the 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 the storage of hazardous material (if any).	Record of harmful incident occurred.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
Restoration of the camp area	Low aesthetic value if the campsite is not restored to its original landscape	Remove all types of waste, debris, and discarded construction materials and machinery from the campsite and other site facilities.	Camp area restored. Photographic record;	At the 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 the activity of steel formation, concreting work, entry of unauthorized persons will be restricted. Without PPEs no person will be allowed to enter the work area. Job-specific PPEs will be provided. Before activity TBTs will be provided. Training on the benefits of the 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 OHS-related issues.	Approved OHS Plan. Evidence of OHS training conducted. PPE provided and used; First aid facilities provided; Record of injuries/ illness and near misses. Job Hazard Analysis (JHA)	Preparation at the start of execution of civil works and monitoring of its implementation on daily basis.	Execution by contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
		The orientation of the 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. Job Hazard Analysis (JHA) will be prepared			
	Workers code of conduct.	The contractor will prepare the worker's code of conduct plans and Camp layout plan and get it approved by the Resident Engineer and PMT for implementation at the site.	The approved code of conduct is implemented.	During the life of the contract.	
	Child Labor	The contractor should maintain the labor registry for workers at the site, and age verification should be conducted upon employment to make sure that children are not employed in the project	Labor register is made available at the site containing complete data of all employees hired by the contractor	During the life of the contract.	
	Prohibition of gender-based violence.	Awareness will be raised regarding the prohibition of gender-based violence through pieces of training.	Evidence of training	During the life of the contract.	
	Employment opportunities for the local community	The contractor would hire employees from the local community (skilled and unskilled) and this would be part of the contract with the contractor.	Employment data from the contractor On-site verification of the data provided by the contractor	During all phases of the 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 control.	Monthly	Execution by contractor Monitoring by PISSC/PMT
		Before entry into the park, heavy equipment will be cleaned to prevent importation of non-native plant species, hydraulic fittings will be tightened, 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.	Monthly	Execution by contractor Monitoring by PISSC/PMT
	Noise from vehicles, compaction rollers concrete mixers and construction	Proper engine tuning of machinery/equipment; Avoid nighttime traffic particularly near communities.	Levels within permissible limits (75dB at daytime and 65dB at nighttime).	daily	Execution by contractor Monitoring by PISSC/PMT





Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	equipment exceeding 80 dB is harmful to receptors.				
Transportation of construction material	Smoke and dust generation; Fall of transported material; Chance of accidents; damage to access roads.	Use earth material with the approval of the Engineer; Prepare traffic Management Plan to procure shingle from the 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; Maintain liaison with communities; Repair damaged roads. Truck and related construction equipment speeds will be limit in active construction areas to a maximum of 15 KM/hr. and strictly adhering to park regulations and posted speed limits in other areas while inside park boundaries	Vehicles properly maintained; Designated borrow and quarry areas used; No fall of transported material; Damaged road repaired. Evidence of implementation of Traffic Management Plan.	Fortnightly	Execution by contractor Monitoring by PISSC/PMT
	Soil erosion and contamination	Vehicle speeds to 20km/h.; Restriction on the repair of vehicles and equipment in the field.	Monitoring compliance; Log of vehicle and equipment repairs; Soil erosion observed	daily	Execution by contractor
	Air pollution	Use of machinery and vehicles properly tuned to avoid exhaust emissions. The 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



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
					PISSC/PMT
	Occupational, Health and Safety issues	Preparation and implementation of OHS Plan. Fixing of signboard 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 training 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 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 into the ponds.	Erosion observed; Photographic record; contamination signs observed.	Fortnightly	Execution by contractor 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 operators to operate machinery.	PPEs provided and used; Record of an accident. Availability of ERPs	Fortnightly	Execution by contractor Monitoring by PISSC
	Loss of natural vegetation and associated fauna	111 Trees including young and mature expected to be removed/relocated from the site. In place of cut down/uprooted trees, 555 new trees will be planted. The cost has been allocated for tree plantation for a 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 the 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 ensure 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



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
					PISSC/PMT
	Noise pollution	Noisy work shall be performed (such as the operation of heavy equipment) between the hours of 8:00 a.m. and 6:00 p.m. to minimize disruption to the 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
	Air pollution	Proper engine tuning of machinery equipment; Water sprinkling particularly at work sites near the communities.	Dust emission controlled; Monitoring on the 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 the approved sites	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 the 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 the local population	Accident risks, particularly for the local population living within/near the subproject especially women, children and elderly people; Public awareness campaigns through displaying signboard at site and haulage routes; Vulnerability to accidents;	Restriction on movement of machinery on the designated haulage routes for transportation of materials; Public awareness campaigns through displaying signboard at site and haulage routes; Interaction with the 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 the accident; any complaint from the community.	All activities on daily basis except public consultation that will be carried out every month	Executing agency and contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
	Deterioration of health due to dust				
Working near Wildlife Habitats	Damage to Wildlife, Hunting, poaching to wildlife in National Park	Effects of light and noise on adjacent habitats shall be limited through controls on construction equipment. The orientation of the 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 activities 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
COVID-19 related risk	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	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 have been given in SOPs attached in Annexure - VIII	The health screening of laborers and workers will be conducted at the start of the project. COVID vaccination should be mandatory for all workers, and to present or submit their vaccination proof/certificate to contractor. Government of Sindh, has provided the COVID vaccine at all district and tehsil Civil Hospitals, and nominated private hospitals free of Cost.	During the life of the contract.	Execution by contractor Monitoring by PISSC/PMT



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
GRM	GBV/ SEA/SH, safety/health measures for local population, etc.	<p>A grievance redress mechanism (GRM) will be established with specific procedures sensitive to treat GBV/SEA/SH complaints ethically, safely, and confidentially, with assignment of properly trained grievance focal points to handle and address these grievances.</p> <p>Gender Based Violence (GBV) Sexual Exploitation and Abuse/Sexual Harassment SEA/SH related complaints will be recoded through existing Grievance Redressal Mechanism (the mechanism will be followed for such cases on an immediate basis). The GRM would primarily serve to (i) refer complainants to the GBV service providers (it should be noted that here it will be up to the GBV survivors, SEA, HS, to decide if they want their complaints to be referred or not).</p> <p>The Project Management Committee (PMT) will conduct training of PMT, Project Implementation Support & Supervision Consultants (PISSC) and contractor's staff 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 counseling support.</p> <p>The GFPs will be trained by the Community Liaison Officer (CLO), who is PISSC staff and overseen by PMT staff.</p>	<p>Functional GRM in place. Any complaint from the community.</p> <p>Number of cases reported/referred to service providers</p> <p>Number of staff trained List of Participants Photographs of training</p>	<p>All activities on daily basis except public consultation that will be carried out every month</p> <p>One training at the outset of contract and follow-up</p>	<p>Executing agency and contractor Monitoring by PISSC/PMT</p>
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 the pit.	Visual observation.	Fortnightly	Executing agency Monitoring by PISSC/PMT
Care of newly planted	Mortality of newly	The Contractor shall be responsible for the aftercare of	Survival of trees	Fortnightly	Executing agency



Activity	Environmental and Social Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
trees	planted saplings	the newly planted trees for the first year, after which trees will be handed over to the client.			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, the aquifer will recharge. It is expected that the groundwater level will be raised.	Make sure that groundwater level is recharged	Monthly basis	Contractor, PMT (Liability period), SID
Impacts on existing community tracks	Few 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 are undertaken as per the Bill of Quantities.	Start of execution of civil works	Contractor (Liability period), PISSC, PMT

Table 43: Environmental Monitoring Plan

Parameters	Parameters	Locations	Frequency	Duration	Standard
Ambient Air Quality Sampling	SOx, NOx, CO, O3, PM2.5, PM10 Lead, SPM	At the project Site	Monthly	Continuous for 8 hrs in full working day	SEQS
Gaseous Emission		Generators & Construction Machinery Stack	Monthly	Continuous for 8 hrs in full working day	SEQS
Drinking-Water Quality Monitoring	Heavy metals, TDS, TSS, pH, Total Coliform, Fecal Coliform	Ground water Source & Other Source	Monthly	Grab Sampling	SEQS
Soil analysis trace metals	Cd, Zn, Cu, Cr, Pb and Ni	At the project Site	Quarterly	Composite sample	WHO standards
Ambient Noise Monitoring	dBA	Generators & Construction Machinery Stack	Monthly	Continuous for 8 hrs in full working day	SEQS
Wastewater Monitoring	BOD, COD, DO, TSS, TDS, pH, NO3, SO4, Oil & Grease)	Washroom/ Kitchen	Monthly	Grab Sampling	SEQS



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

Title of Sub-project: Tikho-III			
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 Tikho-III.			
· There are no settlement near the proposed dam site			
· Proposed project falls in Kirthar National Park			
· 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 a storage volume of 0.364 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area 0.268 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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	Yes		
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: Pipe Baricha			
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			
<ul style="list-style-type: none"> · There are 12 number of trees located within area of Pipe Baricha. · There are no settlement near the proposed dam site · Proposed project falls in Kirthar National Park · 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 a storage volume of 0.060 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area 0.041 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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	Yes		
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: Ghulam Mustafa			
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			
<ul style="list-style-type: none"> · There are 13 number of trees located within area of Ghulam Mustafa · There are no settlement near the proposed dam site · Proposed project falls in Mahal Kohistan Wildlife Sanctuary (MKS) · 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 a storage volume of 0.214 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area 0.119 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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	Yes		
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: Kamal Shodo			
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			
<ul style="list-style-type: none"> · There are 13 trees located within the area of Kamal Shodo · There are no settlement near the proposed dam site · Proposed project falls in Mahal Kohistan Wildlife Sanctuary (MKS) · 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 be affected by construction activities. · No 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 a storage volume of 0.082 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area 0.058 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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		Yes	
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: Moosa Shoro			
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 2 number of trees located within the area of Moosa Shoro			
· There are no settlement near the proposed dam site			
· Proposed project falls in Buffer zone of KNP			
· 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 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 a storage volume of 0.469 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area of 0.219 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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		Yes	
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: Purkhani			
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			
<ul style="list-style-type: none"> · There are 18 trees located within the area of Purkhani · There are no settlement near the proposed dam site · Proposed project falls in Buffer zone of KNP · 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 be affected by construction activities. · No 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 a storage volume of 0.142 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area 0.097 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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	Yes		
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: Kand Nai			
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			
<ul style="list-style-type: none"> · There are 5 trees located within the area of Kand Nai · There are no settlement near the proposed dam site · Proposed project falls in Kirthar National Park · 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 be affected by construction activities. · No 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 a storage volume of 0.199 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area of 0.125 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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		Yes	
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: Asabo			
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			
<ul style="list-style-type: none"> · There are 05 trees located within the area of Asabo · There are no settlement near the proposed dam site · Proposed project falls in Kirthar National Park · 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 be affected by construction activities. · No 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 a storage volume of 0.106 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area of 0.046 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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		Yes	
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: Janai			
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			
<ul style="list-style-type: none"> · There are 04 trees located within the area of Janai · There are no settlement near the proposed dam site · Proposed project falls in Hub wildlife sanctuary · 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 a storage volume of 0.085 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area of 0.053 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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	Yes		
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: Hub-3			
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			
<ul style="list-style-type: none"> · There are 14 trees located within the area of Hub-3 · There are no settlement near the proposed dam site · Proposed project falls in Downstream of Hub Dam Wildlife statutory · 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 be affected by construction activities. · No 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 a storage volume of 0.041 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area of 0.023 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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	Yes		
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: Hub-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			
<ul style="list-style-type: none"> · There are 07 number trees located within the area of Hub-2 · There are no settlement near the proposed dam site · Proposed project falls in Downstream of Hub Dam Wildlife statutory · 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 be affected by construction activities. · No 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 a storage volume of 0.064 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area of 0.041 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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		Yes	
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: Hub-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			
<ul style="list-style-type: none"> · There are 05 number trees located within the area of Hub-2 · There are no settlement near the proposed dam site · Proposed project falls in Downstream of Hub Dam Wildlife statutory · 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 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 a storage volume of 0.035 (million cubic meters)	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
Dams and reservoirs having a surface area less than 4 sq.-km	Schedule-I	Yes, the proposed dam has a surface area of 0.029 sq.-km	Sub-project is falling in schedule-I but due to its presence in the Protected area, an ESIA has been envisaged.
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		Yes	
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 II: Copy of NOC from Sindh Wildlife Department



OFFICE OF THE CONSERVATOR WILDLIFE SINDH
SINDHCENTREBUILDING, M.D.M WAFAI ROAD
OPP. PIA BOOKING OFFICE KARACHI
Phone No. 99204951 – 52, Fax No. 99204959



No. CW/GEN/NOC/2019

7th January, 2019

To,

Additional Project Director,
PMT (Irrigation Component)
SRP, Irrigation Department,
Government of Sindh.

SUBJECT: - PERMISSION FOR CONSTRUCTION OF SMALL RAINWATER RECHARGE DAMS; UNDER SINDH RESILIENCE PROJECT IN KHIRTHAR NATIONAL PARK&HAB DAM WILDLIFE SANCTUARY

With reference to your office letter No. PD/SRP/GEN//990 dated 26th December 2018, it is inform you that, Sindh Wildlife Department (SWD) is key stakeholder taking initiatives to protect and conserve the Wildlife resources in Province, Khirthar National Park is the only National Park exist in the Sindh Province and declared as protected area under Sindh Wildlife Protection Ordinance 1972 amended 2001, as per provision in ordinance under section- 15 following acts shall be prohibited in National Park;

- "Clearing or breaking up any land for cultivation , mining or for any other purpose is prohibited"
- "Polluting water flowing in and through the National Park"

Accordingly with the approval competent authority this Department has no objection on the project titled "Construction of Small Rainwater Recharge Dams Under Sindh Resilience Project in Khirthar National Park& Hab Dam Wildlife Sanctuary" as per attached list of locations and coordinates provided in your letter. The concerned authority of the project may ensure to keep above acts prohibited in National Park.

The office of the Additional Project Director SRP, irrigation Department is not allowed to sublet this permission to any other organization/ department or individual without prior permission of this Department.

Sindh Wildlife Department reserve the rights to cancel this permission in case of any proven misuse of this authority and empowers to field staff to visit and monitor the project site in case of any complain.

(TAJ MOHAMMAD SHAIKH)
CONSERVATOR WILDLIFE SINDH
KARACHI



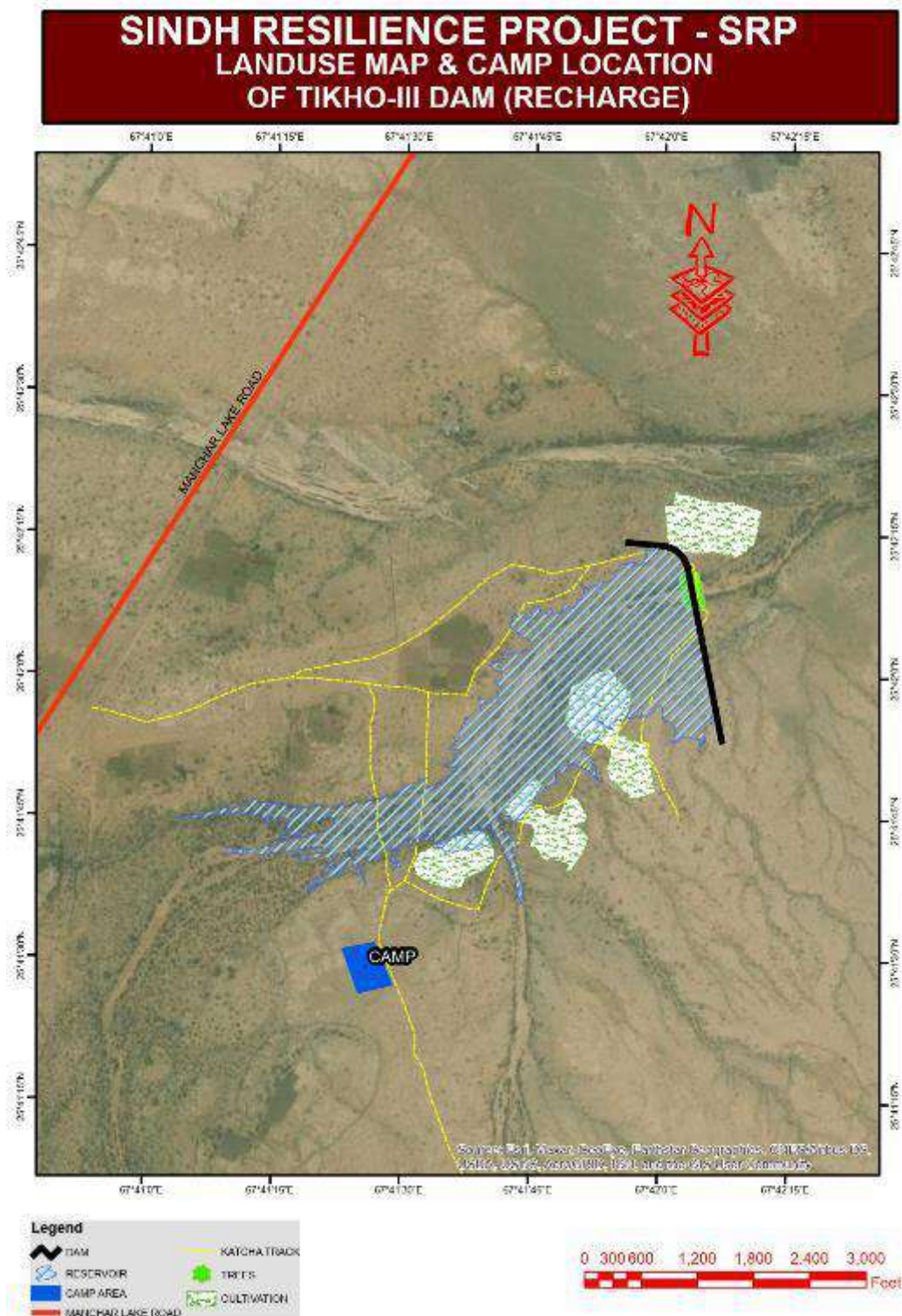
Details and Location Map of Sub-Projects

List of Dams Sub projects of SRP falling within Khirthar National Park & Hub Dam Wildlife Sanctuary

S.No	Sub-project Name	Co ordinates	
1.	Sangchat jo Tar	N 25 33 06 4174	E 67 27 46 3786
2.	Gurand	N 25 25 39 4537	E 67 36 36 7585
3.	Moso choro	N 25 32 75 78	E 67 45 20.24
4	Tikko III	N 25 42 58 2886	E 67 44 00 6257
5	Pipre Baricha	N 25 37 02 8388	E 67 26 19 7974
6	Ghulam Mustafa	N 25 31 12 3616	E 67 32 25 2566
7	Kamal Shodo	N 25 23 27 9952	E 67 32 06 0731
8	Kand Nai	N 25 22 01 9989	E 67 21 36 2664
9	Asabo	N 25 19 43 4682	E 67 17 33 0191
10	Janai	N 25 12 04 7356	E 67 17 33 0191
11	Hub-3	N 25 10 07 8723	E 67 03 01 8923
12	Hub-2	N 25 11 53 8205	E 67 03 35 2588
13	Hub-1	N 25 08 16 8286	E 67 02 35 0067

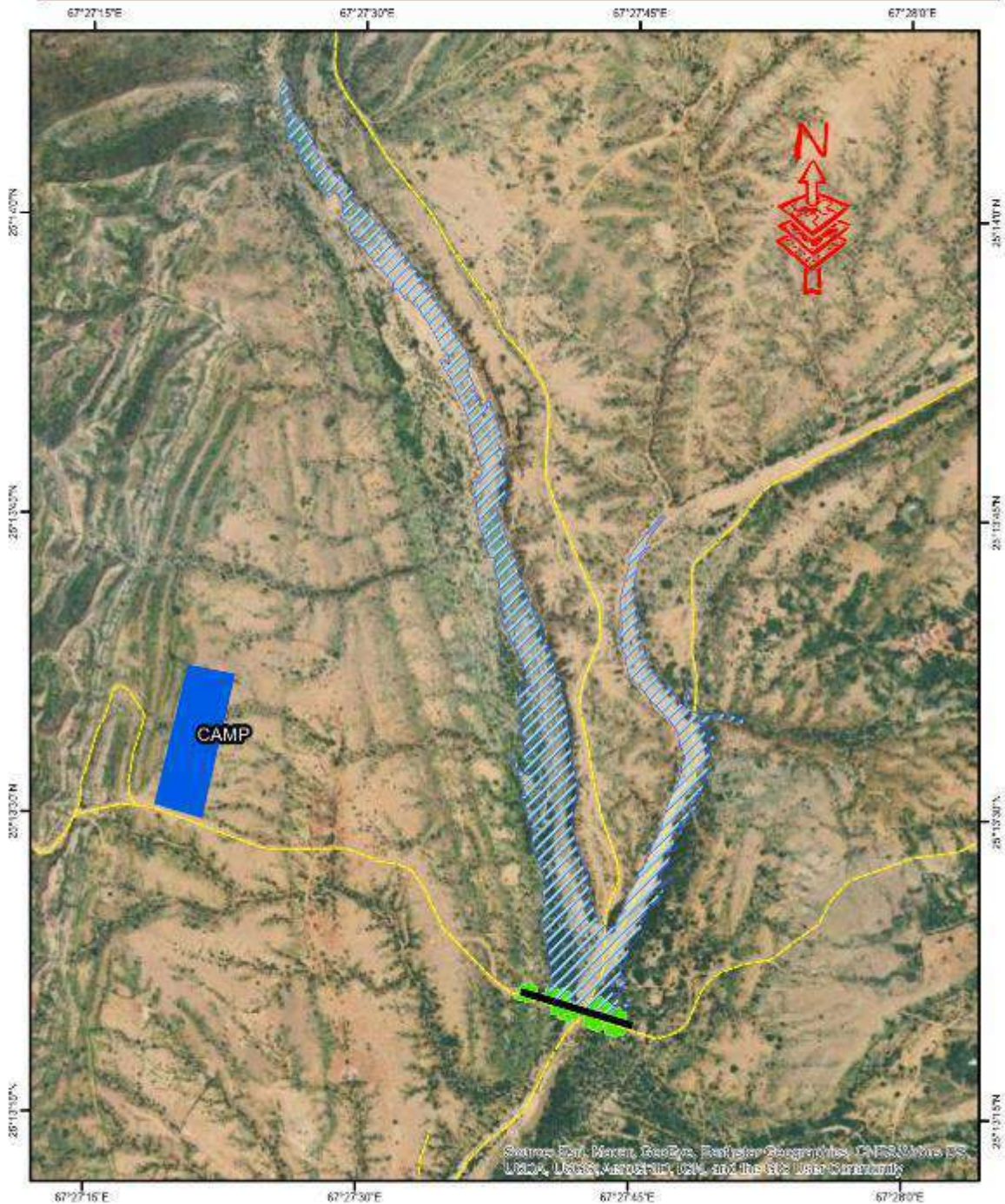


Annexure III: Land use Map and Camp Area Locations





SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF PURKHANI DAM (RECHARGE)

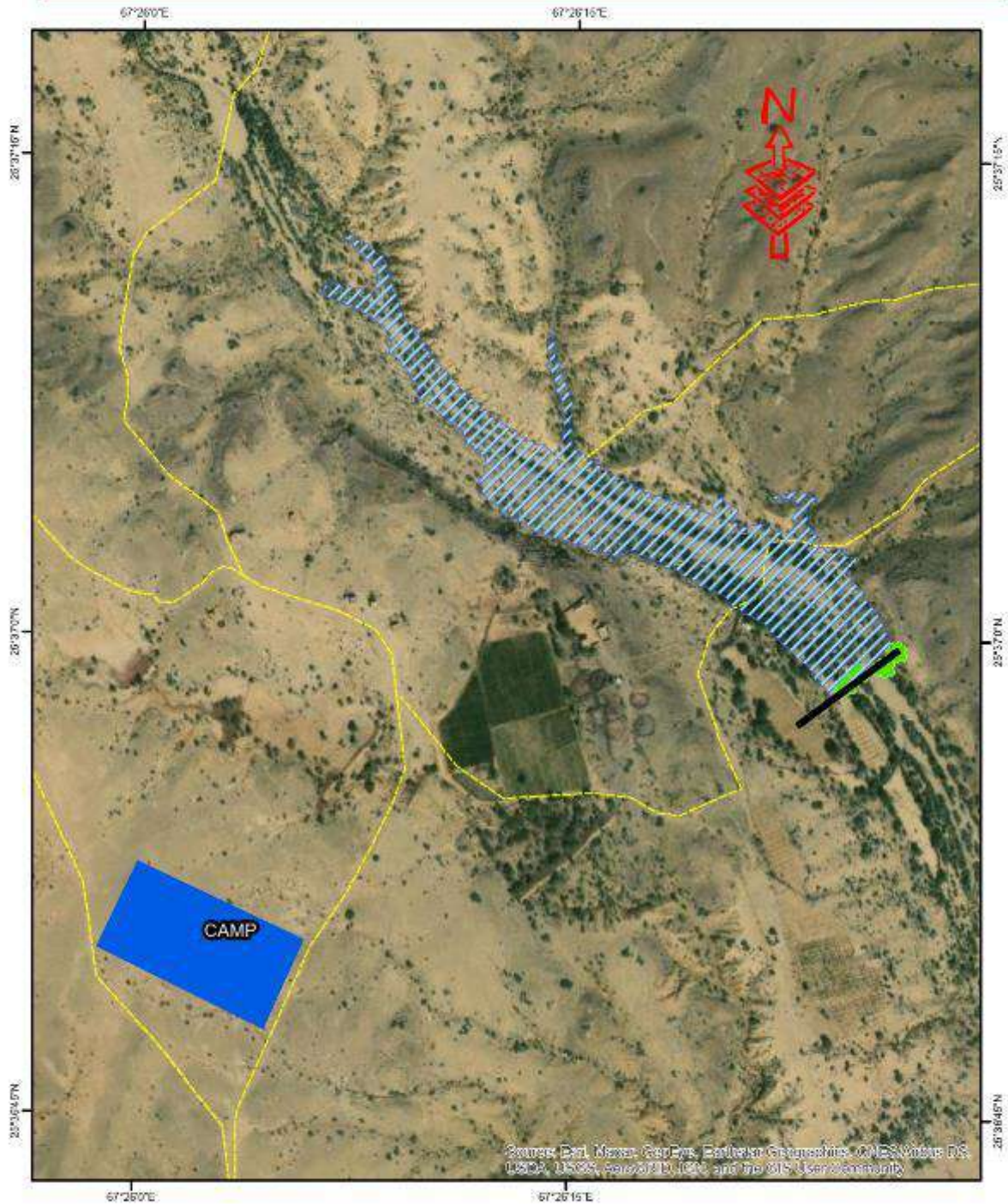


Legend



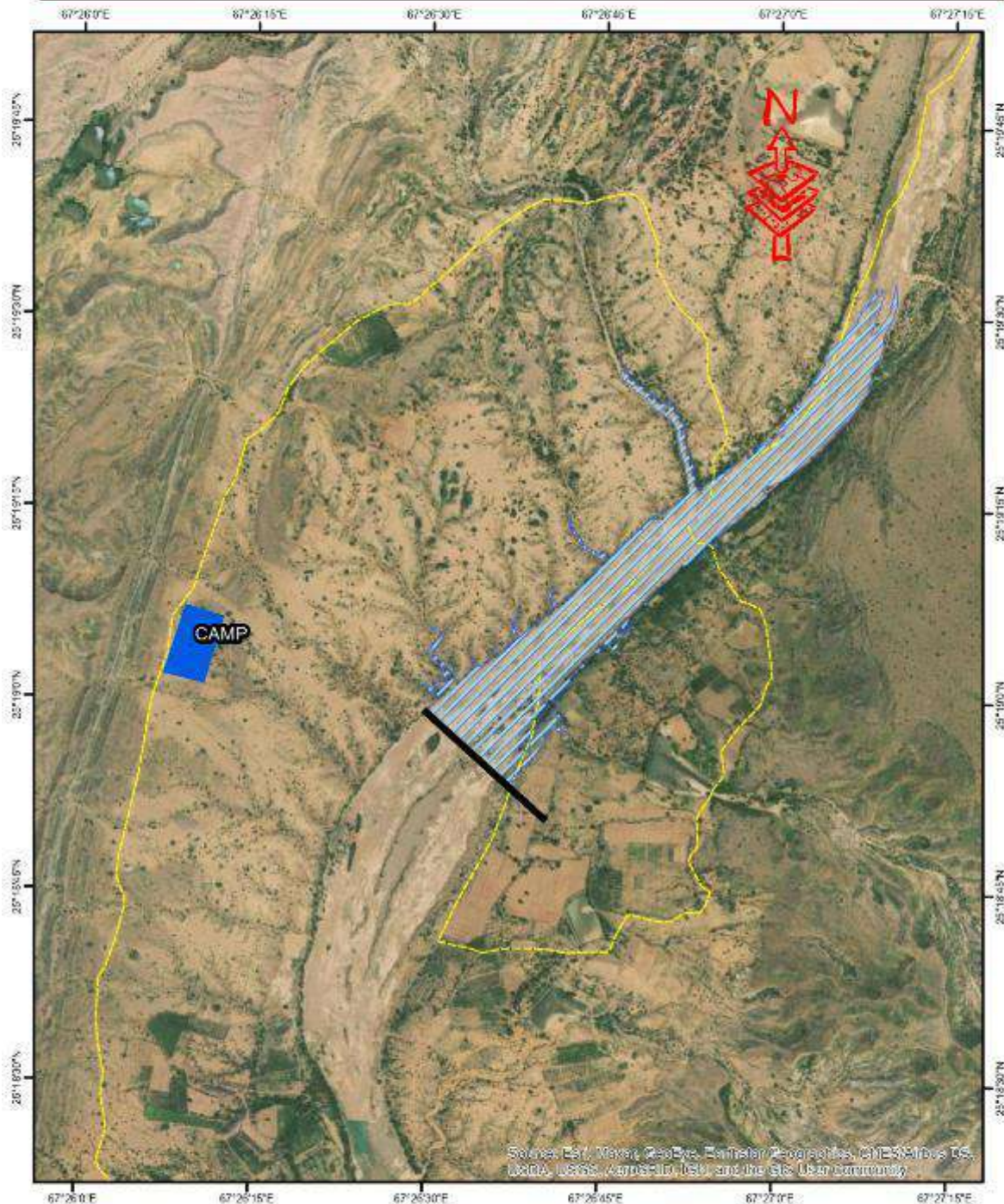


SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF PIPE BARICHA DAM (RECHARGE)



