Environmental Impact Assessment (EIA)

Project Readiness Financing for Punjab Urban Development Projects

IEE for Augmentation of Water Supply to Rawalpindi City based on Chahan Dam under DREAMS-I

Prepared by Project Management Unit of PRF PUDP, Government of Punjab, Pakistan

ENVIRONMENTAL IMPACT ASSESSMENT

AUGMENTATION OF WATER SUPPLY TO RAWALPINDI CITY BASED ON CHAHAN DAM, DISTRICT RAWALPINDI.

Submitted by

PROGRAM MANAGEMENT UNIT (PMU), PUNJAB INTERMEDIATE CITIES IMPROVEMENT INVESTMENT PROGRAM (PICIIP), LOCAL GOVERNMENT AND COMMUNITY DEVELOPMENT DEPARTMENT GOVERNMENT OF PUNJAB | Plot 41, Block B1, Gulberg III, MM Alam Road Lahore, Pakistan; Email: pd@piciip.gop.pk; Tel: 042-99210013-4 / 042-99268484

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Report Summary: This document presents findings of Environmental Impact Assessment (EIA) regarding Augmentation of Water Supply to Rawalpindi City based on Chahan Dam, District Rawalpindi.				
0	Report	EDCM	RR	SMM
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GLOSSARY

a. **Act:** means Punjab Environmental Protection Act, 1997 [Amendment 2012].

b. **Dust:** are fine powdery material such as dry earth/ pollen that can be blown in the air.

c. **Discharge:** means spilling, leaking, pumping, depositing, seeping, releasing, flowing out, pouring, emitting, emptying or dumping

d. **Environment:** means air, water and land; all layers of the atmosphere; all organic and inorganic matter and living organisms; the ecosystem and ecological relationships; buildings, structures, roads, facilities and works; all social and economic conditions affecting community life; and the inter-relationships between any of the factors mentioned.

e. **Environmental Impact Assessment:** means an environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigatory and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed.

f. **Effluent:** means any material in solid, liquid or gaseous form or combination thereof being discharged from industrial activity or any other source and includes a slurry, suspension or vapor.

g. **Hazardous Substance:** a substance or mixture of substances, other than a pesticide as defined in the Agricultural Pesticides Ordinance, 1971 (II of 1971), which, by reason of its chemical activity or toxic, explosive, flammable, corrosive, radioactive or other characteristics causes, or is likely to cause, directly or in combination with other matters, an adverse environmental effect; and any substance which may be prescribed as a hazardous substance.

h. **Hazardous Waste:** means waste which is or which contains a hazardous substance or which may be prescribed as hazardous substance or which may be prescribed as hazardous waste, and includes hospital waste and nuclear waste.

i. **Industrial Activity:** means any operation or process for manufacturing, making, formulating, synthesizing, altering, repairing, ornamenting, finishing, packing or otherwise treating any article or substance with a view to its use, sale, transport, delivery or disposal or for mining, for oil and gas exploration and development, or for pumping

water or sewage, or for generating, transforming or transmitting power or for any other industrial or commercial purpose.

j. **Industrial Waste:** means waste resulting from industrial activity.

k. **Incineration:** The thermal destruction of waste for the primary purpose of disposal, with or without recovery of energy.

Note: the term incineration generally means 'the act of burning to ashes'.

l. Initial Environmental Examination: means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an environmental effect for requiring preparation of an environmental impact assessment.

m. Leachate: A liquid that has percolated through and/or been generated by decomposition of waste material. It includes water that come in contact with waste and is potentially contaminated by nutrients, metals, salts and other soluble or suspended components and products of decomposition of waste.

n. Landfill: A waste disposal site used for the controlled deposit of solid waste onto or into land.

o. Mitigation Measure: means measure for control, reduce or elimination of an adverse impact of a development on environment, including a restorative measures.

p. Punjab Environmental Quality Standards: means the permissible standards for emission of air pollutants and noise and for discharge of effluent and waste.

q. Regulations: means the Pakistan Environmental Protection Agency, Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000.

r. Recycling: Set of processes (including biological) for converting recovered materials that would otherwise be disposed of as waste into useful material and/or products

s. Reuse: using a waste product again for the same or different purpose without further manufacture.

t. Suspended Solids: are solid particles suspended in water or air that can be removed by filtration or settlement.

u. **Sustainability:** means such developments that meet the needs of the present generation without compromising the ability of future generations to meet their needs.

v. Waste: means any material, substance, or by-product eliminated or discarded as no longer useful or required after the completion of a process.

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AIP	Access to Information Policy
AMSL	Above Mean Sea Level
AC	Asbestos Cement
BC	Before Construction
BCP	Building Code of Pakistan
BOQ	Bill of Quantities
DDMA	District Disaster Management Authority
IBAT	Integrated Biodiversity Assessment Tool
COVID-19	Corona Virus Infection Disease-2019
CSC	Construction Supervision Consultation
DC	During Construction
DMA	District Metered Area
DO	During Operation
EA	Executing Agency
EDCM	Engineering Design Construction Management
EGL	Existing Ground Level
EHS	Environment Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
GFR	Gross Enrollment Rate
GI	Galvanized Iron
GST	Ground Storage Tanks
GoP	Government of Pakistan
GRM	Grievance Redress Mechanism
GWSS	Gravity Water Supply Scheme
HDPE	High Density Polyethylene
IA	Implementing Agency
IEE	Initial Environmental Examination
IFC	International Finance Corporation
KPI	Key Performance Indicators

LAA	Land Acquisition Act (of 1984)
LARP	Land Acquisition and Resettlement Plan
Lea	Equivalent sound pressure level
MGD	Million Gallons per Day
MSDS	Material safety Data Sheet
NEP	National Environmental Policy
NEQS	National Environmental Quality Standards
PEQS	Punjab Environmental Quality Standards
NER	Net Enrolment Rate
NRW	Non-Revenue Water
OHS	Occupational Safety and Health
O&M	Operation and Maintenance
OHR	Overhead Reservoirs
PAP	Project Affected People
PC	Public Consultation
PPC	Plain Cement Concrete
PDD	Planning and Development Department
PEPA	Pakistan Environmental Protection Act 1997
PEPC	Pakistan environmental protection Council
PEQS	Punjab Environmental Quality Standards
PGA	Peak Ground Acceleration
PMU	Program Management Unit
PPE	Personal protective Equipment
RCC	Reinforced Cement Concrete
Punjab-EPA	Punjab Environmental Protection Agency
REA	Rapid Environmental Assessment
RP	Resettlement Plan
RWASA	Rawalpindi Water and Sanitation Agency
SOPs	Standard Operating Procedures
SS	Suspended Solids
TDS	Total Dissolved Solids
SPS	Safeguard Policy Statement
SSEMP	Site Specific Environmental Management Plan
TMA	Tehsil Municipal Administration

TMP	Traffic Management Plan
USEPA	United States Environmental Protection Agency
WHO	World Health Organization
WTP	Water Treatment Plant
UCs	Union Councils

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1. TITLE & LOCATION OF PROJECT:

The local Government and Community Development Department, Government of Punjab, through the Water and Sanitation Agency, Rawalpindi (WASA), is planning to implement a project, "Augmentation of Water Supply to Rawalpindi City based on Chahan Dam", with the financial support of Asian Development Bank (ADB). Initial Environmental Examination (IEE) report of the proposed project has been prepared, as a requisite, for complying with the ADB Environmental Safeguard Policy 2009 while Environmental Impact Assessment (EIA) is prepared for submission to EPA Punjab and to obtain NOC from EPA. The aim of the Project is to supply potable/treated water to the areas recently added in WASA service delivery jurisdiction. These areas comprise of Dhamial, Quaid-e-Azam Colony, Girja, Dhama Syedan, Lakhan (Lalarukh), Chak Jalal Din, Kalyal, Chakra and adjoining areas.

Water and Sanitation Agency (WASA), Rawalpindi is responsible to provide water supply and sewerage services to 1.6 million people living in 66 Union councils of the City of Rawalpindi. The domestic water demand is 290,950m³/d (64MGD) which is almost 13MGD less than the current water supply. Groundwater is depleting due to extensive abstraction and as a result number of abandoned tube-wells are increasing. There are almost 67 tube wells out of 495 that are either abandoned or non-functional due to decrease in water table. Around 136 tube wells installed before the year 2000 are now outlived and need to be rehabilitated or replaced.

The project management unit (PMU) has hired Joint Venture (JV) of M/s Tractebel GKW GmbH (Lead Firm), M/s National Development Consultants Pvt. Ltd. (NDC), M/s Osmani & Company (Pvt.) Ltd. (OCL), M/s Jers Consultancy (Pvt.) Ltd. (JERS) to provide consultancy services for conducting Feasibility Study to treat, transport and distribute a daily raw water withdrawal of around 12 MGD (54,553 m³/d) water from Chahan Dam to meet the future shortage of the water supply-demand of the newly added UCs under the WASA's jurisdiction.

The project intends to improve community health, and reduce environmental degradation in Rawalpindi; by improving the quality and quantity of water supply. The project is

expected to improve the living conditions and quality of life of residents living in areas recently included in Rawalpindi WASA jurisdiction. The main objectives of the Project are summarized below:

- To augment water for present and future needs;
- To address water scarcity and poor condition of water supply;
- To mitigate the problem of contaminated water being supplied to the residents of the city;
- Reduction in the O & M expenditure of WASA;
- To improve the overall environment of the city with the provision of sufficient water to the poor and low-income people;
- To devise effective measures for suitable quality control of water supply system from health consideration and pollution control; and
- To design a system to integrate various sources of water supply for alternate use in case of break down.

2. PROJECT PROPONENT

Program Management Unit (PMU), Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government and Community Development Department Government of Punjab are the Executing Agency (EA) of project. Mr. **Hamza Salik**, **Program Director** will be the contact person for the proposed project "**Augmentation of Water Supply to Rawalpindi City based on Chahan Dam**". Detail of the proponent is given hereunder.

Name:	**Hamza Salik**
Address:	Plot 41, Block B1, Gulberg III, MM Alam Road, Lahore, Pakistan.
Post:	Program Director PMU, PICIIP Local Government and Community Development Department Government of Punjab Augmentation of Water Supply to Rawalpindi City based on Chahan Dam.
Contact Details:	**Cell:** 042-99210013-4 / 042-99268484

3. CONSULTANTS:

In order to satisfy EPA's requirement to carry out Environmental Impact Assessment (EIA), **M/S Engineering Design and Construction Management (EDCM)** is engaged by the Executive Agency of the Project "Program Management Unit (PMU), Punjab Urban Development Projects (PUDP), Local Government and Community Development Department Government of Punjab" as their Environmental Consultant for this project.

4. PROJECT PARTICULARS:

The basic idea of the project is to use the Chahan dam water intake structure as the raw water source. From the intake, 12 MGD raw water will transmit water to treatment plant (WTP) by means of raw water pumps. After treatment, the treated water from the WTP will the dispense to the water distribution areas (PP-12 RWASA Zone) with the help of intermediate pumping station (IPS), water works (WW), conductance and gravity mains.

The Basic Components of the project are:

- Raw water intake structure
- Water treatment plant
- Intermediate pumping station and Water Works comprises on;
- Under Ground Storage Tanks
- Over Head Reservoirs
- Conductance main and Gravity mains
- Distribution networks system consist of;
- Distribution Pipe network
- Water metering
- House connections

The project is expected to improve the living conditions and quality of life of 298,468 residents living in areas recently included in Rawalpindi WASA's jurisdiction.

Project Alternatives

Alternatives for Water Supply Distribution to PP-12

The treated water from IPS Ranial will further distribute into the distribution area (RWASA PP12). For this purpose, different options have been studied for the conveyance system from IPS Ranial to water distribution area.

Following alternatives are evaluated for conductance of treated water from IPS Ranial to PP-12.

- Option 1: Distribution of treated water supply in the project area through one Water Works (Chakra).
- Option 2: Distribution of treated water supply in the project area through two IPS (Akbar Chowk & Biscuit Factory) and three water works (Akbar Chowk, Chakra & Adiala).
- Option3: Distribution of the treated water supply in the project area through one IPS (Akbar Chowk) and three water works (Akbar Chowk, Chakra & Adiala).
- Option 4: Distribution of treated water supply in the project area through one IPS (Akbar Chowk) and three water works (Akbar Chowk, Chakra & Adiala) comprising of overhead reservoir (OHR) and ground storage tank.

After evaluation and keeping in view the land availability, capital and O&M cost, it is recommended to adopt Option 4 for distribution of treated water from Chahan Dam to the water distribution area PP-12.

Similarly, various water treatment methods were considered. In the light of advantages and disadvantage of different processes, the best process which is commonly used worldwide and efficient as per required drinking water quality in low land area and with nominal electricity requirement is “Rapid Sand Filtration” with coagulation, flocculation and settling as pre-treatment and disinfection with chlorination as post treatment. So, Rapid Sand Filtration method/ technique will be used for water treatment process.

An estimated cost of the proposed project is **PKR 18,879 Million.** The cost includes the hiring of staff, arrangements for water sprinkling, provision of PPEs to workers, tree plantation, the arrangement of first aid kits at the site, waste management, and capacity building etc.

As per legal requirement under Section 12 of Punjab Environmental Protection Act, 1997 (Amendment 2012) this project require Environmental Approval from EPA Punjab. As a part of Conductance Main is passing through the federal territory of Islamabad, this project also requires Environmental Approval from Pak EPA under Section 12 of Pakistan Environmental Protection Act, 1997. As per clause F, Schedule-II of Pakistan

Environmental Protection Agency (Review of IEE and EIA) Regulations 2000 of the acts ibid, the proposed project falls in category of projects requiring Environmental Impact Assessment (EIA) on the basis of project cost.

Regular environmental monitoring, by a third party will also ensure environmentally sound construction of the project. The proponent / contractor will hire trained staff to ensure the enforcement of Environmental Management Plan. No trees will be cut down for this project. The equipment will be kept in proper condition to save the environment from any damage. During construction and operation phase; air and water quality will be monitored.

5. ENVIRONMENTAL ASSESSMENT:

Considering the potential impacts of the Proposed Project, existing baseline environmental conditions of the proposed project's Corridor of Impact (CoI) has to be used as a benchmark for comparison of the physical, ecological and socio-economic conditions before and after construction phases of the Project. This baseline will also provide the datum for assessing the impacts and suggesting the mitigation measures, which will be implemented effectively at various phases of the proposed project activities.

The data has been collected from the primary and secondary sources. For primary data acquisition, the Environment and Social team conducted the field visit during the month of November, 2022. The secondary data was collected from published sources/reports and relevant departments, which were also verified through visual observations during detailed surveys. Data has been collected for following elements of environment.

- Physical Environment
- Biological Environment
- Socioeconomic environment

Environmental parameters such as air quality, noise level, and Drinking Water Quality was also analyzed to assess the baseline conditions of project area. It is evident from the monitoring results that water from project area is not fit for drinking. It has contamination of wastewater and has concentration of E. coli and Fecal Coliform which make this water unfit for drinking. The results show that concentration of PM_{10} and $PM_{2.5}$ exceeds the

limiting values set by World Health Organization (WHO) for ambient air. The noise levels at IPS Ranial exceed the limiting values set by Punjab Environmental Quality Standards (PEQS) for day and night times. It is important to mention here that comparison has been made with more stringent standards. Detailed results of the monitoring are given in Chapter 4.

Potential Environmental Impacts and Mitigation Measures

Apart from positive impacts, there are some potential adverse environmental and social impacts on the local environment. The proposed Project is divided into three (03) stages i.e. Pre-construction / Planning and Design Stage, Construction Stage and Operation and Maintenance (O&M) Stage. Adverse impacts envisaged at these three (03) stages of the proposed water supply project are identified and appropriate mitigation and remedial measures are proposed accordingly. Project impact evaluation matrices have also been developed to evaluate the potential impacts of the proposed project during planning, construction and operation phases of the project.

The majority of the environmental impacts are associated with the distribution networks including transmission main and generation of solid waste, sludge and waste water during water treatment plant operation. Major impacts during construction phase will be related to traffic congestion and community health and safety issues during laying of water supply system in populated areas. **Table ES-1**, **Error! Reference source not found.** and **Error! Reference source not found.** shows the impact matrix for pre-construction, construction and operational stages, respectively.

Table ES-1: Impact Screening during Pre-Construction Phase

S/No.	Potential Issue	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)	Residual Impact (Short term, Long term)
1	Improper selection of intake source and reduce ecological flows Impacts	2 / Likely	5 / Moderate	10 / Medium	Low / Long Term
2	Improper design of water treatment plant and distribution networks including transmission main	2 / Likely	5 / Moderate	10 / Medium	Low / Long Term

3	Lack of integration of IEE/EMP requirements into Construction bid documents	2 / Likely	3 / Moderate	6 / Medium	Low / Short Term
4	Contractor's Environmental Safeguards Capacity	3 / Likely	3 / Moderate	9 / Medium	Low / Short Term
5	Relocation of existing utilities	2 / Likely	3 / Moderate	6/ Medium	Low residual Impact
6	Identification of Locations for Labor Camps and ancillary facilities	3 / Likely	2 / Moderate	6 / Medium	Medium / Short Term
7	Traffic Issues/ Traffic Management Plan	3 / Likely	2 / Moderate	6 / Medium	Low / Short Term
8	Land acquisition and resettlement impacts	5 / Unlikely	2 / Moderate	10 / Medium	Low residual Impact
9	Topographic Impact	2 / Unlikely	2 / Moderate	Low	Low residual Impact
10	Seismic Impacts	2 / Unlikely	2 / Moderate	Low	Low residual Impact

Table ES-2: Screening of Environmental Impacts during Construction Phase

S/No.	Potential Issue	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)	Residual Impact (Short term, Long term)
1	Construction of water treatment plant and other structures not in accordance with finalized design	2 / Likely	5 / Moderate	10 / Medium	Low / Short term
2	Site Accessibility Issues	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
3	Traffic Issues	3 / Likely	3 / Moderate	9 / Medium	Low / Short term
4	Impact on local Resource	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
5	Community Health & Safety	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
6	Occupational Health & Safety	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
7	Impacts due to Construction Camps/ Camp Site	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
6	Waste water generation	3 / Likely	3 / Moderate	9 / Medium	Low / Short term
7	Solid Waste Generation	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
8	GHG Emissions	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
9	Potential Emergencies during construction phase	3 / Likely	2 / Moderate	6 / Medium	Low / Short term

10	Impacts of Natural and Man-Made Disaster	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
11	Degradation of air quality due to construction works	3 / Likely	3 / Moderate	9 / Medium	Low / Short term
12	Noise/ Vibration	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
13	Flora	3 / Likely	3 / Moderate	9 / Medium	Low / Short term
14	Fauna	3 / Likely	3 / Moderate	9 / Medium	Low / Short term
15	Social and Cultural Conflicts	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
16	Communicable diseases incl. COVID-19	3 / Likely	2 / Moderate	6 / Medium	Low / Short term

Table ES-3: Screening of Possible Impacts during Operation Phase

Sr./No.	Potential Issues	Likelihood (Certain, Likely, Unlikely,	Consequence (Catastrophic, Major, Moderate,	Risk Level (Significant, Medium,	Residual Impact (Short term, Long term)
1	Generation of Sludge and Wash Water	5 / Certain	2 / Moderate	10 / Medium	Low / long Term
2	Water system leaks and water discharges during flushing	2 / Unlikely	3 / Major	6 / Medium	Low / Short Term
3	Handling of Hazardous Chemicals and Chlorine Release	2 / Unlikely	5 / Catastrophic	10 / Medium	Low / Long Term
4	Impacts on Landscape	2 / Unlikely	3 / Major	6 / Medium	Low / Long Term
5	Impacts on Aquatic life of Chahan Dam due to uncontrolled abstraction of water	2 / Unlikely	5 / Catastrophic	10 / Medium	Low / Long Term
6	Impacts on Aquatic life of Chahan Dam due to change in quality of water	2 / Unlikely	5 / Catastrophic	10 / Medium	Low / Long Term
7	Impact on the Proposed Project due to Climate Change	2 / Unlikely	3 / Major	6 / Medium	Low / Long Term
8	Improved drinking water availability	Positive impacts expected			Long term positive
9	Impacts on Public Health	Positive impacts expected			Long term positive

The EIA has evaluated potential impacts that are likely to arise during proposed project in detail, both negative and positive impacts at each stage of the project. To minimize the

effects of adverse impacts, appropriate mitigation measures have been recommended in the Environmental Management Plan (EMP).

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

The impacts of the project activities on environment during construction & operational phases of proposed project have been considered. The mitigation measures have been proposed to minimize / eliminate the negative impacts of the project on the environment. A complete Environmental Monitoring and Environment Management Plan have been recommended to regulate the requirements of Punjab Environmental Protection Act, 1997 [Amendment, 2012].

The impacts on environment which are likely to be generated during Pre-construction / Planning and Designing Stage are summarized in table below:

ACTIVITY	ENVIRONMENTAL IMPACTS	MITIGATION MEASURES
Impacts of Labor Camps/ancillary facilities/machinery used	- Damage to local vegetation/ trees - Mobility of Heavy machinery	- In order to prevent a nuisance, specific locations shall be designated for development of the labor camps. All necessary facilities and amenities shall be provided in these camps such as resting area, drinking water, electricity, supply of water. - Solid and liquid effluent waste disposal facilities shall also be designed to cater waste of administration/office building etc. - The use of proper planning while indenting locations for the labor camps will ensure there is minimal disturbance to all key receptors and the traffic is not disrupted by labor camps being set up roadside next to the construction sites.

Improper selection of intake source and reduce ecological flows Impacts	- Disrupt environmental/ecological characteristics - Disrupt uninterrupted raw water supply to WTP	- Detailed Catchment studies shall be conducted as part of designing intake flow from sources. - Runoff volume calculations shall be carried on periodic basis to ensure water supplies from intake structure. - Periodic flow measurement shall be carried out to ascertain the continuous water availability for the project. - PMU LG&CD will ensure that design of intake structure is carried out with minimal impact of aquatic life and ecological flows.

The impacts on environment which are likely to be generated during Construction Stage are summarized in table below:

ACTIVITY	ENVIRONMENTAL IMPACTS	MITIGATION MEASURES
Execution on Project designing and planning	- Cutting of trees - Involvement of forest	- Cutting and / or disturbance of trees shall be avoided, as far as possible; - A tree plantation program shall be implemented with the recommendations and technical support of Punjab, Forest Department for the enhancement ecological condition of the area; - There is no protected forest situated in and around the Project area.
Construction of water treatment plant and other structures not in accordance with finalized design Improper method for the construction of water treatment plant;	- it could lead to a number of unanticipated impacts such as inadequate water supply, degraded water quality and choking of water distribution networks or ground water contamination due to	- Method statements must be prepared by the Contractor and approved by the Construction Supervision Consultant (CSC) prior to commencement of construction works. - The CSC must closely monitor the construction works being conducted by the Contractor to ensure the finalized design is implemented in full and the WTP design is developed completely in compliance of the approved finalized designs. - Any deviation by the Contractor from

	mishandling wastage (sludge/solid waste) from WTP etc.;	following the finalized design must be immediately highlighted and corrective measures must be implemented to ensure full compliance with the finalized design of the WTP. - PMU LG&CD shall ensure that construction activities are being carried out in compliance to project design following best international practices. It will closely review and monitor the activities of CSC and contractors involved in construction activities**.**
Traffic Issues	- Movement of vehicles carrying construction materials and equipment/machinery	- Movement of vehicles carrying construction materials and equipment/machinery will be restricted during the daytime to reduce traffic load and inconvenience to the local population; - Construction vehicles, machinery and equipment will be parked at designated areas (at construction camps site) to avoid un-necessary congestions on roads;
Solid Waste	- Open dumping of solid waste; - Disposal of Spoil & Demolition Waste	- All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. The contractor will coordinate with local representatives and administration of the concerned solid waste management department for the disposal of solid waste; - The contractor must develop a plan of action with the help of concerned solid waste management department for transporting the waste to the disposal site; - Waste to be reused in the project or by any other interested parties. - All material that is produced shall be transported in tarpaulin covered trucks for disposal at the designated site. At the disposal site, the demolition waste will be disposed of in accordance with the best practices to ensure no residual impact. - Disposal trucks will be properly maintained

		to minimize oil leakages during the construction.
Wastewater generation	- Discharge of wastewater in open area;	- Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks. - Proper monitoring to check the compliance of PEQS will be carried out; and - Sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit. - The contractor(s) will be responsible to submit details of site-specific wastewater management plan along with details of wastewater collection, transportation and its disposal.

The impacts on environment which are likely to be generated during execution of operations are summarized in table below:

ACTIVITY	ENVIRONMENTAL IMPACTS	MITIGATION MEASURES
Proper maintenance of plant & pipelines	- Water system leaks and water discharges - Physical damage to structures from flooding Water - Corrosion of metal pipes weaken structures over time - Physical damage to pipes from flooding and landslides	- Ensure construction meets applicable standards and industry practices; - Conduct regular inspection and maintenance; - Implement a leak detection and repair program (including records of past leaks and unaccounted-for water to identify potential problem areas); - Consider replacing mains with a history of leaks of with a greater potential for leaks because of their location, pressure stresses, and other risk factors. - Discharge the flush water into a municipal sewerage system with adequate capacity; - Discharge the flush water into a separate storm sewer system - Minimize erosion during flushing, for example by avoiding discharge areas that are susceptible to erosion and spreading the flow to reduce flow velocities.

		- Pipe material and protection selection must be design by considering the unseen event of floods. - Metering system for controlling the unauthorized use of water. - A climate change resilience plan or climate change adaptation measure will be adopted to avoid any such impacts.
Handling of Hazardous Chemicals and Chlorine Release	- Chemical used for coagulation Alum ($Al_2SO_4.14H_2O$) may cause eye/skin irritation and Prolonged or repeated contact with Alum dust may cause redness, dryness Over-exposure and itching of the skin (dermatitis) while dusts of aluminum sulfate hydrate if inhaled may probably cause irritation of the nose, throat and respiratory tract based on pH - Vapors of Sodium Hypochlorite may irritate the respiratory system and cause coughing, asthmatic breathing and breathlessness	- A chemical house will be provided to accommodate the solution tanks, Alum Bags and other chemicals (if required). Monorail and overhead crane have been provided for handling of the chemicals. - For chlorination Sodium Hypochlorite (NaOCl) will be stored in chlorination building, in which sodium hypochlorite will be mixed with water, and the solution of sodium hypochlorite and water will be fed in the chlorine contact tank through dosing pumps. - Minimize the amount of chlorination chemicals stored on site while maintaining a sufficient inventory to cover intermittent disruptions in supply; - Mandatory health and medical check-ups for all employees especially workers working at chemical building as they shall be exposed to Alum and Sodium hypochlorite - Provision of PPEs to the workers working in chemical building. - Use corrosion-resistant piping, valves, metering equipment, and any other equipment coming in contact with gaseous or liquid chlorine, and keep this equipment free from contaminants, including oil and grease.

Comprehensive Environmental Monitoring and Environment Management Plans are prepared to satisfy the requirements of Punjab Environment Protection Act, 1997 [Amendment, 2012] and rules and regulations made thereunder. Regular overall environmental monitoring by a third party will also ensure environmentally sound

Construction and operation of the project. The proponent / contractor will hire trained staff to ensure the enforcement of Environmental Management Plan. The equipment will be kept in proper condition to save the environment from any damage.

Project impact evaluation matrixes have been developed to evaluate the potential impacts of the proposed Project during planning, construction and operation phases of the project. Qualitative description of each aspect and the affected environment in both RoW and the project's corridor of impact is prepared.

Environmental parameters such as air quality, noise level, and Drinking Water Quality was analyzed to assess the baseline conditions of project area. . The test results show that majority of the parameters of water, air and noise levels are incompliance with applicable National/Punjab Environmental Quality Standards and other international standards like WHO. These tests were performed by experienced staff from an EPA certified environmental laboratory.

Sensitive receptors have been identified which falls under CoI of 100 meters along the alignment of proposed project. The sensitive receptors, present around within the radius of 2 km of Water Treatment Plant (WTP), Intake Structure and Water Works are also included. These receptors include places of worship, educational institutes, health facilities and area of spiritual value. Mapping of these receptors has been carried out to assess the impacts and proposed mitigation accordingly.

Detailed Public Consultation (PC) has been carried out with all relevant stakeholders. It includes formal discussions, individual consultation and meeting with officials of different relevant Government Departments. The disclosure of relevant information was made according to requirements of ADB SPS 2009, PMU and EPA Punjab. Total 174 persons including 31 females (17.8%) and 143 males (82.2%) were consulted. The consultation was carried out around the proposed WTP site, sites for IPS and water works and along the route of Conductance Mains where population density is high. As the project will be executed within existing ROW and the number of APs (in terms of displacement and involuntary resettlement) are negligible, therefore, random consultation was carried out. With reference to the consultation of Government Stakeholders, all the relevant departments were invited for consultation meeting at DC Office. The overall response of PC was positive and people showed their consent in favor of project with few

suggestions which have been taken care in mitigation plans. After completion/revision and approval from the ADB, EPA Punjab and Pak EPA the IEE/EIA will be disclosed to all the stakeholders as part of public consultation process.

Based on the above, this report concludes that there are no potential significant adverse environmental impacts from proposed project. Impacts of less significance can be mitigated to an acceptable level by adequate implementation of the mitigation measures identified and suggested, hence, no significant or unacceptable change in the baseline environmental conditions will occur. Similarly, the project will have a visible positive impact on the socio-economic conditions of the local residents in terms of uninterrupted treated water supply and it will fix the issue of portable water availability in the project area.

Site Specific Environmental Management Plan (SSEMP) shall be developed and implemented by the contractor under the template of SSEMP, given under this EIA report.

Mitigation measures to help alleviating potential identified impacts have been recommended and an EMP has been provided for implementation of these mitigation measures. Further PMU LG&CD and WASA will ensure that selected construction contractor has contractual obligation with respect to EMP implementation. Also contractor will ensure appropriate staffing and budgeting for effective implementation and monitoring of project EMP.

The contractor will manage the site specific impacts by developing and implementing the Site Specific Environmental Management Plan (SSEMP). The mitigation measures have been recommended in the EIA Report based on the best available techniques which will facilitate the project to operate in environmental friendly manner. Based on the findings of the EIA, the project is unlikely to cause any significant, irreversible or unprecedented environmental impacts. The potential impacts localized, temporary in nature and can be addressed through proven mitigation measures.

CHAPTER-1

INTRODUCTION

1.1 OVERVIEW

The local Government and Community Development Department, Government of Punjab, through the Water and Sanitation Agency, Rawalpindi (WASA), is planning to implement a project, "Augmentation of Water Supply to Rawalpindi City based on Chahan Dam", with the financial support of Asian Development Bank (ADB). Initial Environmental Examination (IEE) report of the proposed project has been prepared, as a requisite, for complying with the ADB Environmental Safeguard Policy 2009 while Environmental Impact Assessment (EIA) is prepared for submission to EPA Punjab and to obtain NOC from EPA. The aim of the Project is to supply potable/treated water to the areas recently added in WASA service delivery jurisdiction. These areas comprise of Dhamial, Quaid-e-Azam Colony, Girja, Dhama Syedan, Lakhan (Lalarukh), Chak Jalal Din, Kalyal, Chakra and adjoining areas.

Water and Sanitation Agency (WASA), Rawalpindi is responsible to provide water supply and sewerage services to 1.6 million people living in 66 Union councils of the City of Rawalpindi. The domestic water demand is 290,950m³/d (64MGD) which is almost 13MGD less than the current water supply. Groundwater is depleting due to extensive abstraction and as a result number of abandoned tube-wells are increasing. There are almost 67 tube wells out of 495 that are either abandoned or non-functional due to decrease in water table. Around 136 tube wells installed before the year 2000 are now outlived and need to be rehabilitated or replaced.

The project management unit (PMU) has hired Joint Venture (JV) of M/s Tractebel GKW GmbH (Lead Firm), M/s National Development Consultants Pvt. Ltd. (NDC), M/s Osmani & Company (Pvt.) Ltd. (OCL), M/s Jers Consultancy (Pvt.) Ltd. (JERS) to meet the requirements of the Asian Development Bank's (ADB) financing and to provide consultancy services for conducting Feasibility Study to treat, transport and distribute a daily raw water withdrawal of around 12 MGD (54,553 m³/d) water from Chahan Dam to meet the future shortage of the water supply-demand of the newly added UCs under the WASA's jurisdiction

During the last two decades Rawalpindi city has undergone considerable expansion and accordingly the WASA jurisdiction and operational boundaries have also been extended to the newly developed residential areas along the southern and eastern side

of the Rawalpindi Municipal Corporation limits and 15 union councils of Potohar Town. These areas are deficient in infrastructural facilities and suffering from water shortage. With the recent water supply sources available, WASA cannot cope with the water requirements of the expanded areas.

Urbanization presents one of the key challenges and, at the same time, opportunities in the new millennium. Urbanization is taking place at a rapid pace and is beyond the effective control of most governments across the world. The scale and complexity of urban problems are increasing everywhere and out of those most challenging is to meet the water and sanitation demands. All cities must plan ahead to enable a sustainable future in the rapidly changing urban environment which is in line with the United Nation's Sustainable Development Goals (SDGs) i.e., "to ensure availability and sustainable management of water and sanitation for all." Cities must review their strategic plans to develop better economic, social and environmental future. Those cities that fail to plan ahead and execute the plans will not be competitive in the globalized world.

According to the previous master plan of Rawalpindi (1996) and the information provided by WASA, the per capita water consumption is estimated to be 182 liters (40 GPCD). The domestic water demand is 290,950m³/d (64MGD) which is almost 13MGD less than the current water supply.

Groundwater is depleting due to extensive abstraction and as a result number of abandoned tube-wells is increasing. There are almost 67 tube wells out of 495 that are either abandoned or non-functional due to decrease in water table. Around 136 tube wells installed before the year 2000 are now outlived and need to be rehabilitated or replaced.

As learnt from WASA, Non-Revenue Water (NRW) is almost 30% of the city water supply which is mainly because of outlived and rusty water supply infrastructure. Overall, the city's current storage capacity is insufficient to fulfil the peak hour demand.

Keeping in view the rapid growth in population of the city and resulting increased water requirement of city demands immediate identification of new surface water sources, like Chahan Dam, Dadhocha Dam, Chirah Dam, and projects like to draw water from Tarbela Dam for Rawalpindi. Keeping in view the dire requirement, a

project for augmentation of water from Chahan Dam has been proposed to meet the current and future water requirements of the project area.

The Project will be financed by the Asian Development Bank (ADB), while Local Government and Community Development (LG&CD) Department, (GoPb) will be the Executing Agency (EA). Tractebel GKW GmbH in joint venture with National Development Consultants Pvt Ltd., Osmani and Company (Pvt) Ltd. and Jers Consultancy (Pvt) Ltd. has been engaged to provide consultancy services for conducting Feasibility Study to treat, transport and distribute a daily water supply of 12 MGD (54,553 m^3/d) from Chahan Dam to meet the water demand of the newly added zone (PP-12) in the WASA's jurisdiction.

Engineering Design and Construction Management (EDCM) Consultants, under the Punjab Intermediate City Improvement Investment Program (PICIIP) have developed the Spatial Plan of Rawalpindi city in collaboration with PMU, City Implementation Unit (CIU) and RWASA. Subject project i.e. "Augmentation of Water Supply to Rawalpindi City based on Chahan Dam" has been enlisted in the priority projects (i.e. Dreams-1 projects).

The proposed project will be located in district Rawalpindi of Punjab Province. The map showing the location of the Proposed Project is shown in **Figure 1.1**.

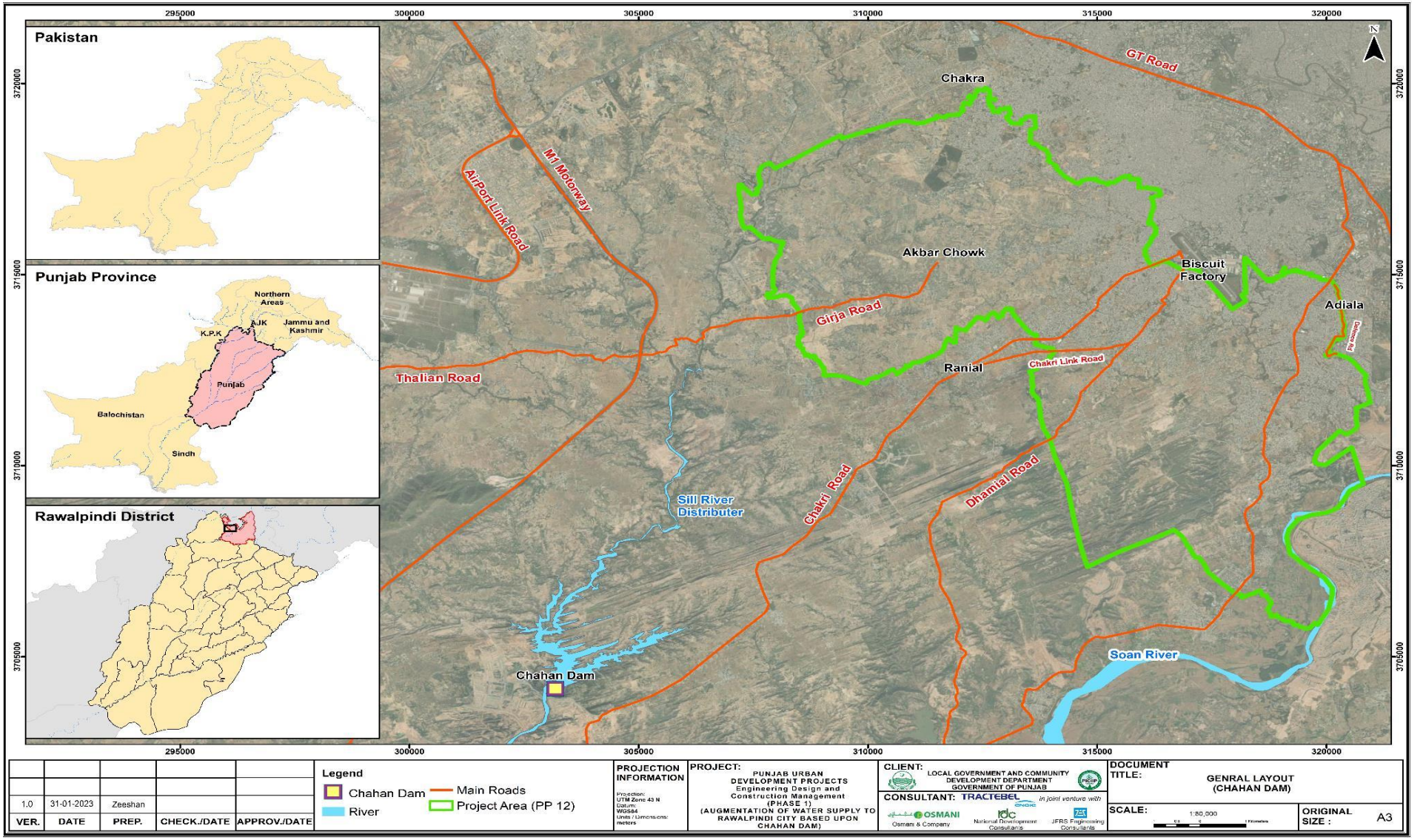


Figure 1. 1: Project Location Map

Project area features a humid subtropical climate with long and hot summers, a monsoon and short, mild and wet winters. Its climate is classified as very similar to its twin city Islamabad, but the geographical location and extreme urbanization of Rawalpindi specially in project area (PP-12) has led to weather and climatic conditions that are notably different from its surrounding region. Rawalpindi's weather has historically been known to change rather quickly due to its proximity to Himalayas and the Pir Panjal Range. These mountains not only influence the weather of the city, but also provide great recreation during the hot months. Furthermore, its warm comfortable mean annual temperature of 21.3 °C (70 °F) attracts people to live here permanently from all over Pakistan.