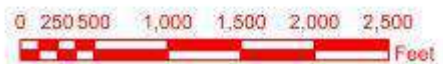


SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF MOOSA CHHORO DAM (RECHARGE)



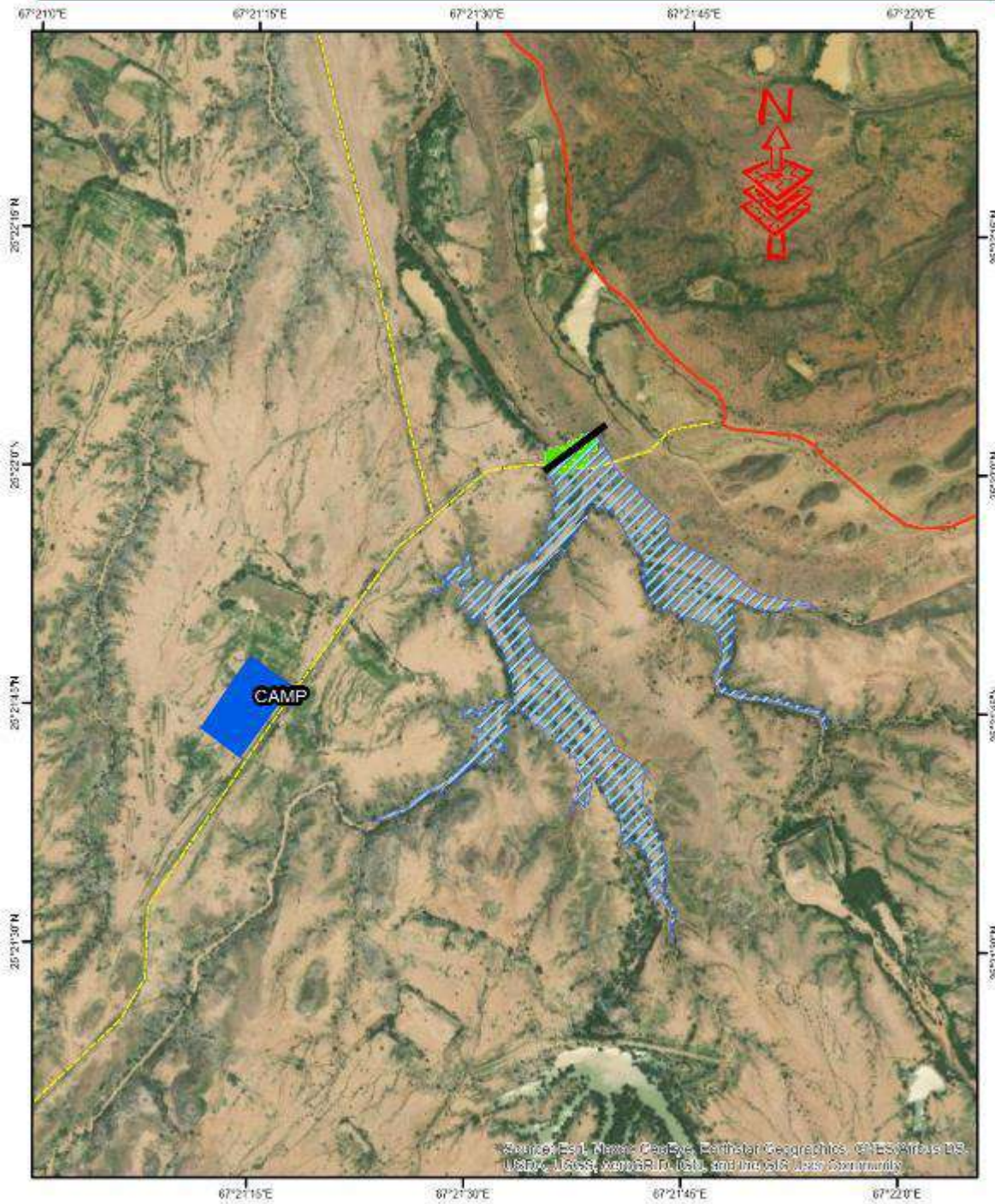
Legend

	DAM		KATCHA TRACK
	RESERVOIR		TREES
	CAMP AREA		





SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF KAND NAI DAM (RECHARGE)

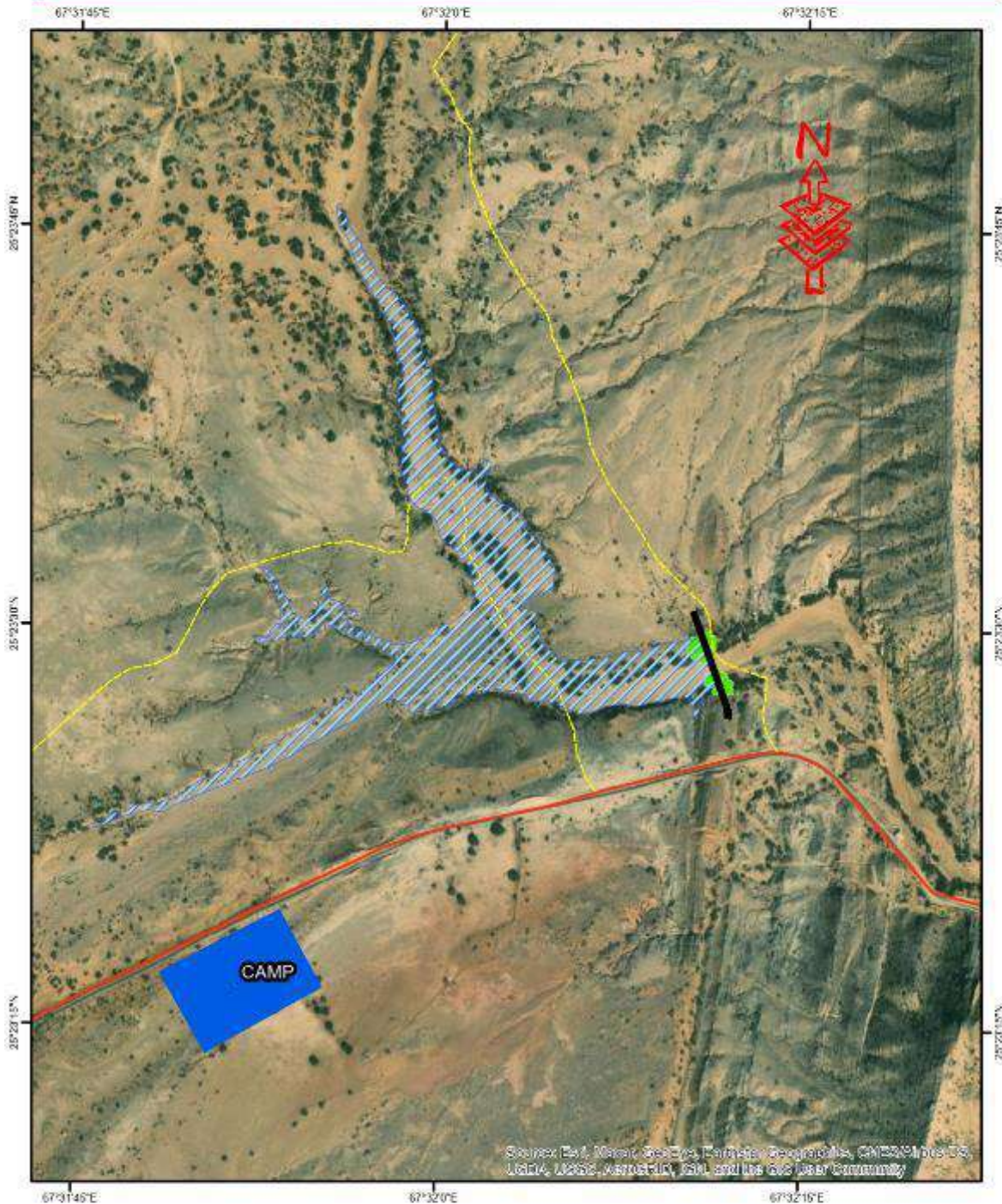


Legend	
	DAM
	RESERVOIR
	CAMP AREA
	KATCHA TRACK
	ROADS
	HILLS





SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF KAMAL SHODO DAM (RECHARGE)



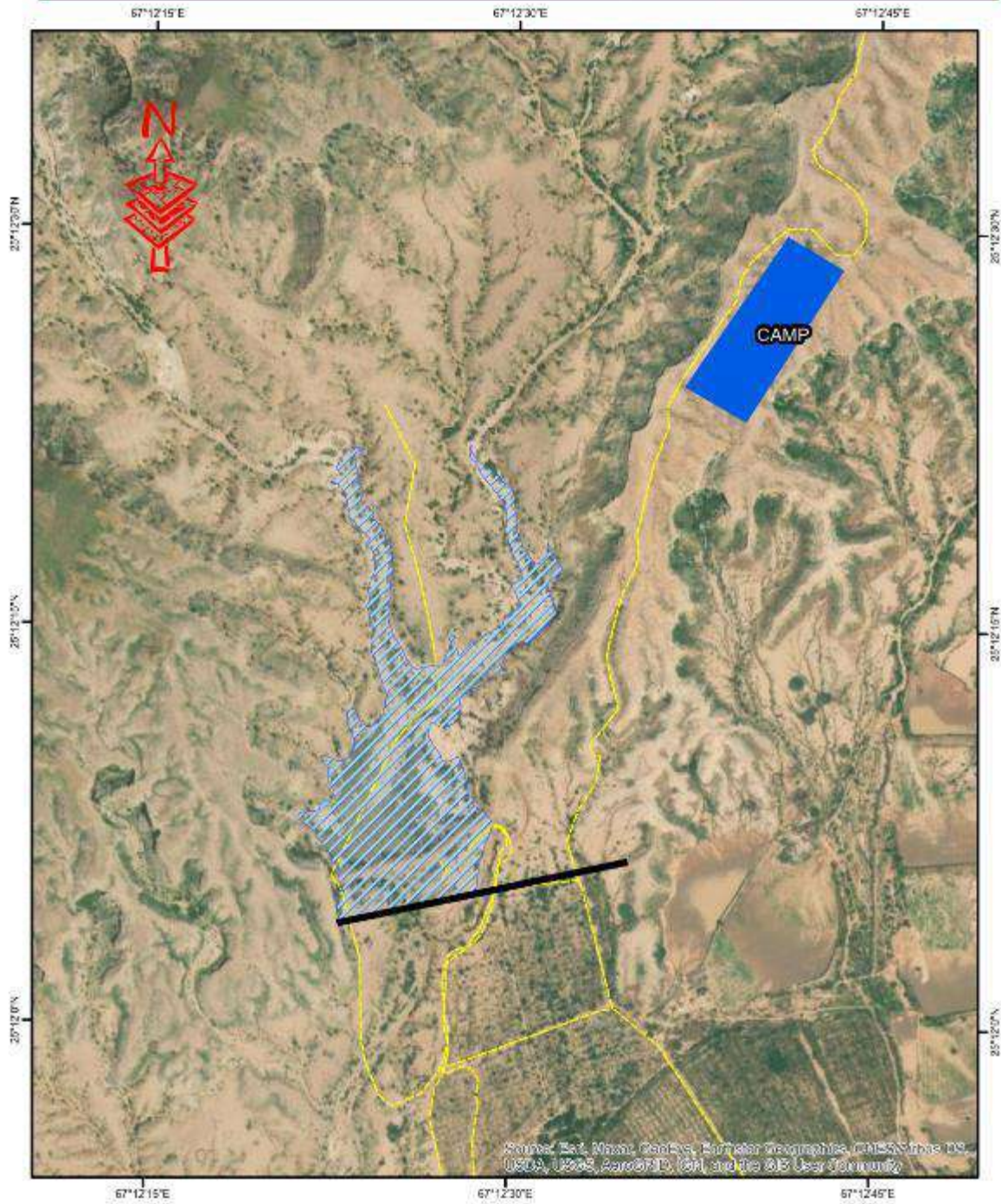
Source: Esri, DeLorme, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, Esri, and the GIS User Community

Legend	
	KATCHA TRACK
	ROADS
	TRILLS





SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF JANAI DAM (RECHARGE)



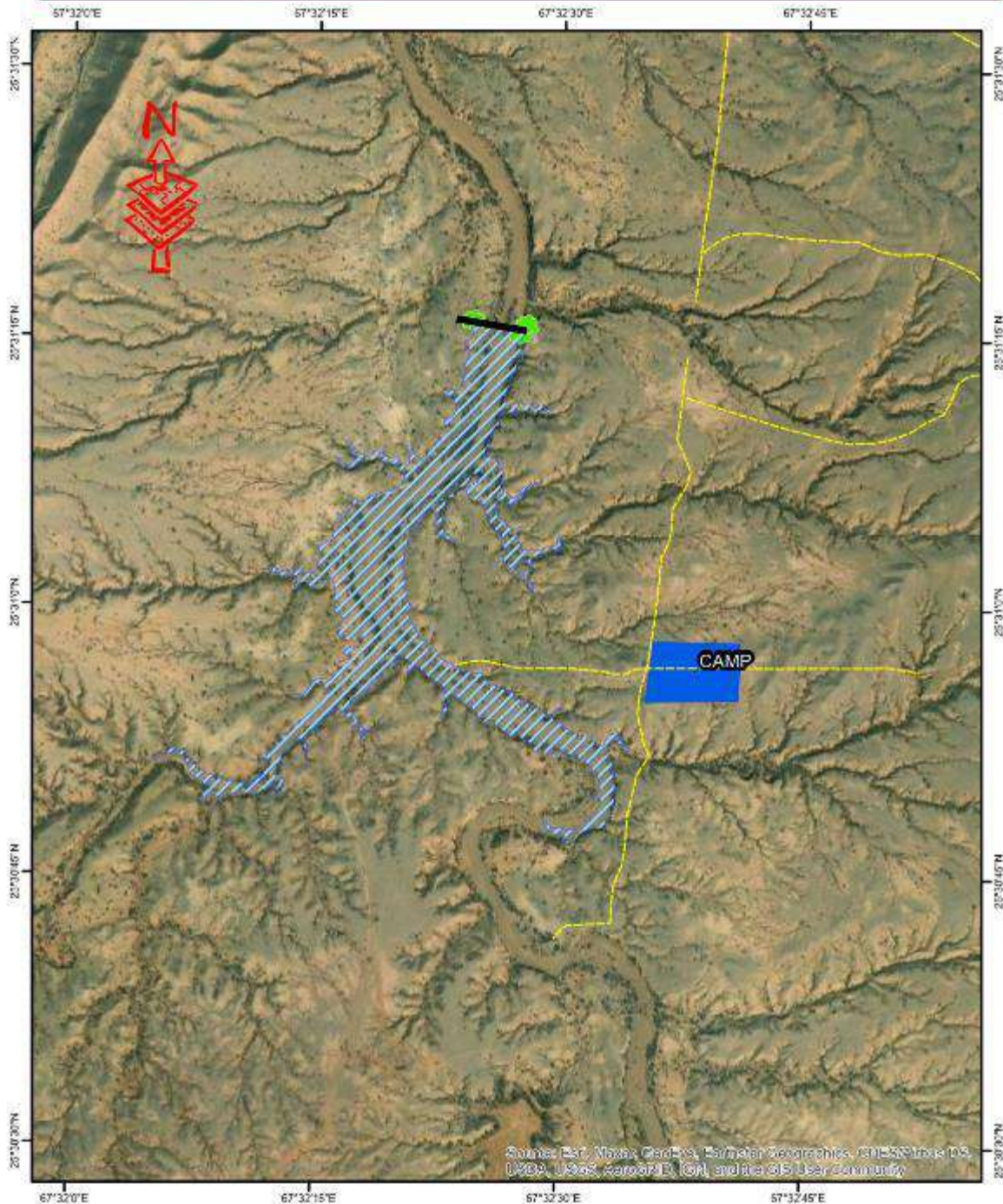
Legend

- DAM
- RESERVOIR
- CAMP/ARLA
- KATCHA TRACK





SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF GHULAM MUSTAFA DAM (RECHARGE)



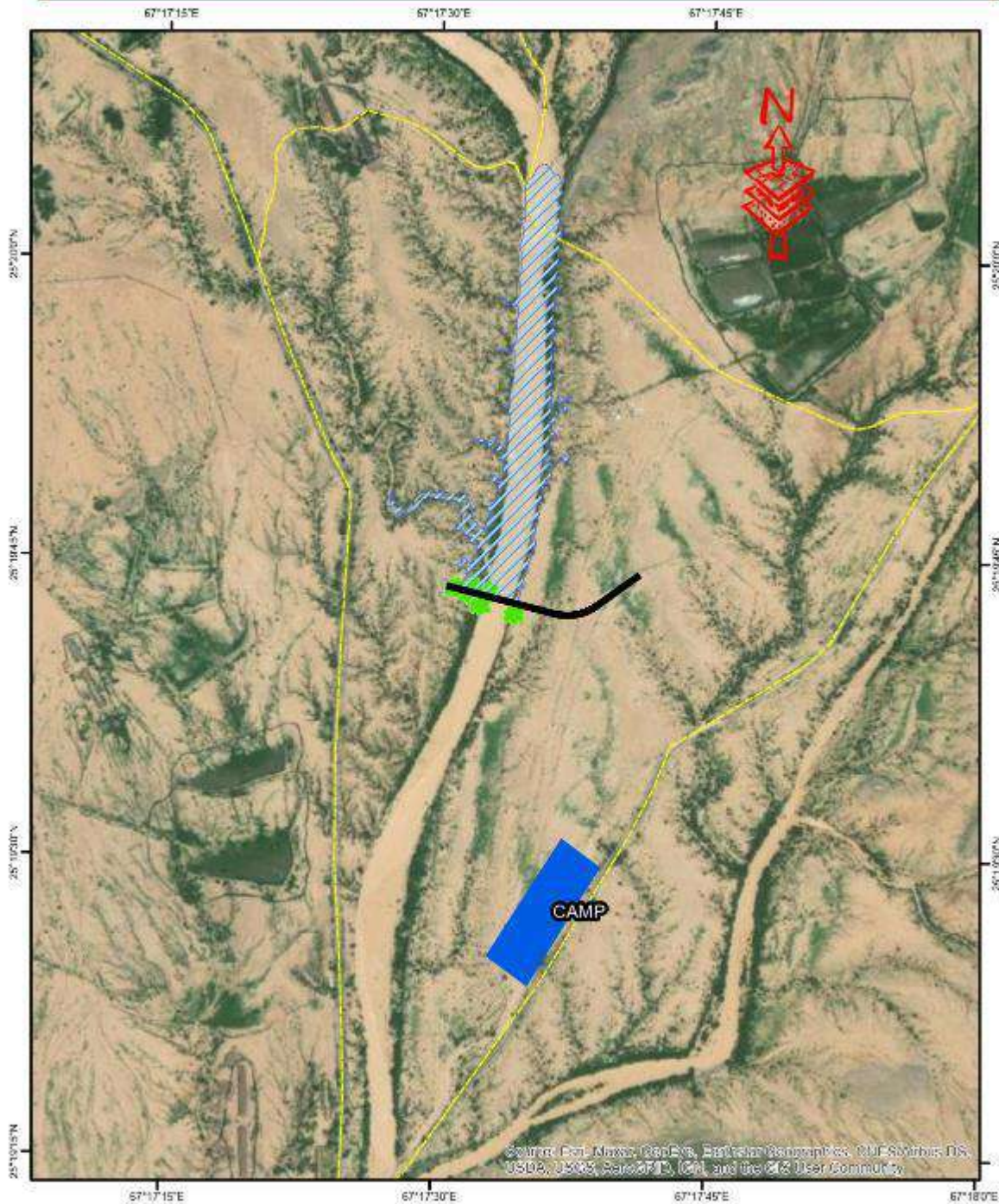
Legend

	DAM		KATCHA TRACK
	RESERVOIR		TREES
	CAMP AREA		



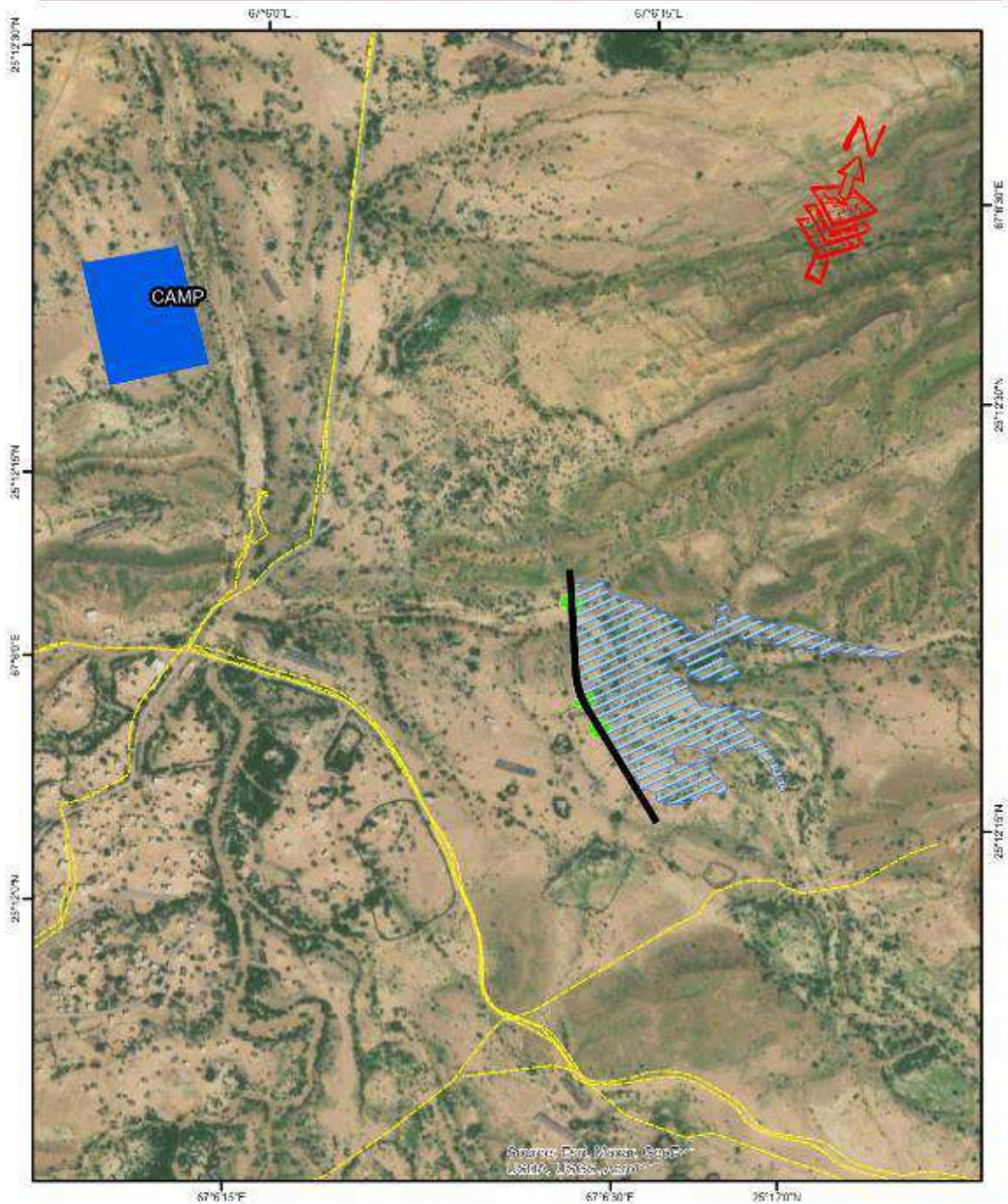


SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF ASABO DAM (RECHARGE)



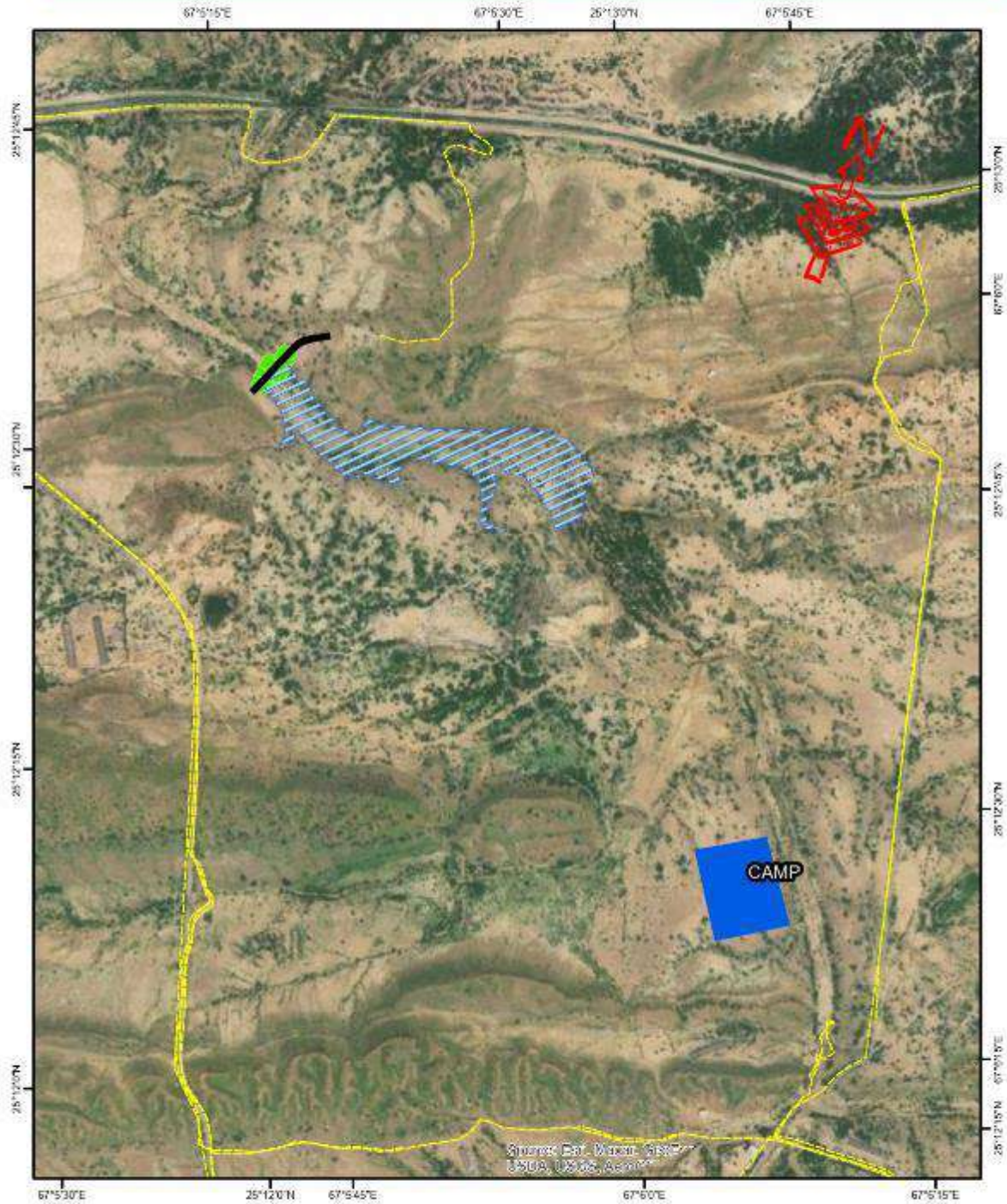


SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF HUB-1 DAM (STORAGE)





SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF HUB-2 DAM (STORAGE)