Changes in the seasonality of precipitation patterns may affect the reliable yields from surface water such as rivers and reservoirs. Direct changes in precipitation patterns and indirect changes in land use within the catchment can negatively impact surface water and groundwater availability.

Throughout the year, Rawalpindi experiences an average of about 90 thunderstorms, which is the highest frequency of thunderstorms in Punjab province of any plane station. In fact, most rainfall in the project area is accompanied by a thunderstorm with peak activity experienced in August.

The average annual rainfall is abundant at 1,249 millimeters (49.2 in), most of which falls in the monsoon season. However, frontal cloud bands also bring significant rainfall in the winter. The driest month is November, with 16 mm of rain. In July, the precipitation reaches its peak, with an average of 237 mm. Record rainfall was experienced in the year 2013 at a massive 1,952 millimeters (76.9 in) mostly due to an unusually wet monsoon season.

Evaporation losses from surface water reservoirs may be expected by increase as temperatures increases, thereby reducing yields and increasing storage losses.

On a typical day, Rawalpindi hosts breezy afternoons (30 kilometers per hour (19 mph)+), but usually calm to light breeze (Beaufort scale) wind conditions are observed after midnight. The mean annual wind speed of project area is roughly 10 kilometers per hour (6.2 mph) at 14 m height. In summers, June is the hottest with record maximum temperature at a blistering 48.3 °C (119 °F) recorded on 13 June 1953. On the other hand, January is the coldest month of the year when temperature can drop to a minimum −3.9 °C (25 °F) in the winter recorded on 17 January 1967.

Groundwater is the only source to supply water to the R-WASA zone PP-12. Currently there are 26 tube wells in the Water supply zone PP-12. These tube wells are located on the recharge beds of the Soan river and Sill River distributaries. There are currently 14 functional tube wells which produce about 374.7m3/d (0.082mgd) compared to the entire design capacity of 750m3/d (0.165mgd). There are almost 12 no tube wells which are now declared obsoleted/outlived.

The water table is depleting as a result of excessive groundwater abstraction and with the less or no recharge by surface water. Hence, the number of non-functional/ abandoned tube wells is also increasing with time.

Climate change impacts that threaten the structural integrity and service sustainability of water supply infrastructure are summarized in the table below.

Table 1. 1: Climate Change Impacts on project

Climate Change Event	Infrastructure Impacts and Consequent Risks
Increased Mean Annual and/or Intensity of Precipitation	**Water Source** Increased water turbidity after heavy storm and flood events Shifts in river morphology from increased erosive capacity of river during storm events may affect water withdrawal Need for dredging to remove sediment, rocks and debris deposited after storm and flood events **Treatment Facility** Physical damage to structures from flooding Water Lower treatment effectiveness due to higher than normal turbidity or disrupted/shorter treatment operation **Storage Tanks** Contamination due to flooding for cisterns Physical damage due to landslides **Pipelines** Corrosion of metal pipes weaken structures over time Physical damage to pipes from flooding and landslides Network contamination from pipes damaged by flooding or landslides

Drought and Decreased Mean Annual Precipitation	**Water Source** Decreased availability of surface water resources Lower river/reservoir levels affect water intake Competing demands for water from industrial, agricultural and urban sectors Treatment Facility Declining raw water quality due to drought-prone algal blooms or diminished runoff and flows that cause concentration of chemical pollutants Increased treatment costs as pollutants become more concentrated **Storage Tanks** Lack of inflow to storage tanks • Frequently emptied due to higher demand Pipelines Decreased supply and intermittent or low pressure Increased risk of contamination from wastewater intrusion Increased demand for increasingly scarce water resources

From the above discussion, it is concluded that while designing of the any new development project mitigation measure should be consider in the designing stage

Selection of the water source must be considered by keeping in mind the unseen event of drought and high flood

Pipe material and protection selection must be design by considering the unseen event of floods.

Metering system for controlled the unauthorized use of water

As per the Feasibility Study of the Chahan Dam, the dam is earth-filled with a design life of 50 years and received the maximum discharge of 89,985 cusecs, including both routed and unrouted discharge. The dam has dead, live, and gross storage capacities of 14.4, 19.37, and 33.78 MCM, respectively, with a normal reservoir level, dead storage level, and Nullah bed level of 426.22, 415.24, and 356.4 m, respectively.

Pond area at normal water levels is 1.781 km2. The dam is 304.80 m long, with a top width of 9.14 m and a height of 44.82 m. There is a difference between HFL and the top level of the dam, i.e., 2.2 m.

Chute type spillway is used with a clear water way of 91.46 meters at normal water level (426.22 m) and will carry a discharge of 38454 cusec. The length of the spillway is 609.4m.

From Chahan Dam, 45 cusecs of water are allotted for irrigation purposes by using a 1.2-m-diameter PRCC siphon of about 76.2 m in length in an irrigation channel, while an additional 22.3 cusec will be used from Chahan Dam for water supply to PP-12.

The following plan has been adopted in the design of the proposed project to mitigate the impact that may be happen due to worst climate change events.

All the conveyance system network pipe material will be proposed to bury with the minimum soil cover of 3 ft. to minimize the impact of physical damage of the pipe network.

1.2 PURPOSE OF THE REPORT

Environmental Impact Assessment (EIA) report is being submitted to the Environmental Protection Agency (EPA), Government of the Punjab, Lahore in compliance with the legal requirement of Section, 12 of Punjab Environmental Protection Act, 1997 [Amendment, 2012]; "Preparation and submission of IEE / EIA" for obtaining the Environmental Approval (EA) before starting project activity and **Schedule-II (Clause-I)** of Review of IEE/ EIA Regulations, 2000 stating the proposed project falls in category of projects requiring Environmental Impact Assessment (EIA) on the basis of project cost. The other relevant regulations and guidelines considered while preparing this EIA report include:

- Policy and procedures for filing, review, and approval of environmental assessments.
- Guidelines for the preparation and review of environmental reports.
- Guidelines for public participation.
- Guidelines for sensitive and critical areas.
- Hazardous Substance Rules, 2003.

This report has been prepared based on detailed engineering designs, pre-feasibility of the project and estimates of water availability, supply and future demand in Rawalpindi under Punjab Urban Development Projects, (DREAMS-1) Rawalpindi.

Different environmental aspects like social, physical biological etc. and other related features of the project both during designing, construction & operational phases are highlighted in this EIA report. Measures necessary to be adopted to mitigate any environmental impacts on any part of the environment around are also described. All the important information is also provided as described under the format used to help decision makers, EPA Punjab in the present case, before issuing the desired Environmental Approval.

1.3 IDENTIFICATION OF THE PROJECT AND THE PROPONENT

a. Contact Person

Program Management Unit (PMU), Punjab Intermediate Cities Improvement Investment Program (PICIIP), Local Government and Community Development Department Government of Punjab are the Executing Agency (EA) of project. Mr. **Hamza Salik**, **Program Director** will be the contact person for the proposed project "**Augmentation of Water Supply to Rawalpindi City based on Chahan Dam**". The detail of the proponent is given hereunder.

Name:	**Mr. Hamza Salik**
Address:	Plot 41, Block B1, Gulberg III, MM Alam Road, Lahore, Pakistan.
Post:	Program Director PMU, PICIIP Local Government and Community Development Department Government of Punjab Augmentation of Water Supply to Rawalpindi City based on Chahan Dam
Contact Details:	**Cell:** 042-99210013-4 / 042-99268484 **Email ID:** pd@piciip.gop.pk

b. Consultant

Engineering Design and Construction Management (EDCM)

1.4 NATURE AND SIZE OF THE PROJECT

Proposed project is about Augmentation of Water Supply to Rawalpindi City based on Chahan Dam.

During the last two decades Rawalpindi city has undergone considerable expansion and accordingly the WASA jurisdiction and operational boundaries have also been extended to the newly developed residential areas along the southern and eastern side of the Rawalpindi Municipal Corporation limits and 15 union councils of Potohar Town. These areas are deficient in infrastructural facilities and suffering from water

shortage. With the recent water supply sources available, WASA cannot cope with the water requirements of the expanded areas. Keeping in view the rapid growth in population of the city and resulting increased water requirement of city demands immediate identification of new surface water sources, like Chahan Dam, Dadhocha Dam, Chirah Dam, and projects like to draw water from Tarbela Dam for Rawalpindi. Keeping in view the dire requirement, a project for augmentation of water from Chahan Dam has been proposed to meet the current and future water requirements of the project area.

The basic idea of the project is to use the Chahan dam water intake structure as the raw water source. From the intake, 12 MGD raw water will transmit water to treatment plant (WTP) by means of raw water pumps. After treatment, the treated water from the WTP will the dispense to the water distribution areas (PP-12 RWASA Zone) with the help of intermediate pumping station (IPS), water works (WW), conductance and gravity mains.

The Basic Components of the project are:

- Raw water intake structure
- Water treatment plant
- Intermediate pumping station and Water Works comprises on;
- Under Ground Storage Tanks
- Over Head Reservoirs
- Conductance main and Gravity mains
- Distribution networks system consist of;
- Distribution Pipe network
- Water metering
- House connections

The project is expected to improve the living conditions and quality of life of 298,468 residents living in areas recently included in Rawalpindi WASA's jurisdiction.

Based on nature of project and anticipated environmental impacts, the project has been categorized under Category "B", ADB SPS, 2009 and IEE report has been prepared and submitted to ADB, accordingly. Further as per legal requirement under Section 12 of Punjab Environmental Protection Act, 1997 (Amendment 2012) this project requires Environmental Approval from EPA Punjab. As a part of Conductance Main is passing through the federal territory of Islamabad, this project also requires

Environmental Approval from Pak EPA under Section 12 of Pakistan Environmental Protection Act, 1997. As per clause F, Schedule-II of Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000 of the acts ibid, the proposed project falls in category of projects requiring Environmental Impact Assessment (EIA) on the basis of project cost.

1.5 LOCATION OF THE PROJECT

The proposed project will be carried out in district Rawalpindi of Punjab Province.

The site of Chahan Dam is located on Sill Kas, a tributary of Sill River which ultimately falls into Soan River. The dam site is at a distance of about 5 km from Chahan village, 35 km south west of Rawalpindi City. Small Dams Organization (SDO), Irrigation and Power (I&P) Department has already completed the construction of Chahan Dam in 2022 and impoundment is in progress. This dam will feed water to irrigate about 12,000 acres and 6 MGD of raw water have been allocated for RWASA, to serve the recently included areas in WASA jurisdiction (PP-12). The water from Chahan dam is mainly used for irrigation as the main purpose of this dam was to use its water for irrigation. With development and conversation of land for housing colonies, the demand of irrigation water is reduced. Keeping in view of this point, RWASA has requested Irrigation Department to provide further 6 MGD water for drinking purpose from Chahan Dam. During the consultative meeting, held on 3rd December, 2022 at DC Office Rawalpindi under the chairmanship of Additional Deputy Commissioner (Finance & Planning) Rawalpindi Division, the representative of Small Dam Organization, Irrigation Department has agreed to fulfill the requirement of RWASA for 12 MGD, although the initial approval was for 6 MGD. Further, control fishing is going on in the dam. However, during the primary survey, the representative of Small Dam Organization and Fisheries department stated that the dead level of dam is very high and there will be no worth mentioning impact on the fish population even at the dead storage level of dam. Aerial view of Chahan Dan is shown in **Figure 1.2**.

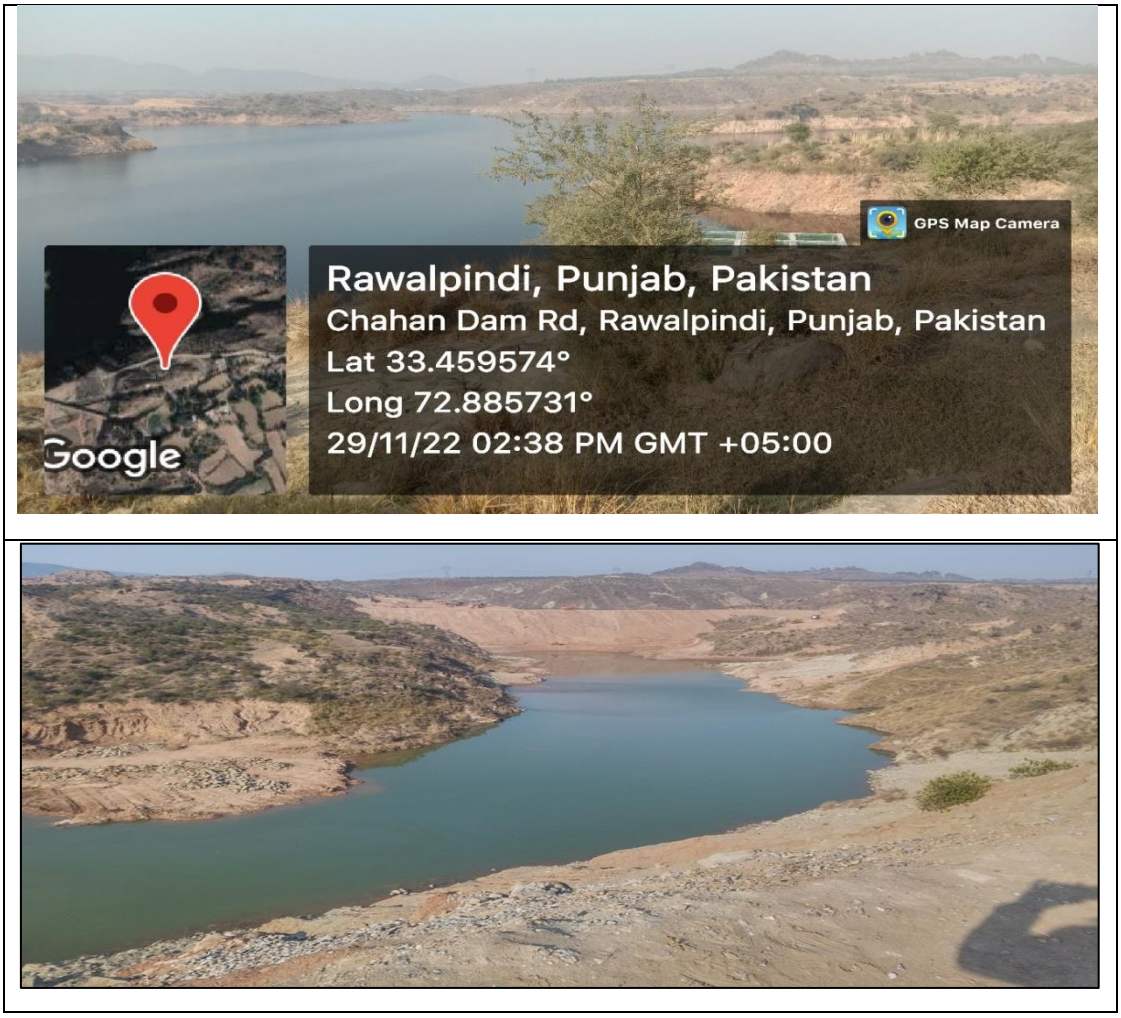


Figure 1. 2: Aerial View of Water Source (Chahan Dam)

Location plan of proposed intake structure is shown in **Figure 1.1**. In order to cover the seasonal fluctuations in the river discharges a multistage water withdrawal arrangement is being proposed. The low-level intake will ensure the supplies during the lean flows, whereas high level intake will be used during the normal to high flow periods.

Intake structure has been proposed to draw raw water from the Chahan Dam. Topography of the area between Chahan Dam and the proposed Treatment plant site does not allow gravitational flow. Raw water will have to be pumped for its treatment. From the intake, raw water main will transmit water to treatment plant by means of raw water pumps. To pump raw water through the intake there are two proposed options for the location plan of intake structure as follow:

- Build an Intake Tower Inside the Dam Reservoir
- Used Existing Intake Tower of Irrigation Department
- Location of Water Treatment Plant (WTP)

The location of WTP is proposed near dam site. The raw water will be pumped from dam intake structure to WTP through raw water pumping main and after its treatment, the treated water will be pumped through treated water main to Intermediate Pumping station (IPS) at Ranial. It is generally preferable to locate WTP near the Raw Water Source. It has advantage to pump treated water through the water main with less chances of any silt deposit in the pipeline. Wear and tear of high lift pumps will be less in this case.

The location plan of intake structure and water treatment plant is shown in **Figure 1.4.**

The treated water from WTP will be supplied to intermediate pumping station (IPS) at Ranial. These pumps deliver water to higher elevation site (Chakara). The storage tank at Chakra shall serve Chakra Union Council and also GSTs at Chakra for remaining areas of Chak Jalal Din, Lakhan, Dhaman Syedan and Kalyal through gravity.

The treated water from the tank shall be pumped to intermediate pumping station, from where one pipeline shall gravitate up to Dhamial ground storage tank and shall serve the Dhamial Union Council. The second force main from intermediate pumping station shall feed ground storage tank at Chakra. The storage tank at Chakra shall serve Chakra Union Council and also GSTs at Chakra for remaining areas serves the areas of Chak Jalal Din, Lakhan, Dhaman Syedan and Kalyal through gravity.

The sizing of raw water main has been based on the water allocated from the dam 126 MGD) considering that it will work for 24 hours to achieve maximum utilization. Since the length of the raw water main is only 900-1000 feet so the size has been worked out on hydraulic consideration only. Keeping in view the maximum velocity of 6 ft/sec, the size comes out to be 24 inches. The alignment of Conductance Mains is given **Figure 1.3**.

From WTP to Intermediate Pumping Station IPS length of treated water main from WTP to IPS is 13.6 KM. keeping in view the maximum velocity of 5 ft/sec, the size comes out to be 26 inches, which provides a velocity of 4.46 ft/sec.

From Intermediate Pumping Station (IPS) to Chakra Water Works as Dhamial area will be served from the IPS by gravity and the storage will be provided for Dhamial area at IPS so the remaining flows reaching at Chkara water works will be the total flow – Dhamial flow (11.13 cusec – 2.13 = 9 cusec). Therefore, the sizing of Treated Water Main from IPS to Chakra water works has been worked out considering that it

will work for 24 hours to achieve maximum utilization. Length of treated water main from IPS to Chakra water works is 8.43 KM. keeping in view the maximum velocity of 5 ft/sec, the size comes out to be 24 inches, which provides a velocity of 4.17 ft/sec.

The sizing of Gravity main from IPS to Dhamial has been based on the water demand of Dhamial area which is 1,196,629 Gallons per day. Size of Pipe comes out to be 16 inches in diameter.

The sizing of Gravity main from Chakra water works to different remaining areas has been based on the water demand of Chakra, Girja, Chak Jalal din, Dhama syedan, Lakhan and Kalyal which comes out to be 4,702,287 Gallons per day. High Density Polyethylene (HDPE) pipe is used for the Gravity Main.

Since the project area mostly consists of G.I and M.S pipe with diameter of 3 inches and less with the fact that the design life of G.I pipe is also low due to corrosion of the pipes as compared to other pipe materials and pipe diameters less than 3 inches also creates low terminal pressure to the end consumer therefore the system failing to meet the water needs of the residents. In the following project, the three outlet pipes lines will originate from the IPS Ranial (EL: 520m) including one gravity main from overhead reservoir (OHR) and two pumping main from ground storage tanks.

Furthermore, each UC of the water distribution area has its independent water supply line, which assures continuous supply of water to one UC without affecting supply to another UC.

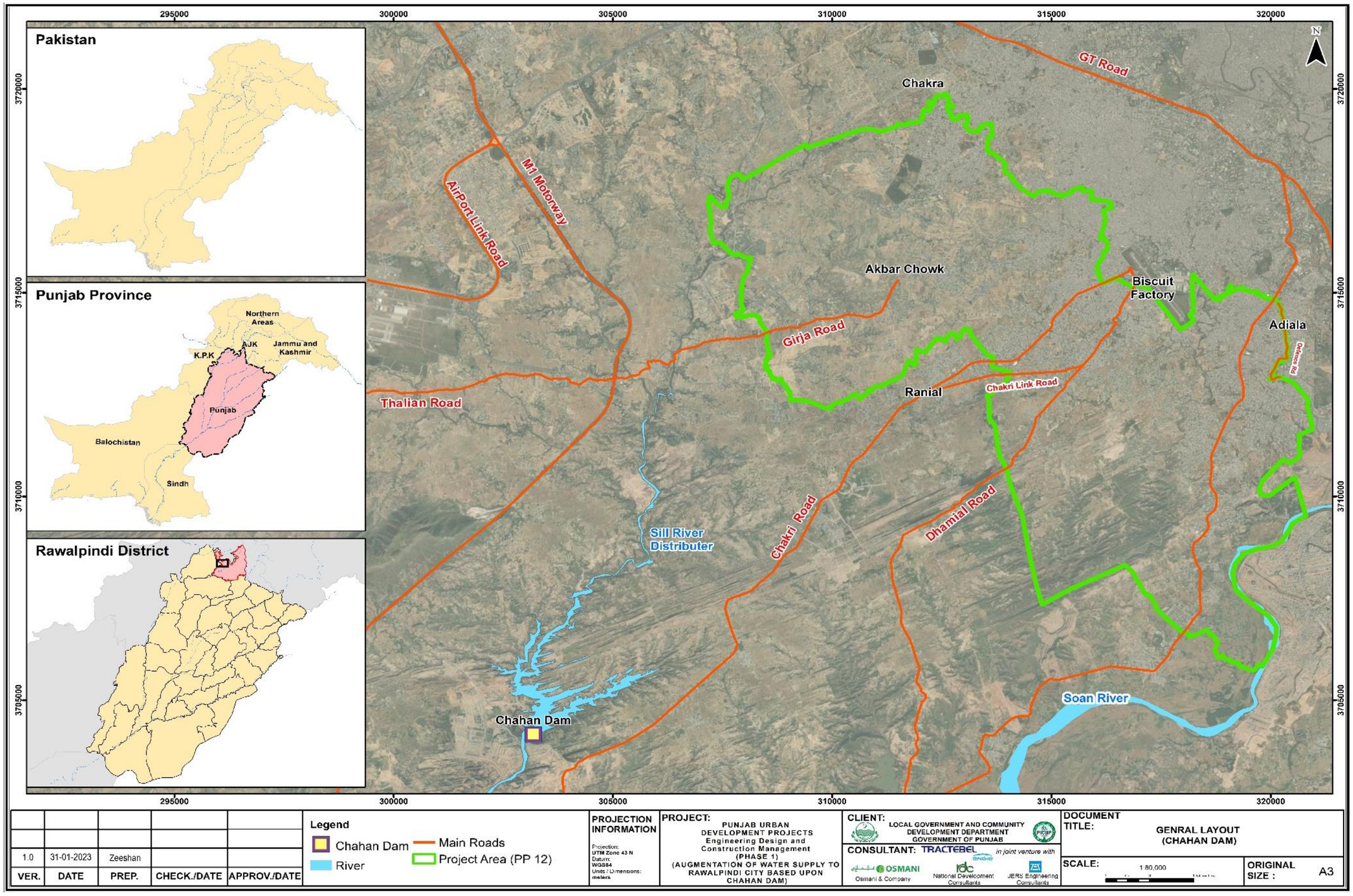


Figure 1. 3: Location Plan of water distribution area

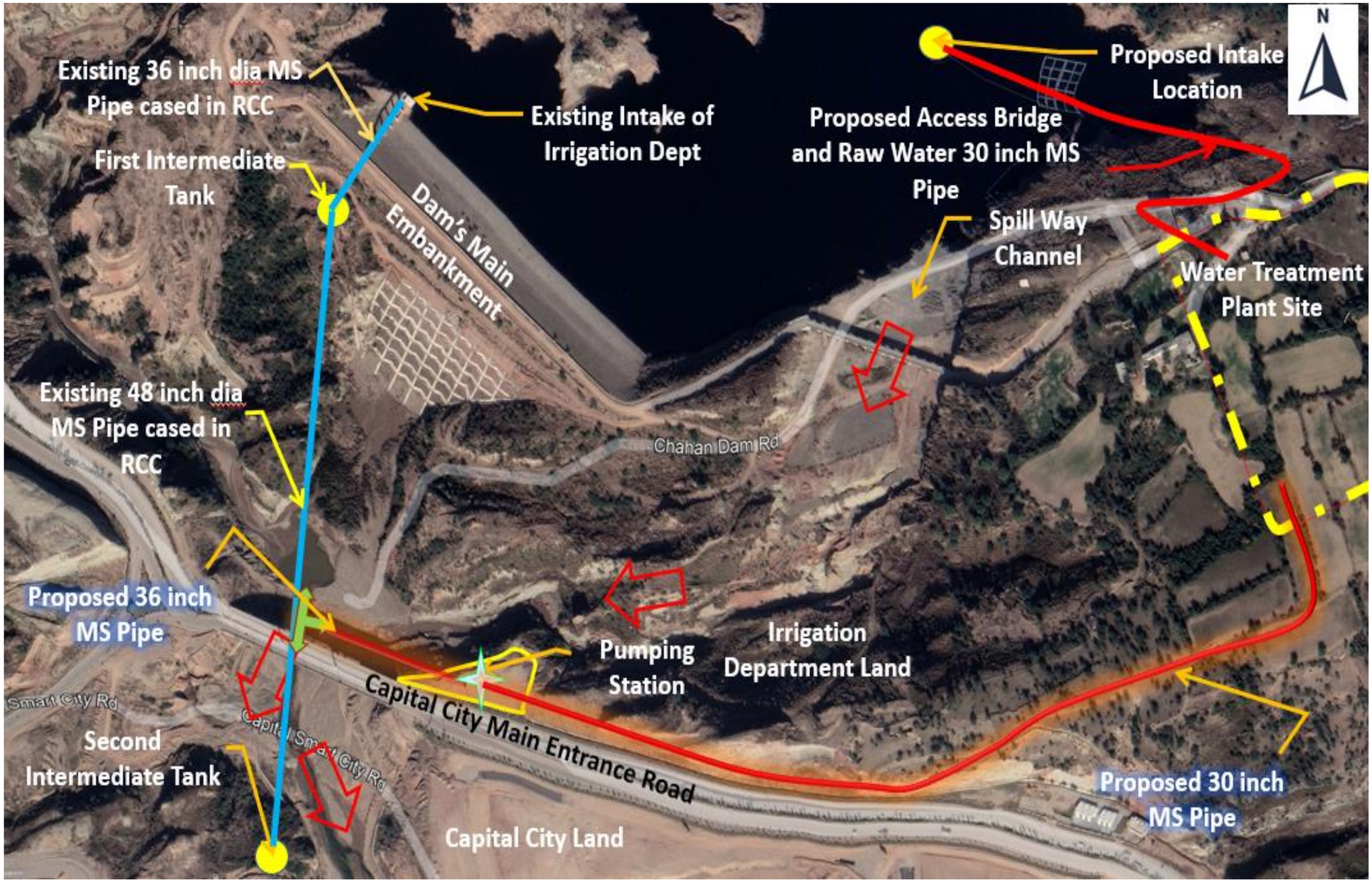


Figure 1. 4: Location plan of water extraction from Existing Intake to WTP

1.6 SCOPE OF STUDY

The prime objective of the EIA study is to fully meet the statutory requirements set forth by the EPA to obtain environmental approval.

The overall objective of this EIA report is to elucidate the anticipated aspects of the proposed intervention and to propose necessary mitigation measures to prevent/minimize adverse impacts on surrounding environment and community. To achieve this objective, an assessment of the existing environmental conditions of the project corridor is a prerequisite and therefore, included after collecting the baseline data of major environmental attributes acquired from secondary sources. This EIA has been prepared to ensure adequate environmental and social management during pre-construction, construction and implementation stages of the proposed project. It provides mechanisms to ensure that potentially significant environmental and social impacts of the proposed project are identified, assessed and mitigated as appropriate. More specific objectives of this EIA report are to:

Facilitate proponents of the project in ensuring environmental and social sustainability of the project;

- Establish a baseline of existing social and environmental conditions prior to project initiation by collecting secondary data/information on physical, biological and socio-economic environment of the project area;
- Identify potentially significant environmental and social impacts (both positive and negative) during all stages of the Project;
- Avoid, minimize, and suggest mitigation measures for significant adverse impacts;
- Conduct, record and report and ensure consultations with major stakeholders; and

Provide Environmental Management Plan (EMP) for all stages of the project as a tool for the implementation of the suggested measure along with monitoring and evaluation mechanism with adequate resources including implementing agencies capacity building.

1.6.1 Literature Review

The Consultants conducted a desktop study through collection and review of guidelines, data and reports related to the Project, that included (a) review of National

Environmental Legislations; (b) Google Earth Satellite Imagery; (c) Relevant District Census Reports (DCR) and any other relevant documents/drawings; and (d) Reference similar project IEE/ EIA documents.

1.6.2 Review of Environmental Laws and Institutional Requirements

The Project needs to comply with all the applicable environmental policies, laws, guidelines, acts and legislations of the Government of Pakistan and Punjab. International policy documents and Asian Development Bank Environmental Guidelines were also reviewed.

1.6.3 Delineation of Corridor of Impact (CoI)

As per the national regulations, impacts and risks have been analyzed within the project Corridor of Impact (CoI). The CoI of the project encompasses primary project site(s), the COI taken for conductance main is 100meter radius, along the route of conductance mains. Environmental impacts and risks will also be analyzed for all relevant stages of the project cycle, including pre-construction, construction and operation phases of the project.

1.6.4 Survey of CoI

A team of environmental and social experts, including Environmental Scientist, ecologist and sociologist carried out the baseline survey of the CoI to establish the potential impacts and categorization of activities. The key environmental sensitive receptors and stakeholders within the project area were identified. During survey, the information regarding the topography, soils, surface water, groundwater, flora and fauna, forested areas, social settings and villages/towns along the CoI was gathered. Physical, Biological and social baseline of the area was studies and stakeholder consultations were also conducted.

1.6.5 Impact Assessment and Mitigation Measures

A logical and systematic approach was adopted for impact identification and assessment. The process began during the screening and continued through scoping which identified the key issues and classified them into different categories. The tools, which were used for impact assessment, are:

- Checklists (Physical & Ecological);
- Matrices; and

- Overlays.

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

1.6.6 Environmental Management Plan (EMP)

An Environmental Management Plan (EMP) has been developed for effective implementation of the recommended mitigation measures. The EMP has included controls to minimize the identified impacts and monitoring program to monitor effect of mitigation measures implemented and residual impacts, if any, during implementation. The EMP has identified roles and responsibilities of all concerned parties during the implementation of the project.

1.6.7 Conclusions and Recommendations

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

1.7 PERSONS PERFORMING EIA STUDY

EIA study of the project has been conducted by ADB/PMU and EDCM team, according to the Review of IEE/EIA Regulations 2000, Pakistan Environmental Protection Agency (Pak EPA), Punjab Environmental Protection Act, 1997 [Amendment, 2012], and other relevant Regulations and completed this EIA Report. List of names with the roles of team members carrying out the EIA study is given in **Table 1.2.**

Table 1. 2: Team involved in the preparation of EIA Report

Members	Status in Project
ADB/PMU Team	
Mr. Saad Malik	ADB's Environmental Consultant
Mr. Aziz Karim	Individual Consultant (Environmental Consultant)
Mr. Waqas Afzal	Deputy Director (Social & Environmental Safeguards)
Syed Osama Faheem Rizvi	Assistant Director M&E, PMU
Ms. Shahnaz Kousar Khan	Assistant Director (Monitoring & Evaluation), PRF
EDCM Team	
Mr. Kevin Holroyd	Team Leader –EDCM
Mr. Farooq Khatak	Deputy Team Leader –EDCM
Asad Yaqoob	GIS Mapping Expert
Mr. Muhammad Mujahid	Project In charge -Environment Component
Dr. Nadeem	Ecological Expert
Ms. Rabia Rafiq	Environmentalist (IEE / EIA specialist)
Mr. Babar Ali	Environmentalist (IEE / EIA specialist)
Mr. Sami Ullah	Social Expert (Env. Team)
Ms. Shagufta Tahir	Female Enumerator
Mis. Komal Aroosh	Jr. Social Expert (Female Enumerator)

1.8 ROLES AND RESPONSIBILITIES

Role and responsibilities have been proposed in the EIA report. Proposed mitigation measures, as defined in the EMP will be primarily implemented by the management of the project with responsibilities assigned to various departments. Project Proponent will strictly adhere to implementation of all mitigation measures contained in this report in order to minimize any negative impact on any component of environment during and after execution of project. Institutional arrangements have been suggested in Chapter-7 of this document, so that proposed mechanism of environmental protection shall work in time.

1.9 ROLE OF ENVIRONMENTAL PROTECTION AGENCY, PUNJAB

The main responsibility of Environmental Protection Agency, Punjab will be to

monitor the mitigation measures, which will be taken up or implemented by **proponent**. EPA is endorsed to inspect compliance of sections 13, 14, 17, & 18 of IEE/ EIA Regulations, 2000, which enunciate the conditions for approval, confirmation of compliance, entry, inspection and monitoring of proposed project. Hence, EPA Punjab is the sole entity which is responsible to issue the necessary approval by exercising powers under section 12 of Punjab Environmental Protection Act 1997 [Amendment, 2012] after proper review of this EIA document.

1.10 ORGANIZATION OF EIA REPORT

The EIA report is divided into following chapter:

Executive Summary

Chapter 1: Introduction - "Introduction" describes introduction, location of project, objective and purpose of the EIA report

Chapter 2: Legal Framework - "Environment Legislative Requirements and Framework" elucidates the current legal framework including national and funding agency's guidelines which is applicable to the proposed project in the context of environment and sustainable development;

Chapter 3: Project Description – "Project Description" furnishes an overall description of the project, including its background, features and key components, timeframe and cost, Alternatives;

Chapter 4: Description of Environment - comprises a detailed narrative of the existing (baseline) conditions of the project area, with respect to its physical, biological and socio-economic environment;

Chapter 5: Stakeholder Consultation - provides summary of consultative sessions with the local community as well as with other stakeholders including local government officials for their opinions and suggestions on the project;

Chapter 6: Impact Identification & Mitigation Measures - elaborates the likely impacts of the project on the physical, biological and socio-economic environment during the construction and operation stages and lays down the proposed measures to mitigate the adverse impacts of the project;

Chapter 7: Environmental Management Plan - provides the mechanism to be adopted for the implementation of measures and monitoring the environment during all stages

Chapter 8: Findings and Recommendations - gives the conclusion of the impact assessment study and recommendations for the construction and operational stages Annexure

CHAPTER-2

POLICY, LEGAL & ADMINISTRATIVE FRAMEWORK

2.1 GENERAL

This chapter provides an overview of the policy framework and legislation that applies to control the environmental consequences as a result of project implementation and operation of project "Augmentation of Water Supply to Rawalpindi City based on Chahan Dam". The project needs to comply with all the applicable environmental policies, laws, guidelines, acts and legislations of Government of Pakistan and the provincial government as well as International Environmental Guidelines.

Guidelines for Environmental Assessment, Pakistan EPA: The Pak-EPA has published a set of environmental guidelines for conducting environmental assessments and the environmental management of different types of development projects. The guidelines that are relevant to the proposed project are listed below:

- Guidelines for the Preparation and Review of Environmental Reports, Pakistan, EPA1997;
- Guidelines for Public Consultations; Pakistan EPA May 1997;

2.2 EXISTING REGULATIONS AND LEGAL FRAMEWORK

According to environmental laws of the country development projects have to undergo the process of Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) in order to predict and mitigate the impacts of the development at an early stage. Based on nature, size, cost and associated impacts, the proposed project has been categorized for EIA Study according to the Regulation "4" of Statutory Notification issued on June 13, 2000 (S.R.O.339 (1) /2001). The Proposed Project is "Augmentation of Water Supply to Rawalpindi City based on Chahan Dam" in District Rawalpindi. As per **Schedule-II (Clause-I)** of the IEE / EIA Regulations 2000 made under section 12 of Punjab Environmental Protection Act, 1997 [Amendment, 2012] under which the Environmental Impact Assessment (EIA) is mandatory for getting Environmental Approval. The Director General, EPA Punjab is the authority to issue the requisite Environmental Approval after proper review of the project.

This EIA Study has been carried out in the light of the policy guidelines of the Government of Pakistan, under the procedures and practices formulated by the Provincial Environmental Protection Agency (EPA-Punjab).

2.3 RELEVANT LEGAL / INSTITUTIONAL FRAMEWORK

The applicable laws for the environmental study of the proposed project are briefly given below. The proponent of the proposed project will abide by the applicable laws and regulations.

2.3.1. NATIONAL CONSERVATION STRATEGY, 1992

Pakistan National Conservation Strategy (NCS), which was approved by the federal cabinet in March 1992, is the principal policy document on environmental issues in the Country. The NCS outlines the Country's primary approach towards encouraging sustainable development, conserving natural resources and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment.

The core areas that are relevant in the context of the proposed project are pollution prevention during construction and conserving biodiversity and forestry.

2.3.2. PAKISTAN LABOUR POLICY, 2010

The main objective of the Labor Policy, 2010 is the social and economic well-being of the labor of Pakistan. The Labor Policy, 2010 has following 4 parts:

- Legal Framework;
- Advocacy: rights of workers and employers;
- Skill development and employment; and
- Manpower export.

2.3.3. NATIONAL ENVIRONMENTAL POLICY 2005

In March 2005, Government of Pakistan (GoP) launched its National Environmental Policy, which provides a framework for addressing the environmental issues. Section 5 of the policy commits for integration of environment into development planning as instrument for achieving the objectives of National Environmental Policy. It also provides broad guidelines to the Federal Government, Provincial Governments, Federally Administered Territories and Local Governments to address their environmental concerns and to ensure effective management of their environmental resources.

Clause (b) of sub-section 5.1 states that Environmental Protection Act, 1997, will be diligently enforced for all developmental projects.

2.3.4. NATIONAL FOREST POLICY 2001

The goal of this policy is to foster the sustainable development of Renewable Natural Resources (RNR) in Pakistan, through maintenance and rehabilitation of these essential resources and enhancement of sustainable livelihoods of rural masses, particularly women, children and other deserving groups.

The various components of the policy include:

- Reducing poverty, powerlessness and unemployment;
- Population planning in critical ecosystems;
- Reducing the impact of socio-economic factors;
- Providing substitutes to firewood in the mountain-woods;
- Reducing political interferences in Forestry and Wildlife Departments;
- Renovating and invigorating the institutions of RNR;
- Supporting Local Governments in the sustainable development of their RNR;
- Policies for fragile ecosystems;
- Riverside forests;
- Irrigated plantations;
- Preservation of sensitive and unique forests;
- Wildlife conservation;
- Rangelands and desert ecosystems; and
- Planting trees and fodder on farmlands.

The proposed project does not pass through a Reserve Forest or other notified areas. However, other relevant components like wildlife conservation, planting trees will be applicable.

2.3.5. PAKISTAN ENVIRONMENTAL PROTECTION AGENCY, (REVIEW OF IEE AND EIA REGULATIONS, 2000)

These regulations set out:

- Key policy and procedural requirements for filing an EIA / IEE;
- The purpose of environmental assessment;
- The goals of sustainable development;
- The requirement that environmental assessment be integrated with feasibility studies;
- The jurisdiction of the Federal and Provincial EPA's and Planning &Development (P&D) Departments;

- The responsibilities of proponents;
- Duties of responsible authorities;
- Provides schedules of proposals that the project requires either IEE or an EIA;
- The environmental screening process of the projects under schedule I, II and III; and
- The procedure for the environmental approval for filing the case with the concerned EPA for the granting of the NOC.

The proposed project falls under the Category 'F' of "Water Supply and Treatment" of the Schedule II. This category requires an EIA study to be conducted to initiate the process of environmental approval.

2.3.6. GUIDELINES FOR THE PREPARATION AND REVIEW OF ENVIRONMENTAL REPORTS, 1997

These guidelines describe the format and content of IEE/EIA reports to be submitted to PEPA for obtaining NOC/approval.

- The guidelines present:
- The environmental assessment report format;
- Assessing impacts;
- Mitigation and impact management and preparing an environmental management plan;
- Reporting;
- Review and decision making;
- Monitoring and auditing; and
- Project Management.

The guidelines are applicable for the preparation of the EIA.

2.3.7. PUNJAB ENVIRONMENTAL QUALITY STANDARDS (PEQS)

The Punjab Environmental Quality Standards (PEQS), 2000 & 2010, specify the following standards:

- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities, and the sea (three separate sets of numbers);
- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources;

- Maximum allowable concentration of pollutants (two parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles;
- Maximum allowable noise levels from vehicles; and
- Maximum allowable concentration of parameters in drinking water.

2.3.8. NATIONAL CLIMATE CHANGE POLICY, 2012

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

The policy cover measures to address issues in various sectors such as water, agriculture, forestry, coastal areas, biodiversity and other vulnerable ecosystems.

Notwithstanding the fact that Pakistan's contribution to global Greenhouse Gas (GHG) emissions is very small, its role as a responsible member of the global community in combating climate change has been highlighted by giving due importance to mitigation efforts in sectors such as energy, forestry, agriculture and livestock.

Furthermore, appropriate measures relating to disaster preparedness, capacity building, institutional strengthening; technology transfer; introduction of the climate change issue in higher education curricula; ensuring environmental compliance through Initial Environmental Examinations (IEE) and Environmental Impact Assessments (EIA) in the development process; addressing the issue of deforestation and illegal trade in timber; promoting Clean Development Mechanisms (CDM); and raising Pakistan's stance regarding climate change at various international forums, have also been incorporated as important components of the policy.

The policy thus provides a comprehensive framework for the development of Action Plans for national efforts on adaptation and mitigation.

This policy document is a 'living' document and will be reviewed and updated regularly to address emerging concepts and issues in the ever-evolving science of climate change.

This policy will accelerate due to the emissions from the construction machinery.

2.3.9. NATIONAL WATER POLICY 2018

This first ever water policy was unanimously approved in April 2018 by Council of Common Interest (CCI). The Policy aims at efficient management and conservation of existing water resources, optimal development of potential water resources, steps to minimize time and cost overruns in completion of water sector projects, equitable water distribution in various areas and canal commands, measures to reverse rapidly declining groundwater levels in low-recharge areas, increased groundwater exploitation in high-recharge areas, effective drainage interventions to maximize crop production, improved flood control and protective measures, steps to ensure acceptable and safe quality of water, minimization of salt build-up and other environmental hazards in irrigated areas, institutional reforms to make the managing organizations more dynamic and responsive.

The policy covered all water related issues, including water uses, allocation of priorities, integrated planning for development, use of water resources, environmental integrity of the basin, impact of climate change, trans boundary water sharing, irrigated and rain fed agriculture, drinking water and sanitation, hydropower and industry, groundwater, water rights & sustainable water infrastructure, water related hazards, quality management, awareness, conservation, legal and capacity building of infrastructure.

This policy will be applicable as the proposed Project utilized water from Chahan Dam and its distribution to the public.

2.3.10. NATIONAL DRINKING WATER POLICY, 2009

The National Drinking Water Policy provides a framework for addressing the key issues and challenges facing Pakistan in the provision of safe drinking water to the people. Drinking water is the constitutional responsibility of the provincial governments and the specific provision function has been devolved to specially created agencies in cities and Town and Tehsil Municipal Administrations under the Local Government Ordinance 2001.

This policy will be applicable as the proposed Project is about the provision of drinking water residents of the project area.

2.3.11. PUNJAB WILDLIFE PROTECTION ACT, 1974

The Punjab Wildlife Act (1974) is developed for the regulation of activities relating to protection, conservation and management of wildlife in Punjab.

The proposed project involves the cutting of trees which may result in loss of habitat; therefore, the provisions of this law are applicable.

2.3.12. PUNJAB FOREST ACT (Amended), 2010

The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests. There is no protected forest situated in and around the Project area.

Therefore, this Act will not be triggered as there is no protected forest situated in the Project area.

2.3.13. PUNJAB ENVIRONMENTAL QUALITY STANDARDS (PEQS), 2016

PEQS promulgated recently in 2016. Specified standards under PEQS are for:

- Drinking Water;
- Ambient Air; •Noise;
- Industrial Gaseous Emissions;
- Municipal and Liquid Industrial Effluents;
- Motor vehicle exhaust and noise; and
- Treatment of Liquid and Bio-Medical Waste.

All projects to be implemented in Punjab must conform to PEQS during all the phases i.e. construction and operation.

2.3.14. PAKISTAN PENAL CODE, 1860

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

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

2.3.15. THE PUNJAB OCCUPATIONAL SAFETY AND HEALTH ACT, 2019

This Act entails provision of occupational safety and health of the workers at workplace and to protect them against risks arising out of the occupational hazards; to promote safe and healthy working environment catering to the physiological and psychological needs of the employees at workplace.

The Act will trigger during construction and operational phase to ensure health and safety of workers at workplace associated with the project activities.

2.3.16. PUNJAB PLANTATION AND MAINTENANCE OF TREES ACT, 1974

The Punjab Plantation and Maintenance of Trees Act, (1974) regulates tree plantations and enforces measures for their protection.

The requirements of this act are applicable in terms of planting new trees and their maintenance by the occupier of the existing land who would have the physical possession.

2.3.17 Pakistan Climate Change Act, 2017

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

This Act will accelerate due to the emissions from the construction machinery.

2.3.18 National Clean Air Act, 2000

The Act aims to control vehicular emissions, pollution from industry, and indoor air pollution in rural and urban areas.

This Act will trigger if vehicles and machinery used for construction activities emanate air pollutants above the permissible limit.

2.3.19 Seismic Building Code of Pakistan 2007

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

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

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

2.3.20 Land Acquisition Act (LLA), 1894 Including Later Amendments

The Land Acquisition Act, 1894, is a "law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be paid on account of such acquisition". The exercise of the power of acquisition has been limited to public purposes. The principles laid down for the determination of compensation, as clarified by judicial pronouncements made from time to time, reflect the anxiety of the law-giver to compensate those who have been deprived of property, adequately. The land needed for the construction of development projects will be acquired under normal conditions based on prevailing market prices or negotiated prices between client and the owners of land. Section 17(4) of the LAA will not be used in the absence of an emergency. Instead, the land will be purchased under willing-seller willing-buyer deal at agreed upon market rates and the seller will have the option not to sell the land, in case an acceptable deal for both the parties is not reached.

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

2.3.21 Punjab Municipal Water Act, 2014

The basic aim of the Act is to recognize, regulate and manage present and future municipal water supply and sanitation services and to establish rights of access to basic water supply and basic sanitation, and to ensure conservation of water resources in the Province. This Act is in draft stage.

This Act will elicit if there is misappropriation of water supply during construction activities.

2.3.22 Fisheries Act, 1897

This Act aims at the protection of fish in water bodies by rules of State Government.

This Act will be applicable due to presence of species of fish in Chahan Dam.

2.3.22 The Punjab Occupational Safety and Health Act, 2019

This Act entails provision of occupational safety and health of the workers at workplace and to protect them against risks arising out of the occupational hazards; to

promote safe and healthy working environment catering to the physiological and psychological needs of the employees at workplace.

The Act will trigger during construction and operational phase to ensure health and safety of workers at workplace associated with the project activities.

2.3.23 Cutting of Trees (Prohibition) Act, 1975

The Act was enforced in 1975 to place restrictions on cutting of trees in order to restrain unchecked trend of tree felling without replacement plantations.

This act will be applicable to the subject project where the cutting of tree will be involved.

2.3.24 Pakistan Antiquities Act 1975 & Punjab Antiquities Amendment Act 2012

The Punjab Antiquities Amendment Act, 2012 is adopted from the Pakistan Antiquities Act of 1975 with a few minor changes. The Antiquities Act, 1975 (amended in 1990) states the following:

- **"**Ancient" is any object that is at least 75 years old;
- All accidental discoveries of artefacts must be reported to the Federal Department of Archaeology;
- The Government is the owner of all buried antiquities discovered on any site, whether protected or otherwise;
- All new construction within a distance of 200 feet from protected antiquities is forbidden;
- No changes or repairs can be made to a protected monument, even if it is owned privately, without approval of the responsible authorities; and
- The cultural heritage laws of Pakistan are uniformly applicable to all categories of sites regardless of their state of preservation and classification as monuments of national or world heritage.

The law will be applicable to the project mainly due to its two provisions:

According to the law, any construction activity within 61 m or 200 ft. of protected antiquities, are prohibited.

The provisions of this act would also be applicable, if any accidental archaeological discoveries may occur during the excavation works for the construction of proposed Project.

2.3.25 Punjab Environmental Protection 1997 (Amended) Act, 2017

The Punjab Environmental Protection Act, 1997 (Amended, 2017) is comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment. The 'environment' has been defined in the Act as: (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social and economic conditions affecting community life; and (g) the interrelationships between any of the factors specified in sub-clauses 'a' to 'f'.

The notable points of the law are:

- No proponent of a project shall commence construction or operation unless he has filed an EIA / IEE with the Provincial Agency designated by the Provincial EPAs an EIA / IEE, and has obtained an approval;
- Establishment and formation of the Punjab Environmental Protection Council (PEPC);
- Prohibition of certain discharges or emissions;
- Punjab Environmental Quality Standards (PEQS) for wastewater, air emissions and noise; and
- Provincial Government can issue notices and enforce them to protect the environment.

In the amendment of 2012, legislatives powers related to environment and ecology are given to provincial governments from the Federal government. The provinces are required to enact their own legislation for environmental protection. Other amendments include increasing the penalties for violations.

For the proposed Project, Environmental Protection Department (EPD)/Environmental Protection Agency (EPA), Government of Punjab (GoPb) is the concerned authority. The capability of regulatory institutions for environmental management is ultimately responsible for the success of environmental assessments and that development projects are environmentally sound and sustainable.

The provision of the act is applicable to proposed Project for conducting an IEE/EIA according to section 12 and to obtain environmental approval from the EPA.

The section 11 of the act is applicable in term of compliance with Punjab Environmental Quality Standards (PEQS). Similarly, section 13 of the act prohibits the import of hazardous waste.

The provisions of section 16 are also applicable to comply with the discharge or emission of any effluent, waste, air pollutant or noise or disposal of waste or handling of hazardous substance. Under section 17, penalties will apply if anyone fails to comply with the provisions of section 11, 12, 13 and 16.

CHAPTER-3

PROJECT DESCRIPTION

3.1 TYPE AND CATEGORY OF PROJECT

The Project will be financed by the Asian Development Bank and Government of Punjab (GoPb), while Local Government and Community Development (LG&CD) Department, will be the Executing Agency (EA). The Engineering Design and Construction Management (EDCM) has been engaged to provide consultancy services for conducting Feasibility Study to treat, transport and distribute a daily raw water withdrawal of around 12 MGD (54,553 m^3/d) water from Chahan Dam to meet the future shortage of the water supply-demand of the newly added UCs under the WASA's jurisdiction. WASA Rawalpindi is in process to enhance the water withdrawal from the Chahan dam other than the allocated water share (12 MGD). The aim of the Project is to supply potable/treated water to the areas recently added in WASA service delivery jurisdiction. These areas comprise of Dhamial, Quaid-e-Azam Colony, Girja, Dhama Syedan, Lakhan (Lalarukh), Chak Jalal Din, Kalyal, Chakra and adjoining areas.

The details of the proposed Project, project components, design considerations, construction aspects, and operation and maintenance activities are discussed below.

The proposed project falls under administrative jurisdiction of the District Rawalpindi, Punjab province.

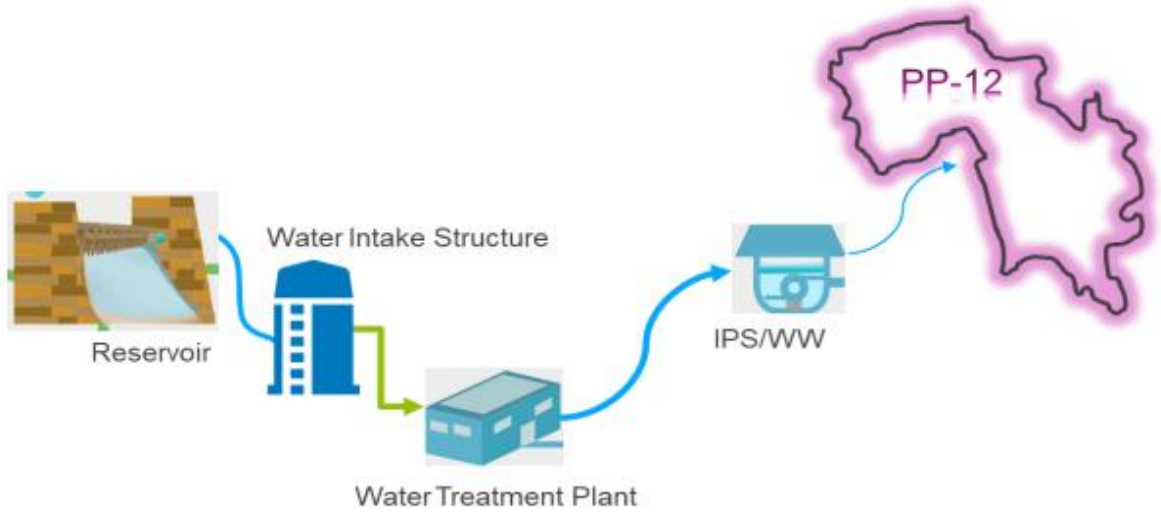


Figure 3. 1: Basic Concept of the Project

The basic idea of the project is to use the Chahan dam water intake structure as the raw water source. From the intake, 12 MGD raw water will transmit water to

treatment plant (WTP) by means of raw water pumps. After treatment, the treated water from the WTP will the dispense to the water distribution areas (PP-12 RWASA Zone) with the help of intermediate pumping station (IPS), water works (WW), conductance and gravity mains as shown in **Figure 3.1.**

The Basic Component of the project are:

- Raw water intake structure
- Water treatment plant
- Intermediate pumping station and Water Works comprises on;
- Under Ground Storage Tanks
- Over Head Reservoirs
- Conductance main and Gravity mains
- Distribution networks system consist of;
- Distribution Pipe network
- Water metering
- House connections

To transmit 12 MGD water from intake structure to water treatment plant, an appropriate pumping station is proposed. The pumping station will comprise of vertical turbine pumps, valves and other appurtenances. The Intake Structure of Irrigation Department will be used to extract water from Chahan Dam.

It is proposed that the 12 MGD water will extract by using the existing intake tower built by Irrigation dept. for irrigation purpose. Irrigation Department has already laid down a pipe line of MS pipe of 36 inch dia encased in RCC from the water intake tower through the dam embankment towards the first intermediate tank for water withdrawal purpose. Another pipeline of 48 inch dia has been laid from first intermediate tank towards the second intermediate tank for additional water supply.

The main idea of this proposed design is as follow

- A tee connection will be installed in existing pipeline at an approximate distance of 270 m near to the washout from the first intermediate tank towards the second intermediate tank.
- From the Tee connection a pipeline of 240 m will be laid down towards the booster pump station
- The booster pump station will be installed at a nearby vacant land of irrigation

dept. Booster pump station will be design on horizontal Centrifugal inline pumps with 3 No of Pumps of (2W+1S). Flow of each pump will be 11.6cusec with a head of 60 m.

- From the booster pump a pipeline of 762 m with a velocity of 1.26 m will be installed towards the treatment plant having dia of 32 inch of MS Pipe.

The layout of proposed intake structures is shown in **Figure 3.2**.

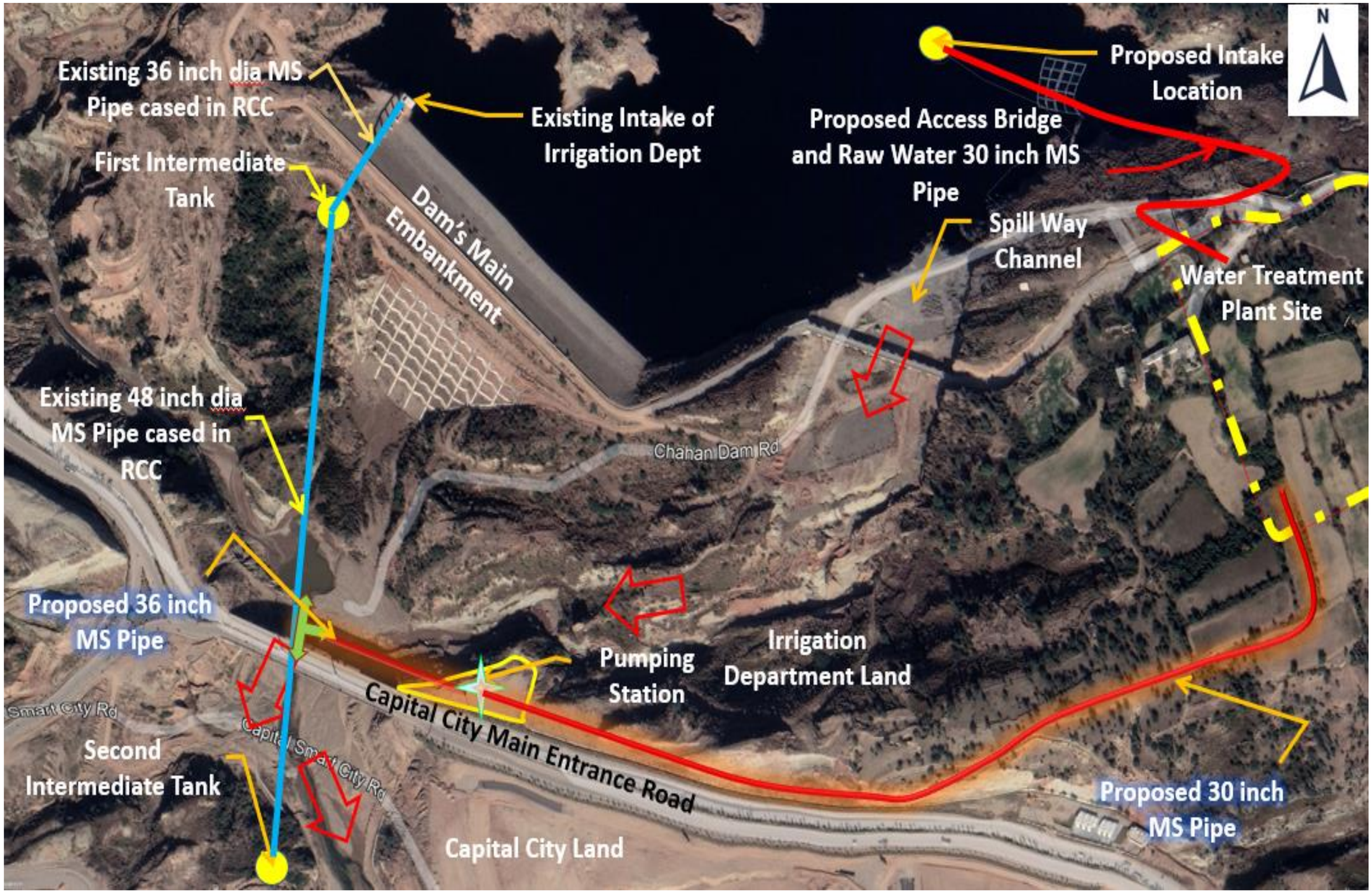


Figure 3. 2: Location plan of water extraction from Existing Intake to WTP

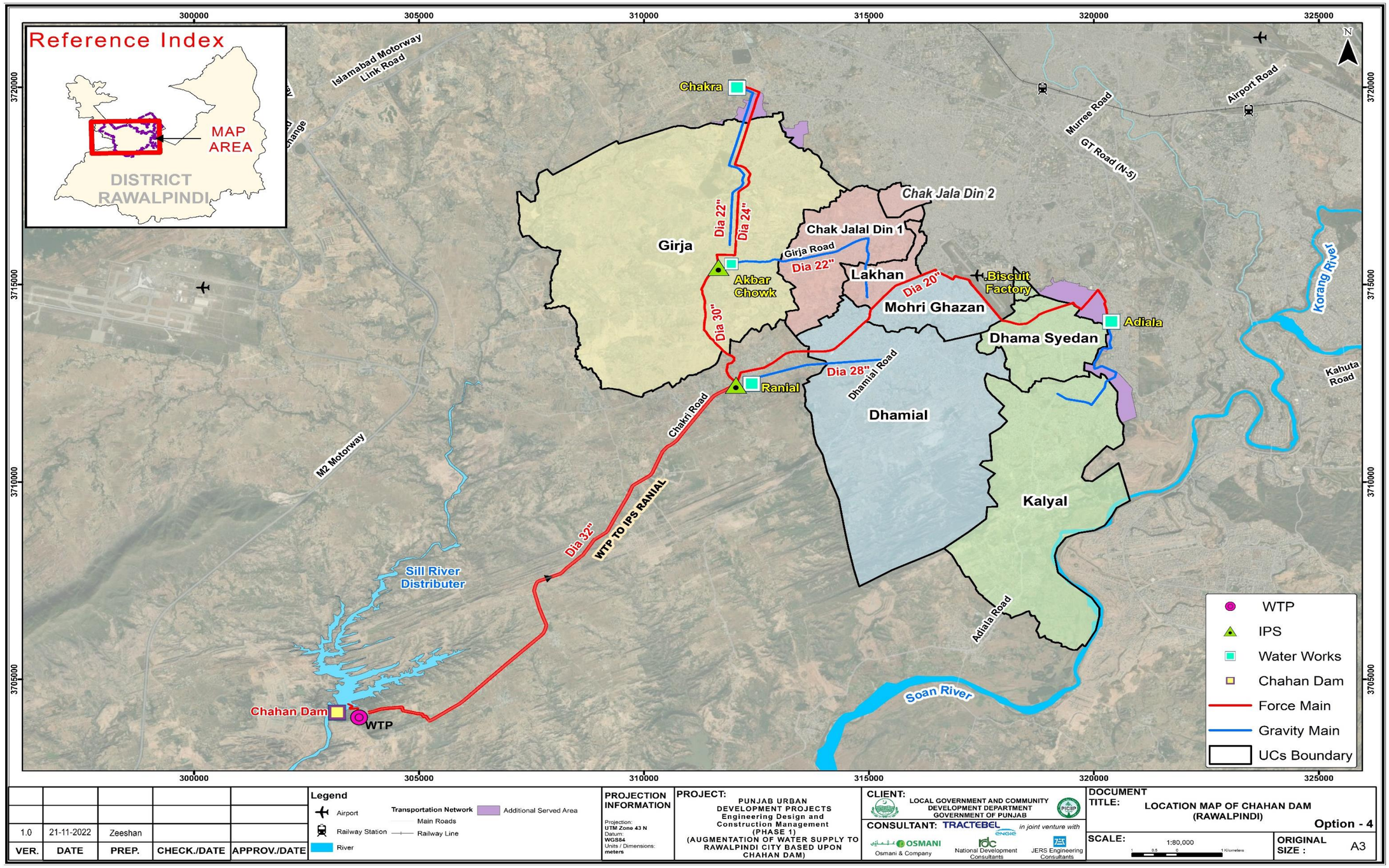


Figure 3. 3: Location of Conductance Mains, WTP, IPS and Water Works

The source of water supply for the project area will be raw surface water from Chahan dam. Surface water normally contains significant concentrations of various impurities, like suspended solids and bacteriological contamination, rendering it unfit for human consumption. The raw water will hence require proper treatment as per WHO standards and other Guidelines before supply to the consumers. The location of WTP should ideally be close to the raw water source. Treatment of the raw water near the intake structure site will be result in lesser pumping and water transmission effort, reduced pipe diameter, elimination of the possibility of corrosion and pipe choking due to silt load. The water treatment plant will consist of raw water storage tanks, treatment plant units and treated water storage tanks.

The proposed water treatment plant site is far away from the water distribution area. Therefore, to regulate the water supply in the water distribution area and to avoid the high size pumps a pressure breaker has been required at the highest elevated point which should be nearest to the water distribution area. For this purpose, an intermediate pumping station (IPS) has been proposed at the Chakri road near to the Ranial village at an elevation level of 522m. The intermediate pumping station will comprise of ground storage tank, pumping station and overhead tanks.

The water works proposed under this project will be located at Akbar Chowk, Chakra and Adiala. These water works will have underground water storage tanks and overhead reservoirs for distribution of water to nearby community. The Raw Water (12 MGD) from intake will be delivered to the Water Treatment Plant (WTP) through a conductance main (32-inch MS pipe) with an approximate length of 633m.The treated water will be transferred to the Intermediate Pumping Station (IPS) at Ranial by another conductance main (32-inch MS pipe) with an approximate length of 13.4 km. The Schematic Diagram of the whole water conductance system is (transmission of raw water from intake structure to Water Treatment Plant (WTP) and then treated water from WTP to Intermediate Pumping Station (IPS) and then finally to water works) is shown in **Figure 3.3**.

The construction activity has to span over approximately twenty-four months. There shall be a number of contracts for a variety of works. The selected Contractors shall have the option to select suitable site(s) located near the project sites to establish his labor camps. If private land is selected, the contractor shall enter into contract with the private owner. During construction phase, an estimated 100-150 persons consisting of

both semi-skilled and skilled human resource will be required. An estimated cost of the proposed project is **PKR 18,879 Million.**

Based on nature of project and anticipated environmental impacts, the project has been categorized under Category "B", ADB SPS, 2009 and IEE report has been prepared and submitted to ADB, accordingly. Further as per legal requirement under Section 12 of Punjab Environmental Protection Act, 1997 (Amendment 2012) this project requires Environmental Approval from EPA Punjab. As a part of Conductance Main is passing through the federal territory of Islamabad, this project also requires Environmental Approval from Pak EPA under Section 12 of Pakistan Environmental Protection Act, 1997. As per clause F, Schedule-II of Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000 of the acts ibid, the proposed project falls in category of projects requiring Environmental Impact Assessment (EIA) on the basis of project cost. Therefore, Environmental Impact Assessment (EIA) is prepared for submission to EPA Punjab and to obtain NOC from EPA.

3.2 OBJECTIVES OF THE PROJECT

The overall objective of the Project is to improve quality of life, the improved environmental conditions of Rawalpindi and adjoining areas, thereby creating favorable environments for better and improved living conditions. More specifically the Project intends to improve community health, and reduce environmental degradation in Rawalpindi; by improving the quality and quantity of water supply. The project is expected to improve the living conditions and quality of life of residents living in areas recently included in Rawalpindi WASA jurisdiction. The main objectives of the Project are summarized below:

- To augment water for present and future needs;
- To address water scarcity and poor condition of water supply;
- To mitigate the problem of contaminated water being supplied to the residents of the city;
- Reduction in the O & M expenditure of WASA;
- To improve the overall environment of the city with the provision of sufficient water to the poor and low-income people;
- To devise effective measures for suitable quality control of water supply system from health consideration and pollution control; and

- To design a system to integrate various sources of water supply for alternate use in case of break down.

For more details, please refer to "1-Introduction-Nature and size of the project" above.

3.3 ALTERNATIVES CONSIDERED & THEIR REASON OF REJECTION

The discussion and analysis of alternatives considers other practicable strategies that will promote the elimination of negative environmental impacts identified. This section is critical in consideration of the ideal development with minimal environmental disturbance.

The report identifies potential environmental impacts of each alternative, develops comparative analysis matrix with respect to water supply distribution network and water treatment methodology and suggest the most feasible alternative that can be taken up for development.

Alternative for Intake Structure

There are two options for intake structure. Following is the detail for the two options;

Design Option 1 (Build an Intake Tower Inside the Dam Reservoir)

Design Option 2 (Used Existing Intake Tower of Irrigation Dept.)

Design Option 1 (Build an Intake Tower Inside the Dam Reservoir)

In design option 1 it is proposed that a new intake tower will be built inside the Dam reservoir near to WTP site. The location plan with proposed design of the intake structure is given in **Figure 3.4** and **Figure 3.5** and **Figure 3.6** respectively. To transmit 12 MGD water from intake structure to water treatment plant, an appropriate pumping station is proposed. The pumping station will comprise of vertical turbine pumps, valves and other appurtenances.

To get ensured supplies round the year and to cover the seasonal fluctuations in the river discharges, pumps are proposed at three different level i.e., normal level, middle level and dead level

- Dead-level intake pumps at an El. 415 m (sufficiently close to the lowest river bed level)
- Middle -level intake pumps at an El. 422 m (close to the normal pond level in Dam)
- Highest level intake pumps at an El.430 m

The low-level intake pumps will ensure the supplies during the lean flows, whereas high level intake pumps will be used during the normal to high flow periods. Control panel for the operation of pumps will be provided and fixed in a masonry chamber constructed at the bank of the reservoir at least 15 m above the Highest Flood Level (HFL) i.e.,430m.

An access bridge towards the approach road is also being proposed for carrying logistics to the intake site during and after the completion of works.

Merits

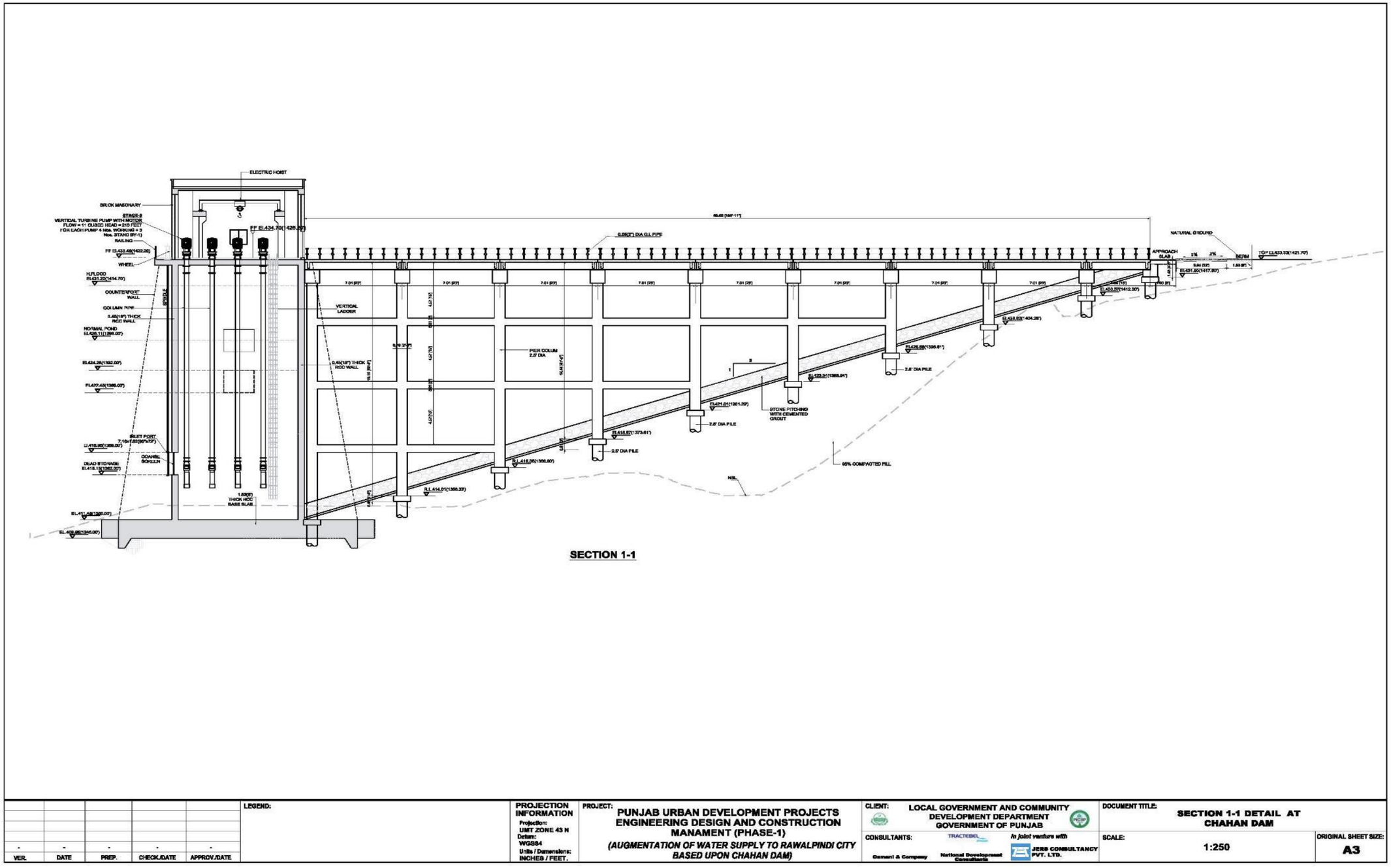
There will be separate operating system available for the withdrawal of water.

Demerits

- Construction and O&M cost will be high
- Construction period requires time for the construction of intake tower and access bridge
- A coffer dam will have to build for the construction of this option.



Figure 3. 4: Location plan of Intake and WTP



SECTION 1-1

					LEGEND:	PROJECTION INFORMATION Projection: UMT ZONE 43 N Datum: WGS84 Units / Dimensions: INCHES / FEET.	PROJECT: PUNJAB URBAN DEVELOPMENT PROJECTS ENGINEERING DESIGN AND CONSTRUCTION MANAMENT (PHASE-1) *(AUGMENTATION OF WATER SUPPLY TO RAWALPINDI CITY BASED UPON CHAHAN DAM)*	CLIENT: LOCAL GOVERNMENT AND COMMUNITY DEVELOPMENT DEPARTMENT GOVERNMENT OF PUNJAB	DOCUMENT TITLE: SECTION 1-1 DETAIL AT CHAHAN DAM
-	-	-	-	-				CONSULTANTS: Gamuel & Company, TRACTEBEL, National Development Consultants, *In joint venture with* JERS CONSULTANCY PVT. LTD.	SCALE: 1:250
VER.	DATE	PREP.	CHECK./DATE	APPROV./DATE					ORIGINAL SHEET SIZE: A3

Figure 3. 5: Intake Structure and Access Bridge

Design Option 2 (Used Existing Intake Tower of Irrigation Dept)

In option 2 it is proposed that the 12 MGD water will extract by using the existing intake tower built by Irrigation dept. for irrigation purpose. Irrigation dept has already laid down a pipe line of MS pipe of 36 inch dia encased in RCC from the water intake tower through the dam embankment towards the first intermediate tank for water withdrawal purpose. Another pipeline of 48 inch dia has been laid from first intermediate tank towards the second intermediate tank for additional water supply.

The main idea of this proposed design is as follow

- A tee connection will be installed in existing pipeline at an approximate distance of 270 m near to the washout from the first intermediate tank towards the second intermediate tank.
- From the Tee connection a pipeline of 240 m will be laid down towards the booster pump station
- The booster pump station will be installed at a nearby vacant land of irrigation dept. Booster pump station will be design on horizontal Centrifugal inline pumps with 3 No of Pumps of (2W+1S). Flow of each pump will be 11.6cusec with a head of 60 m.
- From the booster pump a pipeline of 762 m with a velocity of 1.26 m will be installed towards the treatment plant, having dia of 32 inch of MS Pipe.