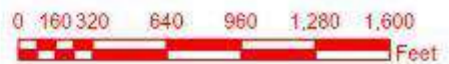
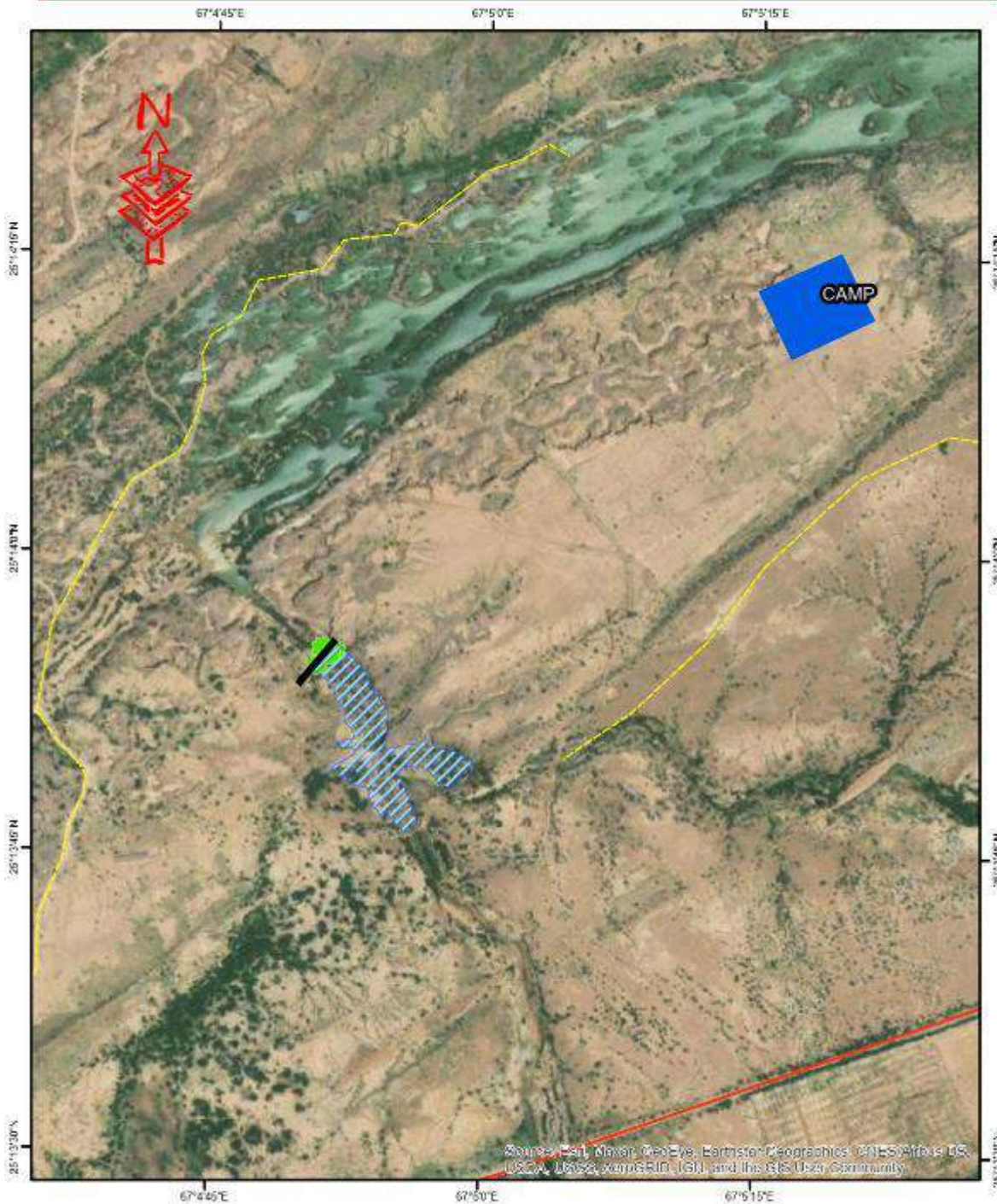
Legend

- DAM
- RESERVOIR
- CAMP AREA
- KATCHA TRACK
- TRPPS





SINDH RESILIENCE PROJECT - SRP LANDUSE MAP & CAMP LOCATION OF HUB-3 DAM (STORAGE)

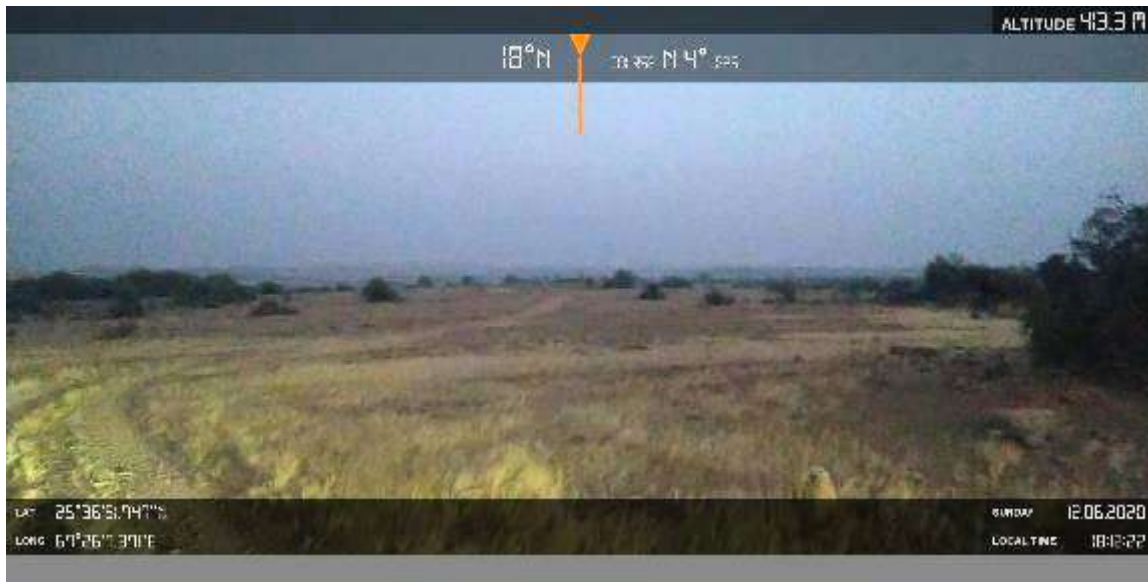




Annexure IV: Photo Log



Proposed small Dam	Nadi /Channel Name	UC Name	Near By Village	Coordinates	KPAC Area
1. Tikho-III	Baran	Toung	M. Murad Brohi	25°42'9.59"N 67°42'4.96"E	Within KNP about 5 km south of Kachrat Center



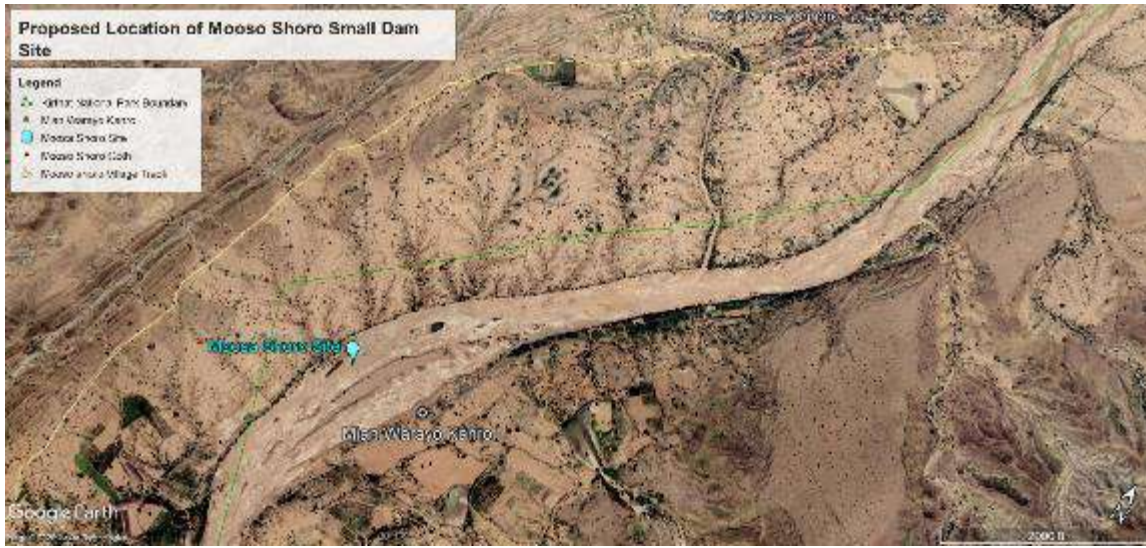
Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates	KPAC Area
2. Pipe Baricha	Bhandi stream	Mole	Piper Barecho	25°37'2.84"N 67°26'19.80"E	Within KNP



Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates	KPAC Area
3 Ghulam Mustafa	Lakaro	Mole	M. Rahim Burfat	25°31'13.55"N 67°32'25.47"E	This site is in MKS



Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates	KPAC Area
4. Kamal Shodo	Sham Nadi	Sari	Kamal Khan Shodo	25°23'28.00"N 67°32'6.07"E	The site is in MKS



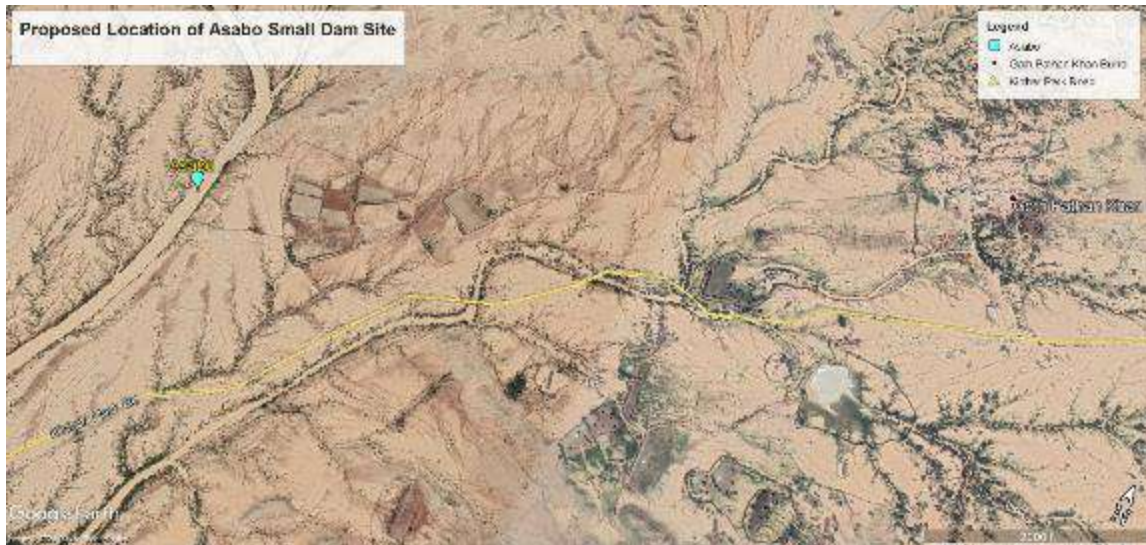
Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates	KPAC Area
5. Moosa Shoro	Thando	Mole	M. Moosa choro	25°18'57.53"N 67°26'31.94"E	Buffer zone of KNP about 1.5 km outside the Park



Proposed Dam Name	Nadi /Channel Name	UC Name	Near Village	By	Coordinates	KPAC Area
6. Purkhani	Purkhani	Mole	Purkhani		25°13'12.18"N67°27'37.26"E	Buffer zone of KNP about 1 km outside the Park



Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates	KPAC Area
7. Kand Nai	Kandnai	Moidan	Mian Warayo Kanro	25°22'2.00"N 67°21'36.27"E	The site is in KNP



Proposed Dam Name	Nadi /Channel Name	UC Name	Near By Village	Coordinates	KPAC Area
8. Asabo	Tadaro nai	Moidan	Pathan Khan Bhurro	25°19'43.47"N 67°17'33.02"E	The site is in KNP



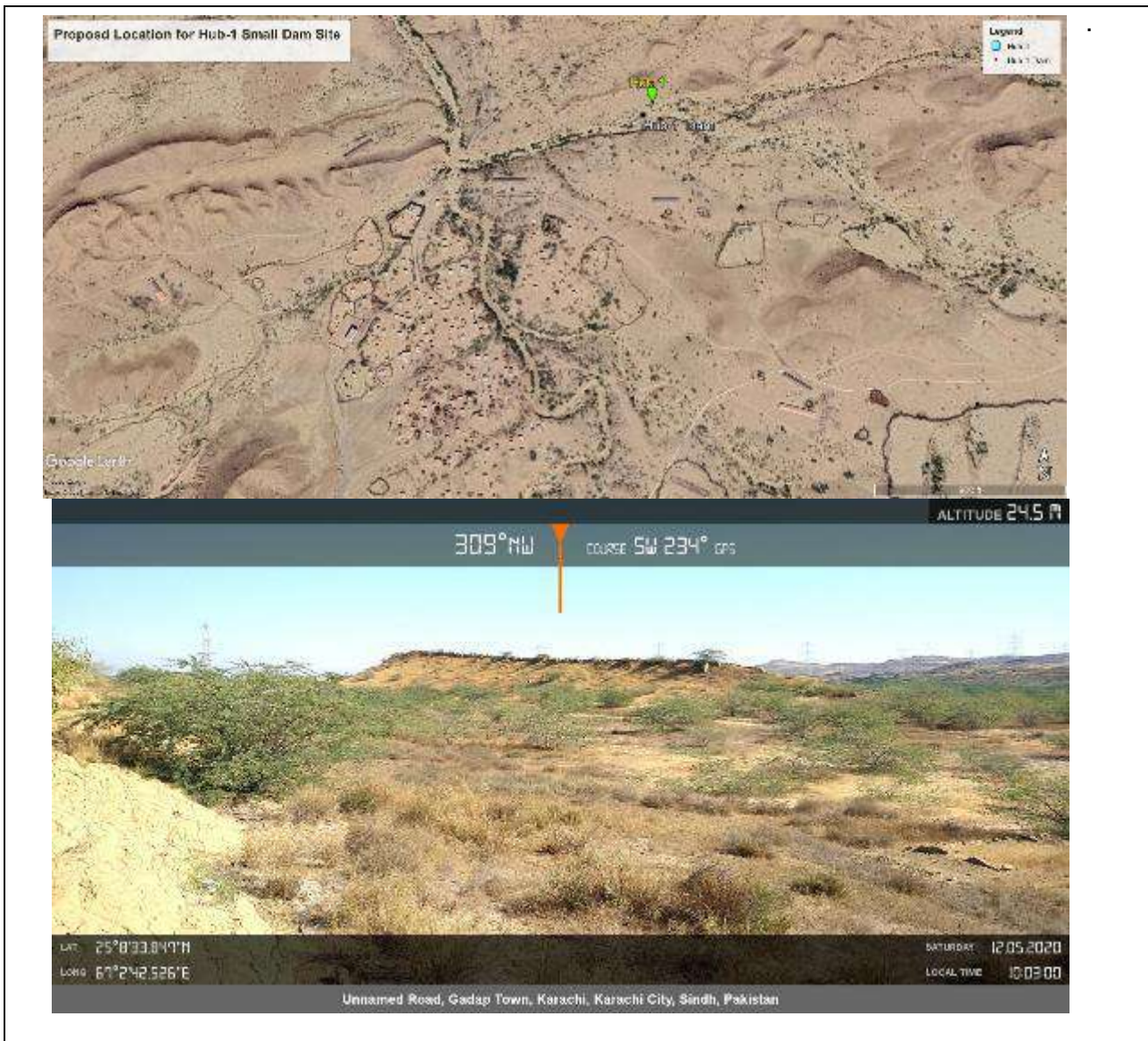
Proposed Dam Name	Nadi /Channel Name	UC Name	Near Village	By	Coordinates	KPAC Area
9. Janai	Jani Nai	Gadap	Rasool Bux Khaskheli		25°12'4.74"N 67°12'25.65"E	The site is in HWS



Proposed Dam Name	Nadi /Channel Name	UC Name	Near Village	By	Coordinates	KPAC Area
10. Hub-3	Lotari nai	Charun	Ali Brohi		25°13'55.05"N 67° 4' 51.12"E	about 6 km downstream of Hub dam



Proposed Dam Name	Nadi /Channel Name	UC Name	Near Village	By	Coordinates	Distance from Protected Area
11. Hub-2	Lotari nai	Charun	Karim Brohi	Bux	25°12'39.12"N 67° 5'20.07"E	about 5 km downstream of Hub dam



Proposed Dam Name	Nadi /Channel Name	UC Name	Near Village	By	Coordinates	Distance from Protected Area
12. Hub-1	Lotari nai	Charun	Molvi Abdul Quadir Brohi		25°12'16.70"N 67° 6'19.00"E	about 6 km downstream of Hub dam



Wildlife Expert during field survey



The topography of Tikho-III small dam site



Vegetation at Tikho-III project area



Data Collection activity at Tikho-III Project area



Modes of transportation at Tikho-III Site



Topography of Pipre Baricha small dam site



Ecological survey at Pipe Baricha



Topography of proposed Pipe Baricha dam site



Topography of proposed Kamal Shodo dam site



Vegetation at Kamal Shodo project area



Topography of proposed Purkhani dam site



Topography of proposed Asabo dam site



Vegetation at Asabo project area



Topography of proposed Moso Choro dam site



Vegetation at Moso Shoro project area



Topography of proposed small dam
at Janai



Vegetation at Janai project area



Agricultural Farm near Janai area



Surface water source near Hub-3 dam site



Topography of proposed Hub-3
dam site



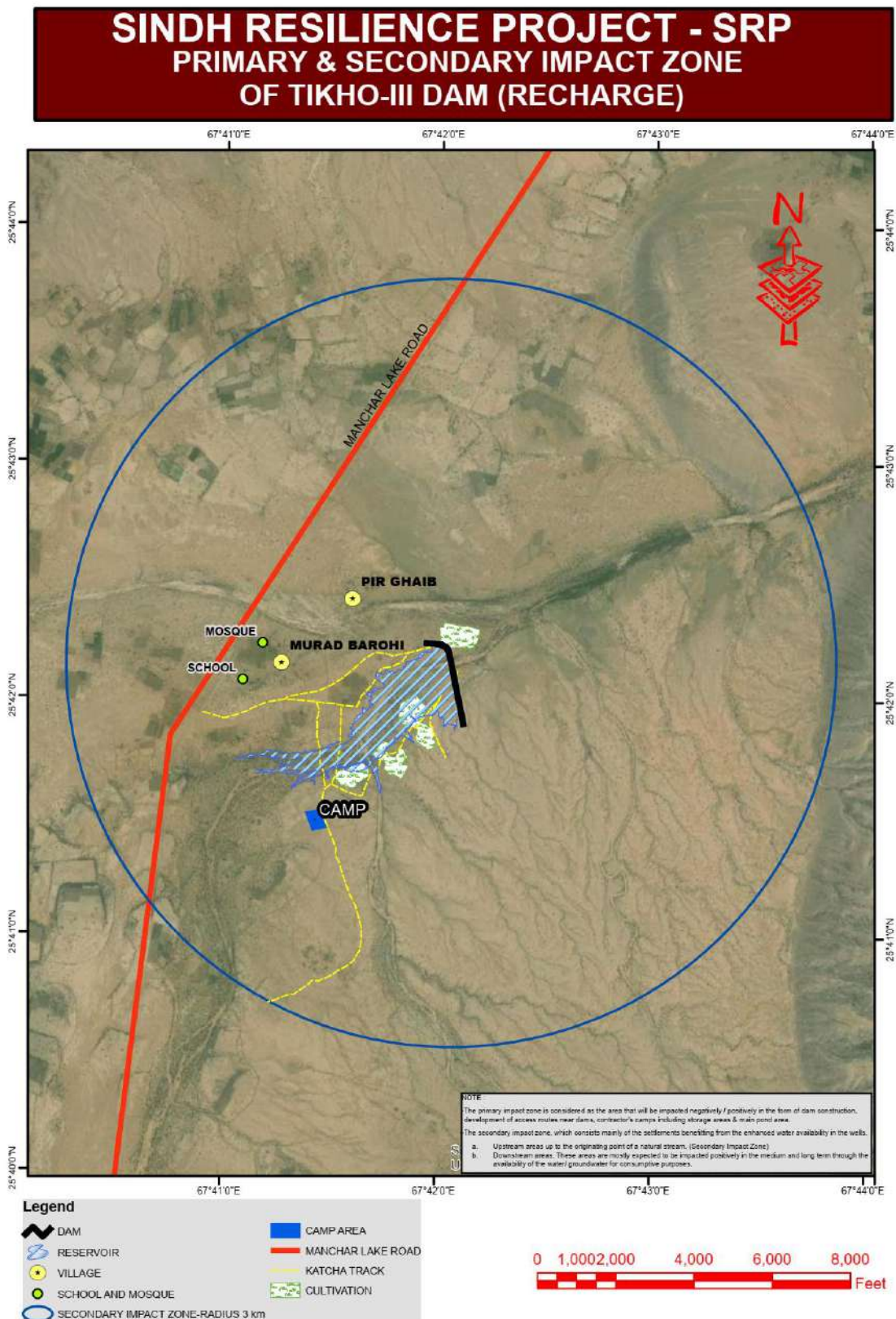
Ecological Survey at Hub -2 Dam site area



Topography of proposed Hub-2 dam site



Annexure V: Secondary Impact Zone and Downstream



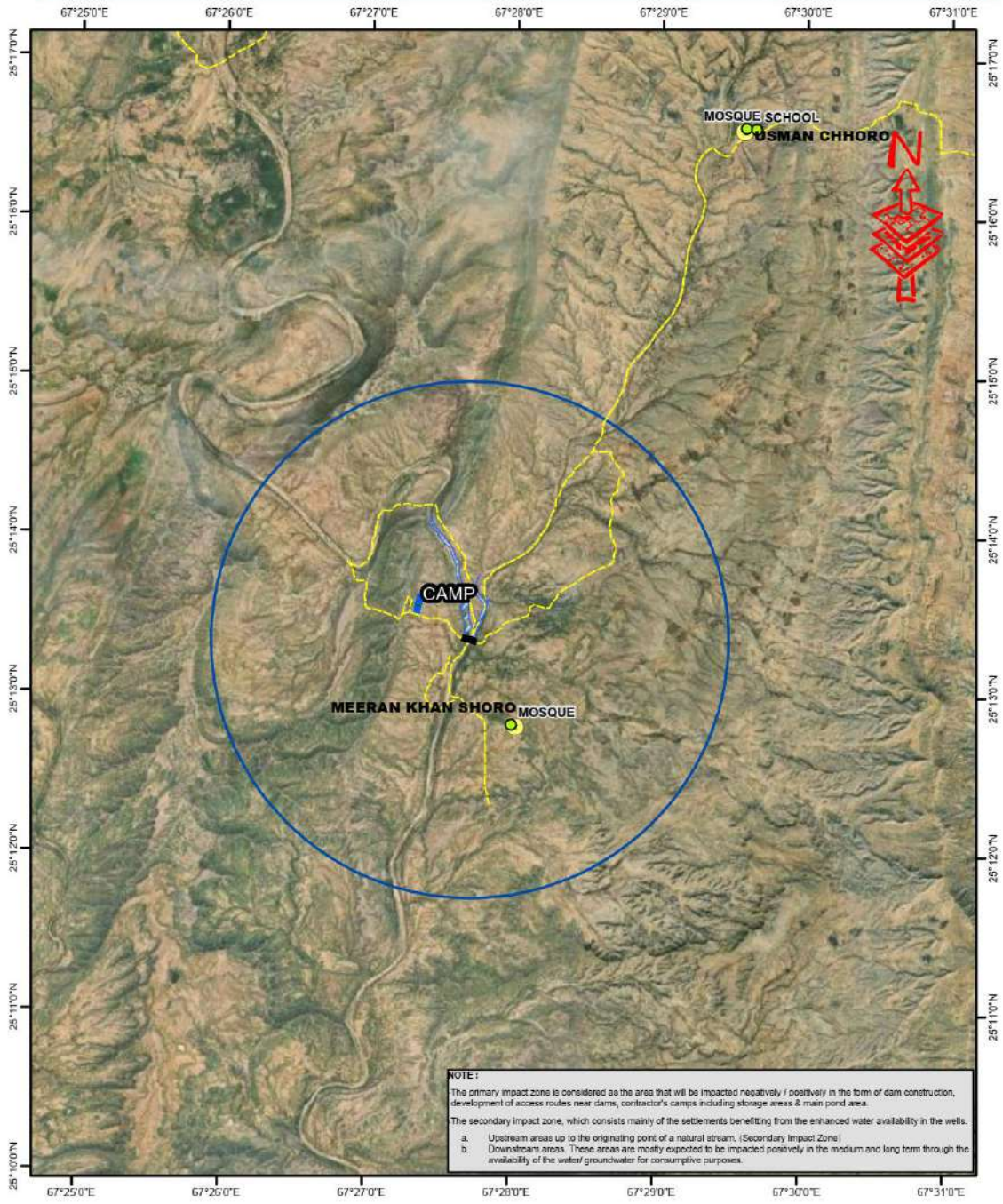
Communities







SINDH RESILIENCE PROJECT - SRP PRIMARY & SECONDARY IMPACT ZONE OF PURKHANI DAM (RECHARGE)



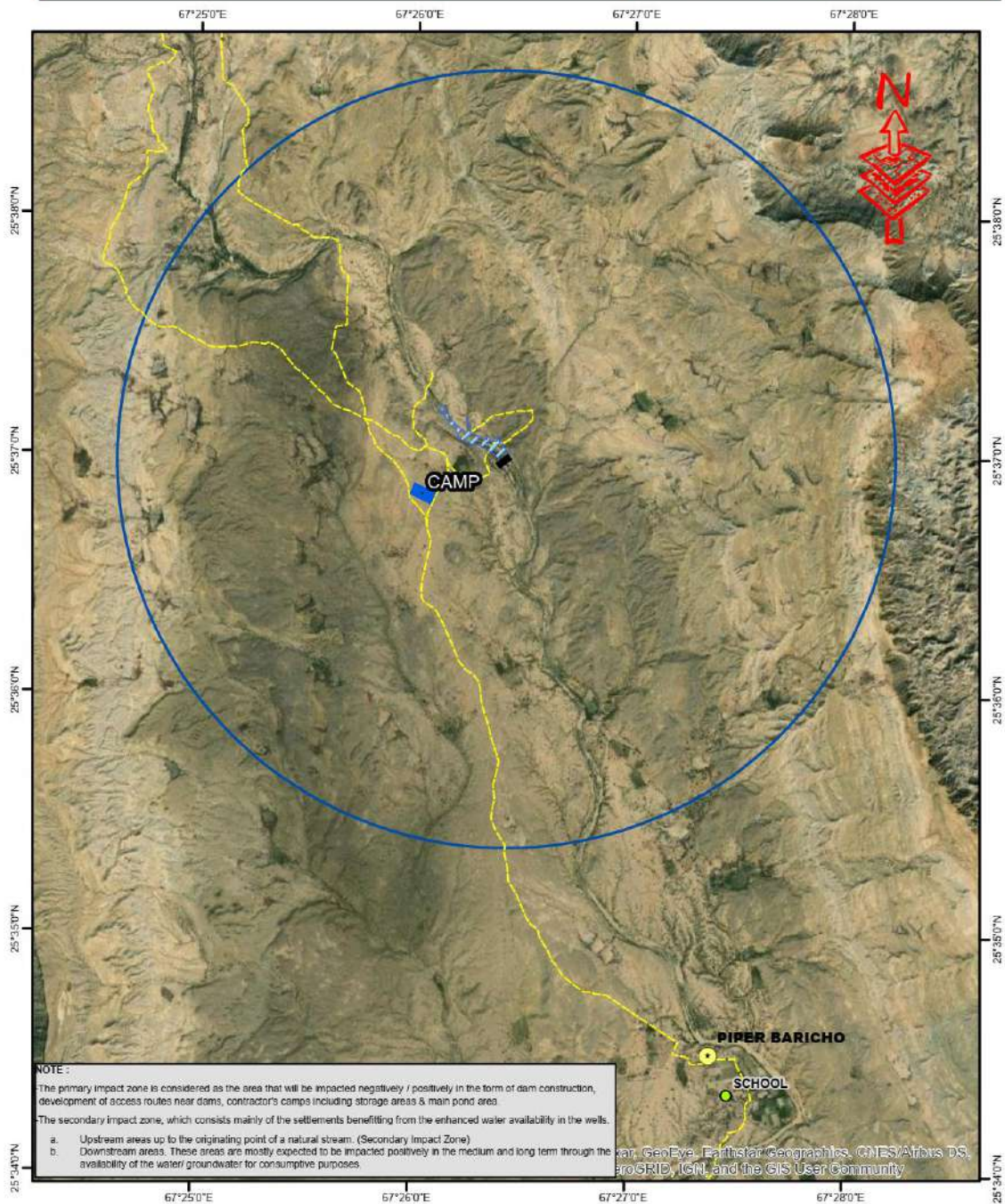
Legend

	DAM		SCHOOL AND MOSQUE
	RESERVOIR		SECONDARY IMPACT ZONE RADIUS 3 km
	VILLAGE		CAMP AREA
	KATCHA TRACK		





SINDH RESILIENCE PROJECT - SRP PRIMARY & SECONDARY IMPACT ZONE OF PIPRE BARICHA DAM (RECHARGE)