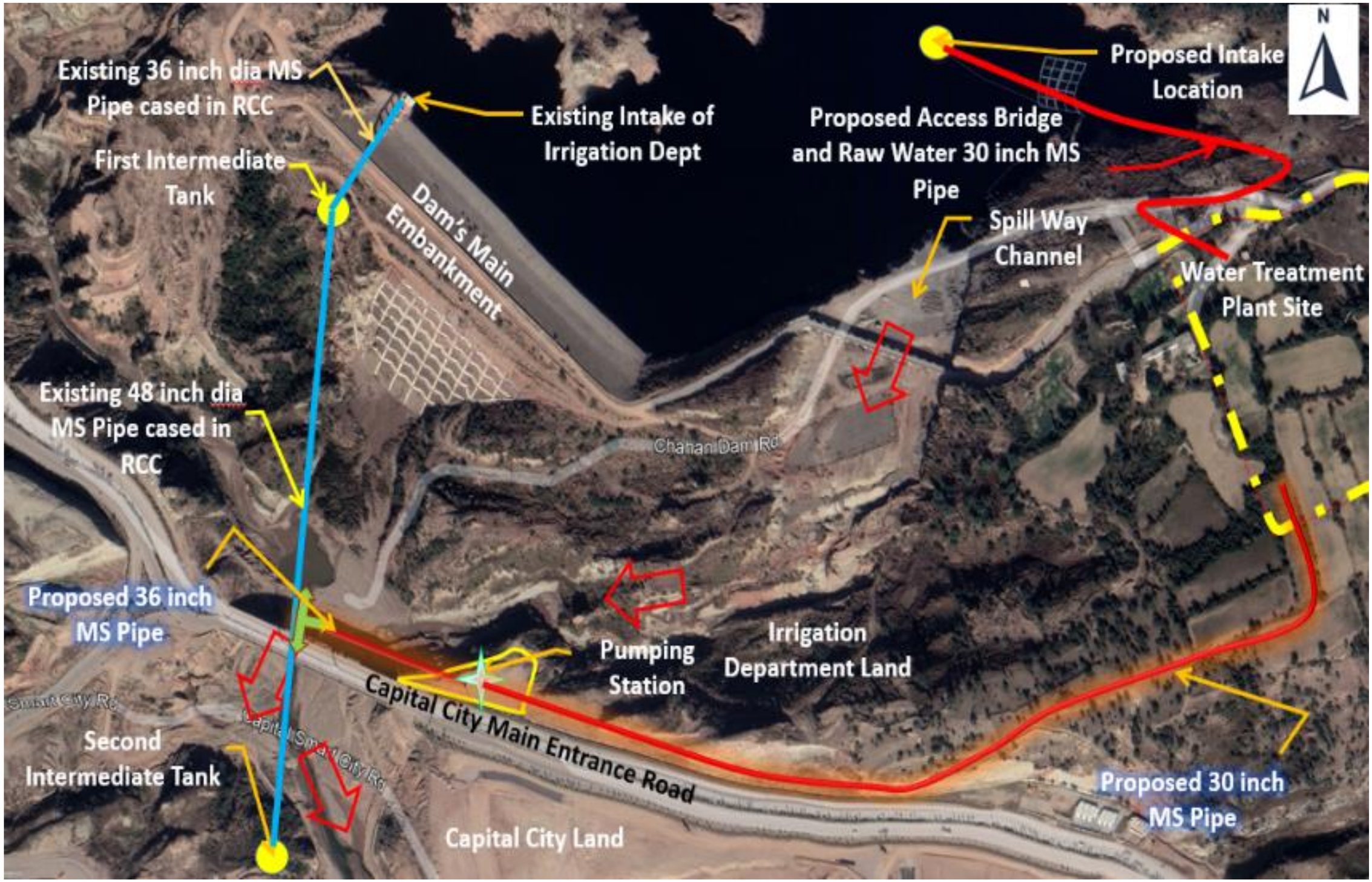


Figure 3. 6: Location of Water Extraction from existing Intake of Irrigation Department to WTP

Merits

- Easy to execute
- Construction and O&M cost will be low as compared to option 1

Demerits

- Extra land will be required for the booster pump station

Recommendation

Option 2 will be most feasible option after getting the NOC from irrigation dept. due to the low construction and O &M cost and easy to operate system.

Comparison / Analysis of Alternatives

The comparison between all proposed options based on environmental, social and economic impacts is described in **Table 3.1**. The alternative to be selected must qualify the basic criteria of cost effectiveness, environmentally sustainable and socially acceptable.

Table 3. 1: proposed options based on environmental, social and economic impacts

Parameters	Option-1	Option-2
Cost	It would be most expensive option as it will involve construction of huge intake structure inside the dam/water reservoir. Operation and maintenance cost will also be high.	This would comparatively involve less cost as existing intake structure being utilized for Irrigation purposes will be utilized. O&M cost will be less as compared with option-1.
Environmental Aspects	As a new structure will be constructed inside dam/water reservoir therefore, there are more chances for the envisaged impacts on the aquatic life. Also, there are more chances of turbidity and siltation.	As the existing intake structure would be utilized only with few construction activities with no chances of impacts on aquatic life, water turbidity and siltation. However, this involves the excavation activity for the laying of water pipes till the water treatment plant.
Social Aspects	Minimum disturbance is expected to local community as the intake structure is closer to the water treatment plant.	As extra land will be required and during construction/laying of pipe, excavation will be done which may hinder the social activities in the area.

Recommended Option:

Option 2 will be most feasible option keeping in view the above comparative analysis.

Alternatives for Water Supply Distribution to PP-12

The treated water from IPS Ranial will further distribute into the distribution area (RWASA PP12). For this purpose, different options have been studied for the conveyance system from IPS Ranial to water distribution area.

Following alternatives are evaluated for conductance of treated water from IPS Ranial to PP-12.

Option 1: Distribution of treated water supply in the project area through one Water Works (Chakra).

Option 2: Distribution of treated water supply in the project area through two IPS (Akbar Chowk & Biscuit Factory) and three water works (Akbar Chowk, Chakra & Adiala).

Option3: Distribution of the treated water supply in the project area through one IPS (Akbar Chowk) and three water works (Akbar Chowk, Chakra & Adiala).

Option 4: Distribution of treated water supply in the project area through one IPS (Akbar Chowk) and three water works (Akbar Chowk, Chakra & Adiala) comprising of overhead reservoir (OHR) and ground storage tank.

Option 1

In option 1, the two outlet pipes lines will originate from the IPS Ranial (EL: 520m) including one gravity main to Dhamial and Mohri Ghazzan and one pumping main to Chakra WWs.

- The Pumping main (30-inch MS pipe) with a length of 9.2 km will carry the 7.54 MGD water to Chakra WW located at north side of Bhatta chowk (required EL: 570m) From Chakara WW further three outlet pipe lines will originate by gravity to serve all UCs (Girja, Chak Jalal Din I&II, Lakhan Mohri Ghazzan Dhama Syedan, and Kalyal) excluded the Dhamial and Mohri Ghazan.
- Gravity main with an approximate length of 10.1 km will carry a discharge of 3.08 MGD to the command area having the UCs Chak Jalal Din I & II and Lakhan by 20-inch HDPE PN 10

- Gravity main with an approximate length of 17.5 km will carry a discharge of 1.92 MGD to the command area having UCs Khayal and Dhama Syedan by 22-inch HDPE PN 10.
- Gravity main from OHR at 15 m height with an approximate length of 5.3 km will carry a discharge of 2.54 MGD to the command area having UCs Girja by 20-inch HDPE PN 10.
- The gravity main carrying water (4.05 MGD) will be laid from IPS Ranial to UC Dhamial and Mohri Ghazan consisting of 28-inch dia HDPE PN10 pipe with a length of 3.4 km.

Area Requirements

The feasible area requirement for Chakra WW is given in **Table 3.2**:

Table 3. 2: The feasible area requirement for Chakra WW (Option 1)

Location	Storage Volume	Area Required	Area Required for Allied Facilities	Total Area Required	Required Elevation
	Million Gallons	Acres	Acres	Acres	Meters
WW Chakra (north side of Bhatta Chowk)	1.88	0.54	0.50	1.1	570

Merits

- The minimum land mechanical assets, and civil structure required.
- The most of the system involve by gravity distribution.

Demerits

- High size pump will be required for the pumping major flow (7.54 MGD) to chakra water works result in high capital and O&M cost.
- The gravity mains originated from IPS Ranial towards water distribution networks of UCs Dhamial & Mohri Ghazan will face a high elevated obstruction due to uneven terrains of Dhamial to Chakri link road. To overcome this obstacles, overhead tanks will be proposed.

Remarks

- The proposed highly/suitable location for Chakra WW is not available due to disputed land or private land ownership.

- 90% of the water supply will be depend on the conductance main from IPS Ranial to Chakra and Chakra water works so, in case of any malfunction, the 90% of the water distribution area will be unserved.

Option 2

In this option, the three outlet pipes lines will originate from the IPS Ranial (EL: 520m) including two gravity mains and one pumping main.

- The Pumping main (28-inch MS pipe) with a length of 3.8 km will carry the 5.62 MGD water to approximate length of 5.3 km will originate having the water (2.54 MGD) to serve the water distribution system of the UC Girja.
- Gravity main along the Chakri road with a length of 6.9 km will carry a discharge of 1.92 MGD to IPS Biscuit Factory (Required EL; 490 m) (by the pipe (20-inch HDPE PN10)
- The pumping main (18-inch MS pipe) with a length of 4.4 km will carry the 1.92 MGD water to Adiala Water Works (WW) (Required EL; 530 m) at Adiala Road. From the Adiala WW a gravity main (12-inch HDPE PN-10) will originate carrying the water (1.9 MGD) to serve the water distribution system of the UCs Kalyal and Dhama Syedan.
- Another gravity main along the Dhamial to Chakri link road having water (4.05 MGD) will be laid from IPS Ranial to UC Dhamial and Mohri Ghazan consisting of 28-inch dia HDPE PN10 pipe with a length of 3.4 km.

Area Requirement

The area requirements for different WWs location for the feasibility of option 2 are as under in **Table 3.3**:

Table 3. 3: The area requirements for different WWs location for the feasibility of option 2

Location	Storage Volume	Area Required	Area Required for Allied Facilities	Total Area Required	Required Elevation
	Million Gallons	Acres	Acres	Acres	Meters
IPS Akbar Chowk (North East of Akbar Chowk)	1.41	0.40	0.36	0.76	544
WW Chakra(North of Bhatta Chowk)	0.64	0.18	0.17	0.35	570
IPS Biscuit Factory	0.48	0.14	0.13	0.27	490

Location	Storage Volume	Area Required	Area Required for Allied Facilities	Total Area Required	Required Elevation
	Million Gallons	Acres	Acres	Acres	Meters
Adiala WW (Adiala Road)	0.48	0.14	0.13	0.27	530

Merits

- Each UC of the water distribution area has its independent water supply line, which assure continuous supply of water to one UC without affecting supply to another UC.
- This System is easy to understand/less complex.

Demerits

- The gravity mains originated from IPS Ranial towards IPS Biscuit factory and water distribution networks of UCs Dhamial & Mohri Ghazan will face a high elevated obstruction due to uneven terrains of Chakri road and Dhamial to Chakri link road.so to overcome this problem OHR has been proposed.

Remarks

The proposed land at highly elevated and/or suitable direction for IPS Akbar chowk (north east of Abkar chowk with EL 544m), Adiala WW (at Adiala road with EL 530m) and Chakra WW (at north side of Bhatta chowk with EL 570m) are not available due to disputed land or private land ownership.

Option 3

In option 3, the two outlet pipes lines will originate from the IPS Ranial (EL: 520) including one gravity main and one pumping main

- The Pumping main (30-inch MS pipe) with a length of 3.8 km will carry the 7.54 MGD water to IPS Akbar Chowk located at north east of Abkar chowk with required EL: 544m). From IPS Akbar Chowk further three outlet pipes lines will originate two gravity and other pumping one.
- Gravity main with OHR at 15m height along Girja road with an approximate length of 5.3 km will carry a discharge of 3.08 MGD to the command area having the UCs Chak Jalal Din I & II and Lakhan by 20-inch HDPE PN 10
- Gravity main along the Girja road with an approximate length of 12.6 km will carry a discharge of 1.92 MGD to the Adiala water works (at Adiala road

required EL: 530m) by 28-inch HDPE PN 10. The command area of Adiala water works is Kalyal and Dhama Syedan.

- The pumping main (22-inch MS pipe) with a length of 5.3 km will carry the 2.54 MGD water to Water Works (WW) at Chakra located at north side of Bhatta chowk with required EL 570m. From the Chakra WW a gravity main with OHR at 15 m height (20-inch HDPE PN-10) with an approximate length of 5.3 km will originate having the water (2.54 MGD) to serve the water distribution system of the UCs Girja
- The gravity main having water (4.05 MGD) will be laid from IPS Ranial to UC Dhamial and Mohri Ghazan along Dhamial to Chakri link road, consisting of 28-inch dia HDPE PN10 pipe with a length of 3.4 km.

Area Requirement

The area requirements for different WWs location for the feasibility of option 3 are as under in **Table3.4**:

Table 3. 4: The area requirements for different WWs location for the feasibility of option 3

Location	Storage Volume	Area Required	Area Required for Allied Facilities	Total Area Required	Required Elevation
	Million Gallons	Acres	Acres	Acres	Meters
IPS Akbar Chowk (North East of Akbar Chowk)	1.88	0.53	0.50	1.1	544
WW Chakra(North of Bhatta Chowk)	0.64	0.18	0.17	0.35	570
Adiala WW (Adiala Road)	0.48	0.14	0.13	0.27	530

Merits

This option involved less pumping and land requirement as compared to the Option 1.

Each UC of the water distribution area has its independent water supply line, which assure continuous supply of water to one UC without affecting supply to another UC.

Demerits

The gravity mains originated from IPS Ranial towards water distribution networks of UCs Dhamial & Mohri Ghazan will face a high elevated obstruction due to uneven terrains of Dhamial to Chakri link road

Remarks

The proposed land at highly elevated and/or suitable direction for IPS Akbar chowk (north east of Abkar chowk with EL 544m), Adiala WW (at Adiala road with EL 530m) and Chakra WW (at north side of Bhatta chowk with EL 570m) are not available due to disputed land or private land ownership.

Option 4

In option 4, the three outlet pipes lines will originate from the IPS Ranial (EL: 520m) including one gravity main from overhead reservoir (OHR) and two pumping main from ground storage tanks.

- The Pumping main (30-inch MS pipe) with a length of 3.8 km will carry discharge of 5.62 MGD water to IPS Akbar Chowk located at south west of Akbar chowk (EL: 544m). From IPS Akbar chowk following pumping main pledge from the Ground storage tank and Gravity main from the OHR
- Gravity main with OHR approximate length of 5.3 km will carry a discharge of 3.08 MGD to the command area, having the UCs, Chak Jalal Din I & II and Lakhan by using pipe of 22-inch HDPE PN 10.
- Pumping main (24-inch MS pipe) with a length of 5.6 km will carry discharge of 2.54 MGD water to Chakra WW, located at south west of Bhatta chowk EL 566m. The one gravity main started from the OHR at Chakra will serve the command area of UC Girja, by using pipe of 22- inch HDPE PN 10.
- The pumping main (20-inch MS pipe) from IPS Ranial with a length of 11.1 km will carry discharge of 1.92 MGD water to Adiala WW (EL: 520m), located at Defence road. From Adiala WW, gravity main will be originated to serve the command area, having UCs Khayal and Dhama Syedan.
- The gravity main carrying water (4.05 MGD) will be started from the OHR at IPS Ranial to UC Dhamial and Mohri Ghazan consisting of 28-inch dia HDPE PN10 pipe with a length of 3.4 km

Area Requirement

The area requirements for different WWs location for the feasibility of option 4 are as under **Table 3.5**:

Table 3. 5: The area requirements for different WWs location for the feasibility of option 4

Location	Storage Volume	Area Required	Area Required for Allied Facilities	Total Area Required	Required Elevation
	Million Gallons	Acres	Acres	Acres	Meters
IPS Akbar Chowk (South West of Akbar Chowk)	1.41	0.40	0.36	0.76	544
WW Chakra(South West of Bhatta Chowk)	0.64	0.18	0.17	0.35	566
Adiala WW (Defence Road)	0.48	0.14	0.13	0.27	520

Merits

Each UC of the water distribution area has its independent water supply line, which assure continuous supply of water to one UC without affecting supply to another UC.

De-Merits

OHR are introduced in this option due to which aesthetic are poor.

Remarks

Each UC of the water distribution area has its independent water supply line, which assure continuous supply of water to one UC without affecting supply to another UC.

This option is most feasible in term of available land.

Analysis of Options

Summary of Area Requirement

The area requirement of the all options are summarized in **Table 3.6**:

Table 3. 6: The area requirement of the all options

Option	Location	Storage Volume	Total Area Required
		Million Gallons	Acres
1	WW Chakra	1.88	1.1
2	IPS Akbar Chowk	1.41	1.65
	WW Chakra	0.64	
	IPS Biscuit Factory	0.48	

Option	Location	Storage Volume	Total Area Required
		Million Gallons	Acres
	Adiala WW	0.18	
3	IPS Akbar Chowk	1.88	1.72
	WW Chakra	0.64	
	Adiala WW	0.48	
4	IPS Akbar Chowk	1.41	1.38
	WW Chakra	0.64	
	Adiala WW	0.48	

Pump Size and Power Requirement

The pump size and power requirement of the all options are summarized in the Table below in **Table 3.7**:

Table 3. 7: The pump size and power requirement of the all options

Option	Location of Pump	Pump Head	Total Flow	Flow Each Pump	Total Pump	Power of Each Pump
		ft	Cusec	Cusec	S=stand-by & W=working	HP
1	IPS Ranial	249	18.68	9.34	2W+2S	426
	IPS Ranial(OHR)	80	17	5.64	3w+1s	83
	Chakra (OHR)	80	11	3.54	3w+1s	52
2	IPS Ranial	133	13.93	6.96	2W+2S	169
	IPS Ranial(OHR)	80	17	5.64	3w+1s	83
2	IPS Akbar Chowk	148	6.28	3.14	2W+2S	85
	IPS Akbar Chowk (OHR)	80	13	4.3	3w+1s	63
	IPS Biscuit Factory	207	4.75	2.37	2W+2S	90
	Adiala (OHR)	80	8	2.67	3w+1s	39
3	IPS Ranial	133	18.68	9.34	2W+2S	227
	IPS Ranial(OHR)	80	17	5.64	3w+1s	83
	IPS Akbar	148	6.28	3.14	2W+2S	85
	IPS Akbar Chowk (OHR)	80	13	4.3	3w+1s	63
	Adiala (OHR)	80	8	2.67	3w+1s	39
4	IPS Ranial (Akbar	133	13.93	6.96	2W+2S	169

Option	Location of Pump	Pump Head	Total Flow	Flow Each Pump	Total Pump	Power of Each Pump
		ft	Cusec	Cusec	S=stand-by & W=working	HP
	Chowk)					
	IPS Ranial(Adiala)	128	4.75	2.38	2W+2S	56
	IPS Ranial(OHR)	80	17	5.64	3w+1s	83
	IPS Akbar Chowk	148	6.28	3.14	2W+2S	85
	IPS Akbar Chowk (OHR)	80	13	4.3	3w+1s	63
	Chakra (OHR)	80	11	3.54	3w+1s	52
	Adiala (OHR)	80	8	2.67	3w+1s	39

Cost Estimation

Capital Cost

The cost estimation of the all options is summarized in **Table 3.8**:

Table 3. 8: The cost estimation of the all options

Design Option	Cost (Million PKR)	Cost (Million USD $)
Option 1	17,607	65.21
Option 2	17,863	66.16
Option 3	17,126	63.43
Option 4	17,573	65.09

O & M Cost

The O & M cost estimation of the all options are summarized in table below in **Table 3.9**:

Table 3. 9: The O & M cost estimation of the all options

Design Option	Cost (Million PKR)	Cost (Million USD $)
Option 1	1,262	4.67
Option 2	1372	5.08
Option 3	1,291	4.78
Option 4	1,305	4.84

Total Cost (Capital and O&M)

The total cost estimation includes capital and O&M of all options are summarized in table below **Table 3.10**:

Table 3. 10: The total cost estimation includes capital and O&M of all options

Design Option	Cost (Million PKR)	Cost (Million USD $)
Option 1	18,869	69.90
Option 2	19,235	71.24
Option 3	18,417	68.21
Option 4	18,879	69.92

From the above discuss option analysis the summary of all options based on different parameters is given below **Table 3.11**:

Table 3. 11: The summary of all options based on different parameters

Sr. No.	Parameters	Option - 1	Option-2	Option-3	Option-4
1	Availability of land at required elevation / suitable locations.	Not available	Not available	Not available	Available
2	Area Requirement	Low	High	Medium	Medium
3	Power requirement	Medium	Medium	Low	High
4.	Capital Cost	Medium	High	Medium	Medium
5.	O & M Cost	Low	High	Low	Medium
6.	Operational Efficiency	Low	Medium	Above Medium	Medium

Comparison / Analysis of Alternatives

The comparison between all four alternatives based on environmental, social and economic impacts is described in **Table 3.12**.

Table 3. 12: Alternatives based on environmental, social and economic impacts

Parameters	Option-1	Option-2	Option-3	Option-4
Cost	Rs. 18,869/- including construction and O&M cost	Rs. 19,235/- including construction and O&M cost	Rs. 18,417/- including construction and O&M cost	Rs. 18,879/- including construction and O&M cost
Environmental Aspects	All options have almost similar nature of environmental impacts.			
Social Aspects	The area required for this option is 1.1 acre therefore less social issues are involved	The area required for this option is 1.65 acre therefore more social issues are involved with respect to land	The area required for this option is 1.72 acre therefore maximum social issues are involved in	The area required for this option is 1.38 acre therefore less social issues are involved in

Parameters	Option-1	Option-2	Option-3	Option-4
	with respect to land acquisition.	acquisition.	comparison with rest of all options.	comparison with Option 2 & 3 but more social issues are involved in comparison with Option-1.

Recommended Option

From the above discussion, it is evident that the option 3 is the most feasible option as it involves minimum power requirement, which results in long term lowest O&M expenditure.

However, in selection of any option, land availability is the limiting factor. The land availability is a huge challenge in the project area, which is worsening with passage of time. However, the efforts have been made for land acquisition, with the help of all relevant Government departments including City Implementation Unit, Project Management Unit (PMU), RWASA, Land Revenue Department etc. and the availability of land for Option 4 has been ensured.

After evaluation and keeping in view that land availability, capital & O & M cost, it is recommended to adopt Option 4 for distribution of treated water from Chahan Dam to the water distribution area PP-12.

Water Treatment Plant

The raw water will be pumped from dam intake structure to WTP through raw water pumping main and after its treatment, the treated water will be pumped through treated water main to Intermediate Pumping station (IPS) at Ranial. From Intermediate Pumping station (IPS) at Ranial following gravity/ pumping mains will serve the different UCs;

From IPS Ranial to waterworks at Chakra.

From IPS/waterworks at Ranial, one gravity main will distribute water to Dhamial UC

The source of water supply for the proposed areas will be surface water from Chahan dam. Surface waters normally contain significant concentrations of various impurities, like suspended solids and bacteriological contamination, rendering it unfit for human consumption. The raw water will hence require proper treatment as per Punjab Environmental Quality Standards (PEQS) for Drinking Water and other Guidelines before supply to the consumers.

Capacity of Treatment Works

The total feeding water amount into the plant will be 12 MGD however, 0.7 MDG will be loss in backwash and other purpose. So, the treatment plant capacities will be 11.3 MGD (20.92 cusecs).

Raw Water Quality

The choice of treatment process is based on quality of raw water. The raw water from water source was tested by SGS Lahore for various parameters such as sediment and chemicals concentration. The water quality result indicates the high sediment loads and since the water is abstracted from a dam, seasonal variations are very minor as compared to water sources such as rivers etc. Quantity and quality of water will have minor changes over the course of a year, therefore rapid gravity filters followed by coagulation, flocculation and sedimentation are proposed.

Treatment Process Option

For raw water, chemical treatment by aluminums sulfate as coagulation will be required to create micro flocs and after that polyelectrolyte used for tougher flocs for effective settlement. Mostly two types of samples are taken, one for high flow other for lean flow but since our source is a dam, water will have sufficient settling time however significant sediment load will still be there for which tube settlers are proposed before filters. Filters will remove physical contaminations and after that chlorination will ensure the removal of any bacteriological contamination.

Full physiochemical treatment will, therefore, be applied throughout the whole year. The test results indicate that the natural alkalinity is sufficient to coagulate with alum for producing the effective flocs. However, liming may be required during certain period of the year to maintain the pH of the flocculated water in the appropriate range prior to settlement in the clarifier.

Variant 1: Slow Sand Filters

Slow sand filtration is a simple and reliable process. They are relatively inexpensive to build, but do not require highly skilled operators. The process percolates untreated water slowly through a bed of porous sand, with the influent water introduced over the surface of the filter, and then drained from the bottom. Properly constructed, the filter consists of a tank, a bed of fine sand, a layer of gravel to support the sand, a

system of underdrains to collect the filtered water, and a flow regulator to control the filtration rate.

Slow filters have the problem that these filters cannot be backwashed. The biomasses accumulate in the filter bed. Unfortunately, the unwanted microorganisms and bacteria also multiply in the filter bed and then the filters work as surface filters.

Slow sand filters require a very low application or filtration rate (0.015 to 0.15 gallons per minute per square foot of bed area, depending on the gradation of the filter medium and the quality of the raw water). The removal action includes a biological process in addition to physical and chemical ones. A sticky mat of biological matter, called a "schmutzdecke," forms on the sand surface, where particles are trapped and organic matter is biologically degraded. Slow sand filters rely on this cake filtration at the surface of the filter for particulate straining. As the surface cake develops during the filtration cycle, the cake assumes the dominant role in filtration rather than the granular media.

Dosing of flocculent cannot be carried out as the hydroxide flakes quickly clog the surface and no colloids are retained either and as a result gravel or sand passages are excellent slow filters that are used at extremely low filter speeds.

For this project, I think the use of technical slow filters is not very suitable.

Typical treatment performance of a conventional Slow Sand Filter and a process diagram is shown in **Figure 3.7** and **Figure 3.8**, respectively.

Typical Treatment Performance of Conventional Slow Sand Filters

Water Quality Paramenter	Removal Capacity
Turbidity	<1.0 NTU
Coliforms	1-3 log units
Enteric Viruses	2-4 log units
Giardia Cysts	2-4+log units
Cryptosporidium Oocysts	>4 log units
Dissolved Organic Carbon	<15-25%
Biodegradable Dissolved Organic Carbon	<50%
Trihalomethane Precursors	<20-30%
Heavy Metals	
Zn, Cu, Cd, Pb	>95-99%
Fe, Mn	>67%
As	<47%

Figure 3. 7:Typical Treatment Performance of Conventional Slow Sand Filters

Local Government and Community Development Department Government of Punjab

Variant 2: The Rapid Sand Filter (RSF)

The Rapid Sand Filter (RSF) differs from the Slow Sand Filter in a variety of ways, the most important of which are the much greater water treatment filtration rate and the ability to clean automatically using back washing. The mechanism of particle removal also differs. Rapid sand Water treatment filter does not use biological filtration and depends primarily on mechanical straining, sedimentation, impaction, interception, adhesion and physical adsorption. In Rapid sand water filter, the complete filtration cycle (filtration and back washing) occurs sequentially.

Water Treatment Filters that must be taken off-line periodically to back wash are classified operationally as semi-continuous. Water Treatment Filters in which filtration and backwash operations occur simultaneously are classified as continuous.

Types of Rapid Sand Filter

There are a number of different types of Rapid sand filters depending upon bed depth (e.g., shallow, conventional and deep bed) and the type of filtering medium used (mono-, dual-, and multimedia).

A further classification can be made based on the driving force as gravity Water Filters or pressure Water filters. Typically, sand is used as the filtering material in single medium filters.

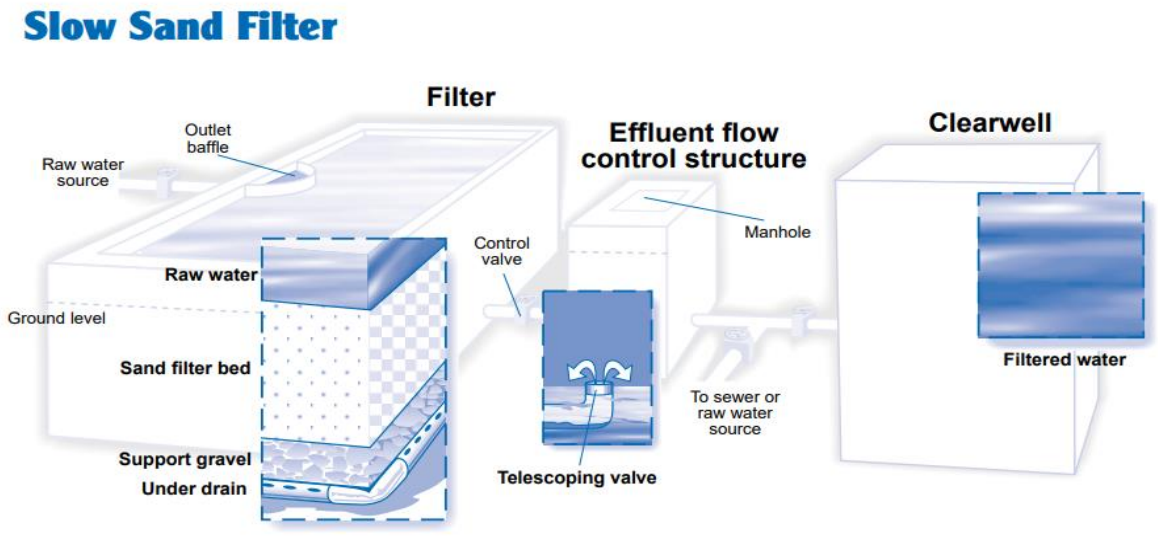


Figure 3. 8: **Process Diagram of Slow Sand Filter**

Dual- medium filters usually consist of a layer of anthracite over a layer of sand. Multimedia filters typically consist of a layer of anthracite over a layer of sand over a

layer of garnet. Filtration and backwash Process of Rapid Sand Filter is shown in **Figure 3.9**.

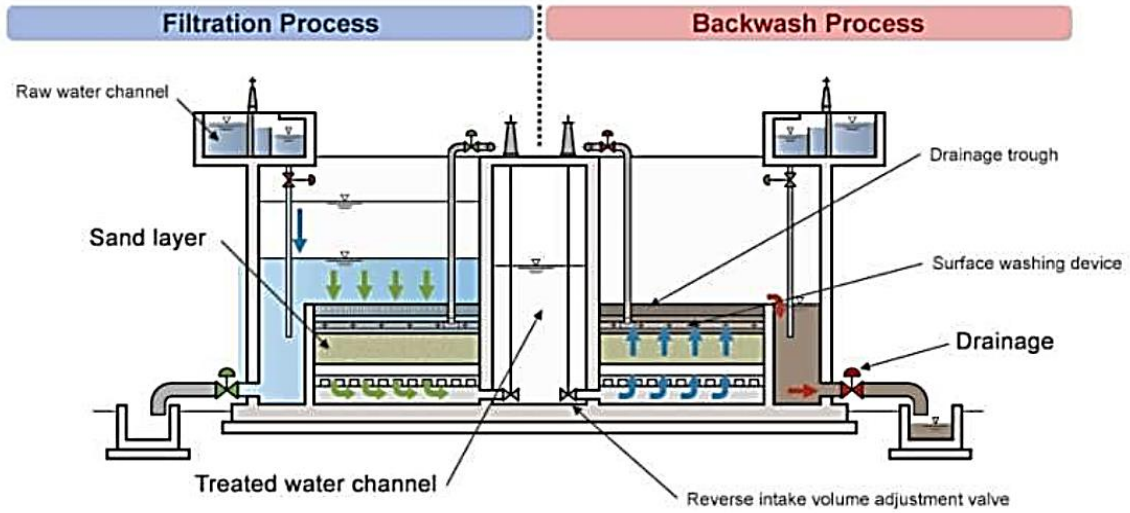


Figure 3. 9: Filtration & Backwash Processes of Rapid Sand Filter

Efficiency of Rapid Sand Filter

- It is expected that bacteria removal efficiency is about 80 to 90%.
- Turbidity of water can remove the extent of 35 to 40 ppm.
- These filters are highly efficient in color removal i.e. below 3 on the cobalt scale.

Variant 3: Ultrafiltration

Ultrafiltration Plant is a membrane-based technology, which is used for separation of higher molecular weight particles from water. It can separate particles of even 0.01 microns from. Different membrane configurations and sizes are available for filtration requirements. Hollow Fibber and Spiral wound configurations are most commonly used in the industry. Ultrafiltration system can be used both in pre-treatment and post treatment process. The best Feature of Ultra Filtration Plant is Simple to operate, easy to maintain, Automatic operation, Compact, Adequate safety interlocks, Automatic forward flush and back flush for ground water.

For surface water like Dam water same pre-treatment like rapid sand filter is required and with addition these pre-treatments project cost will be very high which is not feasible. A typical Ultrafiltration plant is shown in **Figure 3.10**.



Figure 3. 10: A typical Ultrafiltration Plant

Advantages

- Size-exclusion filtration as opposed to media depth filtration.
- Good and constant quality of the treated water in terms of particle and microbial removal.

Disadvantages

- Cost is very high
- Membrane life is low
- Highly competent staff is required
- Operational cost is high

Comparison / Analysis of Alternatives

The comparison between all three alternatives based on environmental, social and economic impacts is described in **Table 3.13**. The alternative to be selected must qualify the basic criteria of cost effectiveness, environmentally sustainable and socially acceptable.

Table 3. 13: Comparison of Available Option

Parameters	Slow Sand Filters	Rapid Sand Filters	Ultrafiltration
Cost	Low construction and operation cost is involved.	More construction and operation cost is involved.	Very high cost is involved.

Parameters	Slow Sand Filters	Rapid Sand Filters	Ultrafiltration
Environmental Aspects	More area is required for production of clean water. This will involve more land to involve. Choking	The design of Rapid Sand Filters (RSF) is compact and produce water at faster rate.	Ultrafiltration plant will require change of membranes and will produce more waste.
Social Aspects	Community will get less water in a day as it will produce less water in a given time. More land is required, which will involve acquisition of more land.	Community will get higher quantity of water in less time due to design efficiency. Further, less land is required, as compared to Slow Sand Filters (SSF)	It involves production of consistent clean water at faster pace.

Recommended Process

In all the three processes above 20NTU pre-treatment is necessary, which consists of coagulation, flocculation and sedimentation.

For slow sand filters Natural organic matter and other DBPs precursors not removed (may be formed if chlorine is applied for final disinfection). Requirement of a large land area, large quantities of filter media and manual labor for cleaning, Low filtration rate. Loss of productivity during the relatively long filter skimming and ripening periods

The advantages of rapid sand filter technology are that it is a proven technology, effective in removing suspended solids and that it requires a minimum land area for construction and operation Compared to slow sand filters.

Ultrafiltration technology is membrane base filtration with constant product water quality and bacteria free water without chlorination due to small pore size. The electricity cost is very high due to pressure require at the inlet of the membrane, high chemicals use in chemical enhance backwash and chemical cleaning of membranes. High membrane replacement cost.

In the light of above advantages and disadvantage of different processes, the best process, which is commonly used world-wide and efficient as per required drinking water quality in low land area and with nominal electricity requirement is Rapid Sand Filtration, with coagulation, flocculation and settling as pre-treatment and disinfection with chlorination as post treatment. Therefore, this option is selected as final option for Chahan Dam Water Treatment Plant.

3.4 PROJECT LOCATION/ SITE LAYOUT

The Chahan Dam site is located on Sill Kas, a tributary of Sill River which ultimately falls into Soan River. The dam site is at a distance of about 5 km from Chahan village, 35 km south west of Rawalpindi City. Small Dams Organization (SDO), Irrigation and Power (I&P) Department has already completed the construction of Chahan Dam in 2022 and impoundment is in progress. This dam will feed water to irrigate about 12,000 acres and 6 MGD of raw water have been allocated for RWASA, to serve the recently included areas in WASA jurisdiction (PP-12). The water from Chahan dam is mainly used for irrigation as the main purpose of this dam was to use its water for irrigation. With development and conversation of land for housing colonies, the demand of irrigation water is reduced. Keeping in view of this point, RWASA has requested Irrigation Department to provide further 6MGD water for drinking purpose from Chahan Dam. During the consultative meeting, held on 3rd December, 2022 at DC Office Rawalpindi under the chairmanship of Additional Deputy Commissioner (Finance & Planning) Rawalpindi Division, the representative of Small Dam Organization, Irrigation Department has agreed to fulfill the requirement of RWASA for 12 MGD, although the initial approval was for 6 MGD. Further, control fishing is going on in the dam. However, during the primary survey, the representative of Small Dam Organization and Fisheries department stated that the dead level of dam is very high and there will be no worth mentioning impact on the fish population even at the dead storage level of dam. Aerial view of Chahan Dan is shown in **Figure 3.11**.

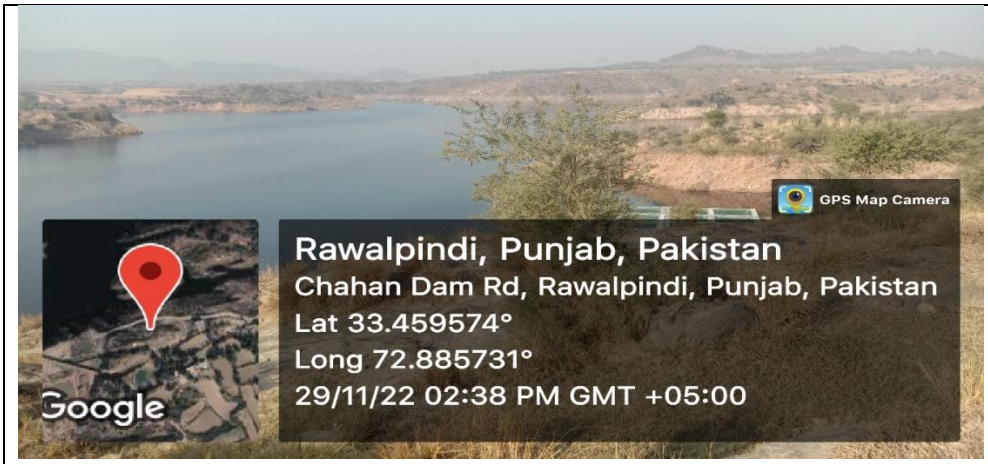




Figure 3. 11: Aerial View of Water Source (Chahan Dam)

.In order to cover the seasonal fluctuations in the river discharges a multistage water withdrawal arrangement is being proposed. The low-level intake will ensure the supplies during the lean flows, whereas high level intake will be used during the normal to high flow periods.

Intake structure has been proposed to draw raw water from the Chahan Dam. Topography of the area between Chahan Dam and the proposed Treatment plant site does not allow gravitational flow. Raw water will have to be pumped for its treatment. From the intake, raw water main will transmit water to treatment plant by means of raw water pumps.

The location of WTP is proposed near dam site. The raw water will be pumped from dam intake structure to WTP through raw water pumping main and after its treatment, the treated water will be pumped through treated water main to Intermediate Pumping station (IPS) at Ranial. It is generally preferable to locate WTP near the Raw Water Source. It has advantage to pump treated water through the water main with less chances of any silt deposit in the pipeline. Wear and tear of high lift pumps will be less in this case.

The treated water from WTP will be supplied to intermediate pumping station (IPS) at Ranial. These pumps deliver water to higher elevation site (Chakara). The storage tank at Chakra shall serve Chakra Union Council and also GSTs at Chakra for remaining areas of Chak Jalal Din, Lakhan, Dhaman Syedan and Kalyal through gravity.

The treated water from the tank shall be pumped to intermediate pumping station, from where one pipeline shall gravitate up to Dhamial ground storage tank and shall serve the Dhamial Union Council. The second force main from intermediate pumping

station shall feed ground storage tank at Chakra. The storage tank at Chakra shall serve Chakra Union Council and also GSTs at Chakra for remaining areas serves the areas of Chak Jalal Din, Lakhan, Dhaman Syedan and Kalyal through gravity.

The sizing of raw water main has been based on the water allocated from the dam 126 MGD) considering that it will work for 24 hours to achieve maximum utilization. Since the length of the raw water main is only 900-1000 feet so the size has been worked out on hydraulic consideration only. Keeping in view the maximum velocity of 6 ft/sec, the size comes out to be 24 inches. The alignment of Conductance Mains is given **Figure 3.2**.

From WTP to Intermediate Pumping Station IPS length of treated water main from WTP to IPS is 13.6 KM. keeping in view the maximum velocity of 5 ft/sec, the size comes out to be 26 inches, which provides a velocity of 4.46 ft/sec.

From Intermediate Pumping Station (IPS) to Chakra Water Works as Dhamial area will be served from the IPS by gravity and the storage will be provided for Dhamial area at IPS so the remaining flows reaching at Chkara water works will be the total flow – Dhamial flow (11.13 cusec – 2.13 = 9 cusec). Therefore, the sizing of Treated Water Main from IPS to Chakra water works has been worked out considering that it will work for 24 hours to achieve maximum utilization. Length of treated water main from IPS to Chakra water works is 8.43 KM. keeping in view the maximum velocity of 5 ft/sec, the size comes out to be 24 inches, which provides a velocity of 4.17 ft/sec.

The sizing of Gravity main from IPS to Dhamial has been based on the water demand of Dhamial area which is 1,196,629 Gallons per day. Size of Pipe comes out to be 16 inches in diameter.

The sizing of Gravity main from Chakra water works to different remaining areas has been based on the water demand of Chakra, Girja, Chak Jalal din, Dhama syedan, Lakhan and Kalyal which comes out to be 4,702,287 Gallons per day. High Density Polyethylene (HDPE) pipe is used for the Gravity Main.

Since the project area mostly consists of G.I and M.S pipe with diameter of 3 inches and less with the fact that the design life of G.I pipe is also low due to corrosion of the pipes as compared to other pipe materials and pipe diameters less than 3 inches also creates low terminal pressure to the end consumer therefore the system failing to meet the water needs of the residents.

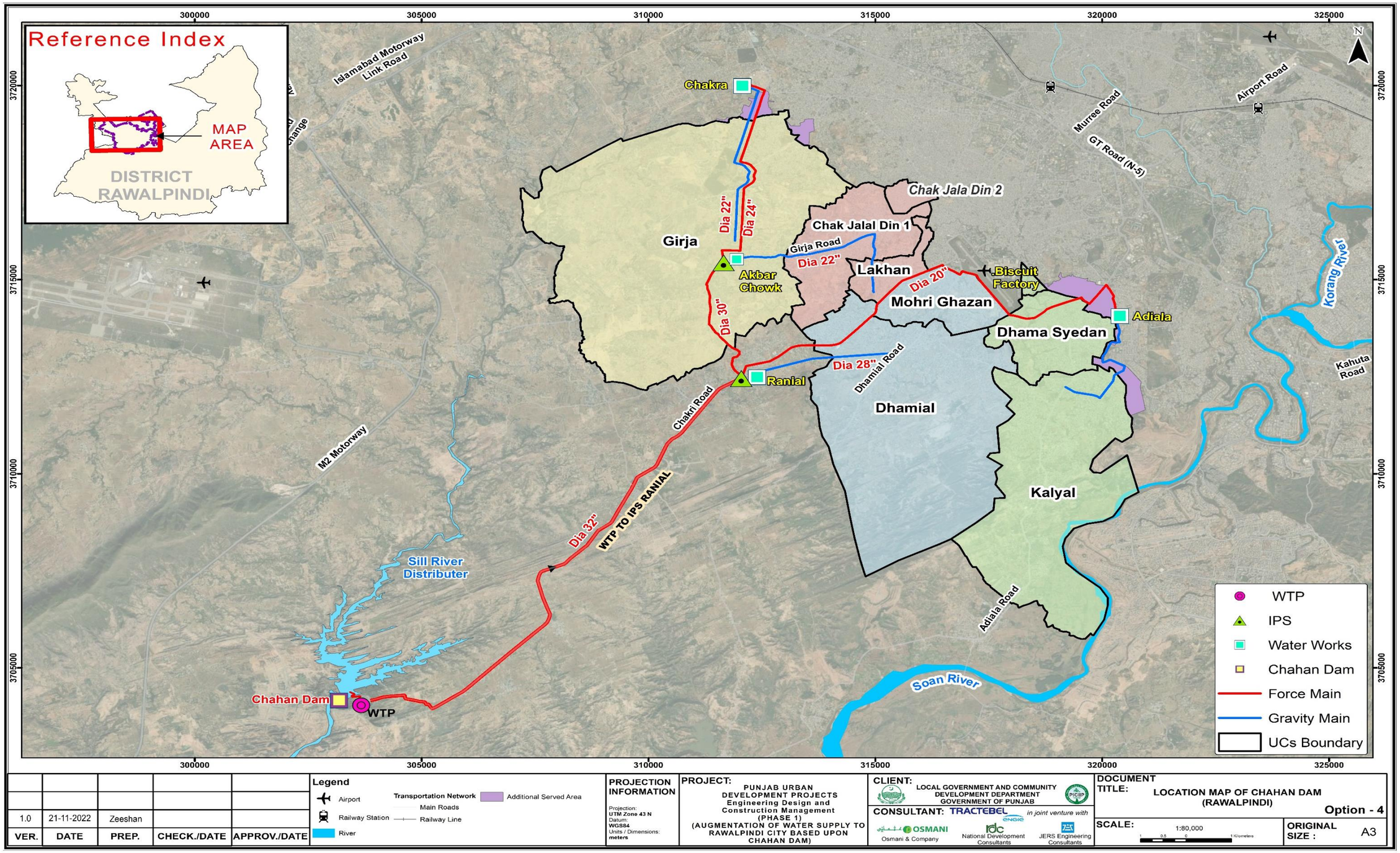


Figure 3. 12: Location of Conductance Mains, WTP, IPS and Water Works

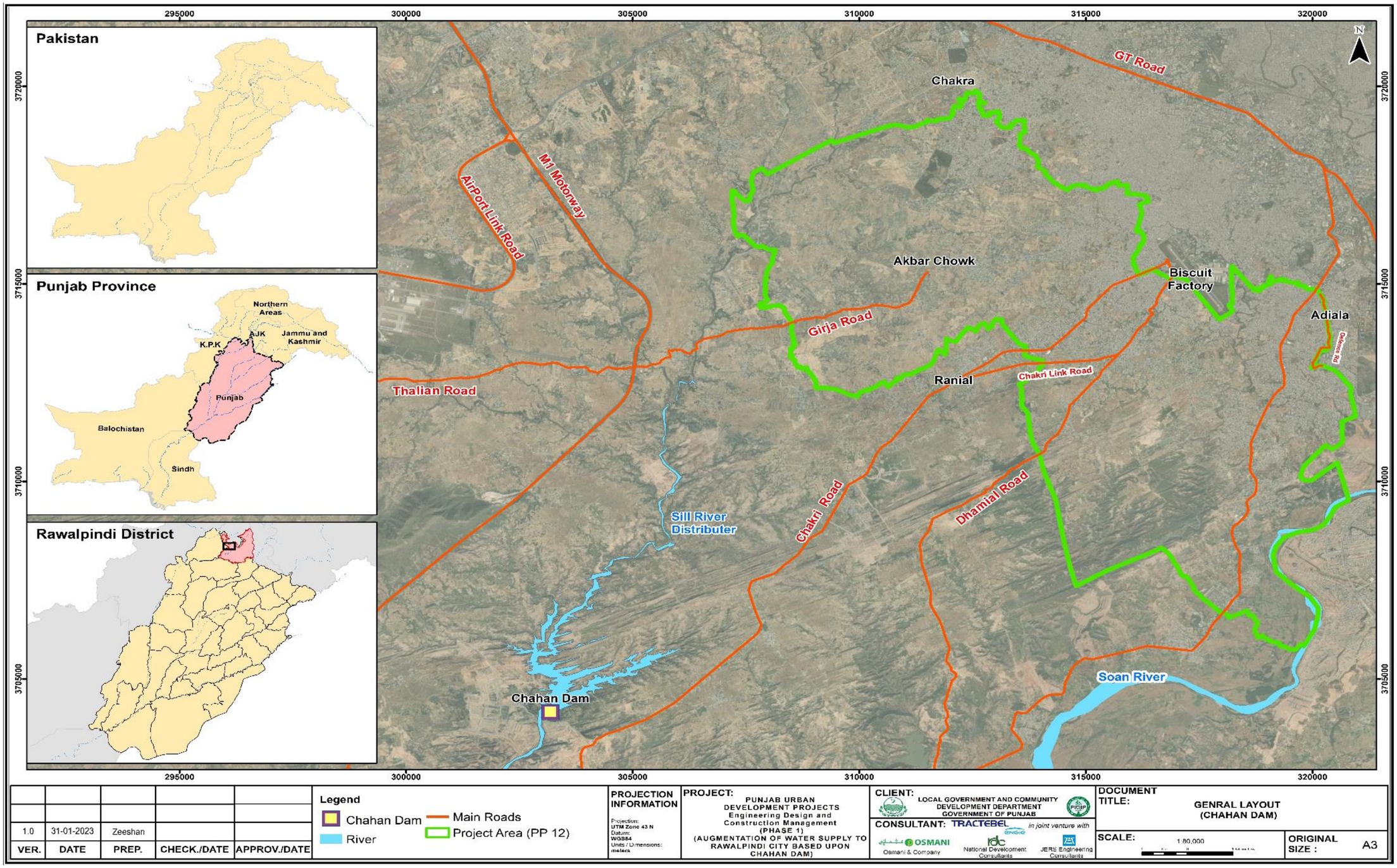
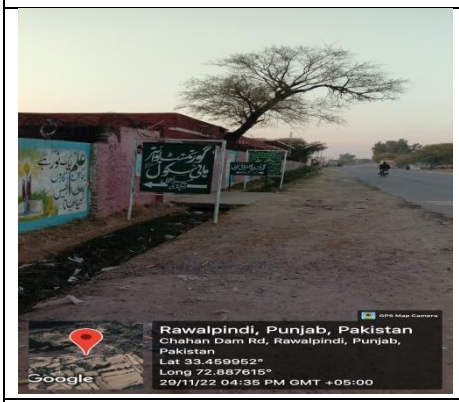
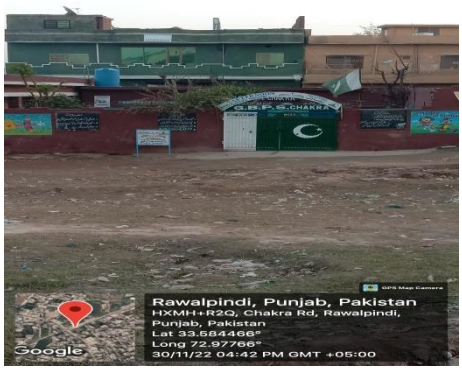


Figure 3. 13: Location Plan of the Water Distribution Area

3.5 LAND USE AT THE PROJECT SITE

There are different types of land use i.e., barren / open, built-up, cultivated land, graveyards, green belt, rivers, road/track, stream/ nullah, residential and commercial details structures, trees/ bushes and water ponds etc. Some scattered houses as well as densely populated houses have also been observed along the entire alignment of the project area. **Figure 3.14** shows the land use around project site.

<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td colspan="2">Reserved area for water treatment plant</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Govt. School at Chahan Dam Road</td><td>Chahan Dam Road</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Graveyard near project site</td><td>Health center at Chahan Dam Road</td></tr>
</table>



School at Chakra Road



Graveyard in Ranial





Chakri road

Figure 3. 14: Land use around the Project Site

3.6 ROAD ACCESS

The water distribution area is consisting of 8 UCs of PP-12. Location plan of for the project area is shown in **Figure 3.2**. The details of each UCs are given as under:

Dhamial (UC # 86) is situated along both sides of Dhamial Road. It consists of the areas namely Ashraf Colony, Shadman Town, Green view Colony, Sardar Town and Khalid Colony. Its area is about 5454 acres and population of 54,861 persons according to 2017 census report. Qasim Airbase is situated at north east of Dhamial.

Girja (UC # 91) is situated at Girja Road and Misrial Road is situated at its top. It consists of Chakra, Razzak Town, Garja, Lakhu, Jatal and Dhok Sama. Its population is about 84,596 persons and area is 8021 acres according to 2017 census report.

Dhama Syedan (UC #85) is situated at Adiala Road, adjacent to Askari XIV having Attock Refinery at east. It consists of Khatana, Munawar Colony, Janjua Town and Jarahi. Its population is about 43,107 persons according to 2017 Census report and area is 1065 Acres.

Lakhan (UC # 88) is situated in the north west of Chakri Road and Qasim Airbase in the North East. It consists of Quaid e Azam Colony and LalaRukh Colony. Its population is 23,280 person according to census report of 2017 and area is about 394 acres. Chak Jalaldin 1 (UC #89) is situated at Girja Road and major areas of Chak Jalaldin are Habib Colony, , Shah Jeevan Colony, Nai Abadi No.1,Nai Abadi No.2, Malik Colony and Qureshia Abad. Its population is 72, 801 person according to 2017 census report and its area is 1465 Acres.

Chak Jalaldin 2 (UC #90) is situated at Girja Road and major areas of Chak Jalaldin 2 are Chaman Abad, Maskeen Abad, Muslim Abad and , Christian Colony. Its population is 6679 according to 2017 census report and its area is 148 Acres. Kalyal (UC#83) is situated on Adiala Road and it comprises areas of National Town, Gulsahan Abad, Kalyal, Samarazad Housing Society, Madina Town and Radio colony. Its population according to 2017 census report is 20,774 person and its area is 4080 acres.

Mohri Ghazan (UC # 87) is situated in between the Dhamial and Chakri Road. The major areas of Mohri Ghazan are Gulshan Iqbal,Mora Chapar and Maryam Town. Its population is 27,702 persons as per 2017 census and area about 803 acres.

3.7 CONSTRUCTION MATERIALS

Coarse aggregate is obtained either by the naturally occurring weathered and abrasion aggregates or by artificially crushing a larger parent mass. Thus, many properties of aggregate depend on the properties of their parent rocks e.g. chemical and mineral composition, petrographic classification and their physical indices like specific gravity, hardness, strength, structure, color etc. along with their particle shape, size, surface texture and absorption.

3.8 WORK FORCE

Man power demand estimation is an essential component to facilitate deployment of manpower. Total man power required for the proposed project will be estimated by the contractor at construction stage, whereas as per consultant’s previous experience the workforce for proposed project has been estimated as 100-150 workers comprising skilled and unskilled staff and labors.

3.9 CONSTRUCTION ACTIVITIES AND REQUIRED MACHINERY

Construction activities involve following:

- Earth work (clearing of vegetation/ trees and top soil);
- Roadwork;
- Excavation of pits:
- Laying of pipes: and
- Structure works.

The list of the machinery and the equipment required for the proposed Project is provided in **Table 3.16.**

Table 3. 14: Machinery and Equipment Requirement

Sr. No.	Machinery / Equipment	Quantity required*
1	Excavators	2
2	Batching Plants	2-4
4	Loaders	1
5	Power Generators	2
6	Tractor Trolley	2
7	Compactor / Roller	1
8	Crane	1
10	Concrete Pump	1
11	Vibro Hammer	1
13	Watering Tanks (moveable)	1
14	Cars/Pickups	4

3.10 CONSTRUCTION CAMPS

Camp sites will be selected keeping in view the availability of adequate area for establishing camp sites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. Keeping in view the following criteria guidelines, the Contractor has to identify the construction camp sites before start of the construction activities:

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

irrigation, and drinking water supply systems;

- The camp site must not be subject to periodic flooding; and
- There should not be any ecological sensitive areas e.g. wildlife sanctuaries, game reserves, national parks, forest areas, etc. near to the construction camp site.

3.11 VEGETATION FEATURES OF SITE

All the available literature was thoroughly reviewed to have a better understanding of the project area and its surroundings including habitat, flora and fauna. The route alignment was thoroughly examined. The stakeholder Forest, Wildlife, EPA, Fisheries and Agricultural departments were also consulted. This survey broadly covers ecosystem sensitivities (If any), vegetation, other flora and fauna. No worth mentioned ecological feature has been noticed during site visit and review of literature. The project has no impact on destruction of vegetation. **No tree cutting** is anticipated during the construction phase of the project. Labor camp area will be selected away from the residential by keeping in view that movement of vehicle does not disturb the flora of the area.

3.12 ENERGY/ POWER SOURCE

As mentioned above in this EIA report, the project under reference of this EIA is augmentation of water supply in Rawalpindi city. Keeping in views the nature of project, estimation of electrical requirement is difficult at this stage especially for construction phase. However, the contractor/s will use their own generators for electricity supply during construction phase.

3.13 WATER REQUIREMENT

The source of water during the construction phase will be from water bowser tanks and groundwater (if available) from local sources will be used. The water consumption is estimated to be 15,000 liters /day[1] for 150 construction workers comprising skilled and unskilled staff/ laborers (approx.) for the proposed Project.

3.14 SOLID WASTE ESTIMATION

Due to construction activities, waste will be generated at construction site and contractors camp. The contractor will provide the estimated quantity of excavation material during the construction phase. These wastes will be generated due to the construction activities and the up to the extent possible the excavated materials will be

1 Tentative Work Force Requirements Including Client and Contractor Staff"
= (100) x (100) = 10,000 liters/day
= (10,000) x (80%) =8,000 liters/day

reused, where applicable, for construction purposes. Solid waste generated during construction and camp sites shall be safely disposed in demarcated waste disposal sites.

The solid waste generation is estimated to be 45 kg/day (as per 0.45 kg/capita/day waste generation)[2] for 100 construction workers comprising skilled and unskilled staff/ labors for the proposed Project.

3.15 WASTEWATER GENERATION

The wastewater generation is estimated to be 12,000 liters/day for 150 construction workers comprising skilled and unskilled staff/ labourers (approx.) for the proposed Project.

3.16 PROJECT COST

The estimated cost of the construction works of proposed Project is Rs. 18,879 Million.

3.17 PROJECT IMPLEMENTATION SCHEDULE

The proposed Project is expected to be completed within Two to Three years.

3.18 DESCRIPTION OF THE PROJECT

The project has been duly described at: "1-Introduction- Nature and size of the Project-Purpose of the report, identification of the project and the project proponent."

3.19 DESCRIPTION OF THE PROCESS

The project has been duly described at: "1-Introduction- Nature and size of the Project-Purpose of the report, identification of the project and the project proponent."

3.20 DETAILS OF RESTORATION & REHABILITATION PLANS

The proposed project is of high significance considering the urgent need for improving sustainable water supply system of Rawalpindi, as the existing water supply is not sufficient to cater the needs of Rawalpindi in terms of water demand.

Major rehabilitation work will include filling back the excavated land, debris disposal according to internationally sustainable practices, scientific disposal of all sorts of solid wastes and grass plantation on pre-planned areas, cleaning of unpaved areas etc.

Debris or any other wastes resulting from demolishing of the buildings will be disposed-off in environmentally sustainable fashion. The materials capable of

2 Source: The World Bank Report 2012 – What a Waste: A global review of solid waste management. Based on UNEP estimates for waste generation in the Asia Pacific. Average is 0.45 kg/capita/day

recycling/ reuse will be either sold in the market or to be reused for other suitable purposes. While dismantling the structures all Government rules and regulations as applicable to such activities will be strictly adhered to.

During entire construction period, necessary precautions will be taken to ensure that no damage will be done to the basic infrastructures like power transmission lines telephone lines, roads, private or public property and daily human life as well. Any utilities if encountered during the laying of bulk supply line shall be restored. Backfilling of the trenches shall be done as per the designed backfilling detail. Restoration of pavements (rigid/flexible) at all roads/streets shall be done.

Safety measures as desired under the code of demolition will be adopted to avoid any harm to humans, property around or the environment in the project area. Dust to be generated will be minimized by constant sprinkling of water. After completion; all construction matrix, debris and garbage will be removed off immediately from the site within the minimum possible time under safe conditions. Any minor spillover of these materials will be cleared adequately. The land, if and where pitted will be adequately leveled. On the whole, the project site and the area in its near vicinity will be made neat and clean.

3.21 GOVT. APPROVALS AND LEASES REQUIRED BY THE PROJECT

For the proposed Project, the Local Government & Community Development Department, Government of the Punjab is the Executing Agency (EA) while the project will be executed through Program Management Unit (PMU) of Punjab Intermediate Cities Improvement Investment Program (PICIIP). Rawalpindi Water and Sanitation Agency (RWASA) will be the implementation agency of this project. Environmental Protection Department (EPD)/Environmental Protection Agency (EPA), Government of Punjab (GoPb) is the concerned authority. For disclosure of information, PMU has submitted the updated IEE report to ADB. So far the Environmental Approval from the EPA, Punjab is another major requirement for which this EIA report has been prepared and submitted.

CHAPTER-4

DESCRIPTION OF ENVIRONMENT

4.1 GENERAL

This chapter provides the description of the baseline conditions along the proposed Project within the CoI.

Considering the potential impacts of the Proposed Project, existing baseline environmental conditions of the proposed project's CoI has to be used as a benchmark for comparison of the physical, ecological and socio-economic conditions before and after construction phases of the Project. This baseline will also provide the datum for assessing the impacts and suggesting the mitigation measures, which will be implemented effectively at various phases of the proposed project activities.

Field Visits for Baseline Study

The data presented in the forthcoming sections has been collected from the primary and secondary sources. For primary data acquisition, the Environment and Social team conducted the field visit during the months of 29-30 November, 2022.

The major objective of the field visits was to collect the baseline data on physical, eco-biological and social aspects along with identification, assessment and categorization of the significant environmental and social impacts of the proposed Project. The secondary data was collected from published sources/reports and relevant departments, which were also verified through visual observations during detailed surveys.

The primary data was collected directly from the concerned communities and affected households while secondary data was the information gathered through secondary sources such as PMU, EDCM, census report, research publications, topographic sheets, other published data related to the project such as wildlife, livestock, fishery, forestry, agriculture, horticulture, climate etc.

Corridor of Impact: The proposed areas where the project activities will be carried out is located in the outskirts of Rawalpindi with scattered population. At some place the population density is high while on other places the population density is very low. The Corridor of Impact has been marked for identification of impact on the route of Conductance Main. The project Corridor of Impact (COI) is referred to all those areas in the region within 100m from the project line and which may be affected directly or indirectly by the project activities. The COI, is only marked for route of Conductance

Mains under this project. **Figure 4.1** shows the location of project component marked with COI.

Right of Way: The area of actual working space is called as Right of Way (ROW). The required ROW for proposed project is estimated to be 15 feet. The ROW for activities of proposed project is already available.

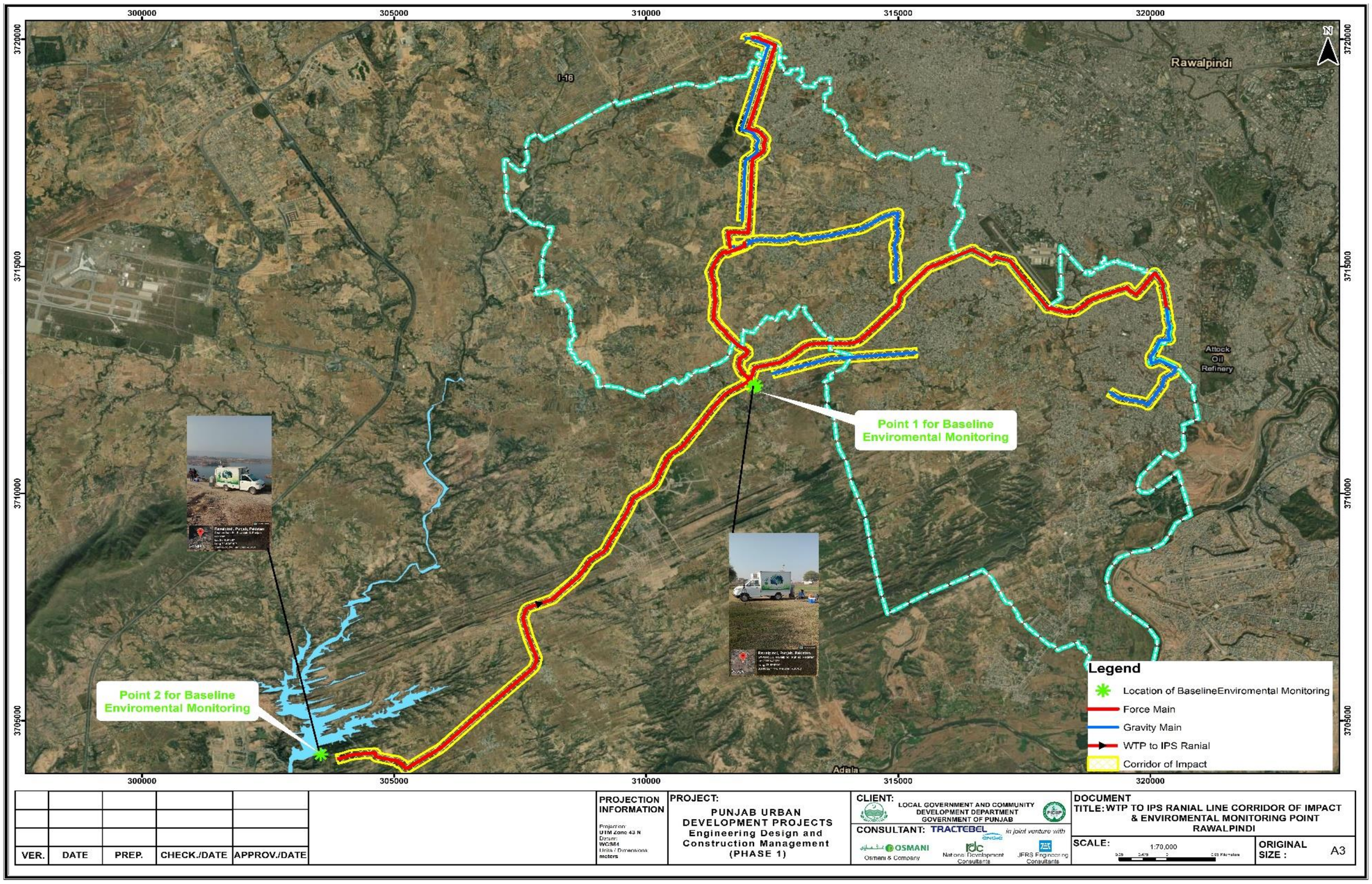


Figure 4. 1: Index Map of COI of Proposed Project

4.2 PHYSICAL ENVIRONMENT/RESOURCES

The following section provides an overview of the information on physical environment of the project area, collected from primary as well as secondary sources. The major parameters covered include Topography, Geology, Seismicity, Soil, Climate, Water Resources, Ambient Air Quality & Noise, Solid Waste and Land-use along the Proposed Project.

4.2.1. Topography

The Project is located in Rawalpindi Tehsil division which falls in the Salt Range and Potohar Plateau. The terrain mainly consists of plains and mountains (reaching an elevation of over 1,175 m) traversed by ravines and nullahs originating from the mountains. The northern part of the metropolitan area lies in the mountainous terrain of the Margala Hills, a part of the lower and outer Himalayas, which also includes the Hazara and Kala Chitta Ranges. The foot of Margalla range stands at an elevation of about 620 m and the top of the mountain is about 1,200 m. The terrain of Rawalpindi gradually falls off towards Lai Nullah in the west and the Kurang River in the east. Lai Nullah enters the city from the southwest and joins the Soan River in the southern side. Occasionally it overflows during the rainy season, causing considerable damage. Four major tributaries, namely Saidpur Kas, Tenawali Kas, Bedarawali Kas, and Johd Kas, originate from Margalla Hills[3]. **Figure 4.2** represents the topography of the area.

[3] Source: Iqbal M. Sheikh et al., (Environmental Geology of the Islamabad-Rawalpindi Area, Northern Pakistan) by Geological Survey of Pakistan

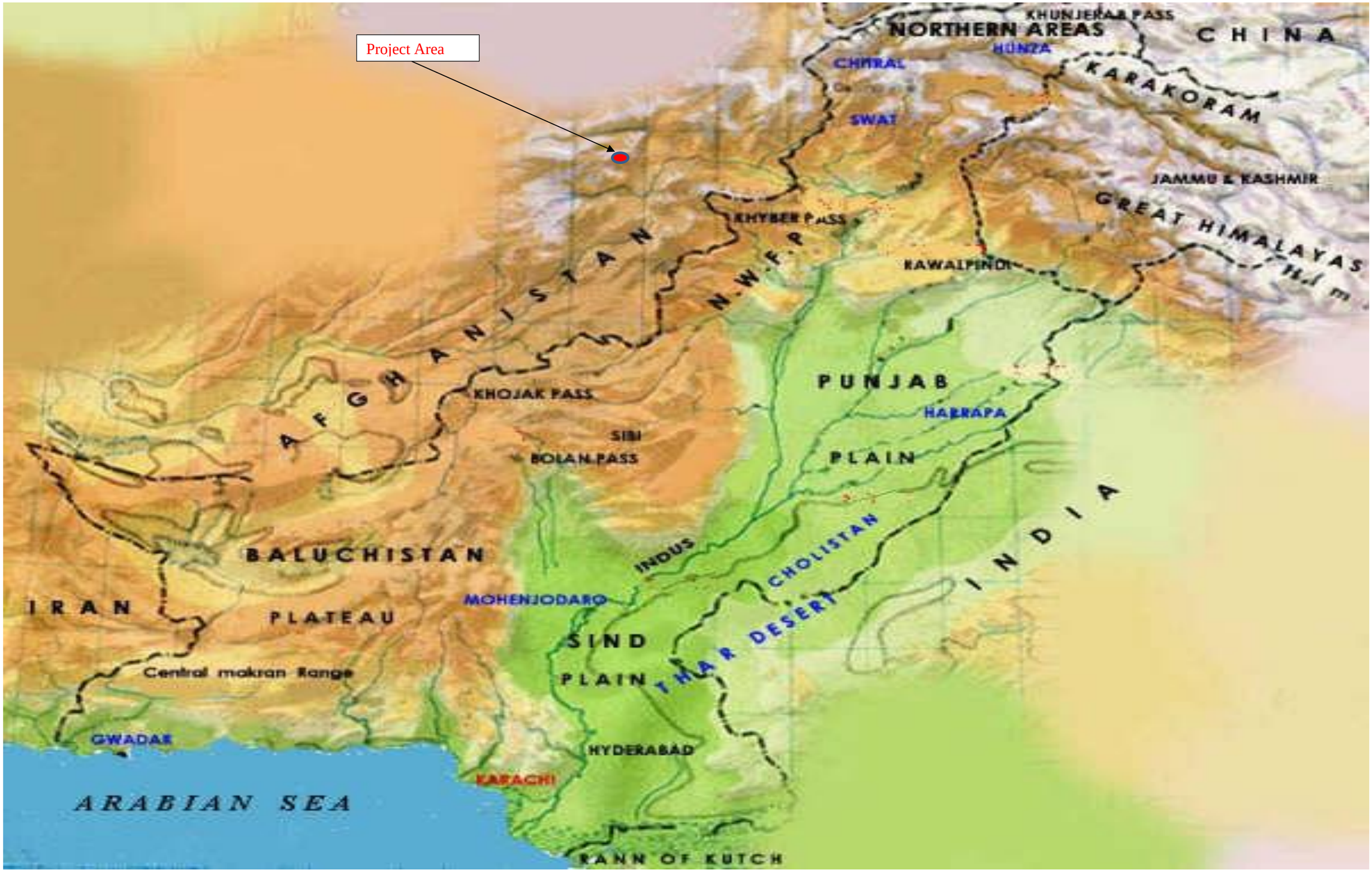


Figure 4. 2: Topography of the Project Area

4.2.2. Regional Geology and Soil

The area in and around Rawalpindi has a complex geological history of mountain formation, alluvial-loessic deposition and erosion cycles. In the west of the Potohar Uplands, the main depositions of loess are from the Pleistocene period. Streams and ravines cut the loess plain, affected by gully erosion and steep slopes. This type of land is unsuitable for cultivation. The areas are composed of sandstone and limestone. There is an extensive area with exposed bedrock and fragmentary, thin soil formations.

The gravel and loess are especially important to the environmental geology because they form most of the building foundations and because gravel is the primary ground-water aquifer. West of Rawalpindi, plains of thick, easily eroded loess is extensively dissected into shallow badland valleys. East of Rawalpindi, the folded ridges of Rawalpindi Group rocks rise above the alluvial cover to form prominent hills. Urban development is concentrated in the piedmont bench area, which is little dissected in its northern part, where Islamabad is located, but is more deeply dissected toward the south near the Soan River, where Rawalpindi is located[4].

Important minerals like limestone, marble, and fireclay are found in the area. Limestone is found abundantly in Margalla Hills and marble in the western section of Margalla range. Limestone is common in the lower hills in Rawalpindi Tehsil, and deposits can also be found in the Kankar Plains. Clay soils in the District exhibit five strata, from bottom to top: (i) coarse pebbles with sand or clay; (ii) an alluvial stratum deposited by an older river system in the Soan Basin, (iii) alluvial deposits of the present river system (iv) an airborne top layer of silt or clay (loess), and (v) conglomerate and loose gravel deposits.

Figure 4.3 indicates the properties (silty clay, clean clay and sand with silt) of soil in the Project Area. Out of these three, the silty clay is a predominant one.

[4] **Source:** Iqbal M. Sheikh et al., (Environmental Geology of the Islamabad-Rawalpindi Area, Northern Pakistan) by Geological Survey of Pakistan

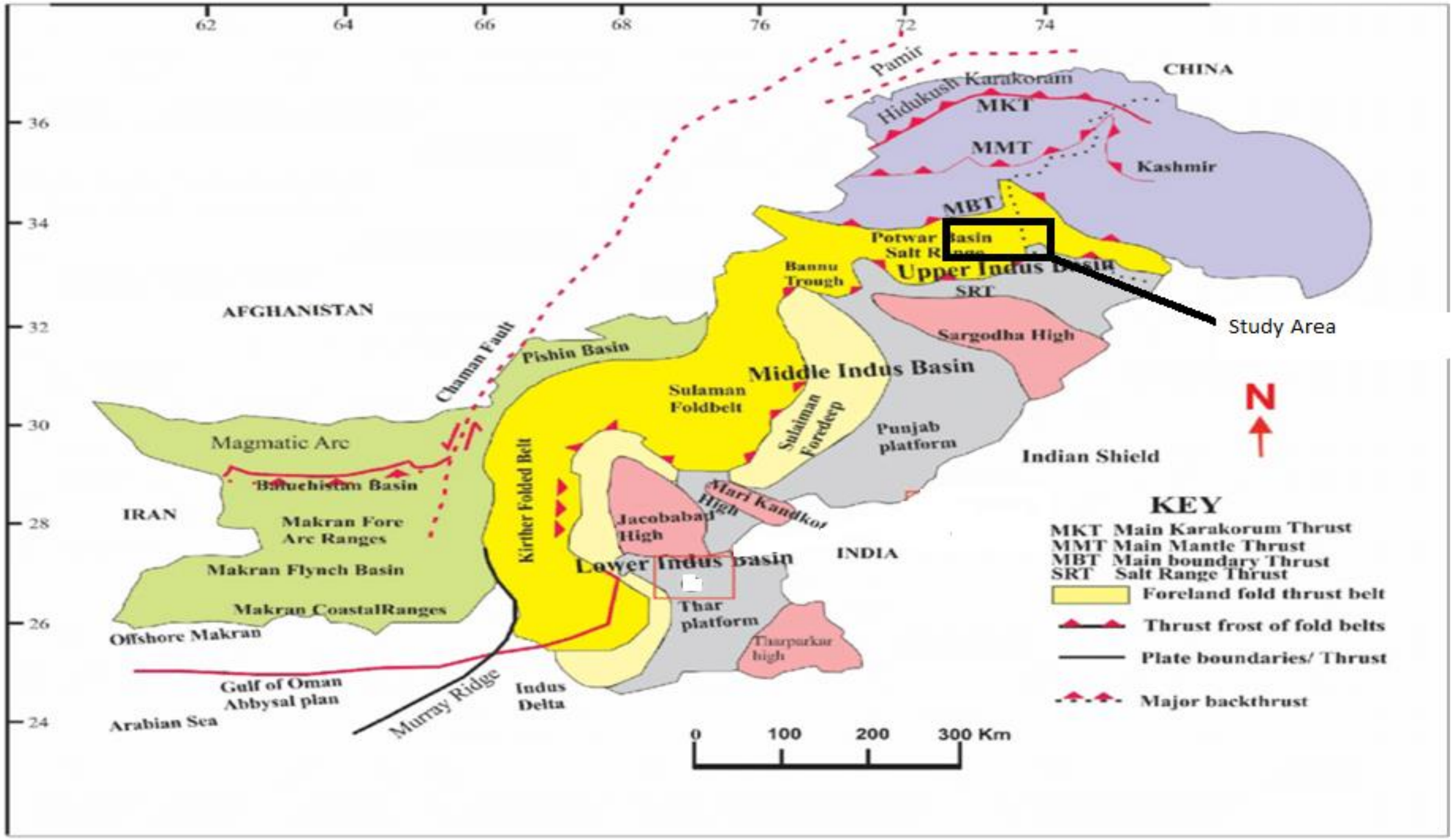


Figure 4. 3: Regional Geological Map

https://www.google.com/imgres?imgurl=https%3A%2F%2Fwww.researchgate.net%2Fpublication%2F257786007%2Ffigure%2Ffig1%2FAS%3A297487400226816%401447937931075%2FGeological-map-of-Pakistan-showing-field-locations-and-main-geological-features-black.png&imgrefurl=https%3A%2F%2Fwww.researchgate.net%2Ffigure%2FGeological-map-of-Pakistan-showing-field-locations-and-main-

4.2.3. Seismology

On the basis of Peak Ground Acceleration (PGA) values obtained through Probabilistic Seismic Hazard Assessment (PSHA), Pakistan is divided into five (05) seismic zones in line with the Uniform Building Code (UBC), 1997 of the Pakistan. The boundaries of these zones are defined on the basis as shown in **Table 4.1**.