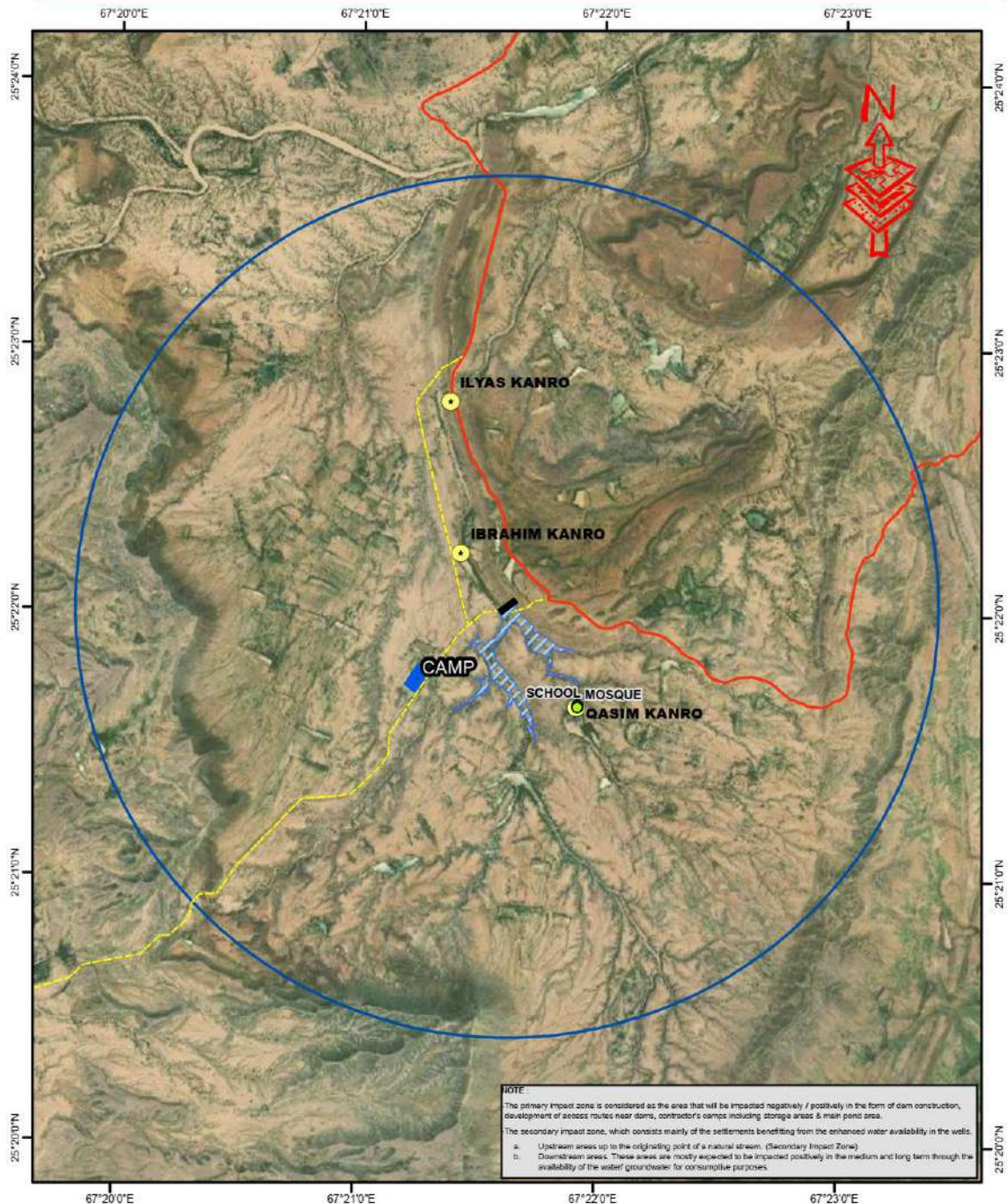
Legend

	DAM		SCHOOL AND MOSQUE
	RESERVOIR		SECONDARY IMPACT ZONE-RADIUS 3 km
	VILLAGE		CAMP AREA
	KATCHA TRACK		





SINDH RESILIENCE PROJECT - SRP PRIMARY & SECONDARY IMPACT ZONE OF KAND NAI DAM (RECHARGE)



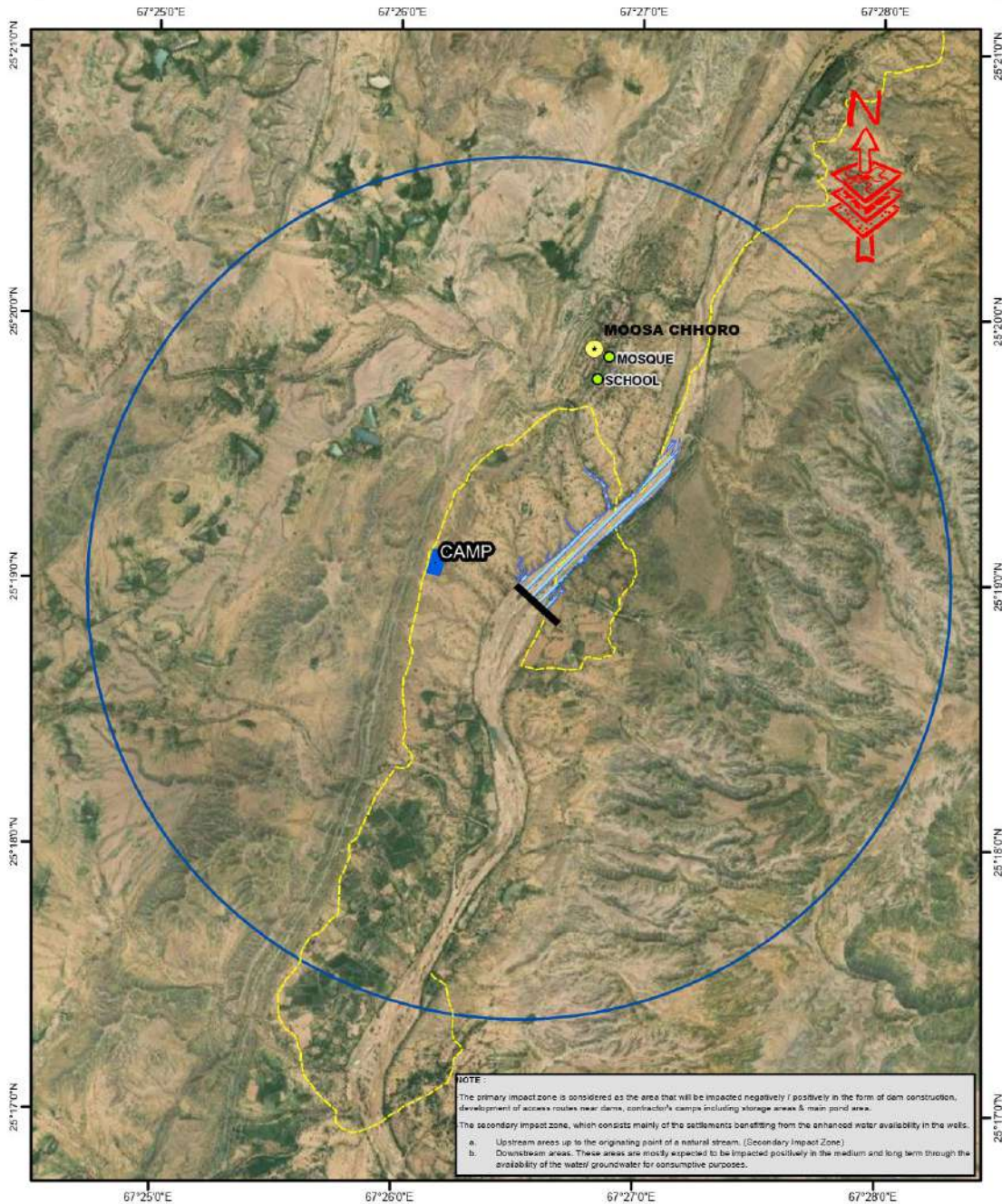
Legend

DAM	SECONDARY IMPACT ZONE-RADIUS 3 km
RESERVOIR	CAMP AREA
VILLAGE	KATCHA TRACK
SCHOOL AND MOSQUE	ROADS





SINDH RESILIENCE PROJECT - SRP PRIMARY & SECONDARY IMPACT ZONE OF MOOSA CHHORO DAM (RECHARGE)



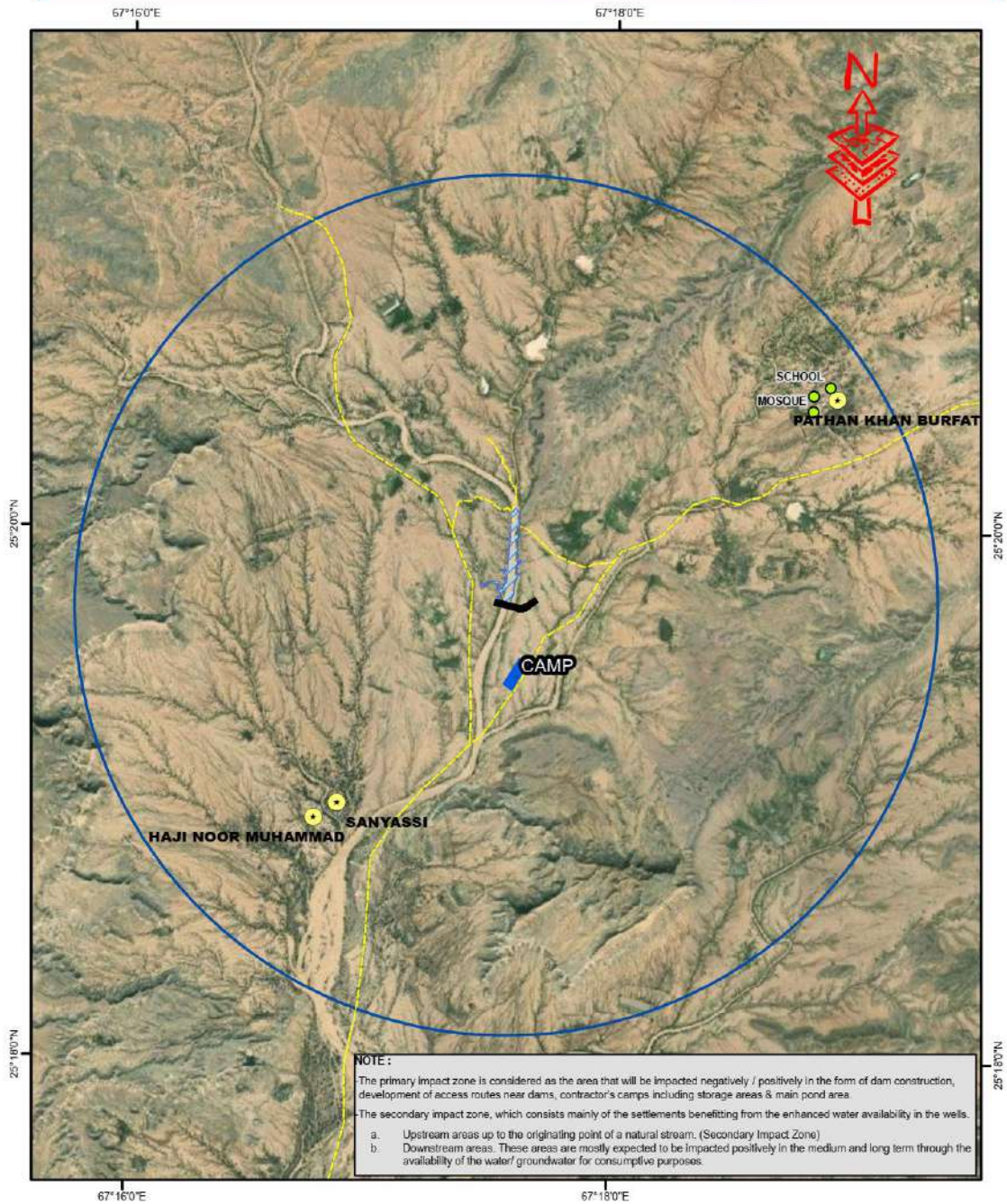
NOTE:
The primary impact zone is considered as the area that will be impacted negatively / positively in the form of dam construction, development of access routes near dams, contractor's camps including storage areas & main pond area.
The secondary impact zone, which consists mainly of the settlements benefiting from the enhanced water availability in the wells.
a. Upstream areas up to the originating point of a natural stream. (Secondary Impact Zone)
b. Downstream areas. These areas are mostly expected to be impacted positively in the medium and long term through the availability of the water/ groundwater for consumptive purposes.

Legend	
	DAM
	RESERVOIR
	VILLAGE
	SCHOOL AND MOSQUE
	SECONDARY IMPACT ZONE-RADIUS 3 km
	CAMP AREA
	KATCHA TRACK





SINDH RESILIENCE PROJECT - SRP PRIMARY & SECONDARY IMPACT ZONE OF ASABO DAM (RECHARGE)



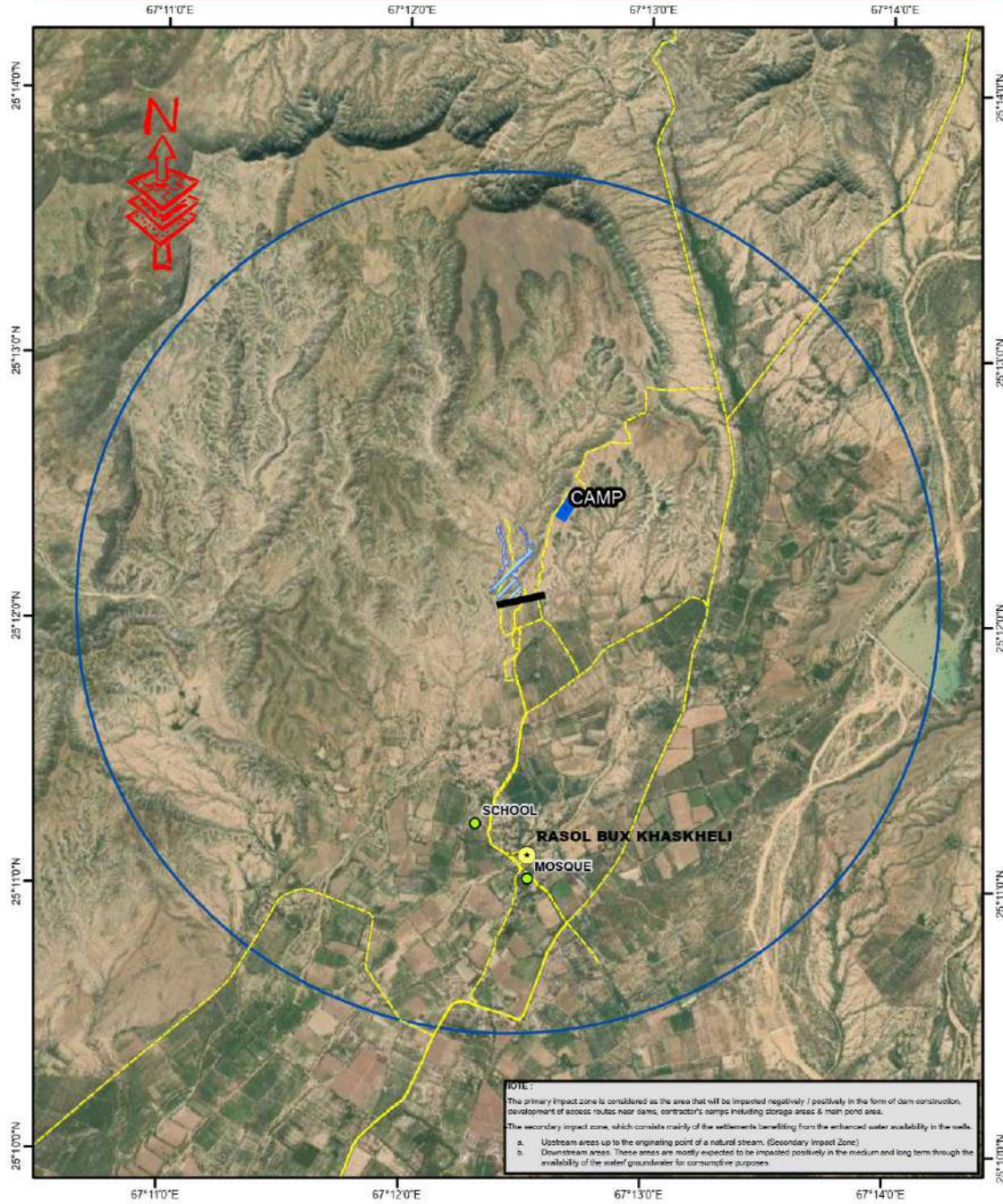
Legend

DAM	SECONDARY IMPACT ZONE-RADIUS 3 km
RESERVOIR	CAMP AREA
VILLAGE	KATCHA TRACK
SCHOOL AND MOSQUE	
RESERVOIR	KATCHA TRACK
VILLAGE	ROADS
SCHOOL AND MOSQUE	
SECONDARY IMPACT ZONE-RADIUS 3 km.	





SINDH RESILIENCE PROJECT - SRP PRIMARY & SECONDARY IMPACT ZONE OF JANAI DAM (RECHARGE)



NOTE:
The primary impact zone is considered as the area that will be impacted negatively / positively in the form of dam construction, development of access routes near dams, contractor's camps including storage areas & main pond area.
The secondary impact zone, which consists mainly of the settlements benefiting from the enhanced water availability in the valley:
a. Upstream areas up to the originating point of a natural stream. (Secondary Impact Zone)
b. Downstream areas. These areas are mostly expected to be impacted positively in the medium and long term through the availability of the water/groundwater for consumptive purposes.

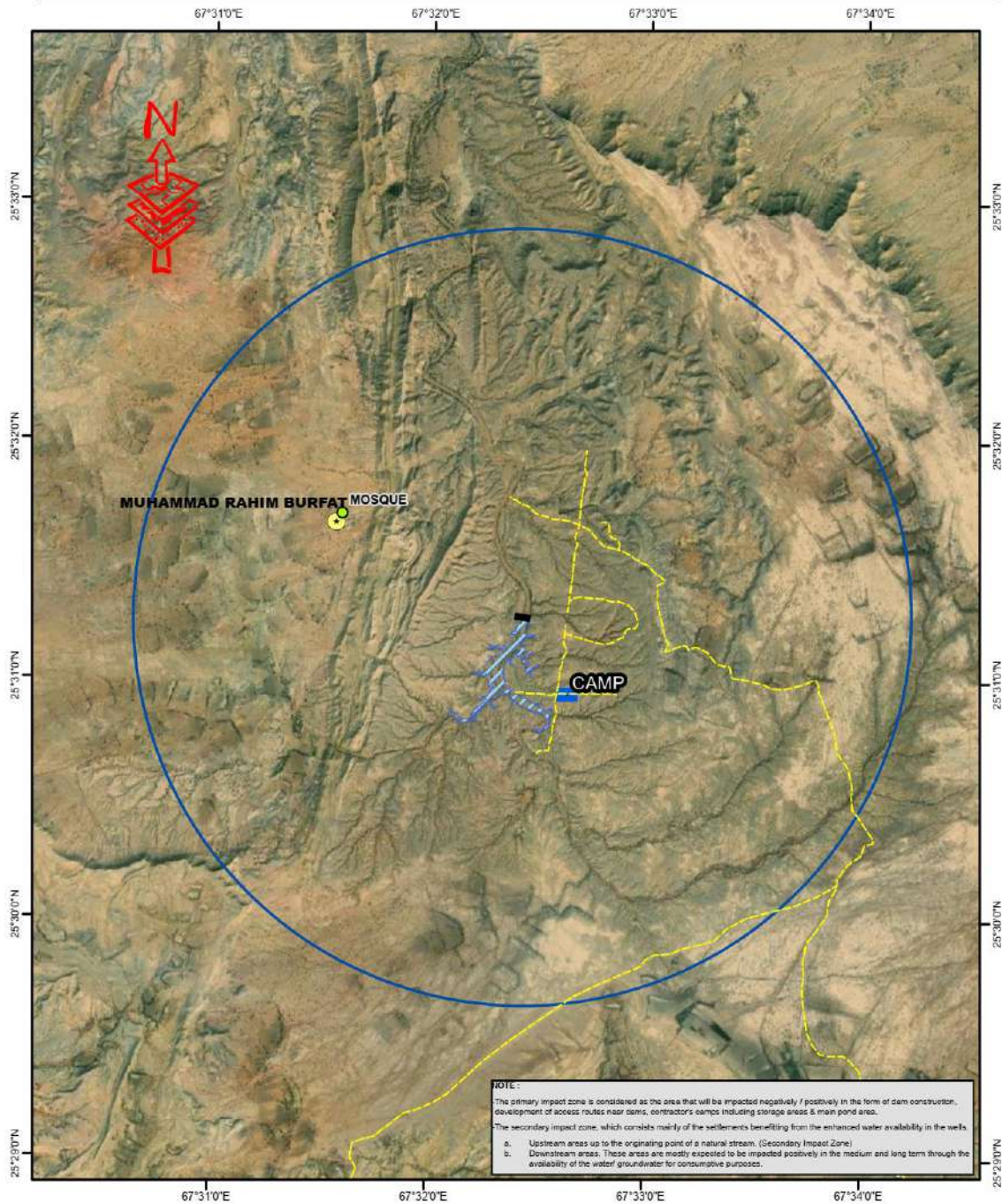
Legend

DAM	SECONDARY IMPACT ZONE-RADIUS 3 km
RESERVOIR	CAMP AREA
VILLAGE	KATCHA TRACK
SCHOOL AND MOSQUE	



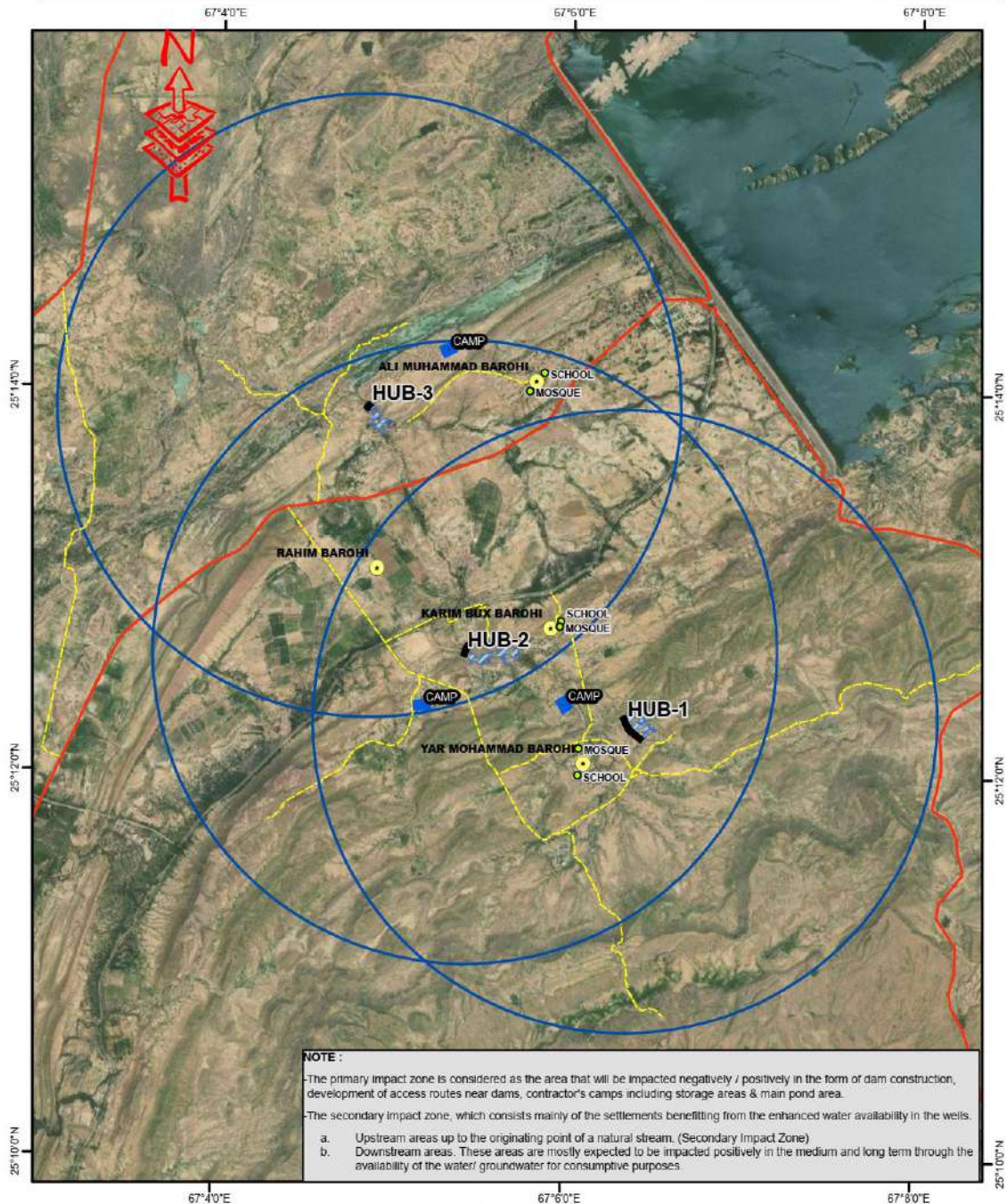


SINDH RESILIENCE PROJECT - SRP PRIMARY & SECONDARY IMPACT ZONE OF GHULAM MUSTAFA DAM (RECHARGE)





SINDH RESILIENCE PROJECT - SRP PRIMARY & SECONDARY IMPACT ZONE OF HUB-1, HUB-2 & HUB-3 DAM (STORAGE)



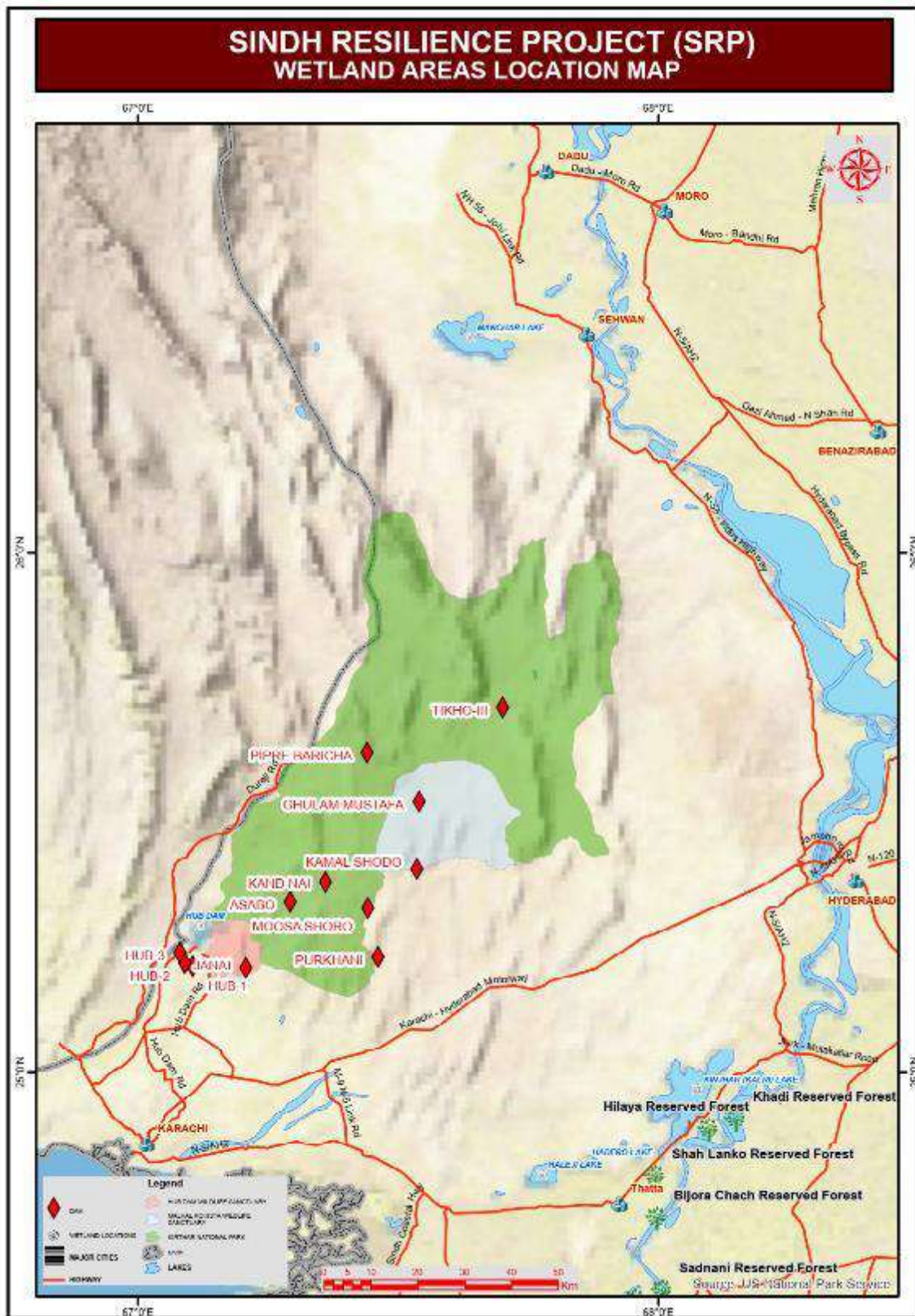
Legend

	DAM		KATCHA TRACK
	RESERVOIR		SECONDARY IMPACT ZONE RADIUS 3 km
	CAMP AREA		ROADS
	VILLAGE		
	SCHOOL AND MOSQUE		





Annexure VI: Location of Nearest Wetlands in Sub-Project Area





Annexure VII: Laboratory Results of Water Samples

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	Khurrand	26°26'17.00"N 68°48'44.51"E	Dam Axis	26°26'11.51"N 68°48'45.86"E	DW25 ft			26°26'4.85"N 68°48'26.92"E	Dam Axis	26°26'23.38"N 68°48'47.28"E	village	26°25'10.14"N 68°49'18.67"E	Road
2	Jaam Dataar Dam	26°25'23.74"N 68°47'27.67"E	Dam Axis	26°25'27.09"N 68°47'24.26"E	DW30 ft			26°25'20.84"N 68°47'28.13"E	Dam Axis	26°25'24.46"N 68°47'27.71"E	road		
3	Tikho-III	25°42'54.27"N 67°43'52.63"E	Dam Axis	25°43'30.17"N 67°44'0.52"E	DW350 ft			25°42'56.52"N 67°44'2.57"E	Dam Axis	25°42'58.41"N 67°42'55.59"E	village	25°43'14.15"N 67°42'34.52"E	Darbar
4	Pipre Baricha	25°37'3.90"N 67°26'15.70"E	Dam Axis	25°36'59.96"N 67°26'20.95"E	DW250 ft			25°37'4.76"N 67°26'16.28"E	Dam Axis	25°36'59.98"N 67°26'15.93"E	village	25°36'52.25"N 67°26'14.37"E	Mosque
5	Ghulam Mustafa	25°31'9.56"N 67°32'21.09"E	Dam Axis	25°31'25.06"N 67°32'28.43"E	DW350 ft			25°31'6.57"N 67°32'23.17"E	Dam Axis	25°30'57.63"N 67°32'24.78"E	village	25°30'59.08"N 67°32'21.44"E	Mosque
6	Kamal Shodo	25°23'22.66"N 67°32'9.19"E	Dam Axis	25°23'25.01"N 67°32'5.04"E	DW300 ft			25°23'30.73"N 67°32'2.78"E	Dam Axis	25°23'22.09"N 67°32'5.04"E	Road	25°23'21.29"N 67°31'58.44"E	Mosque
7	Kand Nai	25°22'9.96"N 67°21'33.46"E	Dam Axis	25°22'13.89"N 67°21'12.59"E	DW200 ft			25°22'7.38"N 67°21'31.71"E	Dam Axis	25°22'18.24"N 67°21'14.43"E	Village	25°22'3.64"N 67°21'45.74"E	Road
8	Asabo	25°19'39.37"N 67°17'35.97"E	Dam Axis	25°19'55.48"N 67°17'45.26"E	DW300 ft			25°19'42.52"N 67°17'30.78"E	Dam Axis	25°19'58.72"N 67°17'44.18"E	Village		
9	Moosa Shoro	25°18'47.39"N 67°26'27.63"E	Dam Axis	25°18'49.78"N 67°26'36.79"E	DW300 ft			25°18'50.27"N 67°26'27.53"E	Dam Axis	25°18'45.08"N 67°26'35.33"E	Village	25°18'42.55"N 67°26'35.22"E	Mosque
10	Purkhani	25°13'17.73"N 67°27'47.25"E	Dam Axis	25°13'38.19"N 67°27'59.16"E	DW 200 Ft			25°13'17.73"N 67°27'47.25"E	Dam Axis	25°13'36.98"N 67°28'0.45"E	Mosque	25°13'40.80"N 67°28'1.96"E	Village
11	Janai	25°12'0.52"N 67°12'29.41"E	Dam Axis	25°11'2.96"N 67°12'33.01"E	DW 300 ft			25°12'0.52"N 67°12'29.41"E	Dam Axis	25°11'0.41"N 67°12'29.29"E	Mosque	25°11'13.10"N 67°12.5140"E	School
12	Hub 3	25°13'56.51"N 67° 4'48.83"E	Dam Axis	25°14'1.58"N 67° 4'44.20"E	DW 120 ft	25°14'6.86"N 67° 4'52.81"E	SW	25°13'58.37"N 67° 4'46.07"E	Near Dam Axis	25°13'39.85"N 67° 4'36.08"E	Road		
13	Hub 2					25°12'45.42"N 67° 5'18.19"E	canal	25°12'38.74"N 67° 5'21.88"E	Road	25°12'46.55"N 67° 5'11.86"E	Road		
14	Hub 1	25°12'16.74"N 67° 6'13.65"E	Dam Axis	25°12'5.97"N 67° 6'7.12"E	DW			25°12'16.74"N 67° 6'13.65"E	Near Dam Axis	25°12'12.40"N 67° 6'37.99"E	Road		





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SURFACE WATER ANALYSIS REPORT

Sample Detail

Nature of Sample	Surface Water	Reporting Date	10-11-2020
Grab/Composite	Grab	Analysis Completion Date	07-11-2020
Sampling Date	31-10-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-SW-07/2020	Sample Receiving Date	31-10-2020
Sampling Coordinates	28° 11' 24.23" N 67° 3' 10.79" E	Sampling Location	Hub 3



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	6.78	6-9
3	Biochemical Oxygen Demand (BOD ₅)	SMWW 5210-B	12	250 mg/L
4	Chemical Oxygen Demand (COD)	SMWW 5220 B	20	400 mg/L
5	Total Suspended Solids (TSS)	SMWW 2540 D	29	400 mg/L
6	Total Dissolved Solids (TDS)	SMWW 2540 C	181	3500 mg/L
7	Phenolic Compounds (as Phenols)	SMWW 5530 D	0.0	0.3 mg/L
8	Grease and Oil	USEPA 1964 B	0.0	10 mg/L
9	Chloride (Cl ⁻)	SMWW 4500 Cl ⁻ B	27	1000 mg/L
10	Fluoride (F ⁻)	SMWW 4500 F ⁻ C	0.0	10 mg/L
11	Cyanide (CN ⁻)	SMWW 4500 CN ⁻ F	0.0	1.0 mg/L
12	An-ionic Detergents (as MBAs)	SMWW 5540-C	0.0	20 mg/L
13	Sulfate (SO ₄ ²⁻)	SMWW 4500 SO ₄ ²⁻ C	22	600 mg/L
14	Sulfide (S ²⁻)	SMWW 4500 S ²⁻ F	0.0	1.0 mg/L
15	Ammonia (NH ₃)	SMWW 4500-NH ₃ D	0.0	40 mg/L
16	Cadmium (Cd)	SMWW 3113 B	<0.008	0.1 mg/L
17	Chromium (Cr)	SMWW 3113 B	0.006	1.0 mg/L
18	Copper (Cu)	SMWW 3113 B	0.165	1.0 mg/L
19	Lead (Pb)	SMWW 3113 B	<0.005	0.5 mg/L
20	Mercury (Hg)	SMWW 3112 B	<0.001	0.01 mg/L
21	Selenium (Se)	SMWW 3114 B	0.02	0.5 mg/L
22	Nickel (Ni)	SMWW 3113 B	0.031	1.0 mg/L
23	Silver (Ag)	SMWW 3113 B	0.003	1.0 mg/L
24	Total Toxic Metals	Calculated Value	0.260	2.0
25	Zinc (Zn)	SMWW 3111 B	0.060	5.0 mg/L
26	Arsenic (As)	SMWW 3114 B	0.008	1.0 mg/L
27	Barium (Ba)	SMWW 3113 B	0.0040	1.5 mg/L
28	Iron (Fe)	SMWW 3113 B	0.964	8.0 mg/L
29	Manganese (Mn)	SMWW 3111 B	0.039	1.5 mg/L
30	Boron (B)	SMWW 3113 B	0.02	5.0 mg/L
31	Residual Chlorine (Cl ₂)	SMWW 4500 Cl ⁻ B	0.0	1.0 mg/L

SEQS: Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/179/2014

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Reviewed By

Approved By

(QM)

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SURFACE WATER ANALYSIS REPORT

Sample Detail			
Nature of Sample	Surface Water	Reporting Date	10-11-2020
Grab/Composite	Grab	Analysis Completion Date	07-11-2020
Sampling Date	30-10-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-SW-08/2020	Sample Receiving Date	30-10-2020
Sampling Coordinates	25° 9'58.34"N 67° 2'38.97"E	Sampling Location	Hub-2



Surface Water Analysis Results				
Sr. No.	Parameter	Analysis Method	Result	SEQS Limits
Field Analysis				
1	Temperature	SMWW 2550 B	23.0	± 3°C
Lab Analysis				
2	pH	SMWW 4500 H ⁺ B	6.74	6-9
3	Biochemical Oxygen Demand (BOD ₅)	SMWW 5210-B	10	250 mg/L
4	Chemical Oxygen Demand (COD)	SMWW 5220 B	17	400 mg/L
5	Total Suspended Solids (TSS)	SMWW 2540 D	34	400 mg/L
6	Total Dissolved Solids (TDS)	SMWW 2540 C	176	3500 mg/L
7	Phenolic Compounds (as Phenols)	SMWW 5530 D	0.0	0.3 mg/L
8	Grease and Oil	USEPA 1664 B	0.0	10 mg/L
9	Chloride (Cl ⁻)	SMWW 4500 Cl ⁻ B	32	1000 mg/L
10	Fluoride (F ⁻)	SMWW 4500 F ⁻ C	0.0	10 mg/L
11	Cyanide (CN ⁻)	SMWW 4500 CN ⁻ F	0.0	1.0 mg/L
12	An-ionic Detergents (as MBAs)	SMWW 5540-C	0.0	20 mg/L
13	Sulfate (SO ₄ ²⁻)	SMWW 4500 SO ₄ ²⁻ C	27	600 mg/L
14	Sulfide (S ²⁻)	SMWW 4500 S ²⁻ F	0.0	1.0 mg/L
15	Ammonia (NH ₃)	SMWW 4500-NH ₃ D	0.0	40 mg/L
16	Cadmium (Cd)	SMWW 3113 B	0.007	0.1 mg/L
17	Chromium (Cr)	SMWW 3113 B	0.005	1.0 mg/L
18	Copper (Cu)	SMWW 3113 B	0.168	1.0 mg/L
19	Lead (Pb)	SMWW 3113 B	0.006	0.5 mg/L
20	Mercury (Hg)	SMWW 3112 B	<0.001	0.01 mg/L
21	Selenium (Se)	SMWW 3114 B	0.02	0.5 mg/L
22	Nickel (Ni)	SMWW 3113 B	0.029	1.0 mg/L
23	Silver (Ag)	SMWW 3113 B	0.003	1.0 mg/L
24	Total Toxic Metals	Calculated Value	0.269	2.0
25	Zinc (Zn)	SMWW 3111 B	0.091	5.0 mg/L
26	Arsenic (As)	SMWW 3114 B	0.007	1.0 mg/L
27	Barium (Ba)	SMWW 3113 B	0.0039	1.5 mg/L
28	Iron (Fe)	SMWW 3113 B	0.611	8.0 mg/L
29	Manganese (Mn)	SMWW 3111 B	0.02	1.5 mg/L
30	Boron (B)	SMWW 3113 B	0.02	6.0 mg/L
31	Residual Chlorine (Cl ₂)	SMWW 4500 Cl ⁻ B	0.0	1.0 mg/L

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	05-11-2020
Grab/Composite	Grab	Analysis Completion Date	05-11-2020
Sampling Date	29-10-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-24/2020	Sample Receiving Date	30-10-2020
Sampling Coordinates	26°26'17.00"N 68°48'44.51"E	Sampling Location	Khurrand



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	1.02
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	380
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1456
pH	SMWW 4500 H ⁺ B	6.5- 8.5	7.36
Aluminum (Al)	SMWW 3113 B	≤ 0.2 mg/L	0.007
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.007
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0037
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl)	SMWW 4500 Cl ⁻ B	< 250 mg/L	196
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.008
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.187
Cyanide (CN ⁻)	SMWW 4500 CN ⁻ F	≤ 0.05 mg/L	0.0
Fluoride (F ⁻)	SMWW 4500 F ⁻ C	≤ 1.5 mg/L	0.05
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	0.019
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	2.2
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.07
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.02
Residual Chlorine (Cl ₂)	SMWW 4500 Cl ₂ B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.03
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	

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Shahbaz

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DRINKING WATER ANALYSIS REPORT

Sample Detail			
Nature of Sample	Drinking Water	Reporting Date	05-11-2020
Grab/Composite	Grab	Analysis Completion Date	05-11-2020
Sampling Date	30-10-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-25/2020	Sample Receiving Date	30-10-2020
Sampling Coordinates	26°25'23.74"N 68°47'27.67"E	Sampling Location	Jaam Dataar



Drinking Water Analysis Results			
Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	1.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non- Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	1.62
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	214
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1260
pH	SMWW 4500 H ⁺ B	6.5- 8.5	7.30
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.008
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.008
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0039
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl ⁻)	SMWW 4500 Cl ⁻ B	< 250 mg/L	110
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.008
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.178
Cyanide (CN ⁻)	SMWW 4500 CN ⁻ F	≤ 0.05 mg/L	0.0
Fluoride (F ⁻)	SMWW 4500 F ⁻ C	≤ 1.5 mg/L	0.02
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	0.020
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	1.8
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.07
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.02
Residual Chlorine (Cl ₂)	SMWW 4500 Cl ₂ B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.05
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.068
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 ml, CFU	0
Fecal Coliforms	SMWW 9222 D	0/ 100 ml, CFU	0

SEQS= Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/139/2014

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DRINKING WATER ANALYSIS REPORT

Sample Detail			
Nature of Sample	Drinking Water	Reporting Date	05-11-2020
Grab/Composite	Grab	Analysis Completion Date	05-11-2020
Sampling Date	28-10-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-26/2020	Sample Receiving Date	30-10-2020
Sampling Coordinates	25°43'30.17"N 67°44'0.52"E	Sampling Location	Tikho-III



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	0.92
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	222
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1556
pH	SMWW 4500 H ⁺ B	6.5- 8.5	7.46
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.007
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	0.0036
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl ⁻)	SMWW 4500 Cl ⁻ B	< 250 mg/L	176
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.006
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.184
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	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	0.018
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	2.6
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.08
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.01
Residual Chlorine (Cl ₂)	SMWW 4500 Cl ₂ B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.04
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.078
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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Shahbaz

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DRINKING WATER ANALYSIS REPORT

Sample Detail			
Nature of Sample	Drinking Water	Reporting Date	05-11-2020
Grab/Composite	Grab	Analysis Completion Date	05-11-2020
Sampling Date	28-10-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-27/2020	Sample Receiving Date	30-10-2020
Sampling Coordinates	25°36'59.96"N 67°26'20.95"E	Sampling Location	Pipre Baricha



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	2.0
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	188
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1360
pH	SMWW 4500 H ⁺ B	6.5- 8.5	7.40
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	0.007
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0040
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.008
Chloride (Cl ⁻)	SMWW 4500 Cl ⁻ B	< 250 mg/L	112
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.008
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	0.05
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.006
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	0.026
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	1.8
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.03
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	0.09
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.068
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	05-11-2020
Grab/Composite	Grab	Analysis Completion Date	05-11-2020
Sampling Date	25-10-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-28/2020	Sample Receiving Date	30-10-2020
Sampling Coordinates	25°31'25.06"N 67°32'28.43"E	Sampling Location	Ghulam Mustafa



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	0.88
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	196
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1290
pH	SMWW 4500 H ⁺ B	6.5- 8.5	7.56
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	0.007
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0039
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl ⁻)	SMWW 4500 Cl ⁻ B	< 250 mg/L	116
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	0.01
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	<0.001
Nickel (Ni)	SMWW 3113 B	≤ 0.02 mg/L	0.02
Nitrate (NO ₃ ⁻)	SMWW 4500 NO ₃ ⁻ B	≤ 50 mg/L	1.1
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.02
Selenium (Se)	SMWW 3114 B	0.01 mg/L	<0.01
Residual Chlorine (Cl ₂)	SMWW 4500 Cl ₂ 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	0.069
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	22-12-2020
Grab/Composite	Grab	Analysis Completion Date	12-12-2020
Sampling Date	03-12-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-29/2020	Sample Receiving Date	04-12-2020
Sampling Coordinates	25°23'25.01"N 67°32'5.04"E	Sampling Location	Kamal Shodo



Drinking Water Analysis Results			
Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	2.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non- Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	2.92
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	410
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1860
pH	SMWW 4500 H ⁺ B	6.5- 8.5	7.26
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.007
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.007
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0035
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl ⁻)	SMWW 4500 Cl ⁻ B	< 250 mg/L	320
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.007
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.167
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	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	0.022
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	5.2
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.3
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.007
Residual Chlorine (Cl ₂)	SMWW 4500 Cl ₂ B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.08
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.068
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	22-12-2020
Grab/Composite	Grab	Analysis Completion Date	10-12-2020
Sampling Date	03-12-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-30/2020	Sample Receiving Date	04-12-2020
Sampling Coordinates	25°22'13.89"N 67°21'12.59"E	Sampling Location	Kand Nai



Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color-	SMWW 2120 C	≤ 15 TCU	1.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non- Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	1.06
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	342
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1642
pH	SMWW 4500 H B	6.5- 8.5	7.66
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	0.008
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0038
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl ⁻)	SMWW 4500 Cl ⁻ B	< 250 mg/L	248
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.008
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	0.03
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	<0.001
Nickel (Ni)	SMWW 3113 B	≤ 0.02 mg/L	0.02
Nitrate (NO ₃ ⁻)	SMWW 4500 NO ₃ ⁻ B	≤ 50 mg/L	3.2
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.2
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	0.04
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

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DRINKING WATER ANALYSIS REPORT

Sample Detail			
Nature of Sample	Drinking Water	Reporting Date	22-12-2020
Grab/Composite	Grab	Analysis Completion Date	12-12-2020
Sampling Date	02-12-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-31/2020	Sample Receiving Date	03-12-2020
Sampling Coordinates	25°19'55.48"N 67°17'45.26"E	Sampling Location	Asabo



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	1.02
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	228
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1192
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	0.006
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0034
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl)	SMWW 4500 Cl ⁻ B	< 250 mg/L	108
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	0.01
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	1.03
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.02
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	0.058
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	22-12-2020
Grab/Composite	Grab	Analysis Completion Date	12-12-2020
Sampling Date	02-12-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-32/2020	Sample Receiving Date	03-12-2020
Sampling Coordinates	25°18'49.78"N 67°26'36.79"E	Sampling Location	Moosa Chhoro



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	1.10
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	264
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1480
pH	SMWW 4500 H ⁺ B	6.5- 8.5	7.49
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.007
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.008
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0038
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006
Chloride (Cl ⁻)	SMWW 4500 Cl ⁻ B	< 250 mg/L	212
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.006
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.190
Cyanide (CN ⁻)	SMWW 4500 CN ⁻ F	≤ 0.05 mg/L	0.0
Fluoride (F ⁻)	SMWW 4500 F ⁻ C	≤ 1.5 mg/L	0.02
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	0.018
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	3.0
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.06
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.02
Residual Chlorine (Cl ₂)	SMWW 4500 Cl ₂ B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.04
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.065
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	1
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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Shahbaz

Analyzed By

[Signature]

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(TM)



Approved By
(QM)

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DRINKING WATER ANALYSIS REPORT

Sample Detail			
Nature of Sample	Drinking Water	Reporting Date	10-12-2020
Grab/Composite	Grab	Analysis Completion Date	10-12-2020
Sampling Date	01-12-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-33/2020	Sample Receiving Date	02-12-2020
Sampling Coordinates	25°13'38.19"N 67°27'59.16"E	Sampling Location	Purkhani



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	0.80
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	306
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1608
pH	SMWW 4500 H ⁺ B	6.5- 8.5	7.77
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	0.006
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0035
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	248
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.007
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.192
Cyanide (CN ⁻)	SMWW 4500 CN ⁻ F	≤ 0.05 mg/L	0.0
Fluoride (F ⁻)	SMWW 4500 F ⁻ C	≤ 1.5 mg/L	0.04
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	0.023
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	4.4
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.06
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.02
Residual Chlorine (Cl ₂)	SMWW 4500 Cl ₂ B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.04
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.059
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	
Fecal Coliforms	SMWW 9222 D	0/ 100 mL CFU	

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	10-11-2020
Grab/Composite	Grab	Analysis Completion Date	07-11-2020
Sampling Date	31-10-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-34/2020	Sample Receiving Date	31-10-2020
Sampling Coordinates	25°11'2.96"N 67°12'33.01"E	Sampling Location	Jarai



Drinking Water Analysis Results

Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	03.0
Taste	SMWW 2160 C	Non-Objectionable	Salty
Odor	SMWW 2150 B	Non-Objectionable	Non-Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	4.2
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	422
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1920
pH	SMWW 4500 H ⁺ B	6.5-8.5	7.21
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.008
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	0.010
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0046
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.009
Chloride (Cl)	SMWW 4500 Cl ⁻ B	< 250 mg/L	360
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.005
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.174
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	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	0.026
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	8.2
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.9
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.03
Residual Chlorine (Cl ₂)	SMWW 4500 Cl ₂ B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.04
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.078
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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Shahbaz

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DRINKING WATER ANALYSIS REPORT

Sample Detail			
Nature of Sample	Drinking Water	Reporting Date	10-11-2020
Grab/Composite	Grab	Analysis Completion Date	07-11-2020
Sampling Date	31-10-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-35/2020	Sample Receiving Date	31-10-2020
Sampling Coordinates	25° 11' 25.05" N 67° 3' 30.94" E	Sampling Location	Hub-3



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	2.2
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	468
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1812
pH	SMWW 4500 H ⁺ B	6.5- 8.5	7.88
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	0.006
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0039
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	380
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	0.006
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.188
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	0.005
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	0.022
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	7.2
Nitrite (NO ₂ ⁻)	SMWW 4500 NO ₂ ⁻ B	≤ 3.0 mg/L	0.9
Selenium (Se)	SMWW 3114 B	0.01 mg/L	0.02
Residual Chlorine (Cl ₂)	SMWW 4500 Cl ₂ B	0.5 mg/L	0.0
Phenolic Compounds (as Phenols)	SMWW 5530 D	NGVS	0.09
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.074
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 ml. CFU	1
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	10-11-2020
Grab/Composite	Grab	Analysis Completion Date	07-11-2020
Sampling Date	30-10-2020	Sample Collected by/Sent By	-
Sample ID	EGEL-DW-36/2020	Sample Receiving Date	30-10-2020
Sampling Coordinates	25° 8'37.28"N 67° 2'17.59"E	Sampling Location	Hub 1



Drinking Water Analysis Results			
Parameter	Analysis Method	SEQS	Results
Lab Analysis			
Color	SMWW 2120 C	≤ 15 TCU	1.0
Taste	SMWW 2160 C	Non- Objectionable	Salty
Odor	SMWW 2150 B	Non- Objectionable	Non- Objectionable
Turbidity	SMWW 2130 B	< 5 NTU	1.09
Total Hardness (as CaCO ₃)	SMWW 2340 C	< 500 mg/L	368
Total Dissolved Solids (TDS)	SMWW 2540 C	< 1000 mg/L	1768
pH	SMWW 4500 H B	6.5- 8.5	7.64
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	0.012
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.0040
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	240
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	<0.004
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	0.05
Lead (Pb)	SMWW 3114 B	< 0.05 mg/L	0.002
Manganese (Mn)	SMWW 3113 B	< 0.5 mg/L	0.024
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001
Nickel (Ni)	SMWW 3113 B	<0.02 mg/L	0.01
Nitrate (NO ₃)	SMWW 4500 NO ₃ B	≤ 50 mg/L	4.1
Nitrite (NO ₂)	SMWW 4500 NO ₂ B	< 3.0 mg/L	0.6
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	0.08
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.069
Microbiological Analysis			
Total Coliforms	SMWW 9222 B	0/ 100 mL CFU	1
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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Annexure VIII: Laboratory Results of Ambient Air Quality

EPA Certified Lab
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Evergreen Environmental Laboratory

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

Date: 22-12-2020

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.



Sampling Date: 05-12-2020
Sample type: Ambient Air Monitoring

Project ID: SRP- Sindh Resilience Project.
Site ID: Khurrand Sr # 08
Sampling Coordinates: 26°26'17.00"N
68°48'44.51"E
Lab. Rpt. Rf. No.: 28371/EGEL/ACE/AE/2020/65


ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	0.94	1.4	1.17	5
2	Sulfur Dioxide (SO ₂)	μg/Nm ³	8.4	8.7	8.55	120
3	Nitrogen Monoxide (NO)		2.9	3.4	3.15	40
4	Nitrogen Dioxide (NO ₂)		7.5	7.9	7.7	80
5	Particulate Matter (PM ₁₀)		131	135	133	150
6	Particulate Matter (PM _{2.5})		29	34	31.5	75


◊ SEQS- Sindh Environmental Quality Standards (The Gazette of Pakistan Registered No: EPA/TECH/7/19/2016)

Note:


- Selected measurement units were μg/m³ 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.



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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Evergreen Environmental Laboratory
Environments

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

Date: 22-12-2020

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



Project ID: **SRP- Sindh Resilience Project.**
Site ID: Jam Dataar Dam Sr # 09
Sampling Coordinates: **26°25'23.74"N**
68°47'27.87"E
Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/66**

Sampling Date: **05-21-2020**
Sample type: **Ambient Air Monitoring**

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	1.1	1.3	1.2	5
2	Sulfur Dioxide (SO ₂)	µg/Nm ³	8.9	9.4	9.15	120
3	Nitrogen Monoxide (NO)		4.3	4.7	4.5	40
4	Nitrogen Dioxide (NO ₂)		8.3	8.9	8.6	80
5	Particulate Matter (PM ₁₀)		131	137	134	150
6	Particulate Matter (PM _{2.5})		35	37	36	75

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

Note:

- Selected measurement units were µg/m³ 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.



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

Prepared By: *Shahbaz*
Section In charge (EGEL): *Usman*

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

Date: 22-12-2020

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: Thiko III Sr # 15
Sampling Coordinates: 26°42'54.27"N
67°43'52.63"E
Lab. Rpt. Rf. No.: 28371/EGEL/ACE/AE/2020/67

Sampling Date: 05-12-2020
Sample type: *Ambient Air Monitoring*

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	0.89	0.92	0.91	5
2	Sulfur Dioxide (SO ₂)	µg/Nm ³	7.3	7.5	7.4	120
3	Nitrogen Monoxide (NO)		2.8	3.4	3.1	40
4	Nitrogen Dioxide (NO ₂)		9.3	9.5	9.4	80
5	Particulate Matter (PM ₁₀)		135	138	136.5	150
6	Particulate Matter (PM _{2.5})		26	29	27.5	75

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

Note:

- Selected measurement units were µg/m³ 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.



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

<i>Shahbaz</i> Prepared By	Section In charge (EGEL)
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Customer's Ref: 10452/ACE/SRP/AW-002R

Date: 22-12-2020

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: **Pipre Baricha Sr # 16**

Sampling Coordinates: **25°37'3.90"N**
67°26'15.70"E

Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/68**

Sampling Date: **04-12-2020**

Sample type: **Ambient Air Monitoring**

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	0.92	0.95	0.935	5
2	Sulfur Dioxide (SO ₂)	µg/Nm ³	7.6	7.9	7.75	120
3	Nitrogen Monoxide (NO)		3.7	4.8	4.25	40
4	Nitrogen Dioxide (NO ₂)		9.1	10.5	9.8	80
5	Particulate Matter (PM ₁₀)		114	119	116.5	150
6	Particulate Matter (PM _{2.5})		29	34	31.5	75

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

Note:

- Selected measurement units were µg/m³ 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.



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

Shabbir
Prepared By

Usman
Section In charge
(EGEL)

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Evergreen Environmental Laboratory

Environments

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

Date: 22-12-2020

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.



Sampling Date: 04-12-2020
Sample type: Ambient Air Monitoring

Project ID: **SRP- Sindh Resilience Project.**
Site ID: Ghulam Mustafa Sr # 17
Sampling Coordinates: 25°31'9.56"N
67°31'21.09"E
Lab. Rpt. Rf. No.: 28371/EGEL/ACE/AE/2020/69

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	0.77	0.84	0.805	5
2	Sulfur Dioxide (SO ₂)	µg/Nm ³	8.7	9	8.85	120
3	Nitrogen Monoxide (NO)		4.5	4.7	4.6	40
4	Nitrogen Dioxide (NO ₂)		9.1	9.7	9.4	80
5	Particulate Matter (PM ₁₀)		137	141	139	150
6	Particulate Matter (PM _{2.5})		37	41	39	75

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

Note:

- Selected measurement units were µg/m³ 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.



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

Prepared By: *Shahbaz*
Section In charge (EGEL): *Usoom*

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

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

Date: 22-12-2020

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: Kamal Shodo Sr # 18
Sampling Coordinates: 25°23'22.66"N
67°32'9.19"E
Lab. Rpt. Rf. No.: 28371/EGEL/ACE/AE/2020/70

Sampling Date: 03-12-2020
Sample type: Ambient Air Monitoring

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	0.83	0.95	0.89	5
2	Sulfur Dioxide (SO ₂)	µg/Nm ³	8.3	8.7	8.5	120
3	Nitrogen Monoxide (NO)		4.7	5.3	5	40
4	Nitrogen Dioxide (NO ₂)		9.2	9.7	9.45	80
5	Particulate Matter (PM ₁₀)		140	149	144.5	150
6	Particulate Matter (PM _{2.5})		40	44	42	75

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

Note:

- Selected measurement units were µg/m³ 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.



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: 22-12-2020

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: Kand Nai Sr # 19
Sampling Coordinates: **25°22'9.96"N**
67°21'33.46"E
Lab. Rpt. Ref. No.: **28371/EGEL/ACE/AE/2020/71**

Sampling Date: **03-12-2020**
Sample type: **Ambient Air Monitoring**

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	0.82	0.94	0.88	5
2	Sulfur Dioxide (SO ₂)	µg/Nm ³	9.4	9.7	9.55	120
3	Nitrogen Monoxide (NO)		4.7	5.1	4.9	40
4	Nitrogen Dioxide (NO ₂)		12.4	13.4	12.9	80
5	Particulate Matter (PM ₁₀)		135	139	137	150
6	Particulate Matter (PM _{2.5})		33	37	35	75

♦ *SEQS - Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/159/2016.*

Note:

- Selected measurement units were µg/m³ 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.



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: 22-12-2020

Report to: **M/S ACE/SPS LAB**
Project: **SRP- Sindh Resilience Project**
Mohammad Ali Society,
KDA-Scheme-I, Karachi, Sindh, Pakistan.