Table 4. 1: Values of Seismic Zones of Pakistan

Sr. No.	Zone	PGA (g)
1	1	0.05 to 0.08
2	2A	0.08 to 0.16
3	2B	0.16 to 0.24
4	3	0.24 to 0.32
5	4	> 0.32 g

Source: Uniform Building Code (UBC), 1997 of the Pakistan

In general, the proposed project, as per Building Code of Pakistan (BCP), 2007 (Seismic Provisions) falls entirely in the zone-2B (Moderate Hazard) category with PGA 0.16 to 0.24g of the seismic zonation map as shown in **Figure 4.4**. Hence all the applicable provisions of BCP should be met during the design and construction[5] for safety against seismic hazards.

[5] Building Code of Pakistan (Seismic Provisions – 2007), Ministry of Housing and Works

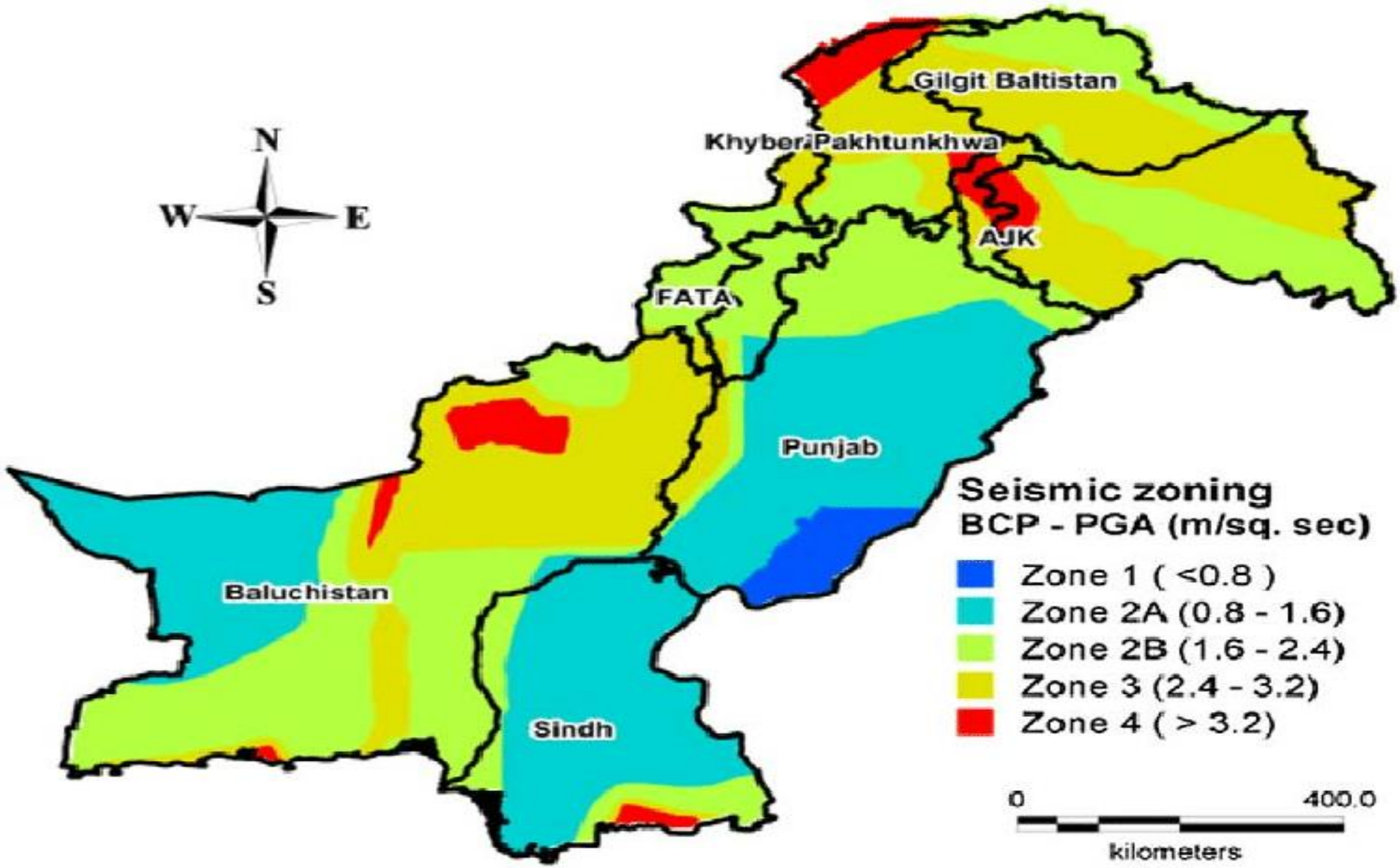


Figure 4. 4: Seismic Zoning Map

4.2.4. Climate

The Project area is classified as humid subtropical climate. The humid subtropical climates are characterized by typically mild, dry and short winters. Summers in Project area are long with higher temperatures starting from mid-April and reaching peak temperatures in June/July. The temperatures often exceed 40 °C in summers. The summers are typically followed by monsoons where heavy rains are experienced. The project area receives rains in all the seasons but monsoon rain is pronounced and constitutes a definite rainy season between the month of July and September. Average high temperatures decrease during the monsoon season, but humidity increases. This results in hot and humid conditions, similar to summers in other humid subtropical climates.

The following sections present the climate details of the meteorological gauging station situated near the proposed project. Airport, Islamabad meteorological station was identified near to the proposed project.

The monthly data for Temperature, Rainfall, Relative Humidity and Wind speed from year (1981-2010) for the above mentioned Weather Stations for the Project Area are presented in subsequent section.

4.2.5. Temperature

The proposed Project Area will be subjected to long periods of high temperature in summers and low temperature in winter. The mean monthly temperature (max & min) of Airport, Islamabad climatic station has been acquired from Pakistan Meteorological Department (PMD) for the 1981 to 2010 years and presented in **Table 4.2**.

Average monthly mean maximum and mean minimum temperatures of above mentioned station has been discussed in this section which represents the temperature conditions. It may be seen from the **Figure 4.5** below that the temperature rises rapidly until June and the temperature drops with advent of monsoon in July. The temperature rises rapidly until June and the temperature drops with advent of monsoon in July. The months of December and January experience a severe drop in temperature and, the temperature falls below the freezing point in areas above 1800 masl. Summer is marked with monsoon rains, which occur usually in July/August.

Table 4. 2: Monthly Temperature Recorded at Meteorological Gauging Station

Sr. No.	Months	Mean Max. Temperature (0C)	Mean Min. Temperature (0C)	Mean Temperature (0C)
1	Jan	17.9	3.2	10.6
2	Feb	19.7	6.0	12.9
3	Mar	24.5	10.7	17.6
4	Apr	30.5	15.8	23.1
5	May	36.0	20.7	28.3
6	Jun	38.4	23.7	31.0
7	Jul	35.3	24.4	29.8
8	Aug	33.7	23.8	28.8
9	Sep	33.7	21.1	27.4
10	Oct	30.9	14.5	22.7
11	Nov	25.9	8.3	17.1
12	Dec	20.2	4.3	12.2

Source: Pakistan Meteorological Department

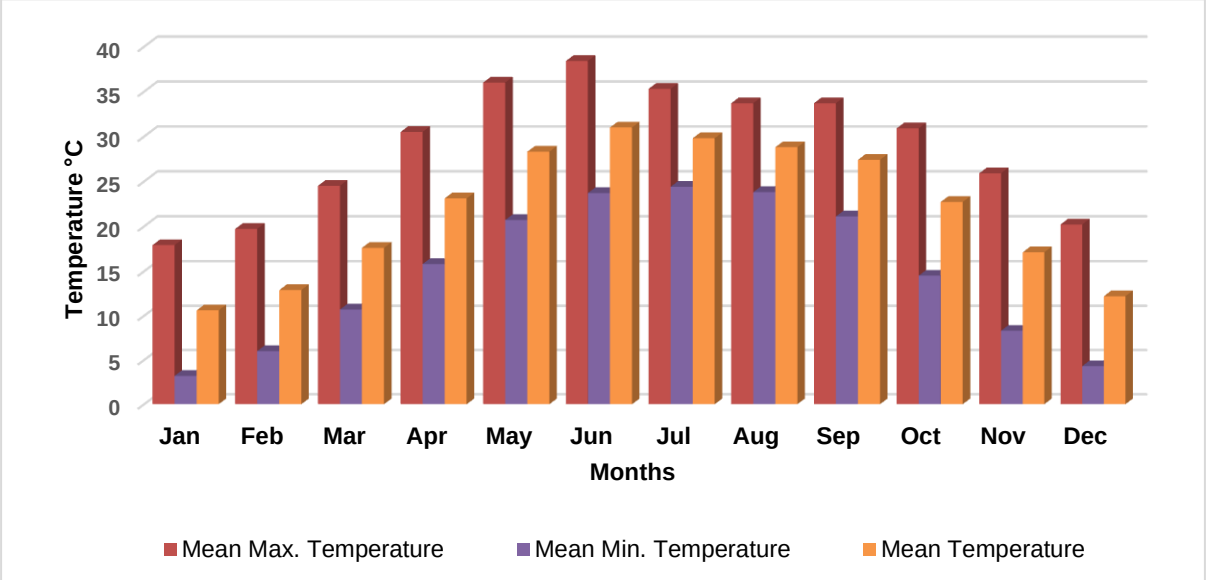


Figure 4. 5: Mean Monthly Temperature at Meteorological Gauging Station

According to the Metrological Gauging Station data, the coldest month is January in which the mean minimum temperature is 3.2°C and the mean maximum temperature is 17.9°C. June is the hottest month with the mean minimum temperature of 23.7°C and the mean maximum temperature as 38.4°C.

4.2.6. Rainfall

Mean monthly rainfall data and the number of rainy days recorded of the project area are given in **Table 4.3**. The average annual rainfall of the project area is 1248 mm.

The maximum rainfall occurs during the months of July and August, which is about 50% of the annual rainfall. Winter rains generally occur during the months of January to March, whereas, November is normally the months with least precipitation.

Table 4. 3: Mean Monthly Rainfall Record

Sr. No.	**Months**	**Mean Monthly Rainfall (mm)**
		Airport
1	Jan	56.2
2	Feb	84.1
3	Mar	92.4
4	Apr	63.2
5	May	35.8
6	Jun	75.3
7	Jul	307.8
8	Aug	340.3
9	Sep	110.7
10	Oct	31.7
11	Nov	14.4
12	Dec	36.3
Annual		1248.5

Source: Pakistan Meteorological Department

Graphical representations of month-wise precipitation of meteorological gauging station are provided below in **Figure 4.6**. The maximum rainfall occurs during the monsoon season in the months of July and August.

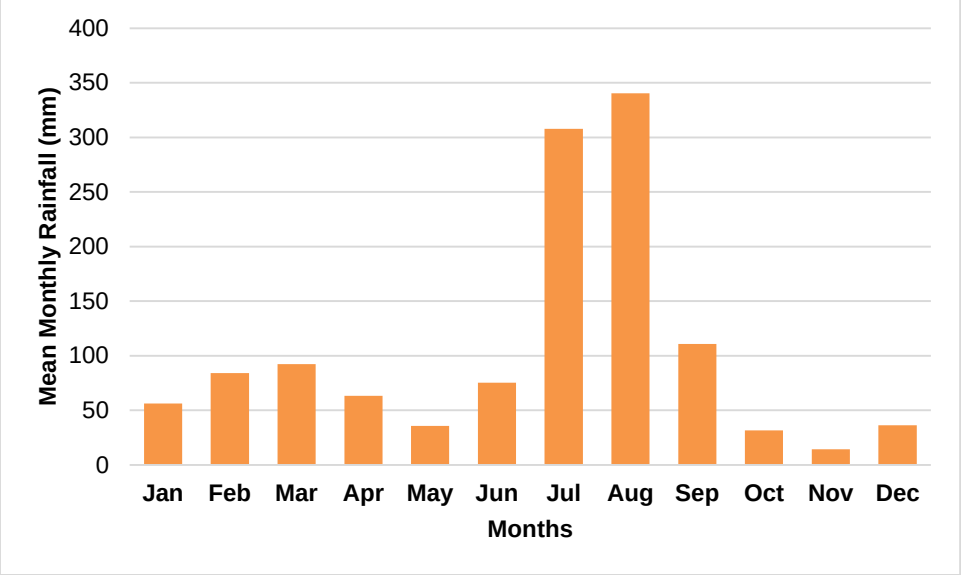


Figure 4. 6: Mean Monthly Rainfall of Meteorological Gauging Station

4.2.7. Relative Humidity

The relative humidity data is given in **Table 4.4**. The data reveals that at 00:00 hours, the relative humidity levels are generally higher while lower relative humidity levels are recorded at 12:00 hours. Relative humidity levels are mostly high during the month of August, whereas, these are extremely lower during the highest temperature i.e., May and June.

Table 4. 4: Relative Humidity Recorded at Airport Meteorological Gauging Station

Sr. No.	Months	Relative Humidity (%)		
		00 UTC	03 UTC	12 UTC
1	January	87.4	86.8	46.6
2	February	84.1	82.5	43.4
3	March	80.2	74.0	39.3
4	April	72.7	60.1	32.3
5	May	62.0	47.6	26.5
6	June	63.5	49.3	30.3

Sr. No.	Months	Relative Humidity (%)		
		00 UTC	03 UTC	12 UTC
7	July	81.7	73.5	52.8
8	August	88.8	81.6	60.9
9	September	85.3	76.0	50.5
10	October	83.9	76.1	41.4
11	November	86.2	82.7	44.0
12	December	87.6	86.8	48.7

Source: Pakistan Meteorological Department

Graphical representations of month-wise Relative Humidity of Airport meteorological gauging stations are provided below in **Figure 4.7**.

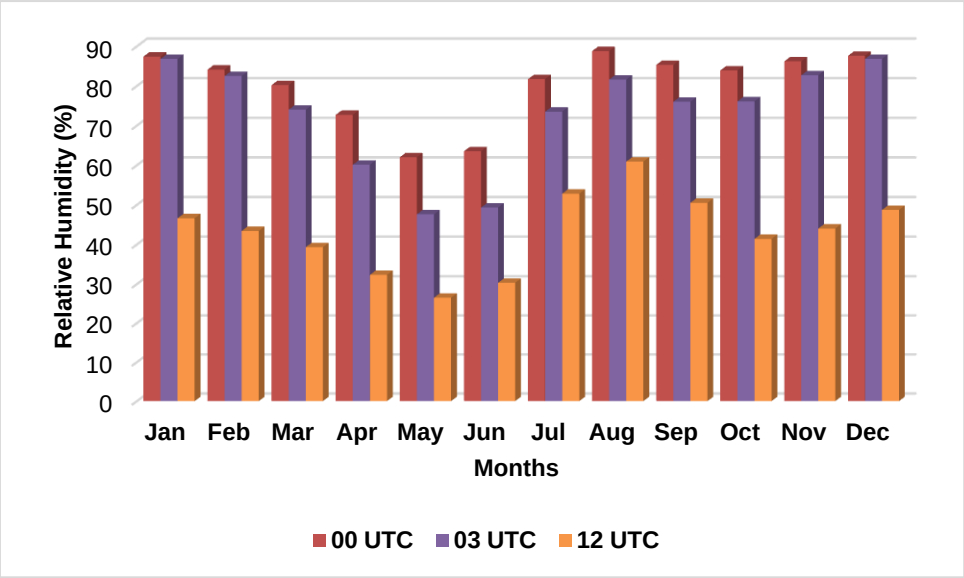


Figure 4. 7: Yearly record of Relative Humidity

The maximum humidity recorded at weather station is in the month of December i.e. 87.6 % and the minimum humidity recorded is in the month of May i.e. 62.0 % at 00 UTC.

4.2.8. Wind Speed

The mean monthly wind speed around proposed project area is given in **Table 4.5**. The data reveals that at 00 UTC, the wind speeds are generally lower while higher

wind speeds are recorded at 12 UTC. During summers wind speeds are generally higher than wind speeds in winters

Table 0-1: Wind Speed Record

Sr. No.	Months	Wind Speed (knots)		
		00 UTC	03 UTC	12 UTC
1	January	0.7	0.6	6.4
2	February	1.2	1.1	8.8
3	March	1.6	1.4	9.5
4	April	2.4	2.2	10.0
5	May	2.9	2.6	9.9
6	June	2.8	3.5	9.4
7	July	3.6	3.5	8.3
8	August	3.1	2.4	6.7
9	September	1.5	1.5	5.9
10	October	0.8	0.7	4.9
11	November	0.6	0.4	4.5
12	December	0.4	0.4	5.0

Source: Pakistan Meteorological Department

Graphical representations of month-wise wind speed is provided below in **Figure 4.8.**

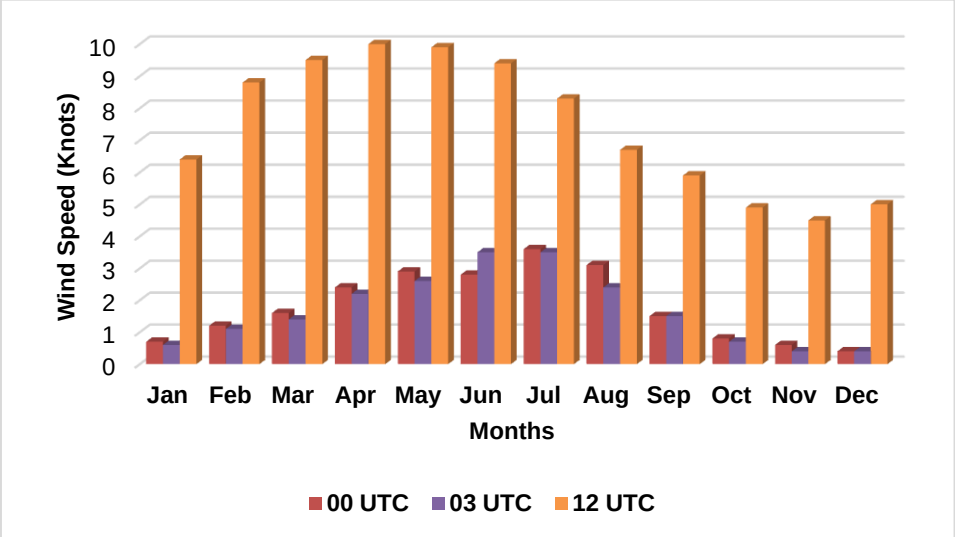


Figure 4. 8: Wind Speed of Meteorological Gauging Station

The maximum wind speed recorded at weather station is 10.0 knots in the month of April and the minimum wind speed is 4.5 knots in the month of November at 12 UTC.

4.2.9. Climate Change Impacts and Vulnerability

The rainfall and temperature pattern of any particular area plays significant role in defining the design layout and parameters of project infrastructure. Based on long term regime analysis, any significant variation in the rainfall and/ or temperature may also be explored in terms of any possible climate change scenario. However, data accuracy or redundancy were analyzed before undertaking any such regime analysis. The average monthly rainfall pattern shows that July to September (monsoon period) are the months having maximum rainfall during the year. Whereas the average monthly temperature shows the months of highest temperature as May to August (35 to 40oC) whereas the lowest temperatures (winter season) are December to February as 2 to 5^{o}C.

4.2.10. Floods:

Disaster management in Pakistan basically revolves around flood disasters, with a primary focus on rescue and relief. The existing institutional structures responsible for disaster management are geared to reactive short-term responses. Experience has shown that abnormal heavy rains in catchment areas result in flash floods in Lai Nullah especially in 2001, 2010, 2011, 2012, 2014 and 2015. **Figure 4.9** shows the distance of flood prone areas of Rawalpindi from project site.

Though the flood water recedes within a period of 3-8 hours, it causes considerable damage in the city area. Local drains from Chah Sultan and Cantonment area also fall in it which further aggravates the situation, especially when these drains cannot find their way into Nullah Lai which is already in flood, causing inundation of surrounding low lying areas (back water effect). Flash Flood urban flood due to Lai Nullah is being planned every year for medium and high risk. The potential sites/vulnerable areas have been pointed out across the board[6].

- Dhoke Naju
- Zain-ul-Haq Colony
- Both sides of Bridge at Ratta.
- Bhoosa Godown

[6] *District Disaster Management Plan 2018 of Rawalpindi, Municipal Corporation, Local Government, Rawalpindi*

- Mohanpura Neae Jinnah Road Bridge.
- Javaid Colony,
- Tipu Road,
- Chamanzer Colony,
- Nadeem Colony.
- Dhoke Chiragh Din
- Mohallah Raja Sultan
- New phagwari Mohallah Raja Sultan
- Gawalmandi.
- Dhoke Ellahi Buksh.

The flood prone area of Rawalpindi are marked on the map given in **Figure 4.9**. Extreme flood years were 1981, 1988, 1997 and 2001, the latter having been the largest among the recorded events (considered as a national disaster). The intensity and amount of rainfall caused the water level of Lai Nullah and its tributaries to rise remarkably and flooding Rawalpindi (where the damages were several times larger than in Islamabad)7.

Housing; Agriculture and Livestock; and Transport and Communications sectors suffered the most significant damage, at USD 5.6 billion, USD 3.7 billion, and USD 3.3 billion, respectively. Sindh is the worst affected province with close to 70 percent of total damages and losses, followed by Balochistan, Khyber Pakhtunkhwa, and Punjab. The Ministry of Planning, Development and Special Initiatives led the Post-Disaster Needs Assessment (PDNA), which was conducted jointly with the Asian Development Bank (ADB), the European Union (EU), the United Nations agencies with technical facilitation by the United Nations Development Programme (UNDP), and the World Bank. The PDNA, in addition to estimating damages, economic losses and recovery and reconstruction needs, also assesses broader macro-economic and human impacts and recommends principles along which to develop a comprehensive recovery and reconstruction framework[8].

[7] **Source: WMO/GWP Associated Programme on Flood Management Pakistan: Lai Nullah basin flood problem, Islamabad – Rawalpindi cities by Ahmed Kamal Federal Flood Commission, Government of Pakistan.*

[8] *Source: https://www.worldbank.org/en/news/press-release/2022/10/28/pakistan-flood-damages-and-economic-losses-over-usd-30-billion-and-reconstruction-needs-over-usd-16-billion-new-assessme*

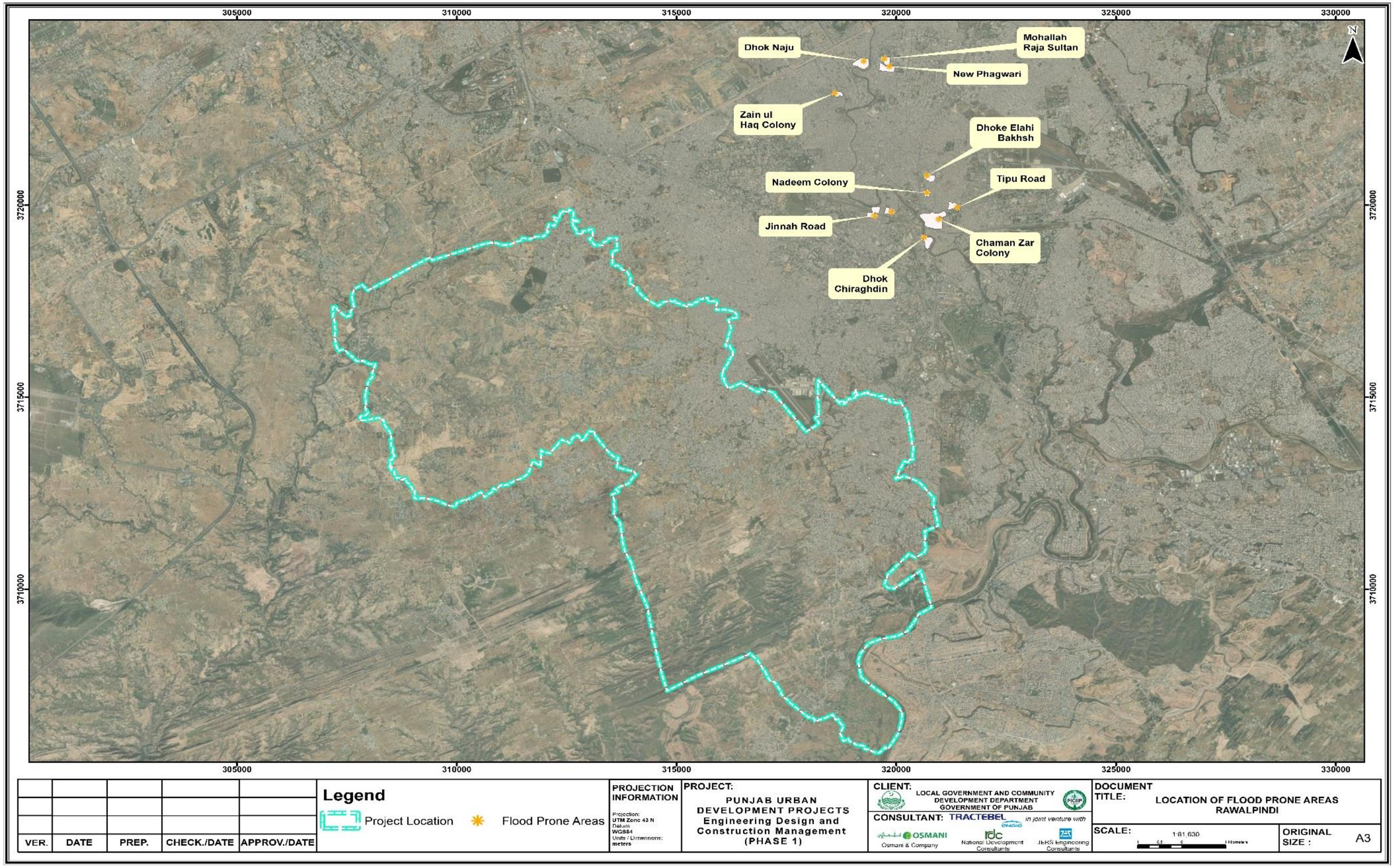


Figure 4. 9: Flood prone Areas of District Rawalpindi

4.2.11. Water Resources

In barani region of Rawalpindi district, small dams have been an important source for drinking water, fish farming and irrigation, built on perennial and non-perennial streams to capture seasonal runoff. Khalasa and Jawa dams are main dams near the proposed project, while Chahan Dam is the source of water for the current proposed project. Moreover, Soan River and Sill River are also located in the project area.

4.2.12. Hydrology and Drainage

The Study Area falls in humid subtropical region. The land use changes from mild slope eroded lands to mix cultural lands under arid conditions.

Nullah Lai has three major tributaries (Saidpur Kas, Tenawali Kas, and Bedarawali Kas) in the administrative jurisdiction of Islamabad. In the jurisdiction of Rawalpindi below Katarian Bridge, other three major tributaries (Nikki Lai, Pir Wadhai Kas, and Dhoke Ratta Nullah) fall into the Nullah Lai. In addition, there are six other drainage channels joining the Nullah after the Dhoke Ratta and finally the Nullah falls down in the Soan River.

Nullah Lai basin drains a total area of 235 km^2 south of Margalla Hills, with 70% of the watershed falling within the territory of Islamabad and the remaining 30% within the downstream Rawalpindi municipal and cantonment limits. Stretching from the Margalla hills in the federal capital Islamabad at north-western edge until the Soan River at south-eastern edge in the District Rawalpindi the maximum length of the Lai Nullah does not exceed 45 km.

The hydraulic analysis provided that all the major rivers are functioning as per design discharges with sufficient conveyance capacity. At most of the bridges no significant scour problem was observed and the canals crossings were noticed satisfactorily in operation. The guide banks and allied protective structures should be maintained regularly to avoid any unprecedented event due to high flood conditions.

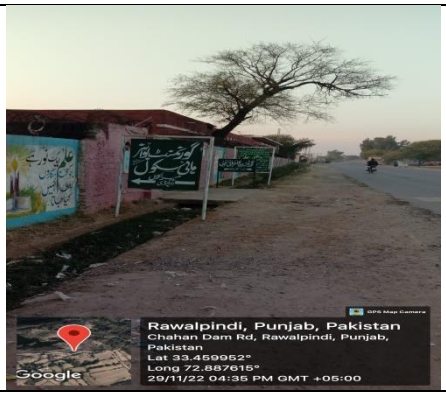
4.2.13. Solid Waste and Wastewater Situation

In Rawalpindi city, proper solid waste management system and sewerage system exist. However, in rural areas, there is no proper sewerage and sanitation system available in the COI. A few villages of the COI were observed to be connected with the proper sewerage system. In a majority of the cases, village's wastewater is disposed of into open spaces or nearby ponds. Ultimately, wastewater is drained into a

pond/nullah, thus it becomes a source of pollution. Same is the case with solid waste there is no proper arrangement for disposed of solid waste. Most of the solid waste is found to be stored in the form of heaps at various locations near the villages. The remaining organic and livestock waste is collected in the designated area which is used to prepare compost utilized by local farmers in their agriculture fields as a fertilizer. The major constituents of solid waste in the area are paper, plastic, and organic waste (food waste and animal waste) and waste from the existing nearby houses.

4.2.14. Land use of the Proposed Project

There are different types of land use i.e. barren / open, built-up, cultivated land, graveyards, green belt, rivers, road/track, stream/ nullah, residential and commercial details structures, trees/ bushes and water ponds etc. Some scattered houses as well as densely populated houses have also been observed along the entire alignment of the project area. **Figure 4.10** shows the land use around project site.

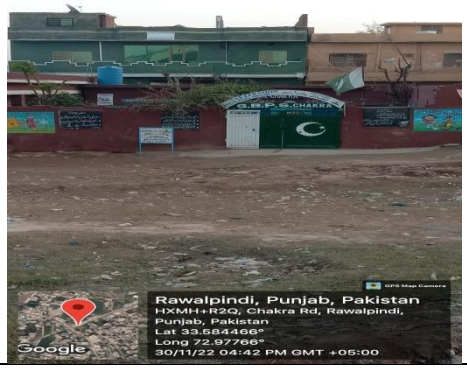
<table>
<tr><td> 
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<tr><td colspan="2">Reserved area for water treatment plant</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Govt. School at Chahan Dam Road</td><td>Chahan Dam Road</td></tr>
</table>



Graveyard near project site



Health center at Chahan Dam Road



School at Chakra Road



Graveyard in Ranial





Chakri road

Figure 4. 10: Land use around the Project Site

4.2.15. Environmental Sensitive Receptor of the Proposed Project

Sensitive receptors are people/places more susceptible to the adverse effects of exposure to the pollutants and social disturbance, due to the developmental projects. Thus, sensitive receptors are necessary to be identified, to evaluate the potential impacts of the proposed project on public health and the environment and adopt necessary mitigation measures to minimize the impact.

The sensitive receptors identified for the proposed project within or near the CoI are religious, educational, health care and cultural places etc. They are prone to sensitivity during construction phase, due to emission of air pollutants, noise and vibration, traffic jams/access, temporary edifice of construction camps, and mobilization issues. The map of sensitive receptors of the study area is shown in **Figure 4.11** and **Figure 4.12**. **Table 4.5** shows the detail of Environmental Sensitive Receptors of the project area.

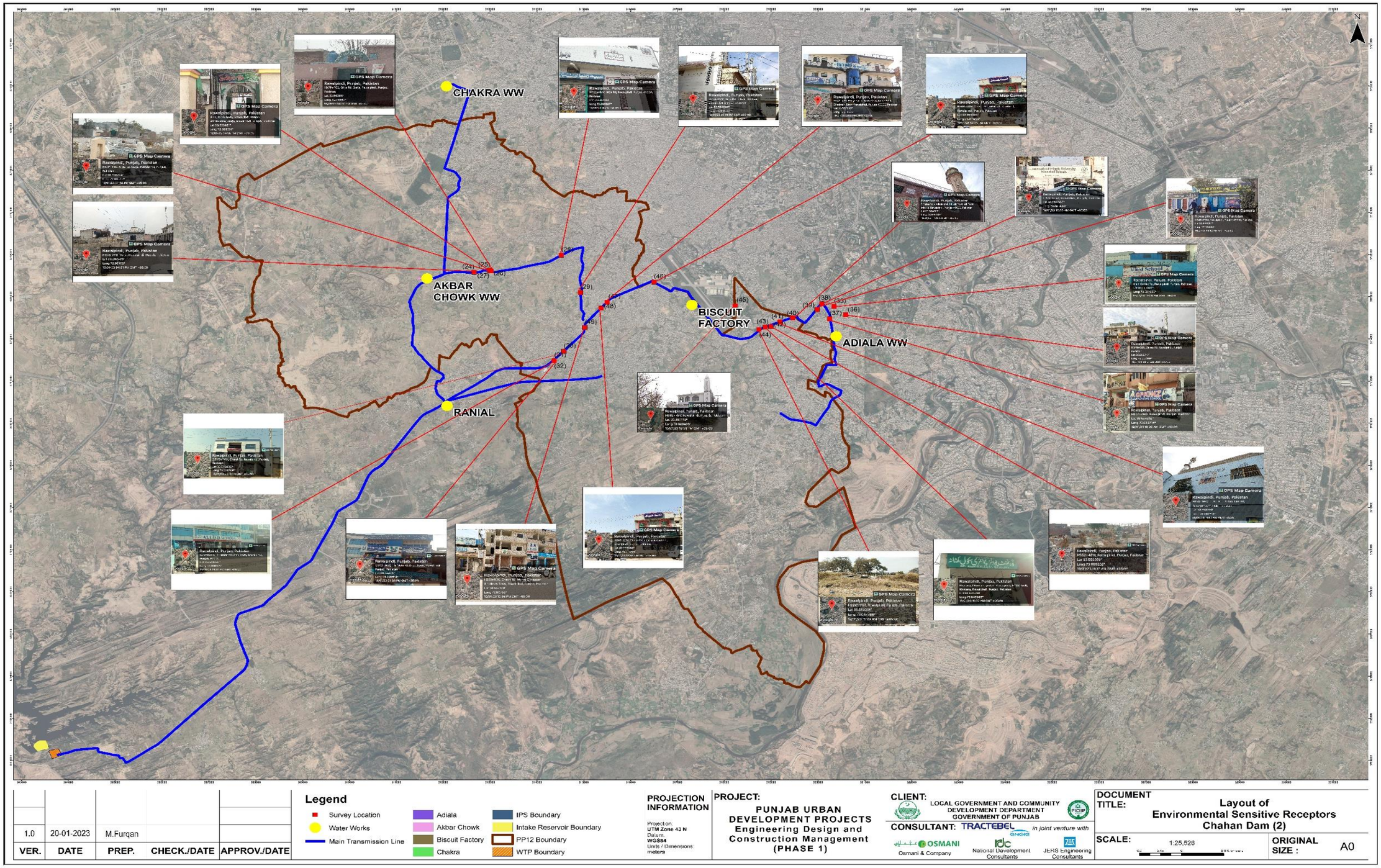


Figure 4. 11: Environmental Sensitive Receptors Map

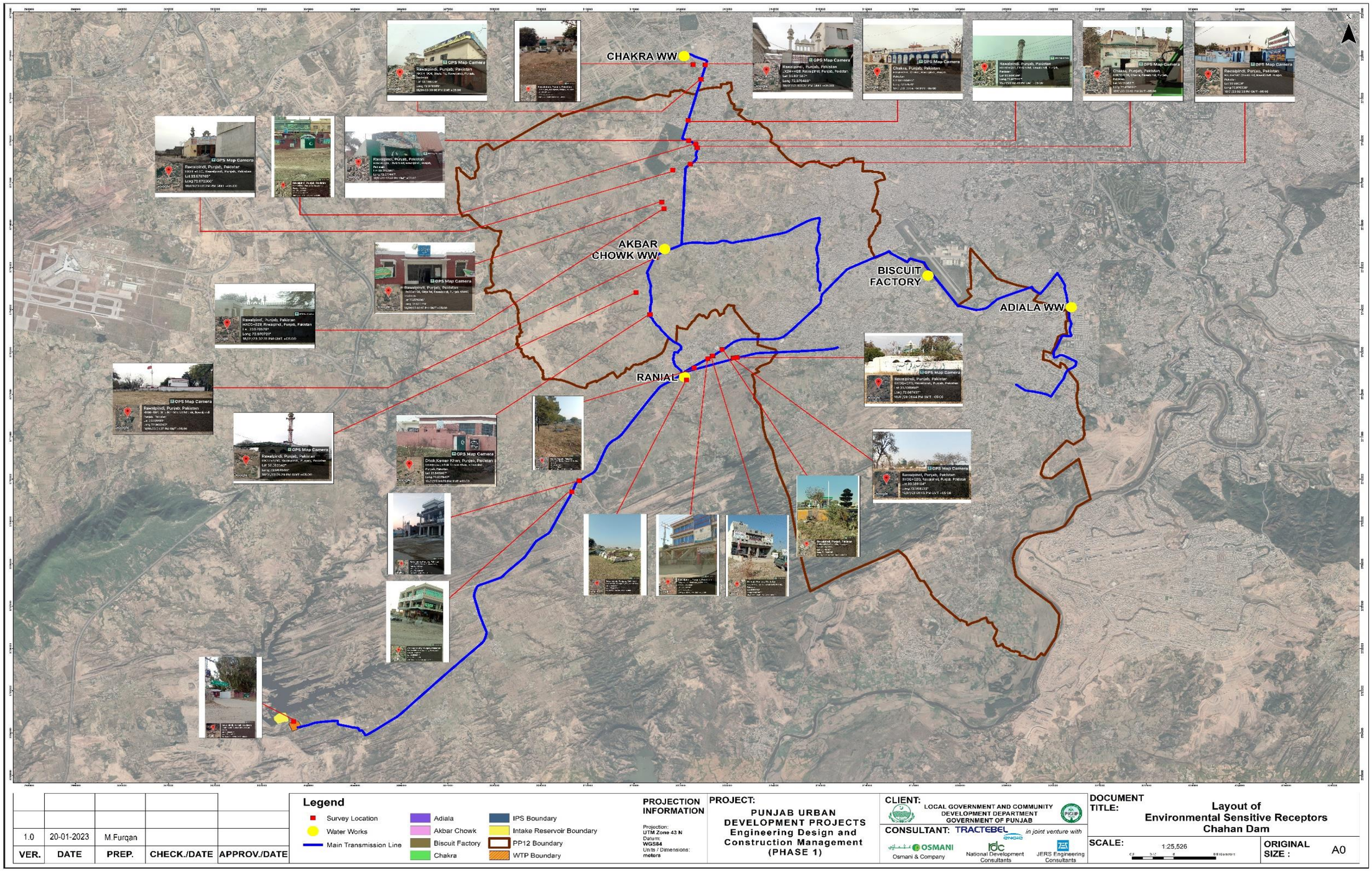
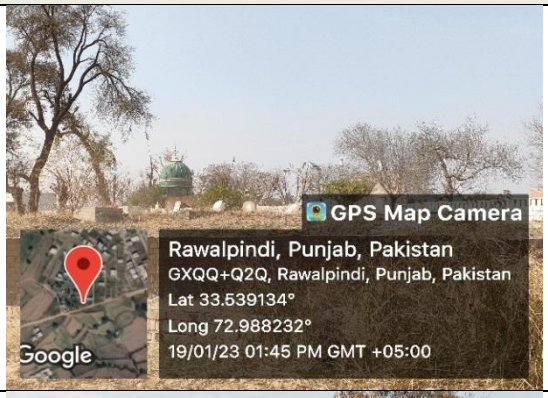
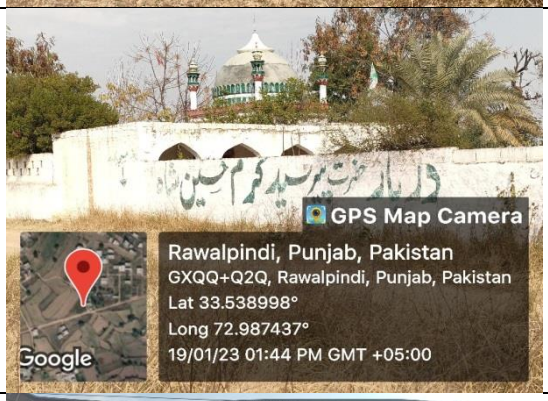
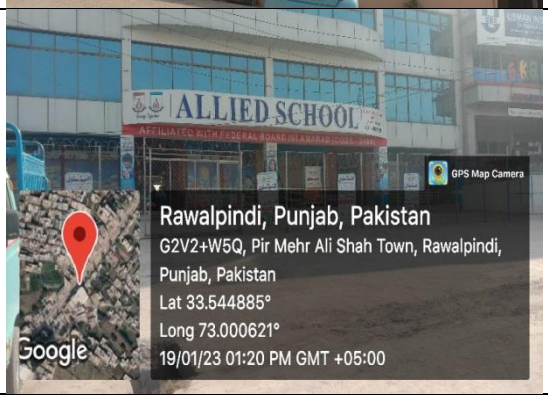
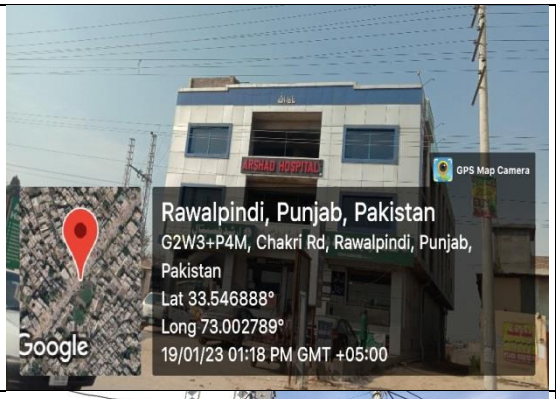
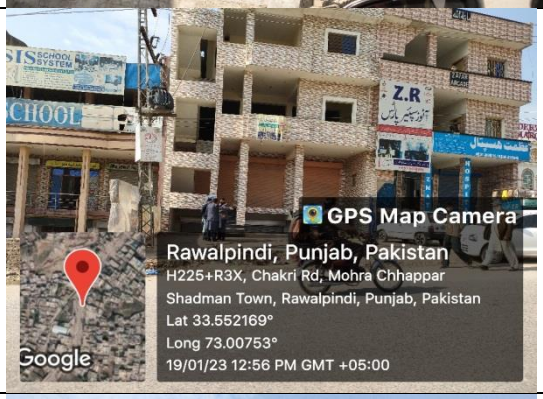
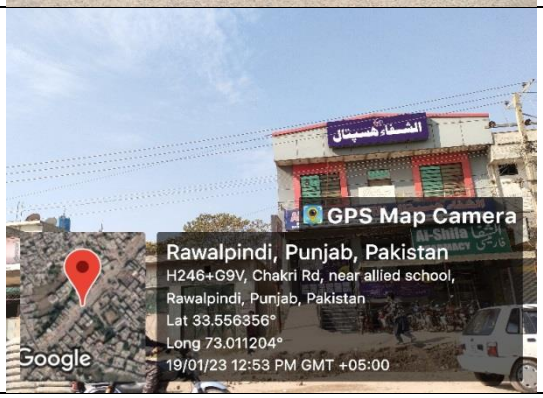
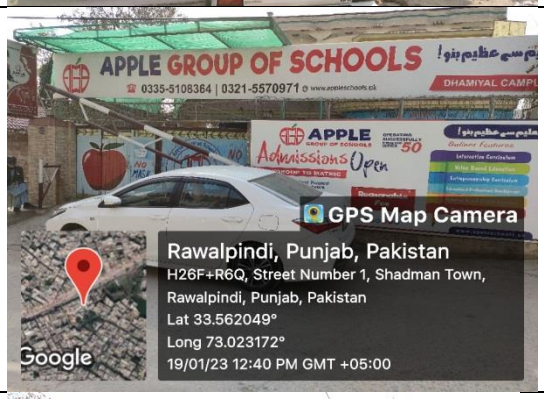
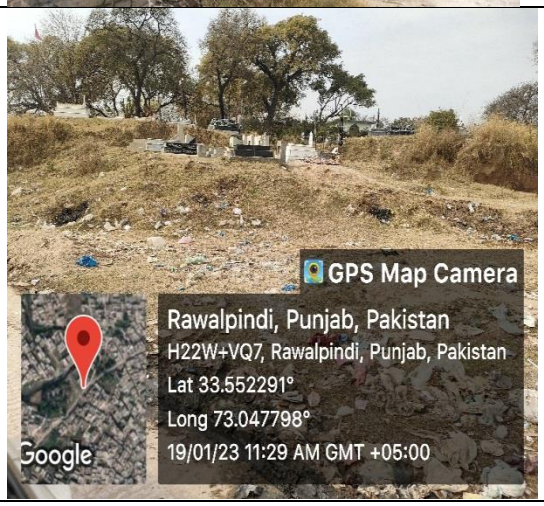


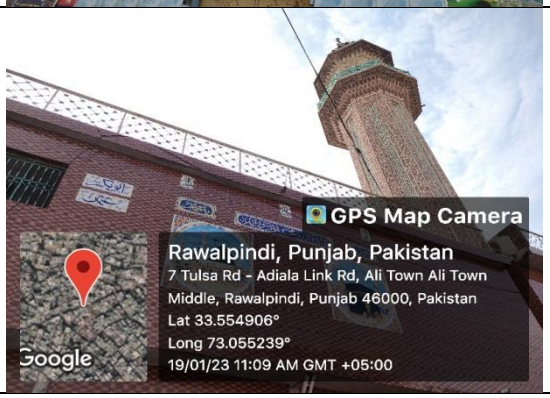
Figure 4. 12: Environmental Sensitive Receptors

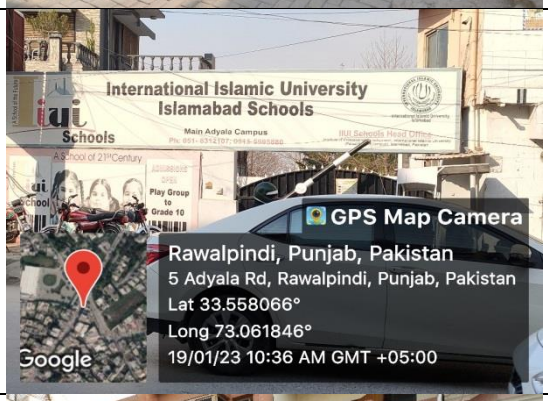
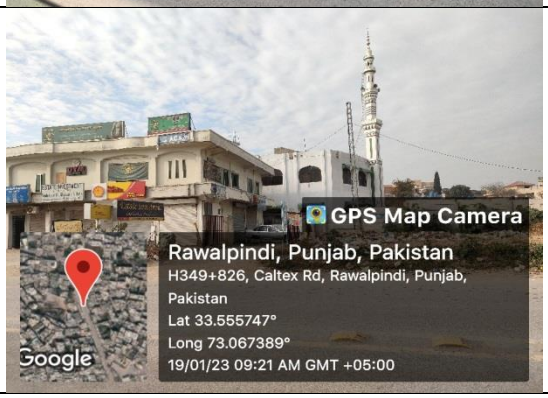
Table 4. 5: Detail of Environmental Sensitive Receptors

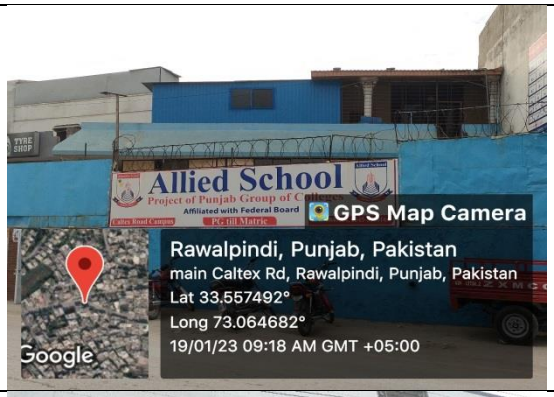
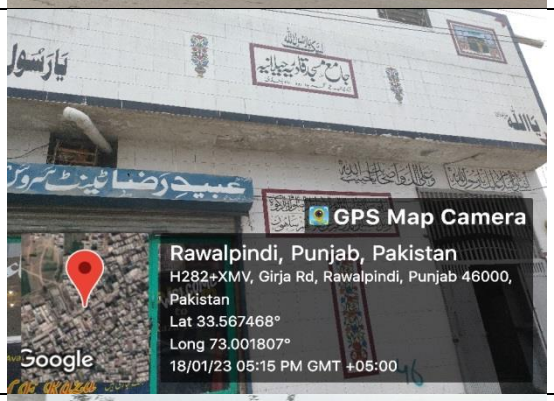
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1.		33.539134 ° N 72.988232° E	Shrine and Graveyard	90
2.		33.538998 ° N 72.987437° E	Shrine and Graveyard	85
3.		33.54488 ° N 73.000614° E	University	15
4.		33.544885 ° N 73.000621° E	School	20

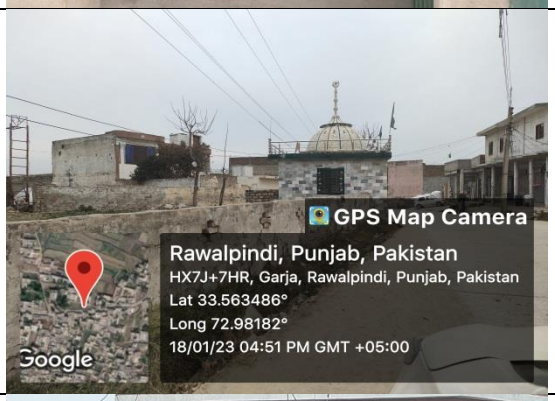
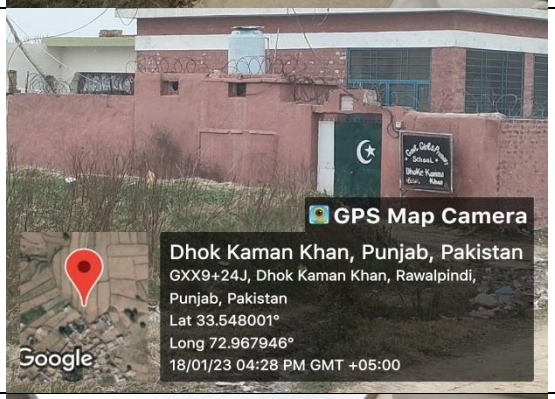
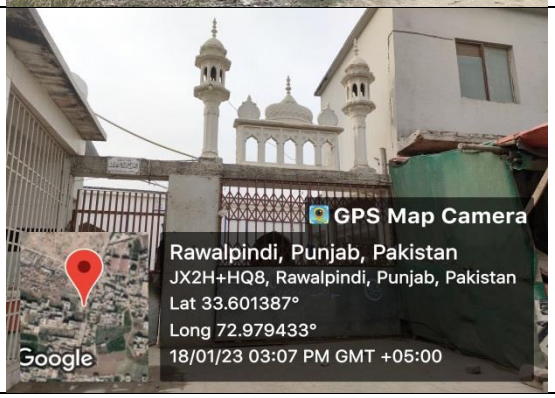
5.		33.546888 ° N 73.002789° E	Hospital	20
6.		33.559548 ° N 73.006337° E	Mosque	12
7.		33.552169 ° N 73.00753° E	Hospital	20
8.		33.556356 ° N 73.011204° E	Hospital	15

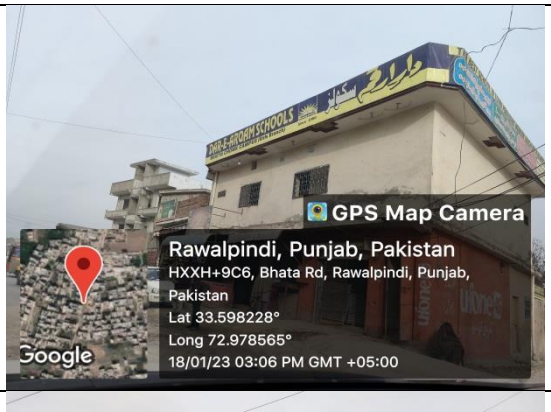
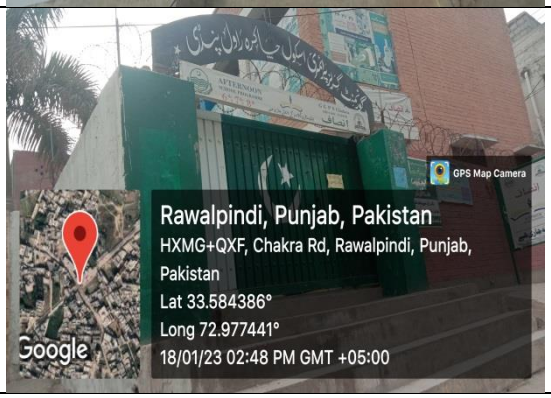
9.		33.552169 ° N 73.00753° E	School	20
10.		33.556356 ° N 73.011204° E	School	10
11.		33.552169 ° N 73.00753° E	Mosque	35
12.		33.556356 ° N 73.011204° E	Graveyard	90

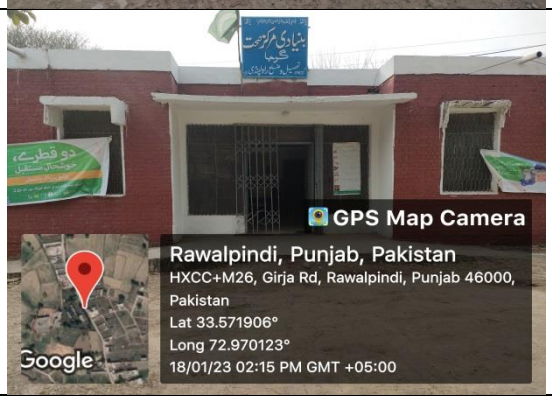
13.		33.552169 ° N 73.00753° E	School	10
14.		33.556356 ° N 73.011204° E	Graveyard	85
15.		33.552169 ° N 73.00753° E	Mosque	15
16.		33.556356 ° N 73.011204° E	Mosque	20

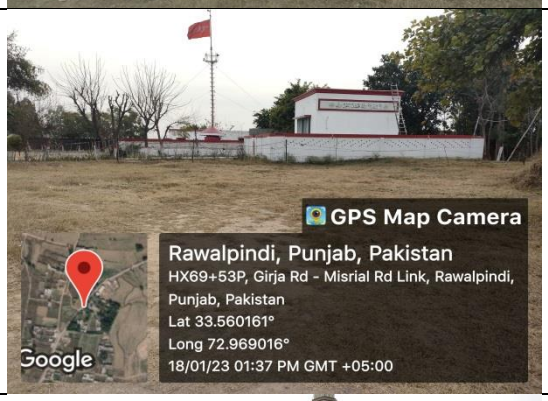
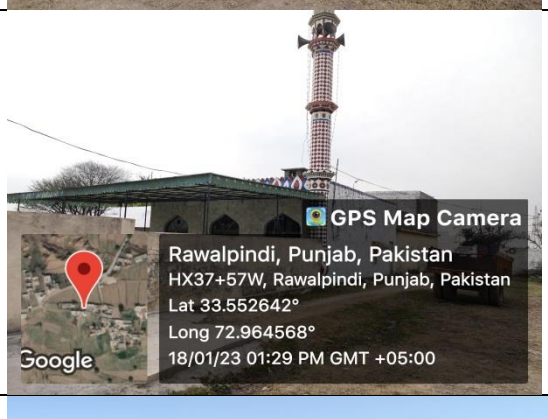
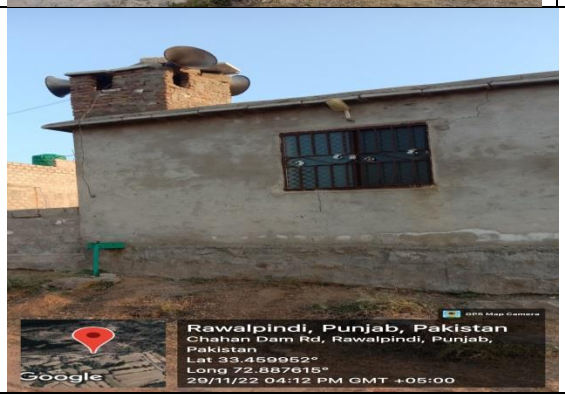
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19.		33.552169 ° N 73.00753° E	School	20
20.		33.556356 ° N 73.011204° E	Mosque	60

21.		33.552169 ° N 73.00753° E	School	30
22.		33.567468 ° N 73.001807° E	Mosque	10
23.		33.563804 ° N 72.985731° E	Graveyard	
24.		33.563884 ° N 72.98559° E	School	

25.		33.563961 ° N 72.985361° E	Shrine	70
26.		33.563486 ° N 72.98182° E	Shrine	90
27.		33.548001 ° N 72.967946° E	School	30
28.		33.601387 ° N 72.979433° E	Mosque	60

29.		33.598228 ° N 72.978565° E	School	10
30.		33.589453 ° N 72.97578° E	School	15
31.		33.584386 ° N 72.977441° E	Mosque	20
32.		33.584386 ° N 72.977441° E	School	10

33.		33.583681° N 72.978034° E	Shrine	50
34.		33.58006 ° N 72.976539° E	School	20
35.		33.578769 ° N 72.972566° E	Mosque	20
36.		33.511906 ° N 72.970123° E	Basic Health Unit	40

37.		33.570529 ° N 72.970721° E	Mosque	90
38.		33.560161 ° N 72.969016° E	Shrine	90
39.		33.552642 ° N 72.964568° E	Mosque	50
40.		33.273583 ° N 72.531540° E	Mosque	30

41.		33.273583 ° N 72.531540° E	School	10
42.		33.459952 ° N 72.887615° E	Basic Health Unit	20
43.		33.509911 ° N 72.950776° E	School	20
44.		33.511935 ° N 72.952049° E	Mosque	30

45.		33.584459 ° N 72.977663° E	School	20
46.		33.601377 ° N 72.976706° E	Shrine & Graveyard	60
47.		33.536765 ° N 72.978416° E	Graveyard	70
48.		33.534213 ° N 72.976744° E	Graveyard	90

49.		33.538792 ° N 72.981506° E	School	20
50.		33.53932 ° N 72.981957° E	School	20
51.		33.53932 ° N 72.981957° E	College	100

4.3 ECOLOGICAL RESOURCES

4.3.1. Methodology

The ecological data was collected through primary survey, during the field visit of the project site and secondary survey (desktop study). Ecological features of project area were identified and recorded including the faunal and floral species. During primary survey, All the available literature was thoroughly reviewed to have a better understanding of the project area and its surroundings including habitat, flora and fauna. The route alignment was thoroughly examined based on the primary and secondary (Flora of Pakistan-MI-Sheikh, Birds of Pakistan-ZB-Mirza-Mammals of Pakistan-TJ Roberts, Previous EIAs of the proposed area, Manual of silviculture for Pakistan [1965] Champion, Sir H.G.; Pakistan Forest Inst., Peshawar eng; Seth, S.K.

Khattak, G.M.) data. The stakeholder Forest, Wildlife, EPA, Fisheries and Agricultural departments were also consulted. This survey broadly covers ecosystem sensitivities (If any), vegetation, other flora and fauna. Number of trees along RoW/CoI and in the project vicinity was recorded which includes, majorly pole crops.

4.3.2. Ecosystem

The climate of the project area has a typical version of humid subtropical and dry climate, with five seasons. The study area majorly lies in sub-tropical scrub zone. The dominant trees species of this natural zone are, Kau (Olea ferruginea), Phulai (Acacia modesta) and sanatha (Dodonaea viscosa).

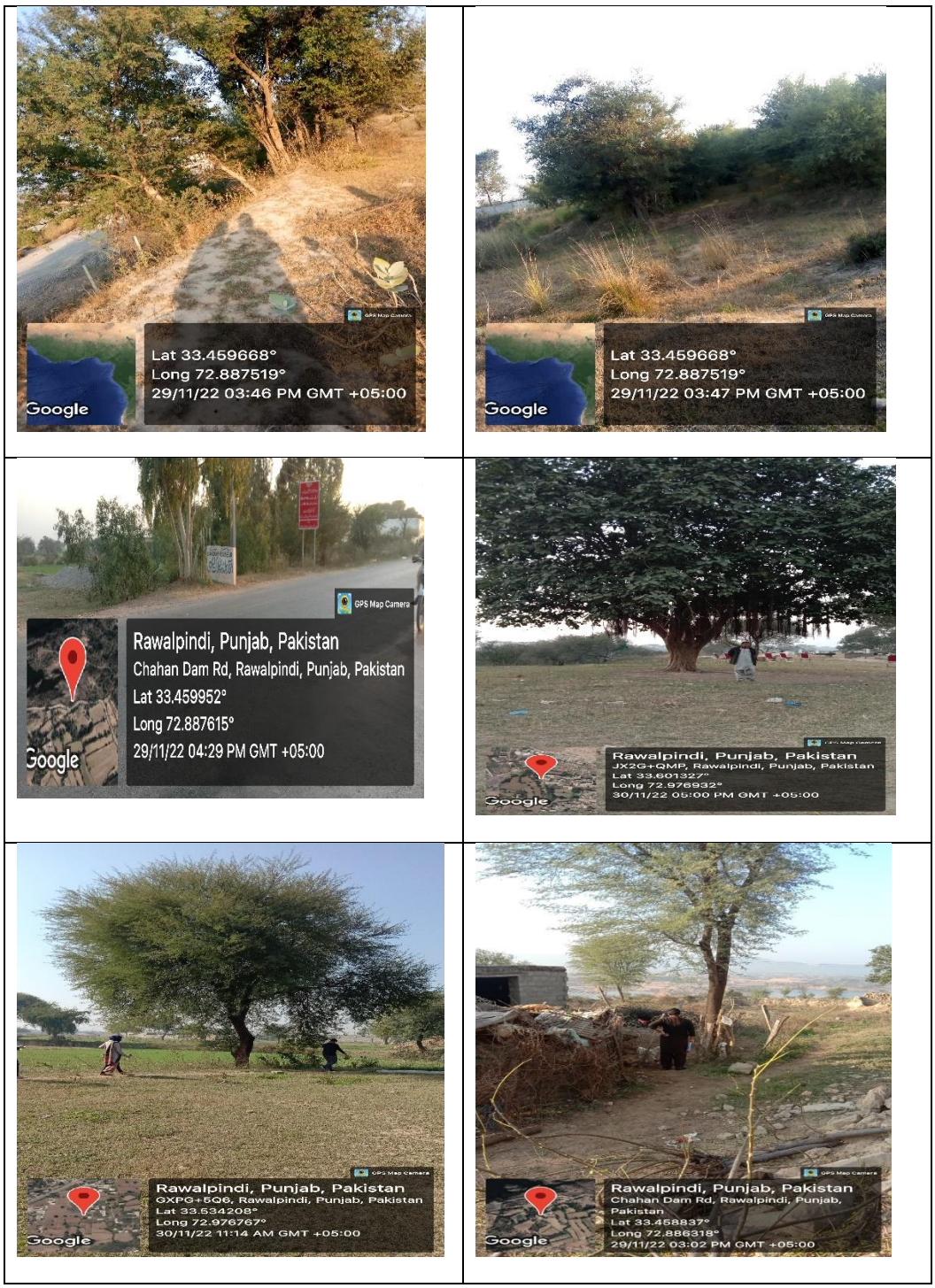
In order to improve the landscape and living environment of the Rawalpindi traits like color or blossom, shade, form or shape, scent and free from disease and nuisance are considered during the selection of trees and shrubs for given location. So, the study area in general is under significant biotic pressure and under retrogression due to various factors such as unsustainable practices, Natural hazards causing the habitat loss, soil erosion and lack of proper functioning of ecosystems. Areas have been accessible to humans for a long time resulting in low diversity and wildlife abundance.

4.3.3. Flora

As climate of study area is subtropical, the vegetation of the area falls under subtropical broad leaved evergreen scrub type as per phyto-geographical classification of the area. The tract, in which the project site exists, was once covered with native vegetation consisting, of trees and thick cover of bushy vegetation, with the onslaught of civilization, this vegetation was cleared for agricultural purposes.

As the project area is part of the Potohar plateau, the vegetation is characteristic of that tract. Kau (Olea cuspidata) is the climax species. However, in the project and the study area, Phulahi (Acacia modesta) and Kikar (Acacia nilotica) dominate. Shisham (Dalbergia sissoo), Mesquit (Prosopis juliflora) and Paper Mulberry (Broussonetia papyrifera) have also grown as secondary species with Phulahi. With the onslaught of civilization and urbanization of the tract, the original vegetation in and around the tract was removed and replaced by agricultural lands, which is the dominant land use in the tract. **Figure 4.13** shows the dominant tree species present in the project area.

Figure 4. 13: Floral profile of project area



The Project site is proposed water supply project. The present ecological conditions of the project area are fallen in the category of agricultural and degraded land. The project area is designated as agriculture area, so no green developmental activates were considered in the past to improve its ecological balance in the targeted area.

The detail of vegetative species of the region is given in **Table 4.6** below:

Table 4. 6: Names of Trees/shrubs & Herbs of the Region

Sr. No.	Common Name	Scientific Name
1	Banyan/Bhor	Ficus benghalensis
2	Phulai	Acacia modesta
3	Wild olive	Olea ferruginea
4	Sanatha	Dodonaea viscosa
5	Dhak	Butea frondosa
6	Anar	Punica granatum
7	Pear	Pyrus pasha
8	Sukh Chain	Pongamia pinnata
9	Amaltas	Cassia fistula
10	Bottle Brush	Callistemon spp
11	Jasmine	Jasminum humile
12	Holmskioldia	Holmskiodia sanguine
13	Beri	Zizyphus mauritiana
14	Royle's Spike Thorn	Gymnosporia royleana
15	Baikarh	Adhatoda vasica
16	Zebrawood	Pistacia integerrima
17	Poplar	Populus sp.
18	Devil tree	Alstonia scholaris
19	Bougainvillea	Bougainvillea spectabilis
20	Sukh chain	Pongamia pinnata
21	Dharek	Melia azedarach
22	Eucalyptus	Eucalyptus camaldulensis

Source: TAS for LAI Expressway Project, 2022

4.3.4. Agriculture and Crop Pattern

Agricultural holdings are small and average is about 5 to 10 Kanals per family. There are generally two' crops in a year. Rabi crop is followed by a Kharif crop, and then the land lies fallow for a year until the Rabi sowing. This system is locally known as Do-Fasli Do-Sala. Wheat, bajra and maize are the common crops. Principal crop during Rabi is wheat and Jawar, maize and fodder are the main crops of Kharif. There are no fruit orchards in the project area. Apart from the wheat crops, whatever area is available is used for growing fodder crops for stall feeding of livestock. **Figure 4.3** depicts the agricultural and crop patterns of the project area.

The people of this area, do not generally take much pains in crop husbandry, because of unfavorable conditions for agriculture. The cultivators generally content themselves with sowing the seeds broadcast after shallow ploughing and leave the rest to Nature. The use of improved agricultural implements and fertilizers is not very common except for cash crops like potatoes and orchards.



Figure 4. 14: Agriculture and Crop Patterns in project area

4.3.5. Fauna/Wildlife

The project area, on account of nature of vegetation and topography, once rich in vegetation and wildlife has now reduced its potential due to over hunting, loss of proper habitat, conversion of forest land. The wild mammals were not spotted commonly. However, domestic mammals were found to be common in Study Area. Fauna of the tract consists of mammals, reptiles, amphibians and birds. The details are given as under

4.3.5.1 Mammals

The study area was once considered as good habitat to many wild species but due expansion of population and commercialization the habitats of many species are decaled as degraded. **Figure 4.15** shows some of the mammal species of project area.

However, there is no wild mammalian specie observed in the project area except some domesticated animals including cats, dogs, cattle etc.



Figure 4. 15: Mammal Species present around the project site

However, the following **Table 4.7** shows the list of mammalian species present in the region, as the project area is to be considered highly degraded in terms of wild fauna. Jackals are quite common. Foxes are also common, and the piercing bark of the fox is usually heard in the hills. Wild boars are quite common.

Table 4. 7: List of indigenous Mammals

Sr. No.	Mammals	Scientific Name	IUCN Status
1	Jackal	Canis aureus	LC
2	Fox	Vulpes	LC
3	Jungle Cat	Felis chaus	LC
4	Palm Squirrel	Funambulus palmarum	LC
5	Mongoose	Herpestes auropunctatus	LC
6	Indian mole rat	Rattus	LC
7	Field mouse	Funambulus pennant	LC
8	Porcupine	Hystrix indica	LC
9	Rabbit	Oryctolagus cuniculus	EN
10	Cape hare	Lepus capensis	LC
11	Masked palm civet	Paguma larvata	LC
12	Wild boar	Sus scrofa	LC

Source: TAS for LAI Expressway Project, 2022
LC = Least Concern
EN = Endangered

4.3.5.2 Amphibians

The amphibians that are found near or around the Project area are given in the **Table 4.8** below.

Table 4. 8: Amphibians of the Study Area

Sr. No.	Local/ English Name	Scientific Name	IUCN Status
1	Common frog	Rana tigrine	LC
2	Common toad	Bufo	LC
3	Marble frog	Uperodon systoma	LC

Source: TAS for LAI Expressway Project, 2022
LC = Least Concern

4.3.5.3 *Fisheries and other Aquatic Life*

The Chahan dam has controlled fish forms. During primary site survey, the information was gathered related to the species of available fish in the dam. The main fish available in dam includes Rahu, Thaila, Grass Carp, Silver Carp. There are some other species of fish available which were managed in floating fish farm. The representative of fisheries department stated that no endangered or threatened species

of fish or other aquatic life is present in Chahan Dam. It is also important to mention here that the construction of Chahan Dam is recently completed and the ecosystem of Chahan Dam is still in development phase.

4.3.5.4 Reptiles

The study supports a good variety of reptiles. In project area, the most common reptile that is worth mentioning and is occasionally witnessed by the hikers is Monitor Lizard. These are generally large reptiles, although some can be as small as 12 centimeters in length. They have long necks, powerful tails and claws, and well-developed limbs.

The reptiles that are found near or around the Study Area are given in the **Table 4.9**.

Table 4. 9: Reptiles of the Study Area

Sr. No.	Local/ English Name	Scientific Name	IUCN Status
1	Fringed toed Lizard	Acanthodactylus cantoris	LC
2	Spiny tailed Lizard	Uromastyx hardwickii	VU
3	Common Krait	Bungarus caeruleus	LC
4	King Cobra	Ophiophagus Hannah	VU
5	Viper	Vipera xanthina	LC

Source: TAS for LAI Expressway Project, 2022
LC = Least Concern
VU = Vulnerable

4.3.5.5 Birds – Avifauna

Many bird species have been reported in and around the study area. These include passage migrants, vagrant, resident, breeding and irregular visitors. The migratory birds descend from higher altitudes during the winter months. Avifauna of the tract consists of small and medium sized birds of different colors, flying from one tree to the other or from crop to crop. Most common birds are House Sparrow, House Crow and Mynah. Birds like Cuckoo, Bulbul, Hoopoe, Parrots, Blue Birds, and Little Egrets etc. were frequently sighted. The common birds observed and reported in the Study Area are given in **Table 4.10** below:

Table 4. 10: Birds Found in Study Area

Sr. No.	Common Name	Scientific Name	IUCN Status
1	Rock Pigeon	Columba livia	LC
2	Myna	Acrido therestritis	LC
3	Grey Partridge	Perdix	LC
4	House Sparrow	Passer domesticus	LC
5	Red-billed chough	Pyrrhocorax	LC
6	Magpie	Pica	LC
7	Yellow-Billed Chough	Pyrrhocorax graculus	LC
8	Spotted doves	Spilopelia chinensis	LC

Source: TAS for LAI Expressway Project, 2022
LC = Least Concern

4.3.6 Wetlands

There are no designated wetlands is falling in the project area.

4.3.7 Protected Areas (Game Reserves/ Wildlife Sanctuaries/Reserve Forests)

There is no Game Reserve, Reserve Forests and wild sanctuaries reported in the project alignment. Further, distance of nearest forests from project sites is given in **Table 4.11**. It is important to mention here that none of the forest is located within even 5 kilometer radius of project location. Therefore, no impact is anticipated due to the proposed interventions as the project area is far away from the boundary of below listed forests. **Figure 4.16** shows the Arial distance of nearest forests.