Project ID: **SRP- Sindh Resilience Project.**
Site ID: **Asabo Sr # 20**
Sampling Coordinates: **25°19'39.37"N**
67°17'35.97"E
Lab. Rpt. Ref. No.: **28371/EGEL/ACE/AE/2020/72**

Sampling Date: **02-12-2020**
Sample type: **Ambient Air Monitoring**

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	0.94	1.3	1.12	5
2	Sulfur Dioxide (SO ₂)	μg/Nm ³	10.5	11.3	10.9	120
3	Nitrogen Monoxide (NO)		5.3	5.7	5.5	40
4	Nitrogen Dioxide (NO ₂)		11.8	12.7	12.25	80
5	Particulate Matter (PM ₁₀)		139	145	142	150
6	Particulate Matter (PM _{2.5})		37	41	39	75

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

Note:

- Selected measurement units were μg/m³ 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.

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

Shahbaz
Prepared By

Usoom
Section In charge
(EGEL)

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

Date: 22-12-2020

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: Moosa Choro Sr # 21
Sampling Coordinates: **25°18'47.39"N**
67°26'27.63"E
Lab. Rpt. Ref. No.: **28371/EGEL/ACE/AE/2020/73**

Sampling Date: **02-12-2020**
Sample type: **Ambient Air Monitoring**

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	0.82	0.94	0.88	5
2	Sulfur Dioxide (SO ₂)	µg/Nm ³	9.4	9.7	9.55	120
3	Nitrogen Monoxide (NO)		4.7	5.1	4.9	40
4	Nitrogen Dioxide (NO ₂)		12.4	13.4	12.9	80
5	Particulate Matter (PM ₁₀)		135	139	137	150
6	Particulate Matter (PM _{2.5})		33	37	35	75

↳ *SEQS= Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/759/2016.*

Note:

- Selected measurement units were µg/m³ 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.



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: 22-12-2020

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: Purkhani Sr # 22
Sampling Coordinates: **25°13'17.73"N**
67°27'47.25"E
Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/74**

Sampling Date: **01-12-2020**
Sample type: **Ambient Air Monitoring**

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	0.78	0.83	0.805	5
2	Sulfur Dioxide (SO ₂)	µg/Nm ³	9.4	10.2	9.8	120
3	Nitrogen Monoxide (NO)		3.4	3.8	3.6	40
4	Nitrogen Dioxide (NO ₂)		9.5	10.3	9.9	80
5	Particulate Matter (PM ₁₀)		119	125	122	150
6	Particulate Matter (PM _{2.5})		29	33	31	75

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

Note:

- Selected measurement units were µg/m³ 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.



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: 22-12-2020

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



Project ID: **SRP- Sindh Resilience Project.**
Site ID: Janai Sr # 23
Sampling Coordinates: **25°12'0.52"N**
67°12'29.41"E
Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/75**

Sampling Date: **31-10-2020**
Sample type: **Ambient Air Monitoring**

ANALYTICAL TEST REPORT

Sr. No.	Parameters	Units	Min	Max	Average	SEQS Limits
1	Carbon Monoxide (CO)	mg/Nm ³	1.2	1.3	1.25	5
2	Sulfur Dioxide (SO ₂)	µg/Nm ³	11.4	1.8	6.6	120
3	Nitrogen Monoxide (NO)		4.8	4.7	4.75	40
4	Nitrogen Dioxide (NO ₂)		10.8	11.4	11.1	80
5	Particulate Matter (PM ₁₀)		141	142	141.5	150
6	Particulate Matter (PM _{2.5})		43	48	45.5	75

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

Note:

- Selected measurement units were µg/m³ 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.



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

 Prepared By	 Section In charge (EGEL)
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Customer's Ref: 10452/ACE/SRP/AW-002R

Date: 22-12-2020

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: HUB 3 Sr # 24
Sampling Coordinates: 25°11'56.16"N
67°2'59.06"E
Lab. Rpt. Rf. No.: 28371/EGEL/ACE/AE/2020/76

Sampling Date: 31-10-2020
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	0.89	0.87	5
2	Sulfur Dioxide (SO ₂)	μg/Nm ³	8.3	8.4	8.35	120
3	Nitrogen Monoxide (NO)		3.5	3.7	3.6	40
4	Nitrogen Dioxide (NO ₂)		9.2	9.5	9.35	80
5	Particulate Matter (PM ₁₀)		125	130	127.5	150
6	Particulate Matter (PM _{2.5})		28	34	31	75

SEQS - Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/719/2016

Note:

- Selected measurement units were μg/m³ 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.



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

Prepared By: *Shahbaz*
Section In charge (EGEL): *Uzma*

The Analysis based on sample provided to us by the Client. The interpretation or opinion expressed represent the best judgement. We have no responsibility and warranty or representation in connection with which such report is used.

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

Date: 22-12-2020

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: HUB 1 Sr # 26
Sampling Coordinates: **25°08'51.13"N**
67°2'29.59"E
Lab. Rpt. Rf. No.: **28371/EGEL/ACE/AE/2020/77**

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	0.72	0.77	0.745	5
2	Sulfur Dioxide (SO ₂)	µg/Nm ³	9.7	9.9	9.8	120
3	Nitrogen Monoxide (NO)		4.5	4.9	4.7	40
4	Nitrogen Dioxide (NO ₂)		8.1	8.5	8.3	80
5	Particulate Matter (PM ₁₀)		131	135	133	150
6	Particulate Matter (PM _{2.5})		29	33	31	75

◦ *SEQS- Sindh Environmental Quality Standards (The Gazette of Pakistan) Registered No. EPA/TECH/719/2016.*

Note:

- Selected measurement units were µg/m³ 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.



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

Prepared By: *Shahbaz*
Section In charge (EGEL): *Uzair*

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

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Annexure IX: Laboratory Results of Ambient Noise Level

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Evergreen Environmental Laboratory

Noise Level Monitoring Report

Monitoring Detail						
Reference No.	10452/ACE/SRP/N-005R		Reporting Date	22-12-2020		
Monitoring Date	30 Oct to 5 Dec, 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	Khurrand	Dam Axis	26°26'4.85"N 68°48'26.92"E	38.5	40.2	39.3
		Deh Akhro II Road	26°25'10.14"N 68°48'18.67"E	43.5	44.5	44.0
		Settlement Sarwarabad	26°26'23.38"N 68°48'47.28"E	40.1	42.5	41.3
2	Jaam Dataar	Dam Axis	26°25'20.84"N 68°47'28.13"E	34.2	35.7	34.9
		Deh Akhro II Road	26°25'24.46"N 68°47'27.71"E	44.7	46.2	45.5
3	Tikho-III	Dam Axis	25°42'56.52"N 67°44'2.57"E	38.7	39.2	38.9
		Darbar	25°43'14.15"N 67°42'34.52"E	34.5	35.1	34.8
		Muhammad Murad Brohi Settlement	25°42'58.41"N 67°42'55.59"E	40.2	43.2	41.7
4	Pipre Baricha	Dam Axis	25°37'4.76"N 67°28'16.28"E	39.5	41.8	40.6
		Mosque	25°36'52.25"N 67°26'14.37"E	35.2	37.8	36.5
		Village Piper Barecho	25°36'59.98"N 67°26'15.93"E	42.3	43.7	43.0
5	Ghulam Mustafa	Dam Axis	25°31'6.57"N 67°32'23.17"E	40.8	42.5	41.6
		Mosque	25°30'59.08"N 67°32'21.44"E	34.7	35.3	35.1
		Village Muhammad Rahim Burfat	25°31'36.90"N 67°31'37.02"E	44.7	46.5	45.6
6	Kamal Shodo	Dam Axis	25°23'30.73"N 67°32'2.78"E	42.8	43.1	42.9
		Mosque	25°23'21.29"N 67°31'58.44"E	35.8	39.2	37.5
		Kirthar Park Road	25°23'22.09"N 67°32'5.04"E	46.7	49.2	47.9
7	Kand Nai	Dam Axis	25°22'7.38"N 67°21'31.71"E	35.2	37.2	36.2
		Village Mian Warayo Kanro	25°22'18.24"N 67°21'14.43"E	40.7	41.2	40.9
		Kirthar Park Road	25°22'3.64"N 67°21'45.74"E	47.5	48.2	47.9
8	Asabo	Dam Axis	25°19'42.52"N 67°17'30.78"E	33.2	34.2	33.7
		Village Pathan Khan Burfat	25°20'22.88"N 67°18'48.23"E	43.5	44.7	44.1

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

Note:

- Selected measurement units were dBA 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.

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

Prepared By

Section In charge
(EGEL)

The Analysts based on test data provided hereby by the Client. The measurements or reports generated represent the best judgment. We have no responsibility and warranty of representation in respect of any which may occur in future.

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Web: www.everglab.com



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Noise Level Monitoring Report

Monitoring Detail

Reference No.	10452/ACE/SRP/N-005R	Reporting Date	22-12-2020			
Monitoring Date	30 Oct to 5 Dec, 2020	Instrument	BSWA Noise Meter			
Sr. No.	Proposed Small Dam Site	Location of Noise Monitoring	Coordinates	80 dBA (SEQS) Noise Levels		
				Min	Max	Average
9	Moosa Shoro	Dam Axis	25°18'50.27"N 67°26'27.53"E	39.2	40.5	39.8
		Village Mian Warayo Kanro	25°18'45.08"N 67°26'35.33"E	50.2	52.4	51.3
		Mosque	25°18'42.55"N 67°26'35.22"E	34.3	39.2	36.7
10	Purkhani	Dam Axis	25°13'17.73"N 67°27'47.25"E	40.9	43.1	42.0
		Mosque	25°13'36.98"N 67°28'0.45"E	38.5	40.8	39.6
		Village Track	25°13'40.80"N 67°28'1.96"E	54.2	55.8	55.0
11	Janai	Dam Axis	25°12'0.52"N 67°12'29.41"E	37.5	39.2	38.3
		Village Haji Rasool Bux Khaskheli	25°11'0.41"N 67°12'29.29"E	44.0	46.8	45.4
		School	25°11'13.10"N 67°12'5.140"E	42.3	47.2	43.4
12	Hub-3	Dam Axis	25°11'4.07"N 67°2'54.15"E	42.9	44.7	43.8
		Dureji Road	25°12'9.36"N 67°1'34.92"E	50.7	53.2	51.9
13	Hub-2	Dam Axis	25°9'58.24"N 67°2'38.87"E	39.5	43.9	41.7
		Dureji Road	25°9'48.64"N 67°0'39.55"E	47.3	49.1	48.2
14	Hub-1	Dam Axis	25°8'3.00"N 67°2'39.95"E	33.8	38.2	36.0
		Hub Dam Road	25°8'19.88"N 67°2'24.86"E	57.3	60.7	59.0

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

Note:

- Selected measurement units were dBA 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.



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

 Prepared By	 Section In charge (EGEL)
---	--

The Analysts found no sample of pollution as per the client. The information or opinions expressed represent the best judgment. We have no responsibility and warranty or representation in connection with which such report is used.

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Annexure X 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 _____ m² 2.7 Total storage capacity _____ m³



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 *kutchha*?

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	<input type="checkbox"/>	To the extent possible, local labor will be used for unskilled, semi skilled and skilled jobs A formal resettlement plan will be prepared	<input type="checkbox"/>	
Water-related diseases	<input type="checkbox"/>	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.	<input type="checkbox"/>	
Wildlife and vegetation	<input type="checkbox"/>	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.	<input type="checkbox"/>	
Safety Concerns	<input type="checkbox"/>	Provisions for the migration of fish and other aquatic organisms will be provided, if needed 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.	<input type="checkbox"/>	
Risk of erosion and landslide	<input type="checkbox"/>	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	<input type="checkbox"/>	
Construction	<input type="checkbox"/>	Stabilization measures will be undertaken 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	<input type="checkbox"/>	



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	Occupation	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)			



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/yyyy)	
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.)	<u>Sources</u>
					1. Relative/friends 2. NGO 3. Bank 4. Others (specify)
1.					<u>Purpose</u>
2.					1. Marriage 2. Purchase of land 3. Purchase of built-up property 4. Establishment of business 5. Others (Please specify)
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 oftenly?	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 Mender/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	Marta _____
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: _____
Name: _____
CNIC No. _____

(Respondent)

Signature: _____
Name: _____
CNIC No. _____

(Community Representative)

Signature: _____
Name: _____
CNIC No. _____

(Interviewer)

Signature: _____
Name: _____
CNIC No. _____

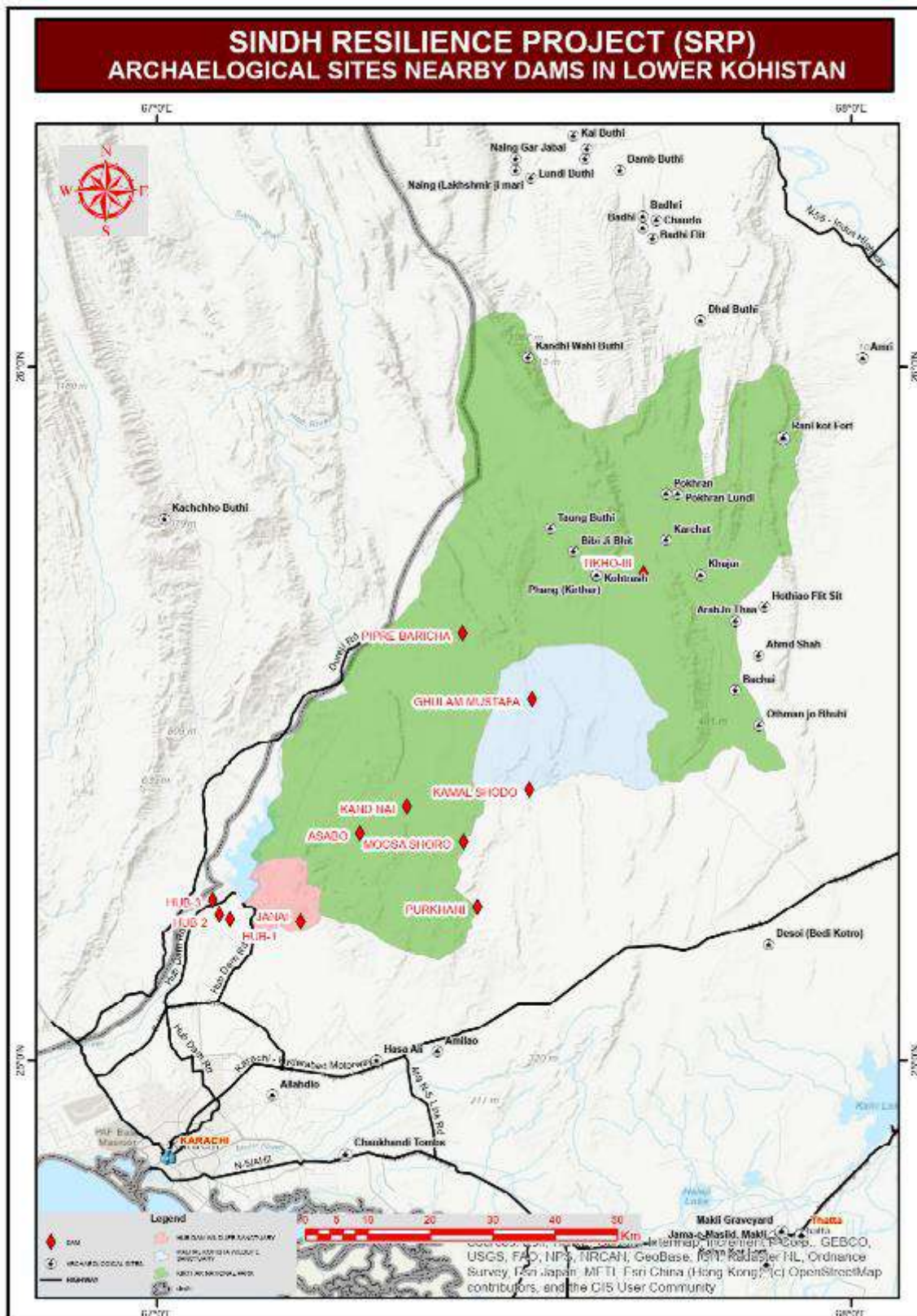
(SID Representative)

Dated: _____





Annexure XI Distance of Proposed Dams from Archaeological Site





Annexure XII TOR of Ecologist

“Ecologist will be required to perform following tasks; Scope of work for each task will be as follows;

MONITORING PERFORMANCE OF OVERALL ECOLOGICAL IMPACTS OF CIVIL WORKS AT KPAC;

Under this task the Ecologist will be required to monitor the overall compliance of the Ecological /Biodiversity Management Plan of SRP – AF sub-project, which will include but not be limited to the following;

- Ecological monitoring during the construction period of 12 Small Dams sub-project.
- Develop training modules on the subject of the environment, ecology, environmental management systems and impart training to the Construction team and other organizations likely to work under ecological management plant component as and when required;
- Conduct capacity building training activities for the project team and other key stakeholders
- Advice and guide project team for effective implementation of all the mitigation measures already developed under the ESIA document to mitigate the adverse environmental impacts associated with civil works of 12 dams;
- Close coordination with the construction team to ensure minimal ecological/environmental degradation and disturbance during construction work.
- Conduct a periodic ecological assessment of the area and hotspot sites and report any ecological development like the breeding period of local birds, bird migratory period, etc.
- Develop service of safe handling/rescue of wildlife in case of accident or encounter in sub-project site.
- Conduct tree plantation activity in sub-project area, involving project team and the local community to develop a sense of ownership.
- Report and discuss, any adverse impacts of sub-projects during the construction or predict future threats

Conduct quarterly review meeting with PISSC/PMT team regarding ESMP Component Implementation Progress and prepare implementation progress report describing; the activities performed by the consultant to monitor and strengthen the effective implementation of ESIA;



Annexure XIII SRP SOPS for Management of COVID-19



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 Tikho-III, Pipre Baricha, Ghulam Mustafa, Kamal Shodo , Moosa Shoro, Purkhani, Kand Nai, Asabo, Janai, Hub 1, 2 & 3

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.	ASABO	TBN	
2.	KAND NAI	TBN	
3.	PIPRE BARICHA	TBN	
4.	MOOSA CHHORO	TBN	
5.	JANAI	TBN	
6.	GHULAM MUSTAFA	TBN	
7.	TIKHO-3	TBN	
8.	PURKHANI	TBN	
9.	KAMAL SHODO	TBN	
10	HUB-1	TBN	
11	HUB-2	TBN	
12	HUB-3	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/situation-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 (0300111166) 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) Health Status of Workers

- 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

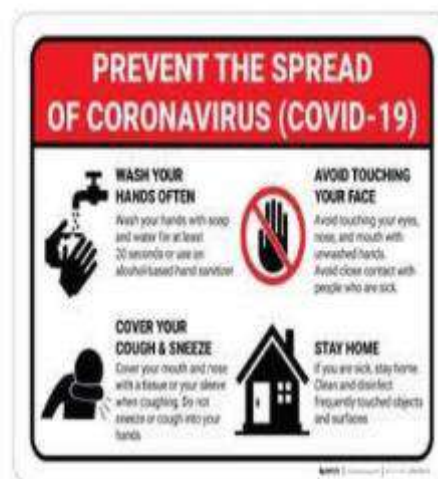
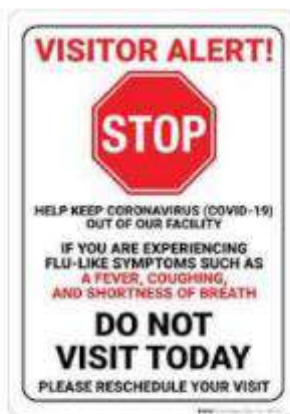
b) Status of Personal Protective Equipment and other supplies at each Sub-project site

- 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.	ASABO	TBN		
2.	KAND NAI	TBN		
3.	PIPRE BARICHA	TBN		
4.	MOOSA CHHORO	TBN		
5.	JANAI	TBN		
6.	GHULAM MUSTAFA	TBN		
7.	TIKHO-3	TBN		
8.	PURKHANI	TBN		
9.	KAMAL SHODO	TBN		
10.	HUB-1	TBN		
11.	HUB-2	TBN		
12.	HUB-3	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;

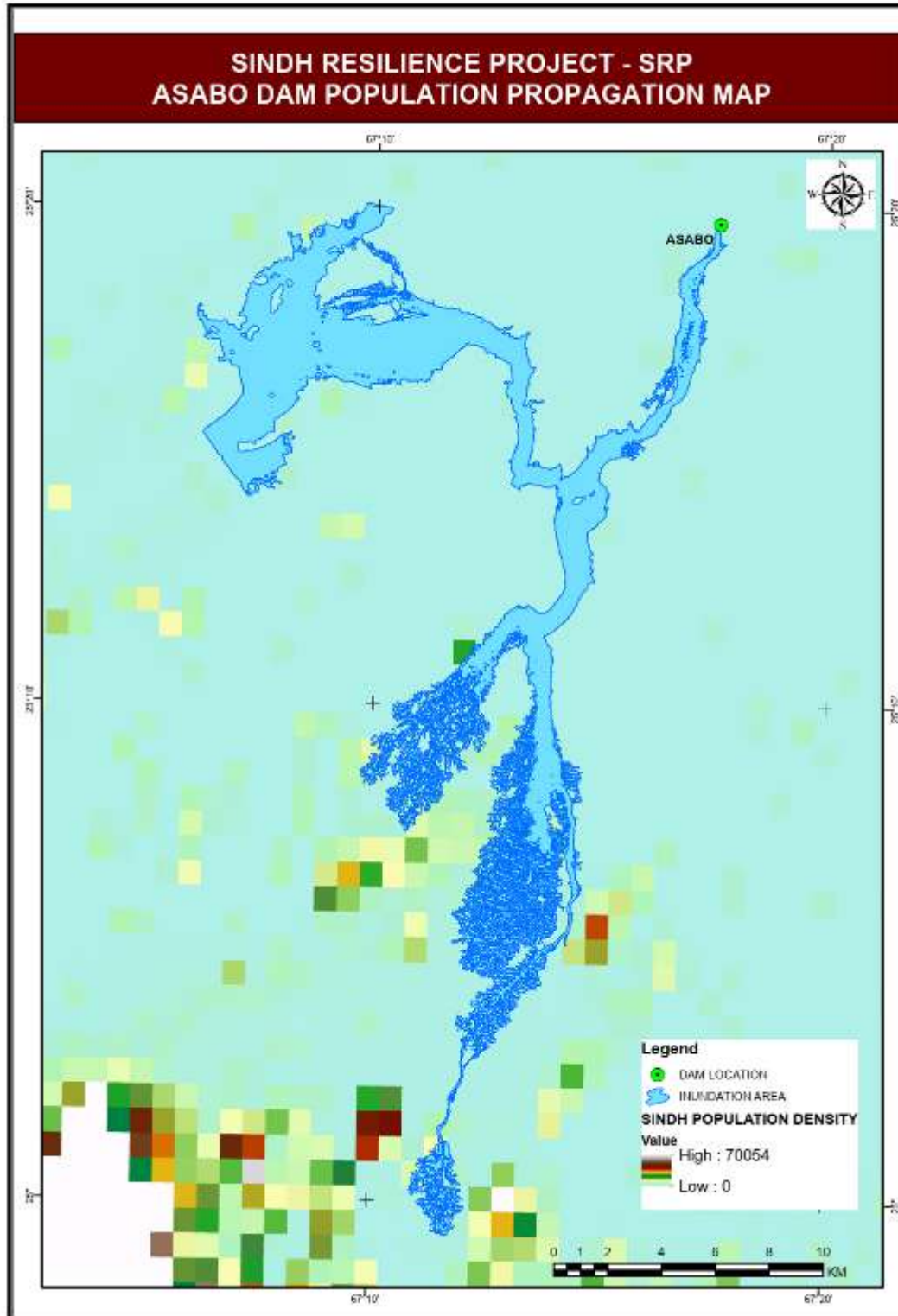
S.NO	Name of Sub-project	Name of Contractor	ESMP Budget	Amount Used till date	Amount remaining
1.	ASABO	TBN			
2.	KAND NAI	TBN			
3.	PIPRE BARICHA	TBN			
4.	MOOSA CHHORO	TBN			
5.	JANAI	TBN			
6.	GHULAM MUSTAFA	TBN			
7.	TIKHO-3	TBN			
8.	PURKHANI	TBN			
9.	KAMAL SHODO	TBN			
10.	HUB-1	TBN			
11.	HUB-2	TBN			
12.	HUB-3	TBN			

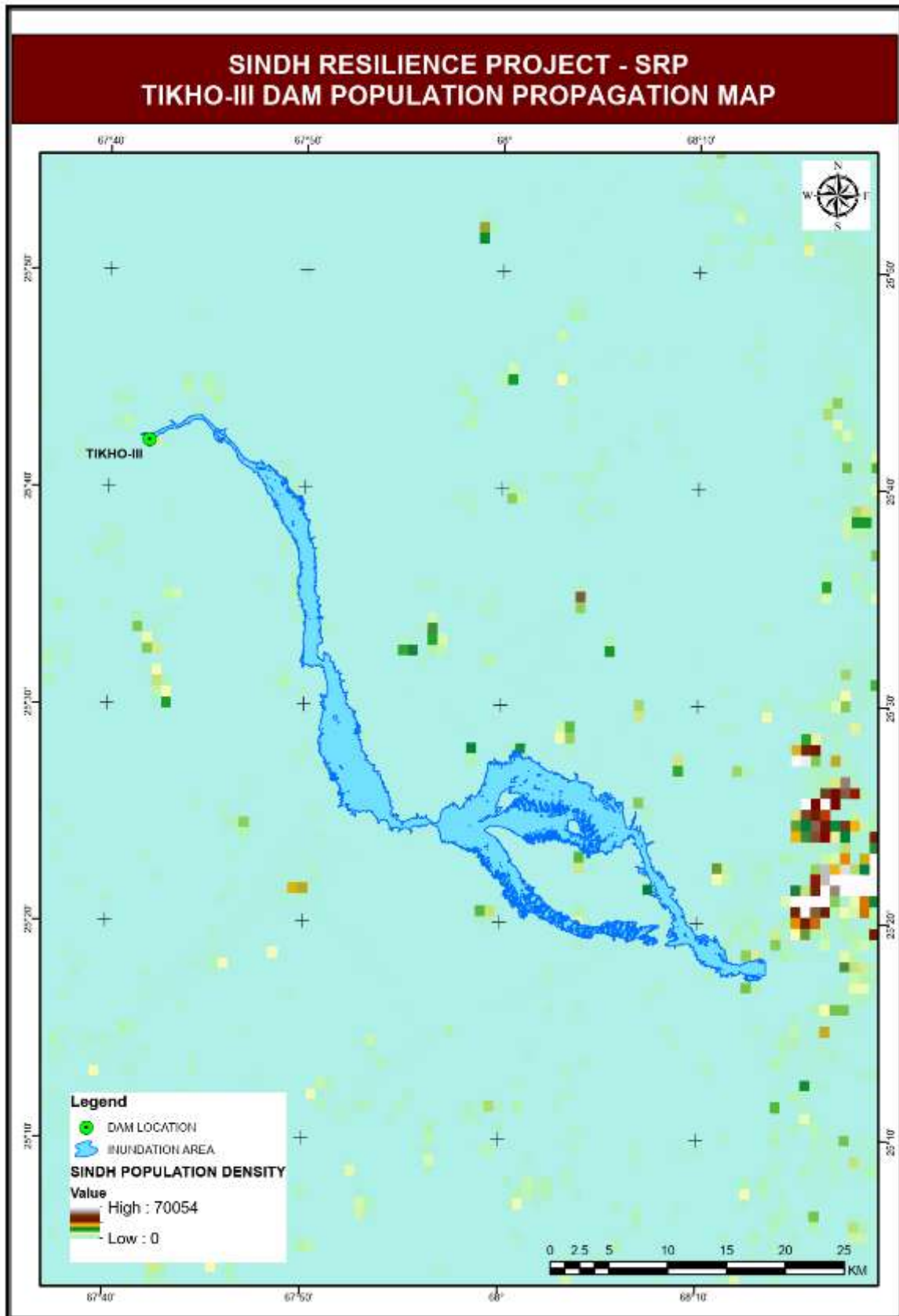
Find the latest information from WHO on where COVID-19 is spreading:

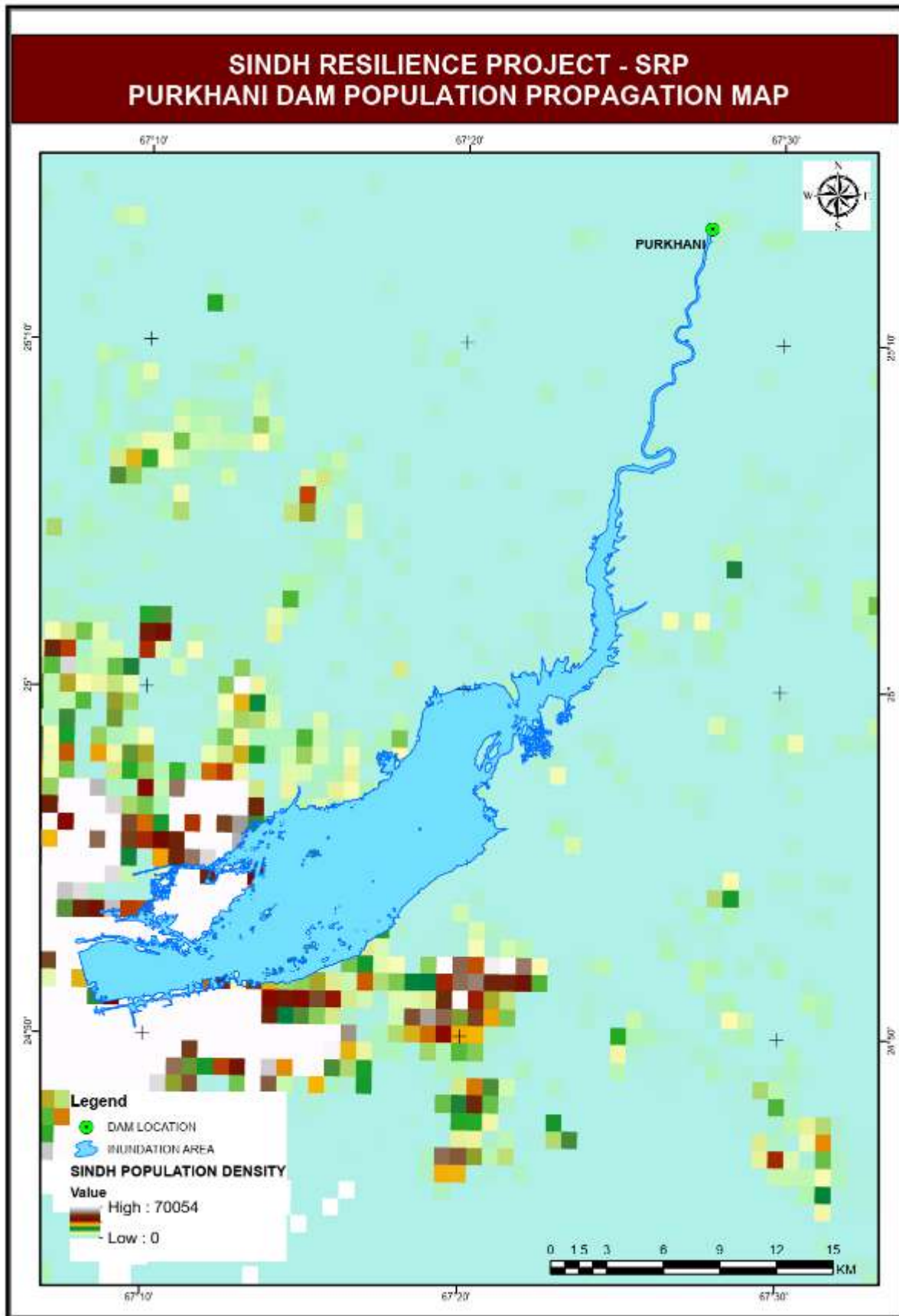
https://www.who.int/docs/default-source/coronaviruse/getting-workplace-ready-for-covid-19.pdf?sfvrsn=359a81e7_6

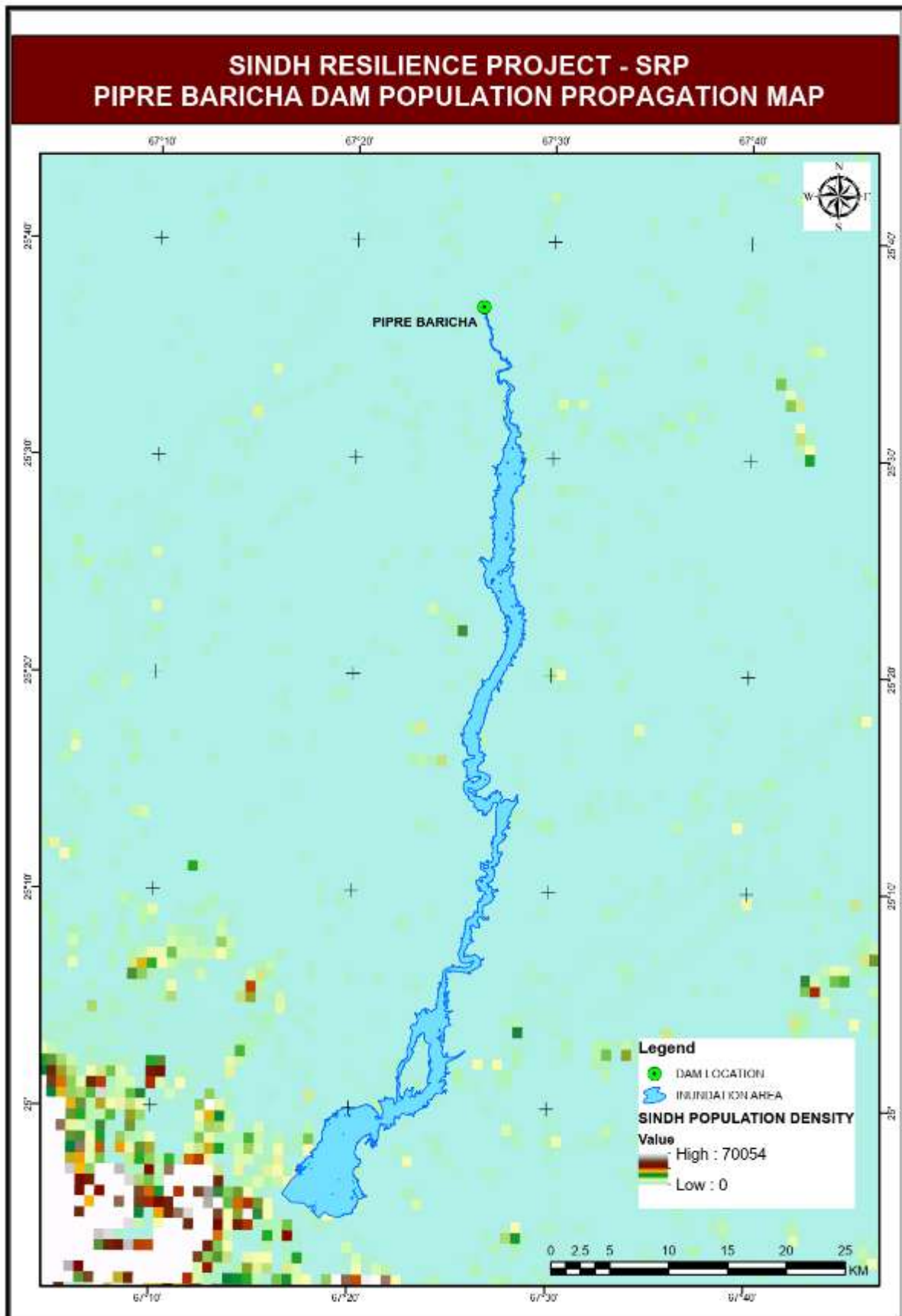


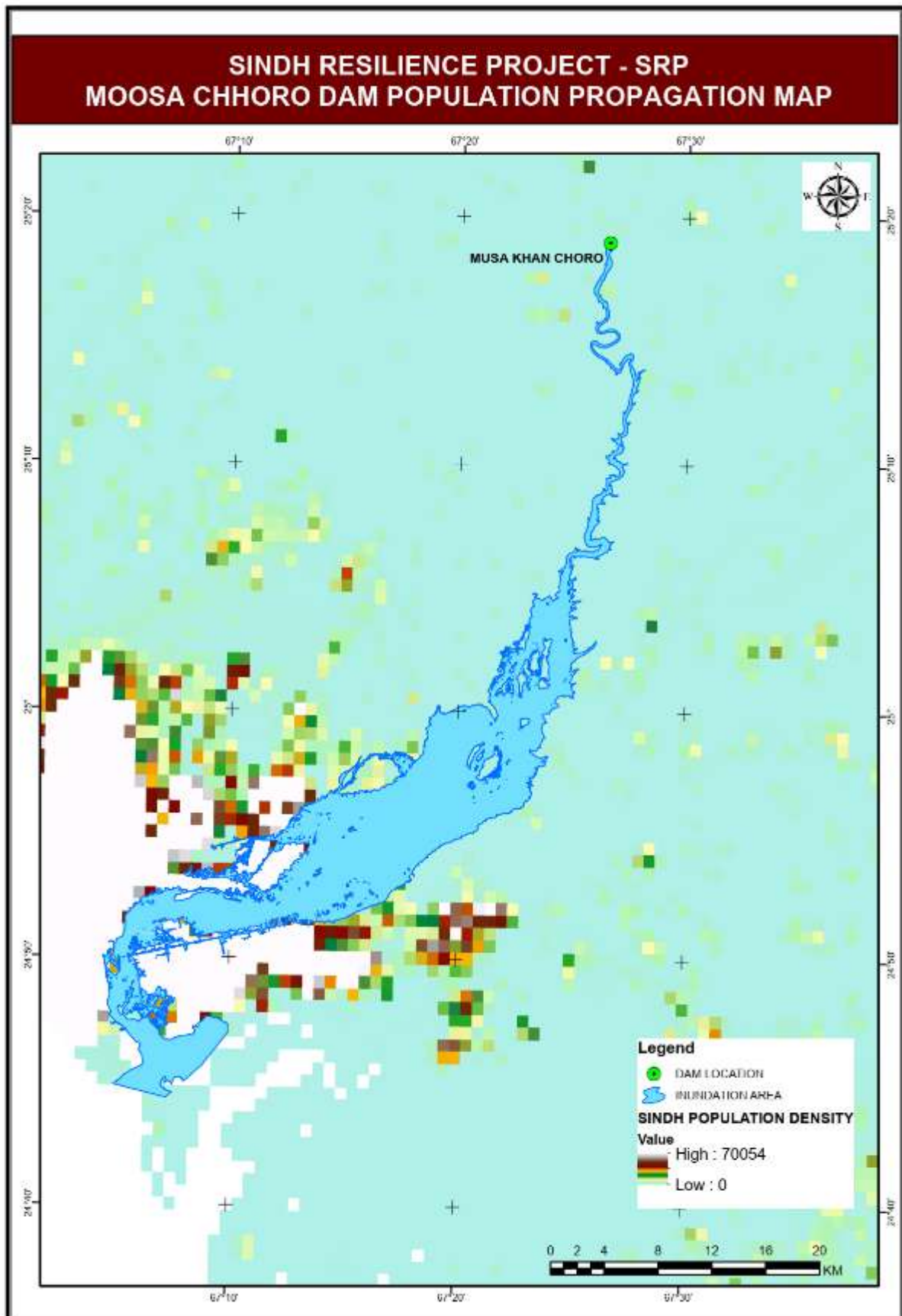
Annexure XIV: Map showing Area Inundated due to 100+ Floods and Dams Break

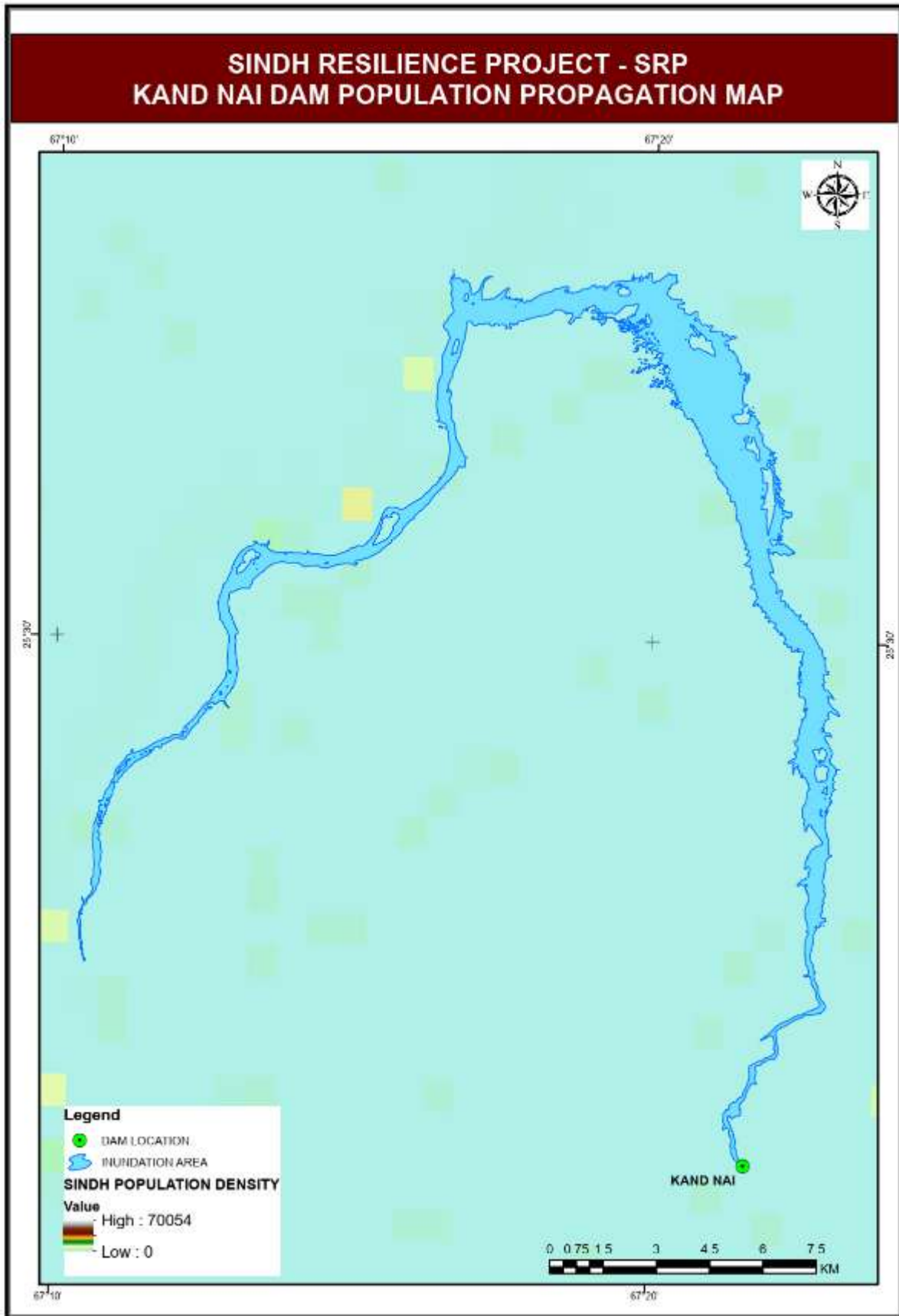


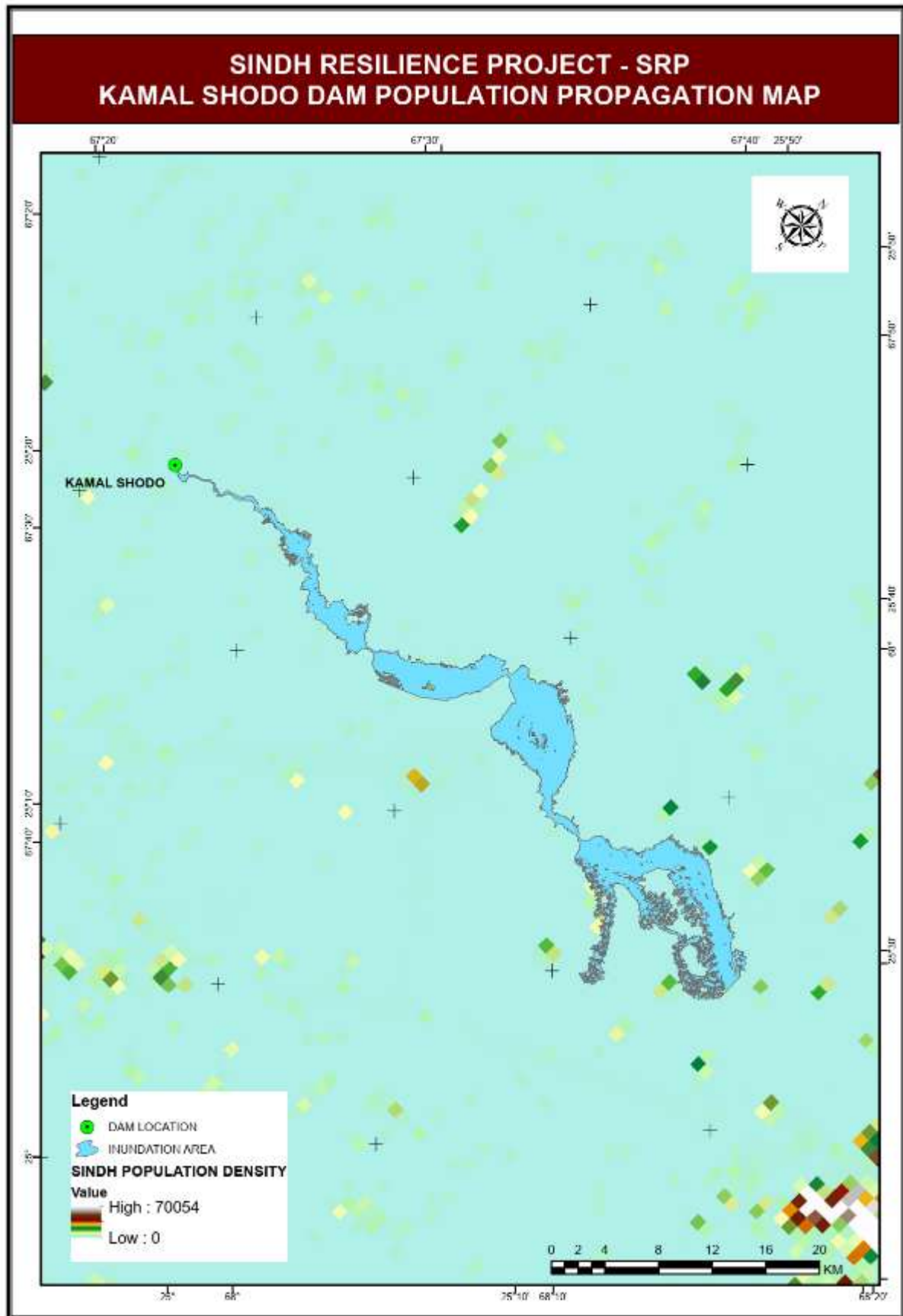


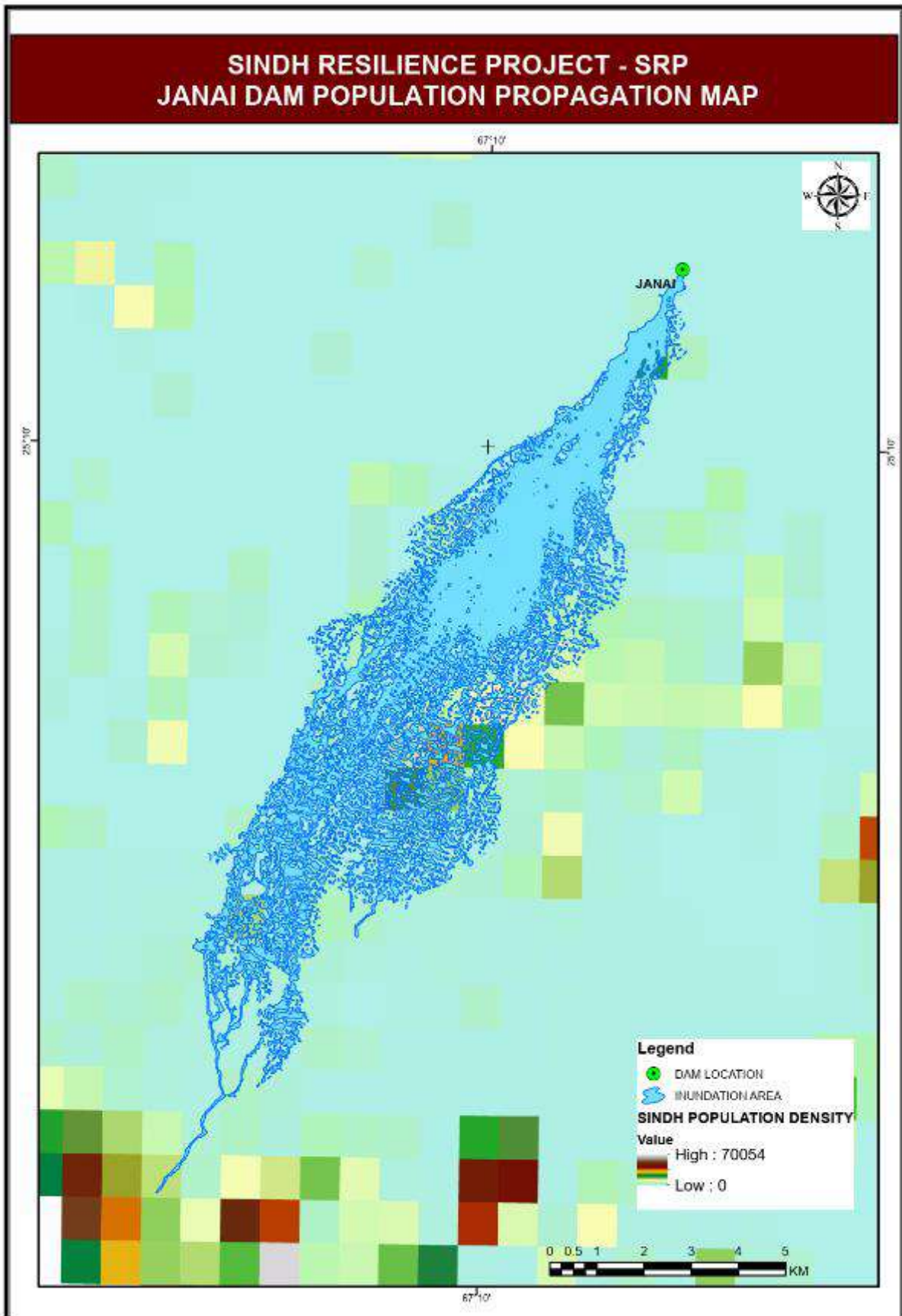


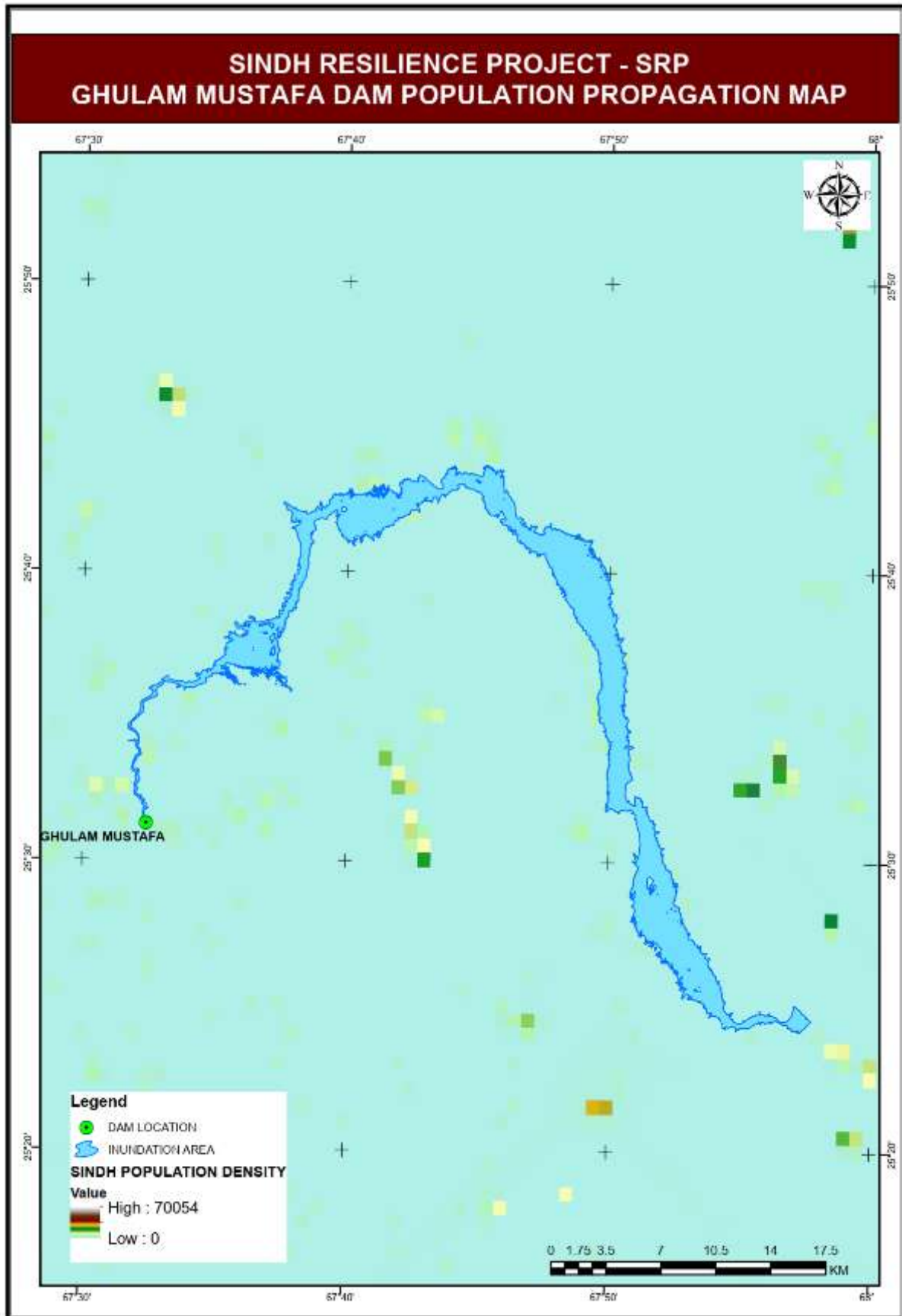


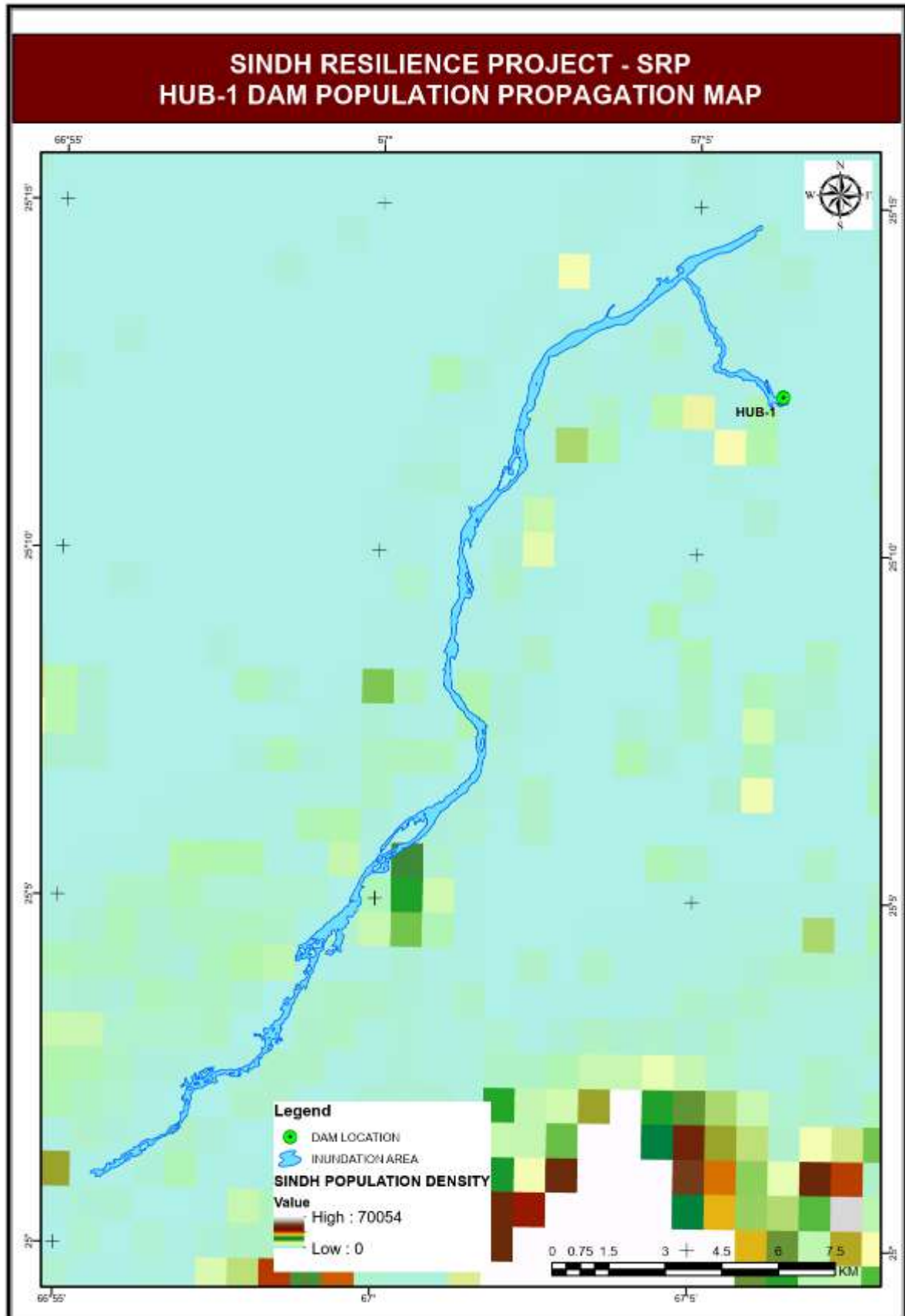


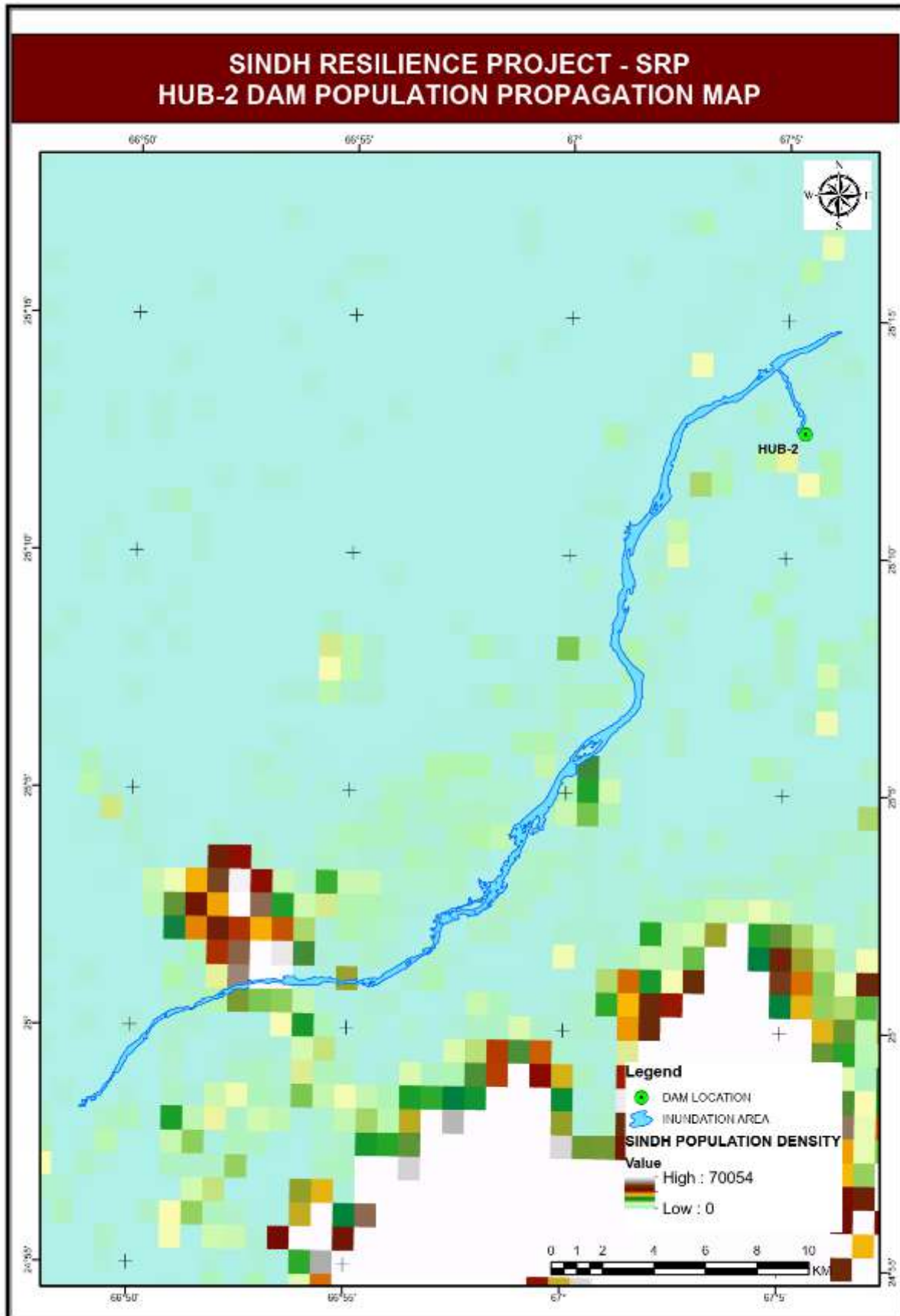




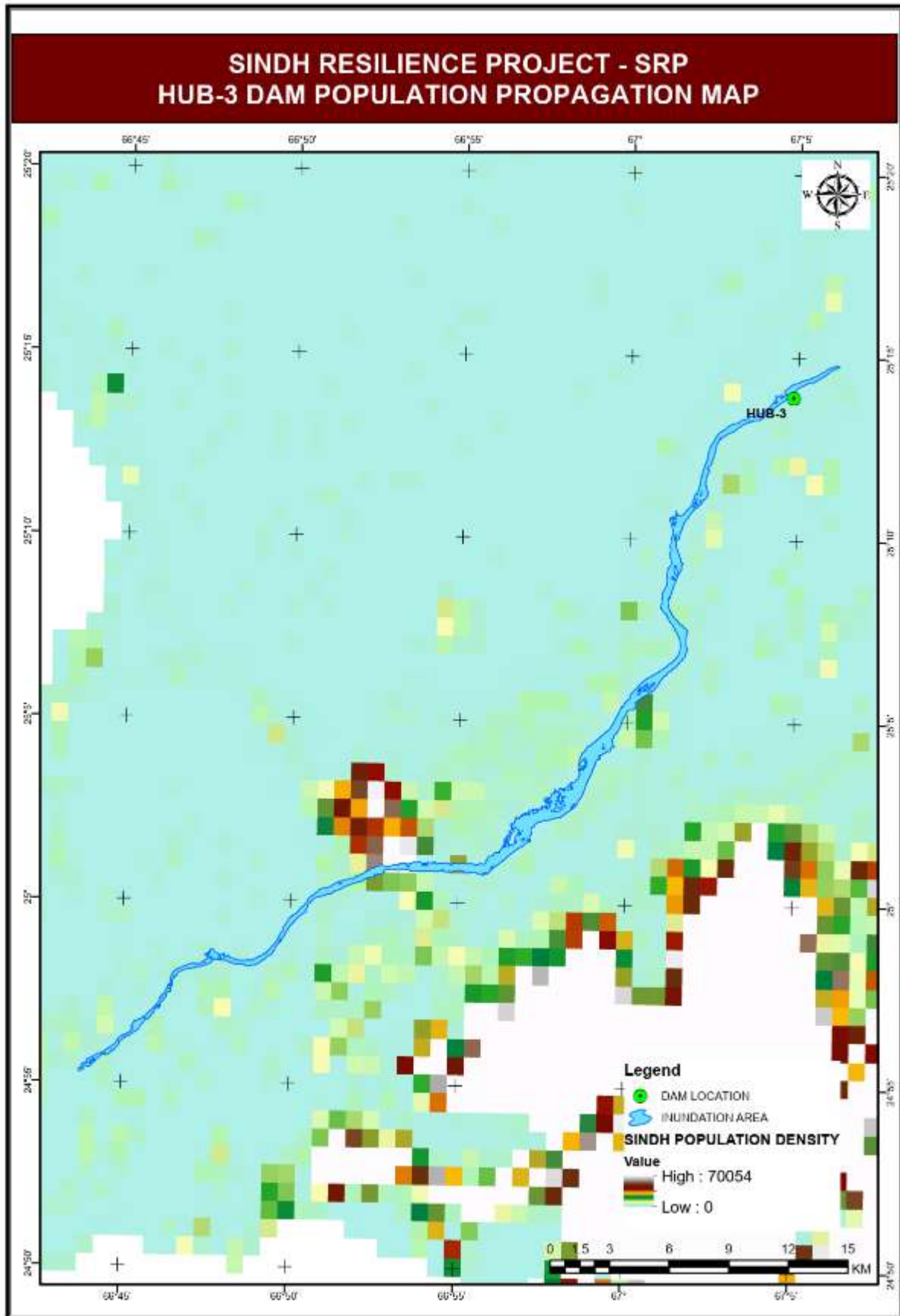






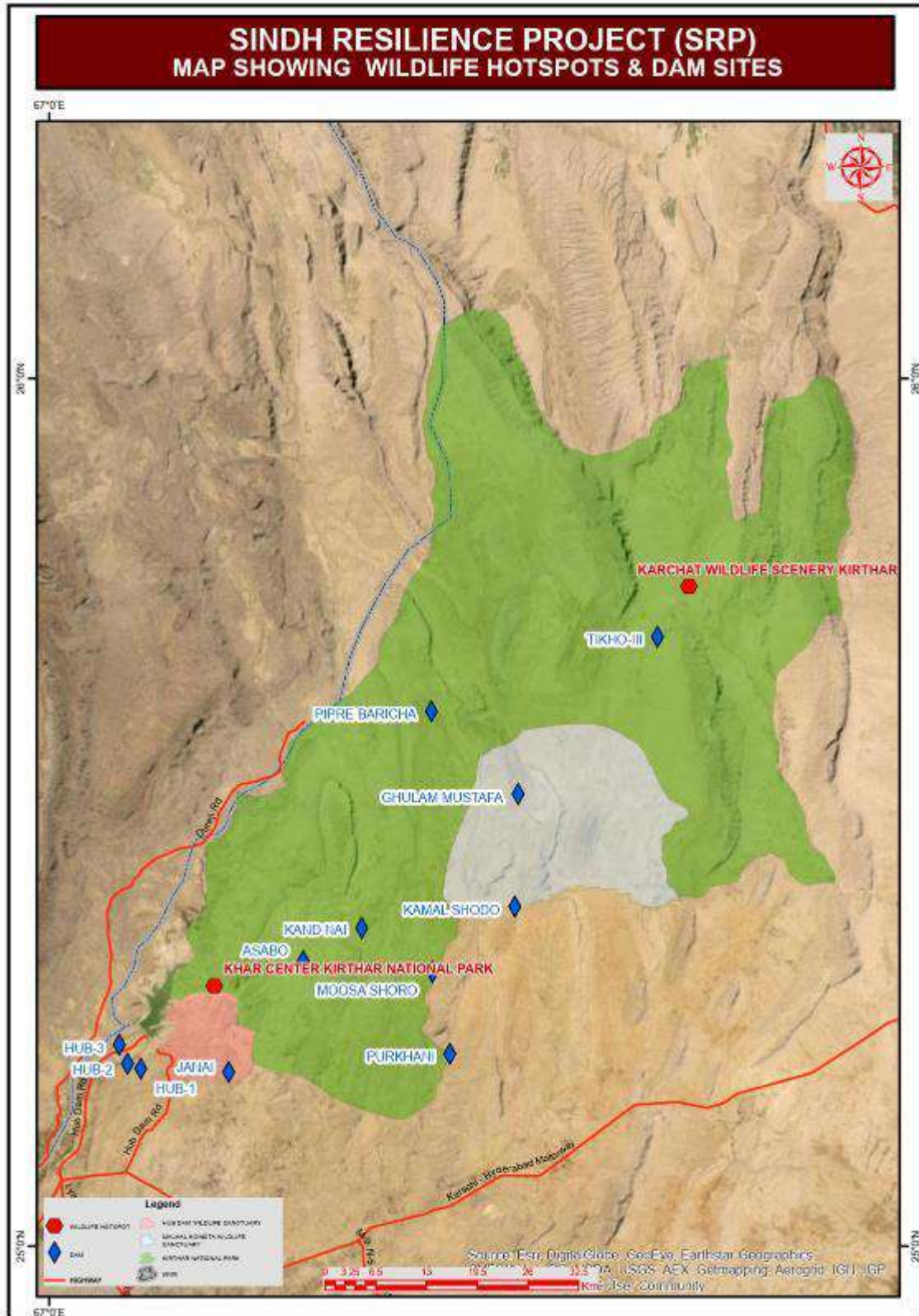








Annexure XV: Map of showing distance from Wildlife Hot Spots to Dam Sites





Annexure XVI: Environmental Code of Practices (ECOPs)

Introduction

The objective of the 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. These 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 how the Contractor will comply with the requirements of ECoPs and the mitigation measures proposed in the ESMP of the ESIA 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 part of the contract documents and will be used as a 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.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> ○ Develop a waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste.) prior to commencing construction and submit it to ESMU PMT and PISSC for approval. ○ Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of the disposal site, to cause less environmental impact. ○ Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach. ○ Segregate and reuse or recycle all the wastes, wherever practical. ○ Collect and transport non-hazardous wastes to all the approved disposal sites. ○ Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process. ○ Provide refuse containers at each worksite. ○ Request suppliers to minimize packaging where practicable. ○ Place a high emphasis on good housekeeping practices. ○ 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	<p>The Contractor shall:</p> <ul style="list-style-type: none"> ○ Collect chemical wastes in 200-liter drums (or similar sealed container), appropriately labeled for safe transport to an approved chemical waste depot. ○ Store, transport and handle all chemicals avoiding potential environmental pollution. ○ Store all hazardous wastes appropriately in bonded areas away from watercourses. ○ Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction. ○ Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment, or disposal at approved locations. ○ Construct concrete or another 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 the potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous substances on-site, and potential spills from these goods may harm the environment or health of construction workers.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> ○ Prepare spill control procedures and submit the plan for PISSC and SID for approval. ○ Train the relevant construction personnel in the handling of fuels and spill control procedures. ○ Store dangerous goods in bonded areas on top of a sealed plastic sheet away from the water course. Refueling should occur only within bonded areas. ○ Make available MSDS for chemicals and dangerous goods on-site. ○ Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by Sindh EPA. ○ Provide absorbent and containment material (e.g., absorbent matting) where hazardous material is used and stored and personnel trained in the correct use. ○ Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use. ○ Make sure all containers, drums, and tanks that are used for storage are in good condition and are labeled with the expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur. ○ Store hazardous materials above flood plain level. ○ Put containers and drums in temporary storage in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area should preferably slope or drain to a safe collection area in the event of a spill. ○ Put containers and drums in permanent storage areas on an impermeable floor that slopes to a safe collection area in the event of a spill or leak. ○ Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. ○ Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials.



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: <ul style="list-style-type: none">○ Follow the management guidelines proposed in ECoPs 1 and 2.○ Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris, and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, stormwater 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 stormwater. The change in hydrological regime leads to the increased rate of runoff and in sediment and contaminant loading, increased flooding and groundwater contamination.	The Contractor shall: <ul style="list-style-type: none">○ Divert runoff from undisturbed areas around the construction site○ Stockpile materials away from drainage lines○ Prevent all solid and liquid wastes from entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot○ Wash out 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 at 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: <ul style="list-style-type: none">○ Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion○ Ensure that roads used by construction vehicles are swept regularly to remove sediment.○ Water the material stockpiles, access roads and bare soils on an as-required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)





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 affect the habitat of fish and other aquatic biology.	The Contractor shall: <ul style="list-style-type: none">• 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, stormwater systems or underground water tables.• Reduce infiltration of contaminated drainage through stormwater management design• Do not discharge cement and water curing used for cement concrete directly into watercourses and drainage inlets.
Drinking water	Groundwater at shallow depths might be contaminated and hence not suitable for drinking purposes.	The Contractor shall: <ul style="list-style-type: none">• Control the quality of the groundwater to be used for drinking water on the basis of NEQS and World Bank standards. Safe and sustainable discharges are to be ascertained before the 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	<ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• 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 stockpiles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall: <ul style="list-style-type: none">• 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 are developed by the Contractor, there will be impacts on local topography, landscaping and natural drainage.	<p>The Contractor shall:</p> <ul style="list-style-type: none">• Reuse excavated or disposed of 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 borrowed material from:<ul style="list-style-type: none">• barren land or land without tree cover outside the road reserve;• Do not dig 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 then the bed of the cross-drain, to ensure efficient drainage. <p>Follow the below for restoration of borrow areas are:</p> <ul style="list-style-type: none">• 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 the base of the borrow pit drains into a sediment trap prior to discharge 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: <ul style="list-style-type: none"> • 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 to not more than 2 minutes
Construction machinery	Air quality can be adversely affected by emissions from machinery and the combustion of fuels.	The Contractor shall: <ul style="list-style-type: none"> • 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 physically 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.	<ul style="list-style-type: none"> • 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, were 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	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Maintain all vehicles to keep them in good working order under manufacturers maintenance procedures • Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours. • Make sure that all operators 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.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Appropriately site all noise-generating activities to avoid noise pollution to residents • Use the quietest available plant and equipment • Modify equipment to reduce noise (for example, noise control kits, the lining of truck trays or pipelines) • Maintain all equipment to keep it in good working order following 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.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Notify adjacent residents before 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 the impact • Monitor and analyze 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 and in National Park.



ECOP 8: PROTECTION OF FLORA

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Local flora is important to provide shelters for the birds, offer fruits and/or timber/firewood, protect soil erosion and overall keep the environment very friendly to human-living. As such damage to flora has a wide range of adverse environmental impacts.	<p>The Contractor shall:</p> <ul style="list-style-type: none">• 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 the need for tree removal.• Clear only the vegetation that needs to be cleared under the plans. These measures apply 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 avoiding felling trees during construction• Supply appropriate fuel in the work caps to prevent fuelwood 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 wildlife habitat and habitat quality,	The Contractor shall: <ul style="list-style-type: none"> 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, their habitat and their active nests	The Contractor shall: <ul style="list-style-type: none"> 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 before the commencement 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: <ul style="list-style-type: none"> 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 that 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	<ul style="list-style-type: none"> Provide adequate knowledge to the workers regarding the 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.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Locate the construction camps in areas that are acceptable from the environmental, cultural or social point of view. • Consider the location of construction camps away from communities to avoid social conflict in using 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, before the development of the construction camps. • Local authorities responsible for health, religion and security shall be duly informed on the set up of camp facilities 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.	<p>Contractor shall provide the following facilities in the campsites:</p> <ul style="list-style-type: none"> • 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 monthly through monthly effects monitoring. • Hygienic sanitary facilities and sewerage systems. The toilets and domestic wastewater will be collected through common sewerage. Provide separate latrines and bathing places for males and females with total isolation by the wall or by location. Female toilets should be marked in the 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 • Stormwater drainage facilities. Both sides of roads are to be provided with shallow v drains to drain off stormwater to a silt retention pond which shall be sized to provide a minimum of 20 minutes retention of stormwater flow from the whole site. Channel all discharge from the silt retention pond



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		to natural drainage via a grassed swale at least 20 meters in length with a suitable longitudinal gradient.
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • 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 the household level. • Store inorganic wastes in a safe place within the household and clear organic wastes daily to waste collectors. Establish waste collection, transportation and disposal systems with the manpower and equipment's/vehicles needed. • Dispose of 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 an 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 by the odor likely to be produced from the 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 of in approved waste disposal sites. • The contractor should agree/got a NOC from the near union council for disposal of solid waste in the municipal facility.
Fuel supplies for cooking purposes	Illegal sourcing of fuelwood by construction workers will impact the natural flora and fauna	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Provide fuel to the construction camps for their domestic purpose, to discourage them to use fuelwood or other biomass. • Make available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them from using biomass for cooking. • Conduct awareness campaigns to educate workers on preserving the protection 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,	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Provide adequate health care facilities within construction sites. • Provide a first-aid facility round the clock. Maintain stock of medicines in the facility and appoint a



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS.	<p>full-time designated first aider or nurse.</p> <ul style="list-style-type: none"> • Provide anti-venom injection at site dispensary to cope with any emergency in case of snakebite. • Provide ambulance facility for the labourers during the 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 regularly • Complement educational interventions with easy access to condoms at campsites as well as voluntary counseling and testing • Provide adequate drainage facilities throughout camps to ensure that disease vector's 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 in by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices
Safety	Inadequate safety facilities to the construction camps may create security problems and fire hazards	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Provide appropriate security personnel (police/home guard or private security guards) and enclosures to prevent unauthorized entry into the camp area. • Maintain register to keep track of a headcount of persons present in the camp at any given time. • Encourage the 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 the 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.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates after the construction work. • Dismantle camps in phases as the work decreases (do not wait for the completion of the entire work. • Give prior notice to the labourers before demolishing their camps/units



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none">• Maintain the noise levels within the national standards during demolition activities• Different contractors should be hired to demolish different structures to promote recycling or reuse of demolished material.• Reuse the demolition debris to a maximum extent. Dispose of remaining debris at the designated waste disposal site by PMT.• Handover the construction camps with all built facilities as it is if the agreement between both parties (contractor and land-owner) has been made so.• Restore the site to its original condition or an agreed condition with the landowner defined before 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 contractor's lack of knowledge on cultural issues cause social disturbances.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • 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 footprints 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 offense to recommence work near 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, religion and security duly informed before commencement of civil works 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 proximity of the construction site and the construction	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • 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 a design) and make ensure the 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,



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, wastewater, vector transmitted diseases), (ii) risk factors resulting from human behavior (e.g. STD and HIV) and (iii) road accidents from construction traffic.	<p>fire safety, etc.</p> <ul style="list-style-type: none"> • 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 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 damaged ones. • Safety procedures include the 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, religion and security duly informed before commencement of civil works and establishment of construction camps to maintain effective surveillance over public health, social and security matters.
	Child and pregnant labour	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Not hire children of less than 14 years of age and pregnant women or women who delivered a child within eight preceding weeks, following 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	<ul style="list-style-type: none"> • 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 center 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



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<p>necessary preventive and protective measures.</p> <ul style="list-style-type: none"> • 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.	<p>The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECoP 14 Construction Camp Management:</p> <ul style="list-style-type: none"> • Adequate ventilation facilities • Safe and reliable water supply. Water supply from deep tube wells that meets the national standards • Hygienic sanitary facilities and sewerage systems. The toilets and domestic wastewater will be collected through common sewerage. • Treatment facilities for sewerage of toilet and domestic wastes • Stormwater drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals following ECoP:2 • Solid waste collection and disposal system following ECoP1. • Arrangement for training • Security fence at least two m height. • Sickbay and first aid facilities
Water and Sanitation Facilities at the Construction Sites	Lack of Water sanitation facilities at construction sites causes inconvenience to the construction workers and affects their hygiene.	<ul style="list-style-type: none"> • The contractor shall provide toilets at the construction sites. • The location of toilet facilities should be at least six meters away from the 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 a septic tank and soaking pit. • The 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	<p>The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community:</p> <ul style="list-style-type: none"> • ECoP Fuels and Hazardous Substance Management • ECoP Air Quality Management • ECoP Noise and Vibration Management



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Pieces of training	Lack of awareness and basic knowledge in health care among the construction workforce, makes them susceptible to potential diseases.	<p>The Contractor shall:</p> <ul style="list-style-type: none">• 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 malaria, HIV/AIDS and STI education campaign before the start of the construction phase and complement it with strong condom marketing, increased access to condoms in the area as well as voluntary counseling 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 an on-going and regular basis. This should be complemented by easy access to condoms at the workplace as well as voluntary counseling and testing.



ECOP 12: WORKER HEALTH AND SAFETY

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best Practices	<p>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 some (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, wastewater, vector transmitted diseases), (ii) risk factors resulting from human behavior (e.g. STD and HIV) and (iii) road accidents from construction traffic.</p>	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • 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 a design) and make ensure the 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 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 damaged ones. • Safety procedures include the 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, religion and security duly informed before commencement of civil works and establishment of construction camps 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: <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 the 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	<ul style="list-style-type: none"> • 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 center 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: <ul style="list-style-type: none"> • Adequate ventilation facilities • Safe and reliable water supply. Water supply from deep tube wells that meets the national standards • Hygienic sanitary facilities and sewerage systems. The toilets and domestic wastewater will be collected through common sewerage. • Treatment facilities for sewerage of toilet and domestic wastes • Stormwater drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals following ECoP 2



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> • Solid waste collection and disposal system in accordance with ECoP1. • Arrangement for training • Security fence at least two m height. • Sickbay and first aid facilities
Water and Sanitation Facilities at the Construction Sites	Lack of Water sanitation facilities at construction sites causes inconvenience to the construction workers and affects their hygiene.	<ul style="list-style-type: none"> • The contractor shall provide toilets at the construction sites. • The location of toilet facilities should be at least six meters away from the 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 a septic tank and soaking pit. • The 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	<p>The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community:</p> <ul style="list-style-type: none"> • ECoP : Fuels and Hazardous Substance Management • ECoP : Air Quality Management • ECoP : Noise and Vibration Management • ECoP : Road Transport and Road Traffic Management
Training	Lack of awareness and basic knowledge in health care among the construction workforce makes them susceptible to potential diseases.	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • 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 malaria, HIV/AIDS, and STI education campaign before the start of the construction phase and complement it with strong condom marketing, increased access to condoms in the area as well as voluntary counseling 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 an on-going and regular basis. This should be complemented by easy access to condoms at the workplace as well as to voluntary counseling and testing.



Annexure XVII: Minutes of the ESIA Public Hearing

Public Hearing on Environmental and Social Impact Assessment (ESIA) of 12 Dams Namely, Purkhani, Piper Barecha, Ghulam Mustafa, Tikk - III, Mossa Choro, Kamal Shodo, Janai, Assabo, Kand Nain, Hub I, Hub II, Hub III.

At Upper Mole, Taluka Tanano Bola Khan, District Jamshoro

Minutes of the ESIA Public Hearing held at. At Upper Mole, Taluka Tanano Bola Khan
District Jamshoro

The Public Hearing of the ESIA study of 12 dams located in Taluka Thano Bola Khan, District Jamshoro. At Upper Mole on Thursday, July 15, 2021.


1. The participants of this meeting were officials from Sindh Environmental Protection Agency, representatives of local communities of dam sites, local NGO, representative of local leadership from the respectively areas, Districts (Jamshoro and Malir). Project Management Team, Sindh Resilience Project (SRP) irrigation component and consultants (List of participants is attached as Annexure-1).
2. The prime purpose of the public hearing was to aware the stakeholders regarding salient features of ESIA for construction of 12 proposed dams namely Purkhani, Piper Barecha, Ghulam Mustafa, Tiko III, Moossa Choro, Kamal Shodo, Janai, Assabo, Kand Nain, Hub I, Hub II and Hub III.
3. The event started with recitation of Holy Quran followed by the introduction of people attending the public hearing.
4. Deputy Director (Technical) SEPA briefed about the objectives of public hearing and said that as per SEPA 2014 review regulations, its mandatory requirement to hold public hearing of the proposed project for the stakeholders, in this regard today's public hearing is being organized.
5. The participants were informed that the proposed project falls under Category -G of Schedule I of the Regulation, as the project is to include: Dams and reservoirs with storage volume less than 25 million cubic meters of surface area less than 4 square kilometers; However, as the project is located in the KhitharThar National Park, a wildlife protected area, hence falls in category -J of Schedule –II, requires to conduct the ESIA of the proposed project.
6. Social Safeguard Specialist of PMT-SRP provided the details of project salient features, the baseline conditions, significant environmental and social aspects of the project, suggested mitigations measures to respond to the adverse impacts, and elements of environmental and social management plan to be implemented by the proponent to ensure safe working conditions for the contractor's, labor, community and protection of the environment.
7. Environment Specialist -PMT-SRP informed about the tree plantation, and its cost dedicated for the project.
8. Proponent representative enlightened the community about the purpose of this public hearing and if there were any queries from the people attending the hearing.



9. Some of the participants from a nearby village i.e, Mr. Jaffer Kahan Barecho from Dam site of Piper Khan Barecha told the participants that the dams built in this area had provided them a hope for better provision of water during the periods of drought.
10. Mr. Muhammad Bux Burfat from village Ghulam Mustafa supported the construction of dams and Mr. Muhammad Mossa Choro from Dam Moossa Choro appreciated the efforts of SRP.
11. Deputy Director- Environment SRP-PMT requested community representatives to support the team during the execution of the construction of the dams as it is for the betterment of the project area.
12. Mr. Muhammad Ibrahim Daudpoto, Deputy Director, SRP shared that since last 30 years he is working with Irrigation Department and well connected with the people of this area and he knew the local needs and priorities of the people, they are facing water scarcity since the years and these proposed small dams will bring positive changes in thier lives.
13. Mr. Nasir Ali Panhwar, Social Safeguard Specialist gave a comprehensive overview of the Project salient features of all the Dams, in addition to Mr. Arshad Hussain Memon he provides the insight on the environmental aspect of the project during the implementation phase and its mitigation measures in the context of environment.
14. In the closing remarks, the Deputy Director (Technical) SEPA Mr. Ali Nawaz Bhambro of District Hyderabad and Mr. Imran Ali Abassi, Deputy Director SEPA said that the valuable concerns of the public hearing participants have been noted.
15. Mr. Sayed Khalid Muneer Shah, Assistant Director said that these comments community notables would be highlighted during Expert's Committee meeting for comments of the concerned experts. SEPA will make sure that all the relevant concerns are well addressed by the project proponent during the entire life cycle of the proposed project.



Annexure XVIII: Notification Regarding Minimum Wages Govt. of Sindh



GOVERNMENT OF SINDH
LABOUR & HUMAN RESOURCES
DEPARTMENT
Karachi dated the 9th July, 2021

NOTIFICATION

No: L-II-13-3/2016: In pursuance of the provisions of Section 4 (1) of the Sindh Minimum Wages Act, 2015 and in exercise of the powers conferred by Sub-Section (1)(a) of Section 6 of Sindh Minimum Wages Act 2015, Government of Sindh is pleased to declare the minimum rates of wages **Rs.25,000/-** per month for unskilled adult and juvenile workers employed in all industrial / commercial establishments in Sindh shall be as given in the schedule appended to the minimum rates of wages, with effect from **01.07.2021**.

The minimum rates of wages for unskilled adult and juvenile workers employed in all the industrial/commercial establishments in the Sindh province on reference from Government of Sindh under Section 4 of Sindh Minimum Wages Act, 2015.

- I. The minimum rates of wages shall apply to all unskilled adult and juvenile workers employed in all industrial / commercial establishments of any sort (registered or unregistered) located in Sindh and minimum rates of wages shall be applicable uniformly throughout the Province.
- II. These minimum rates of wages shall be applicable as per provisions of the Sindh Minimum Wages Act, 2015 and shall come into force with effect from 01.07.2021, after approval and Notification to be issued by Government of Sindh, under Section 6 of the said Act.
- III. A female worker of the category shall get the same minimum wages as allowed to a male worker of the category of such work.
- IV. The daily / weekly working hours and conditions of overtime work and work on weekly days of rest and on paid holidays, etc. in respect of the unskilled adult and juvenile workers of the given category shall be regulated by the Sindh Factories Act, 2015, Payment of Wages Act, 2015 and other relevant Labour laws.



Annexure XIX: WHO Permissible Limits for Heavy Metals in Soil

S.No	*Elements	*Target Value of Soil (mg/kg)
1.	Cd	0.8
2.	Zn	50
3.	Cu	36
4.	Cr	100
5.	Pb	85
6.	Ni	35

*Target values are specified to indicate desirable maximum levels of elements in unpolluted soils.