Table 4. 11: Forests Located Near the Project Area

Sr. No.	Name	Area (Acre)
1	Takhar Pari Forest	2,210
2	Khairi Murat Reserved Forest	12,680
3	Dhungi Reserved Forest	4,746
4	Adiala Reserved Forest	1,330

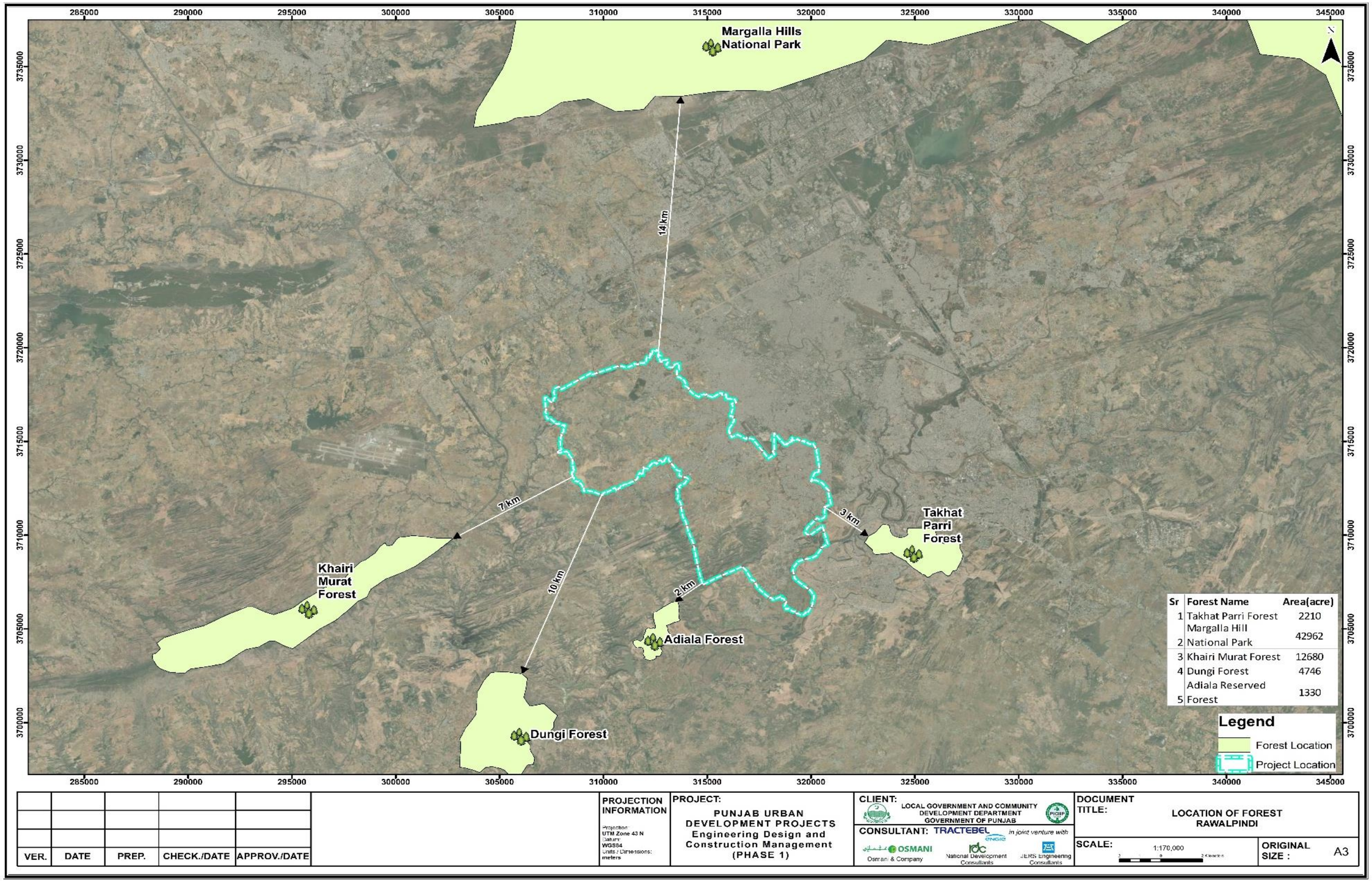


Figure 4. 16: Distance of Proposed project from nearest Forest

4.3.8 IBAT Study:

The Integrated Biodiversity Assessment Tool (IBAT) has been used to identify the presence of endangered and threatened species of flora and fauna in the study area. Screening was carried out for the species that are located within the buffer zone of: 1 km, 3 km and 5 km. From the results of IBAT, it is evident that no endangered or threatened species of flora and fauna are present in the project area. The findings of IBAT study are present in **Figure 4.17** and the complete IBAT report is attached as **Annexure-XII.**

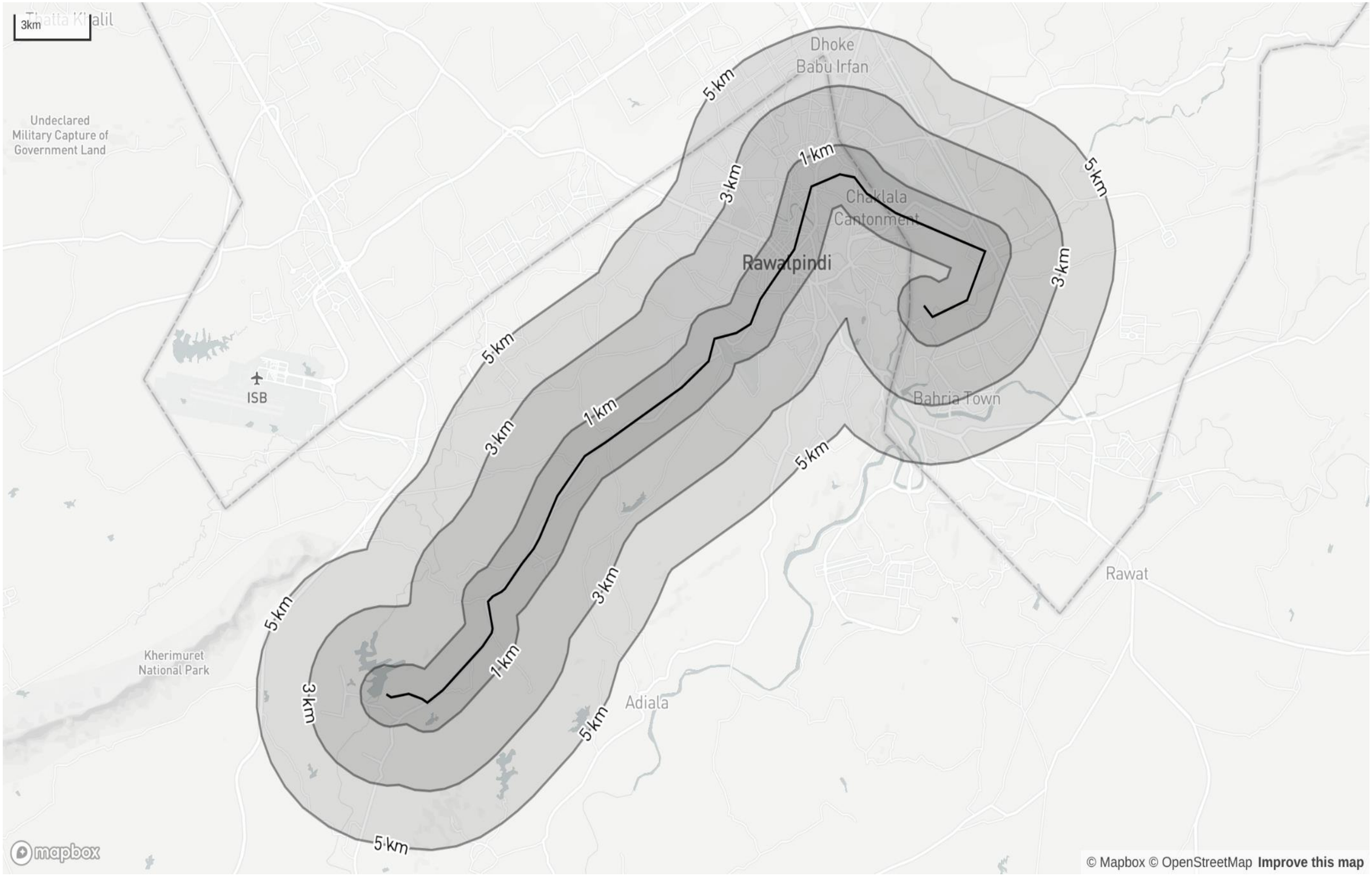


Figure 4. 17: Results of IBAT study

4.4 SOCIOECONOMIC ENVIRONMENT

This section includes a summary of the prevailing socio-economic conditions in the project area and the population that will be potentially affected by the project. To ascertain the socio-economic condition of the project area, primary and secondary data was collected including social and physical infrastructure in the project area.

To assess the socioeconomic conditions of the project area, consultations are being carried out with participants in the area. Households (HH) has been studied during field survey based on individual interviews as well as focus group discussions/ public consultations. Consultation participant include project affected people and community residing along the route of Conductance Main and Replacement of ECM Pipelines. In addition, the secondary data, including Economic Survey of Pakistan (2018-19), Bureau of Statistics (2017-18) and District Population Census report.

Detailed surveys were conducted for project scoping during the month of December 2022. For the purpose of the environmental and social assessment and sensitive receptor data collection, a Corridor of Impact of 100 meters was taken. Most of the field data collection was carried out within this corridor though where relevant data was also collected from a wider area along the proposed project site. The reason for selecting this corridor is to cover those areas that have a potential to be affected by the project activities.

The names of the major settlements falling within the close vicinity of project area are Rawal Town, Orchard Scheme, Dhoke Kala Khan, Satellite Town, Asghar Mall Scheme, Shamsabad, etc. **Figure 4.18** shows socioeconomic conditions of the area.

4.4.1 Administrative Setup

The proposed project components are located in two territories, Rawalpindi and Islamabad. Start of New Conductance Main is from Rawal Town of Islamabad and it will run parallel to Saidpur road and enter into Rawalpindi. Rest of the project component are located in District Rawalpindi.

Rawalpindi district is governed by the Rawalpindi District Council, while several regions sub-divided into one Municipal Corporation, two Cantonment Boards and Seven Tehsils;

- Rawalpindi Municipal Corporation
- Rawalpindi Cantonment Board

- Chaklala Cantonment Board

Below **Table 4.12** shows the Administrative subdivision of Rawalpindi District.

Table 4. 12: Administrative subdivision of Rawalpindi District

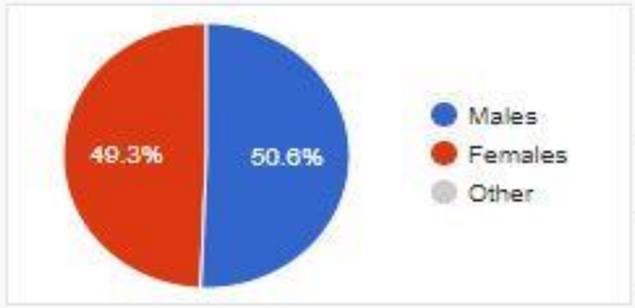
Sr. No.	Tehsil	Headquarters	Area (km2)	Population (2017)
1	Taxila	Taxila	NA	677,951
2	Rawalpindi	Rawalpindi	NA	3,258,547
3	Gujar Khan	Gujar Khan	1,466	678,503
4	Kallar Syedan	Kallar Syedan	421	217,273
5	Kahuta	Kahuta	NA	220,576
6	Potohar	Potohar	NA	NA

Source: District wise population Census 2017 by Pakistan Bureau of Statistics Government of Pakistan

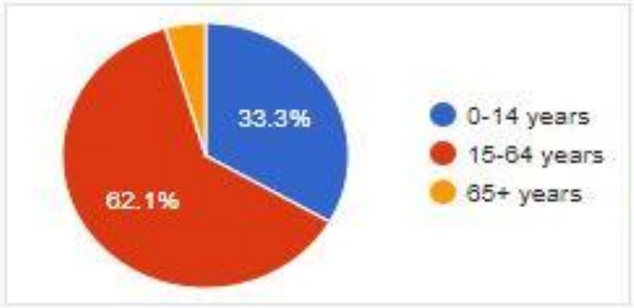
4.4.2 Demography & Population

According to Census 2017 the male population of Rawalpindi was 2,736,180 and female population was 2,665,089. The ratio of people living in rural and urban area was; 2,396,672 (44.36%) lived in rural areas and 3,005,708 (55.64%) lived in urban areas.

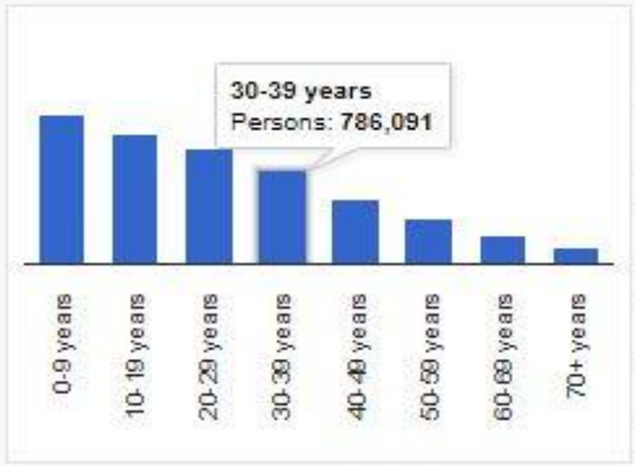
Similarly, the population of Islamabad was 2.01M and total area is 906.50 Sq. Km. Islamabad city is divided into five major zones: Zone I, Zone II, Zone III, Zone IV, & Zone V. Zone IV is the largest in area while Zone I is the largest developed residential area. Zone 1 is divided into sectors. Each residential sector is identified by a letter of the alphabet and a number, and covers an area of approximately 2 km × 2 km. the **Figure 4.18** showing the demographic features of Rawalpindi.



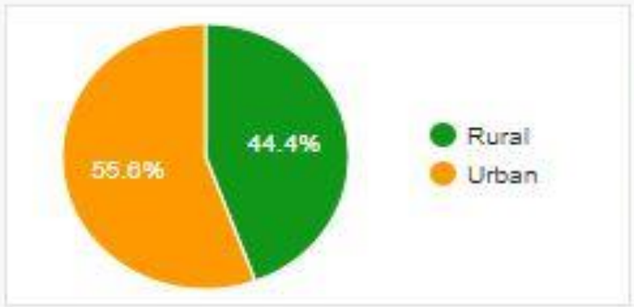
Gender (C 2017)	
Males	2,736,180
Females	2,665,089
Transgender	1,111



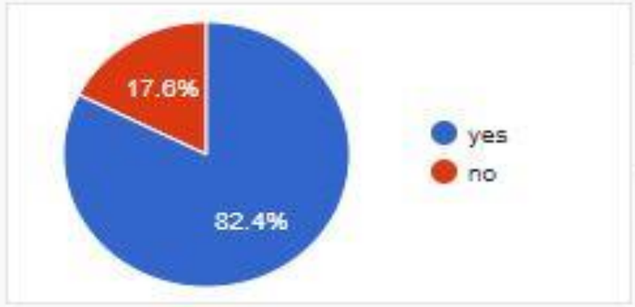
Age Groups (C 2017)	
0-14 years	1,800,127
15-64 years	3,356,182
65+ years	246,071



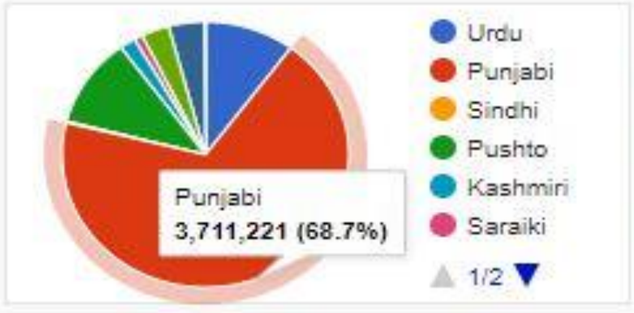
Age Distribution (C 2017)	
0-9 years	1,243,221
10-19 years	1,084,364
20-29 years	969,529
30-39 years	786,091
40-49 years	540,859
50-59 years	389,436
60-69 years	240,132
70+ years	148,748



Urbanization (C 2017)	
Rural	2,396,672
Urban	3,005,708



Literacy (A10+) (C 2017)	
yes	3,429,112
no	730,047



Mother Tongue (C 2017)	
Urdu	548,517
Punjabi	3,711,221
Sindhi	10,280
Pushto	588,570
Balochi	3,304
Kashmiri	97,545
Saraiki	51,512
Hindko	170,677
Brahvi	3,662
Other Language	217,092

Figure 4. 18:Demographic features of Rawalpindi[9]

[9] *https://www.citypopulation.de/en/pakistan/distr/admin/728__rawalpindi/*

4.4.3 Religion

Majority of the population of project area is Muslims. Cultural festivals are mostly linked with traditional religious events. According to the 2017 census Muslims were the overwhelming majority religion with 98.01%, while Christians were 1.90% of the population.

4.4.4 Archaeological and Cultural Site

No archaeological and cultural site was observed in close proximity of proposed project. However, if any archaeological antiquity discovered Archeological Chance Find procedure shall be adopted. Archeological Chance Find procedure has been attached as **Annexure-V**.

4.4.5 Ethnicity in the Project Area

During Social survey of the proposed project site it was found that the entire population is Muslims and they did not consider themselves to be called any other type of population such as indigenous peoples.

4.4.6 Language and Dialects

The major language of the area is Hindko, Punjab, Urdu and Pashto. People also speak other languages like Kashmiri, Saraiki and Brahvi.

4.4.7 Dwellings

Housing conditions of the respondents have been analyzed according to the type of houses in which they were residing. The house or building constructed with concrete or burnt bricks fall in pacca category whereas house or building constructed with burnt bricks with mud comes under semi-pacca category while house constructed with mud bricks or temporary wooden logs etc. are categorized as kacha house. All the respondents in project area are living in category of Pacca Houses.

4.4.8 Economics of Rawalpindi / Islamabad

The economy of majority of the people of study area is based on their private business and government jobs. People lived in Rawal Town, Satellite town etc. areas are well settled with high rage in per capita income. Some family members are settled outside the country and send remittances to family members in Pakistan. Majority of the

people of Rawalpindi and Islamabad are directly or indirectly depends on mining, Government/private jobs in educational/government institutions for their income.

4.4.9 Education Facilities in Project area

The cities of Islamabad and falls under category of large cities and they are among the hub of educational facilities. The Government and private Schools, Colleges and etc. are present in the study area. **Figure 4.18** shows the presence of number of Schools and other educational institutes.

4.4.10 Social Amenities in the project area

During the field survey, the access/ availability of the social amenities/ basic infrastructure was asked from the surveyed households as well as physically observed at site. It was noted that facilities such as Electricity, Sui Gas, Water Supply, Telephone, Sewerage Drainage, school are available in Rawalpindi and Islamabad.

4.4.11 Major Source of Drinking Water

Currently, there are two main source of water supply in people of project area. The major source is water supply from RWASA. While the other source of water is ground water. Some households have installed their own electrical pumps on bore holes.

4.4.12 Health Facilities in project area

Health facilities in the form of Government and Private health care institutes is present in and around the project area. Being the major ciites, Rawalpindi and Islamabad has primary, secondary and tertiary health care facilities. PIMS, Shifa International, CMH, Rawal Foundation, Ripha International Hospital, Islamabad International Hospital and Research Centre etc.

4.5 BASELINE ENVIRONMENTAL QUALITY

In order to determine the ambient air, background noise levels, and waste water quality of the study area, different locations were selected in or near the RoW. The sampling locations for the environmental monitoring of ambient air, noise and water for proposed project is shown in **Figure 4.19**. Detailed environmental motoring, sampling and testing report is attached as Annexure-III. The baseline monitoring was carried out with state of the art equipment with due calibration. Calibration certificates are attached as Annexure-IV.

Two (02) water samples has been collected. Similarly, two (02) points have been selected for ambient air and background noise monitoring at site. The work for third party monitoring and testing was awarded to an EPA approved environmental laboratory i.e. M/S Environmental Services Pakistan. The details of monitoring points are provided in **Figure 4.19**.

4.5.1 Water Quality

Water sampling was carried out at two locations; (i) Near Water Intake and water Treatment Plant site (ii) IPS Ranial on 29-30 November, 2022. Ground water samples were taken for analysis of physical, chemical and biological parameters. The complete lab results for drinking water quality of the sample collected at two locations are given as Annexure-II of the EIA report. Four water samples were taken from different locations at recharge drains of Chahan dam.

Locations and Reason for selection of Monitoring point:

The location and rationale of the water sampling is given below in **Table 4.13.**

Table 4. 13:Water Quality Sampling Location Description

Sample	Coordinated	Location	Sample Taken	Rationale of Selection
W.1	Lat. 33.534561 Long. 72.977173	Near Water Intake and water Treatment Plant Site	Drinking water (Tap Water)	The sampling locations were identified to check the water quality near the treatment plant (source)
W.2	Lat. 33.460186 Long. 72.885823	IPS Ranial	Drinking Water (tap water)	The sampling location was identified based on the presence of Environmental Receptors like schools, mosques etc. and the level of construction activity to be carried out.

The sampling locations were identified to check the water quality near the treatment plant (source) and the other sample was taken from midway to establish baseline of the area. At IPS Ranial, major construction, after WTP, will be carried out and major structure will be constructed. Therefore, it is important to establish the quality of

ground water at IPS to check the impacts of construction, during construction and operation phase of the project.

The sampling locations for 4 water samples, to design the water treatment plant were taken from the drains which are discharging their water into Chahan dam.

Results and Analysis

It is evident from the laboratory results that majority of the analyzed parameters are within compliance of limiting values set by WHO and PEQS for drinking water. The biological parameters, total coliform and fecal coliform bacteria are exceeding the prescribed limits of WHO and PEQS. The value of turbidity is also high in the water sample which shows the presence of high concentration of suspended and dissolved solid. The water samples were taken from nearby house. The water sample W-1 was taken from Well and the sample W-2 was taken from the nearby house of IPS Ranial. All the water sampels taken from the drains, which discharge their water into Chahan dam shows the presence of fecal and coliform contamination. This shows that wastewater from nearby communities is entering into the dam. Accordingly, chlorination process will remove biological contaminants and make the water fit for drinking. **Table 4.14** shows the analysis results of water samples taken from the project site.

Table 4. 14: Results of Water Quality Analysis

WTP Water Intake Structures Site						
Sr. No.	**Parameters**	**PEQS**	**WHO**	**Unit**	**Result**	**Method**
01	pH	6.5-8.5	--	-	7.6	SMWW 4500*B
02	TDS	<1000	1000	Mg/l	302 mg/L	SMWW 2540C
03	Chloride	<250	250	Mg/l	25mg/L	SMWW 4500Cl-B
04	Fluoride	≤1.5	1.5	Mg/l	0.7 mg/L	U.S. EPA 9214
05	Taste	Nonobjectionable/Acceptab	--		ND	Organoleptic
06	Odor	Nonobjectionable/Acceptab	--		Acceptable	Organoleptic
07	Colour	≤15	--	TCU	ND	SMWW 2120C
08	Nitrate	≤50	50	Mg/l	1.5 mg/L	SMWW 4500NO3-
09	Nitrite	≤3	--	Mg/l	0.3 mg/L	SMWW 4500NO2-
10	Lead	≤0.05	0.01	Mg/l	ND	U.S. EPA-200.7

11	Total Hardness as	<500	--	Mg/l	136mg/L	SMWW 2340C
12	Turbidity	<5	--	NTU	10.6NTU	SMWW 2130B
13	Zinc	5	3	Mg/l	ND	U.S. EPA-200.7
14	Aluminum	≤0.2	0.2	Mg/l	ND	U.S. EPA-200.7
15	Cadmium	0.01	0.003	Mg/l	ND	U.S. EPA-200.7
16	Selenium	0.01		Mg/l	ND	U. S. EPA-200.7
17	Copper	2	2	Mg/l	ND	U.S. EPA-200.7
18	Boron	0.3	0.3	Mg/l	ND	U.S. EPA-200.7
19	Barium	0.7	0.7	Mg/l	0.1 mg/L	U.S. EPA-200.7
20	Antimony	≤0.005	≤0.02	Mg/l	ND	U.S. EPA-200.7
21	Arsenic	≤0.05	0.01	Mg/l	ND	U.S. EPA-200.7
22	Cyanide	≤0.05	0.07	Mg/l	ND	SMWW 4500 CN-F
23	Mercury	≤0.001	0.001	Mg/l	ND	U.S. EPA-200.7
24	Nickel	≤0.02	0.02	Mg/l	ND	U.S. EPA-200.7
25	Residual Chlorine	0.2-0.5	--	Mg/l	ND	SMWW 4500-Cl B
26	Total Coliform	-----	0/100ml	------	1.1 MPN/100m	SMWW 9221 B
27	Fecal	0/100ml	0/100ml	ml	1.1	SMWW 9221 F
28	E. Coli	0/100ml	0/100ml	ml	1.1	SMWW 9221 F
29	Manganese	< 0.5		Mg/l	ND	U. S. EPA-200.7
30	Phenolic Compounds	NGVS		---	ND	SMWW 5530 C
IPS Ranial Site						
Sr. No.	**Parameters**	**PEQS**	**WHO**	**Unit**	**Result**	**Method**
01	pH	6.5-8.5	--	-	7.3	SMWW 4500*B
02	TDS	<1000	1000	Mg/l	604 mg/L	SMWW 2540C
03	Chloride	<250	250	Mg/l	32 mg/L	SMWW 4500Cl-B
04	Fluoride	≤1.5	1.5	Mg/l	0.4 mg/L	U.S. EPA 9214
05	Taste	Nonobjectionable/Acceptab	--	Unobjec.	ND	Organoleptic
06	Odor	Nonobjectionable/Acceptab	--	Unobjec.	Acceptable	Organoleptic
07	Color	≤15	--	TCU	ND	SMWW 2120 C
08	Nitrate	≤50	50	Mg/l	28.4 mg/L	SMWW 4500NO3-B

09	Nitrite	≤3	--	Mg/l	ND	SMWW 4500NO2-B
10	Lead	≤0.05	0.01	Mg/l	ND	U.S. EPA-200.7
11	Total Hardness as	<500	--	Mg/l	336 mg/L	SMWW 2340C
12	Turbidity	<5	--	NTU	10 NTU	SMWW 2130B
13	Zinc	5	3	Mg/l	0.1 mg/L	U.S. EPA-200.7
14	Aluminum	≤0.2	0.2	Mg/l	0.1 mg/L	U.S. EPA-200.7
15	Cadmium	0.01	0.003	Mg/l	ND	U.S. EPA-200.7
16	Selenium	0.01		Mg/l	ND	U. S. EPA-200.7
17	Copper	2	2	Mg/l	ND	U.S. EPA-200.7
18	Boron	0.3	0.3	Mg/l	0.1 mg/L	U.S. EPA-200.7
19	Barium	0.7	0.7	Mg/l	0.1 mg/L	U.S. EPA-200.7
20	Antimony	≤0.005	≤0.02	Mg/l	ND	U.S. EPA-200.7
21	Arsenic	≤0.05	0.01	Mg/l	ND	U.S. EPA-200.7
22	Cyanide	≤0.05	0.07	Mg/l	ND	SMWW 4500 CN-F
23	Mercury	≤0.001	0.001	Mg/l	ND	U.S. EPA-200.7
24	Nickel	≤0.02	0.02	Mg/l	ND	U.S. EPA-200.7
25	Residual Chlorine	0.2-0.5	--	Mg/l	ND	SMWW 4500-Cl B
26	Total Coliform	----	0/100ml	Number/100ml	>8.0 MPN/100m	SMWW 9221 B
27	Fecal Coliform	0/100ml	0/100ml	Number/100ml	>8.0 MPN/100m	SMWW 9221 F
28	E. Coli	0/100ml	0/100ml	Number/100ml	>8.0 MPN/100m	SMWW 9221 F
29	Manganese	< 0.5		Mg/l	0.1 mg/L	U. S. EPA-200.7
30	Phenolic Compounds	NGVS		---	ND	SMWW 5530 C

4.5.2 Ambient Air Quality

There is no major anthropogenic source found near and around the proposed project site area, other than local road and a few cooking stoves in villages. The agricultural land results in windblown dust in dry conditions. The pollutants selected for evaluation, based on the expected emissions from the project activities and the level of risk to human health posed by these pollutants, are as follows:

- Respirable particulate matter: ($PM_{2.5}$, PM_{10})
- Sulfur dioxide (SO_2)
- Oxides of Nitrogen (NO_X): Mainly Nitrogen dioxide (NO_2) and Nitric oxide (NO)
- Ozone (O_3)
- Carbon Monoxide (CO)
- Suspended Particulate Matter (SPM)
- Reason for selection of Monitoring point

The sampling locations were identified to check the ambient air quality near the treatment plant and the other sample was taken from IPS Ranial, where commercial activities are going on. Further, these are the main points where more environmental receptors are available and potential for exposure is high. Furthermore, these are the locations where more construction activities will be going on during construction phase of the project. The monitoring was carried out by engaging the EPA approved laboratory. Detailed results of ambient air quality as presented as Annexure-III of this report.

The sampling location and rationale is given below in **Table 4.15**.

Table 4. 15: Detail of Air Quality Sampling Locations

Sample ID	Coordinates	Location	Rational for selection
A-1	Lat. 33. 459747 Long. 72.886223	Near proposed Water Intake and water Treatment Plant Site	The sampling locations were selected based on the presence of Environmental Sensitive Receptors (like health care institutes, educational institutes and places of religious importance) and scale of construction activity.
A-2	Lay. 33. 53412	IPS Ranial	The sampling locations were

	Long. 72. 976822		selected based on the presence of Environmental Sensitive Receptors (like health care institutes, educational institutes and places of religious importance) and scale of construction activity.

Results and Analysis

Ambient Air Quality sampling was carried out at two locations (i) Near Water Intake and water Treatment Plant Site (ii) IPS Ranial on 29-30 November, 2022. The complete lab results for ambient air quality at all two locations and results are given in **Table 4.16** below. The original lab reports are attached as Annexure-II. It is evident from the monitoring results that the concentration of PM10 and PM2.5 exceeds the limiting values set by World Health Organization (WHO) for ambient air.

Key results:

All parameters analyzed are within the prescribed limits of PEQS and WHO for ambient air except PM10 and PM2.5. Both parameters exceeded the limiting values set by WHO which is more stringent than PEQS. The major source of particulate matter, Carbon monoxide and Sulphur dioxide are traffic and commercial activities in the area. The monitoring was carried out for 24 hrs. **Table 4.16** shows the results of ambient air monitoring.

Table 4. 16: Ambient Air Quality Results

Near Water Intake and water Treatment Plant Site						
Sr. No	Parameters	PEQS	WHO	Units	Results	Test Method
1	PM_{10}	150	45	$\mu g/m^3$	139	Particulate sensors
2	$PM_{2.5}$	35	15	$\mu g/m^3$	34	Particulate sensors
3	CO	10	4	mg/m^3	1.6	Non Dispersive Infrared Absorption (NDIR)
4	O_3	130	100(8 hr.)	$\mu g/m^3$	13	Non Dispersive U.V Absorption
5	NO	40	200 (1 hr.)	$\mu g/m^3$	13	Chemiluminescence Detection
6	NO_2	80	25	$\mu g/m^3$	21	Chemiluminescence Detection
7	SO_2	120	40 (24Hrs.)	$\mu g/m^3$	20	U.V Fluorescence (UVF)
8	SPM	500	--	$\mu g/m^3$	404	Particulate sensors

Near IPS Ranial						
Sr. No.	Parameters	NEQS	WHO	Units	Results	Test Method
1	PM_{10}	150	45	$\mu g/m^3$	146	Particulate sensors
2	$PM_{2.5}$	35	15	$\mu g/m^3$	34	Particulate sensors
3	CO	10	4	mg/m^3	1.8	Non Dispersive Infrared Absorption (NDIR)
4	O_3	130	100 (8 hrs.)	$\mu g/m^3$	12	Non Dispersive U.V Absorption
5	NO	40	200 (1 hr.)	$\mu g/m^3$	13	Chemiluminescence Detection
6	NO_2	80	25	$\mu g/m^3$	23	Chemiluminescence Detection
7	SO_2	120	40 (24Hrs.)	$\mu g/m^3$	22	U.V Fluorescence (UVF)
8	SPM	500	--	$\mu g/m^3$	447	Particulate sensors

4.5.3 Noise Level

This section defines the baseline ambient noise levels in the CoI in a manner that can be used for the assessment of the noise impact of the proposed project. Noise levels were measured at two selected locations on 29-30 November, 2022. The summary of results is shown in **Table 4.18**. The detail monitoring report is attached as Annexure-III.

Reason for selection of Monitoring point

The sampling locations were identified to check the noise levels at major construction sites of WTP and IPS Ranial. The samples were taken from two locaitons; (i) Near Water Intake and water Treatment Plant Site (ii) IPS Ranial. IPS Ranial is densely populated area with large number of environmental receptors and people to be affected by project activity. Baseline has been established to check the level of impact during construction and operation phase of the proposed project. Sampling location and coordinates are marked on the map are given in **Figure 4.19**.

The location of noise levels sampling with rational for selection of site is given below in **Table 4.17**.

Table 4. 17: Detail of location for Noise Levels Monitoring

Sample ID	Coordinates	Location	Rational for selection
N-1	Lat. 33. 459747 Long.	Near Water Intake and water	The sampling locations were selected based on the presence of

	72.886223	Treatment Plant Site	Environmental Sensitive Receptors (like health care institutes, educational institutes and places of religious importance) and scale of construction activity.
N-2	Lay. 33. 53412 Long. 72. 976822	IPS Ranial	The sampling locations were selected based on the presence of Environmental Sensitive Receptors (like health care institutes, educational institutes and places of religious importance) and scale of construction activity.

Key results are:

All parameters analyzed were within NEQS limits values for ambient noise levels in the day time at Water Intake and WTP Site. The noise levels at IPS Ranial are above the prescribed limits of PEQS. The reason of higher noise levels is the commercial activity near the proposed IPS Ranial site. The monitoring was carried out for 24 hrs. Leq values of noise levels are calculated and added in the results. **Table 4.18** shows the results of noise levels monitoring.

Table 4. 18: Noise Level Monitoring Results

Near Water Intake and water Treatment Plant Site							
Day Average (24hrs)	**Noise db(A)**		**PEQS Limits**		**WHO Limits**		**Remarks**
	Day	**Night**	**Day Time**	**Night Time**	**Day**	**Night**	
57.31	59	54	65	55	70	70	**Within limits**
Near IPS Ranial							
Day Average (24hrs)	**Noise Levels (db(A)**		**PEQS Limits**		**WHO limits**		**Remarks**
	Day	**Night**	**Day Time**	**Night Time**	**Day**	**Night**	
59.8	63	58	55	45	70	70	**Night times results exceed the PEQS limits**

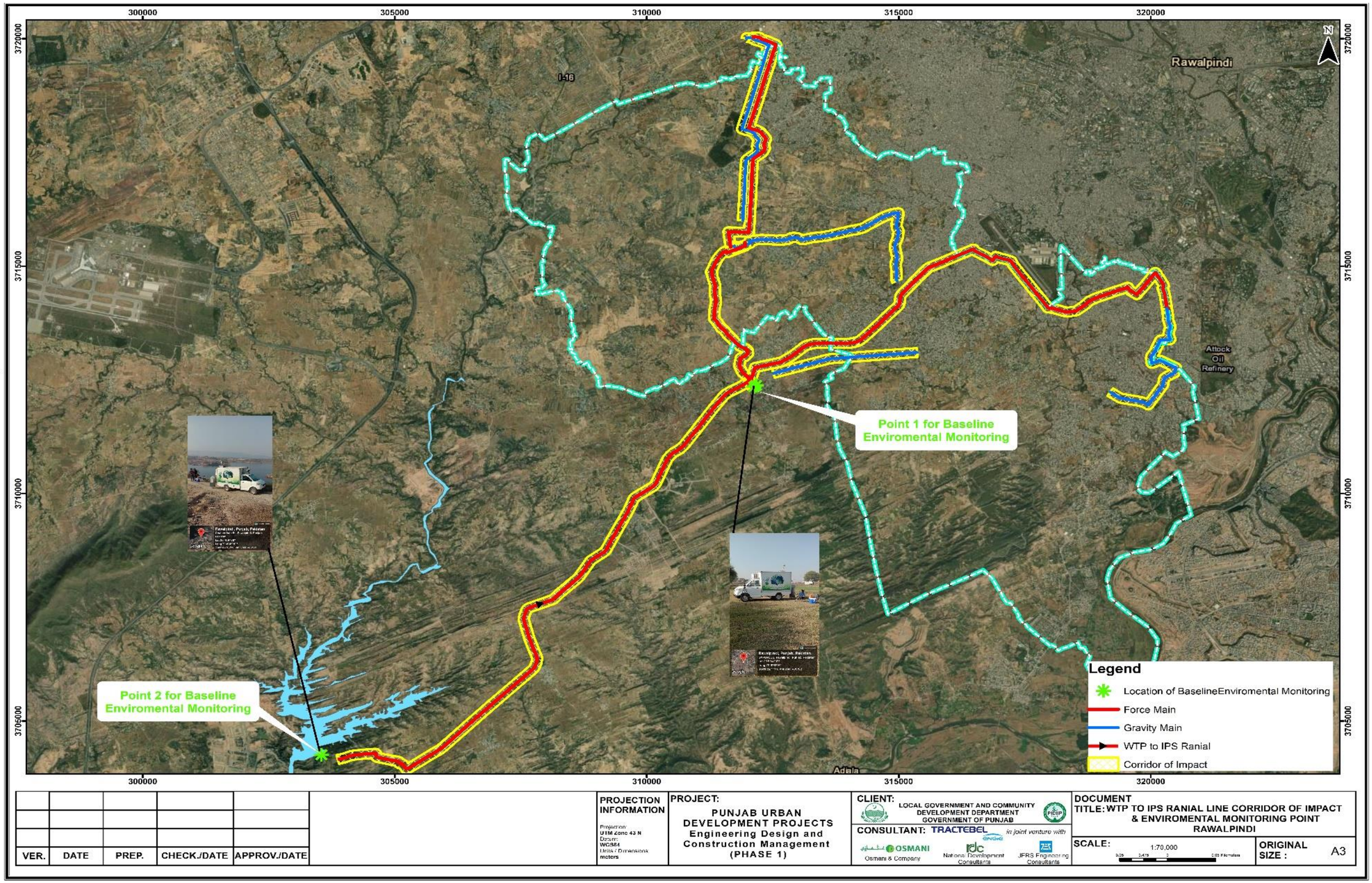


Figure 4. 19: Environmental Monitoring & Sampling Points



Water Sampling location near water intake and water treatment plant site and IPS Ranial









Ambient Air Monitoring location near water intake and water treatment plant site and IPS Ranial





Noise Monitoring location near water intake and water treatment plant site and IPS Ranial

Figure 4. 20: Sampling location and coordinates

CHAPTER-5

PUBLIC CONSULTATION

5.1 GENERAL

This section describes the process and outcomes of the consultations carried out with various groups of stakeholders as part of the environmental and social assessment for "Augmentation of Water Supply to Rawalpindi City Based upon Chahan Dam". It includes a brief discussion on the concerns expressed by the stakeholders during the consultation meetings and responses provided in order to address the concerns through necessary mitigation measures.

The specific objectives of the consultation were: (i) obtaining local and indigenous knowledge about the environment and people living in the project area; (ii) interaction with the project affected population and other stakeholders for the collection of primary and secondary data on environment and people; and (iii) engaging stakeholders for maximization of the project benefits.

The disclosure of the enhancement project in advance and subsequent consultation with stakeholders has advantages in the environmental assessment and mitigation of impacts. Public consultation can also provide a conduit for the improvement of the project implementation to better serve the stakeholders.

Information disclosure through public consultation was carried out. Short brief of project activities was developed and shared with stakeholders in the verbal and written form. The briefing about the project components were carried out in Urdu language which is understandable in all the project area.

The implementing agency (RWASA) will prepared brochures related to project containing basic information of the project, construction activities, traffic diversion routes, time of construction etc. for awareness of general public.

The environmental assessment process under the Pakistan Environmental Protection Act requires the disclosure to the public after the statutory IEE / EIA has been accepted by the Punjab EPA to be in strict adherence to the rules.

The public consultation was carried out by the EDCM's Social and Environment teams in November, December 2022 and January 2023. Mainly key informants were consulted for these consultations which were carried out in an open and frank atmosphere conducive to appreciation of the basic elements of the project and

dissemination of information on beneficial and adverse impacts and mitigation for adverse impacts of the proposed project.

The consultation was carried out with general public and concerned government departments. The methodology of Focus Group Discussion (FGD) and individual consultation was used for public consultation. Total 12 FGDs were carried out including the consultative sessions with RWASA, CIU Rawalpindi, Fisheries, Forest, Revenue etc. and other relevant Government Departments under district administration. Total 174 persons were consulted in these FGDs and individual consultations including 31 females (17.8%) and 143 males (82.2%). The consultation was carried out around the proposed WTP site, sites for IPS and water works and along the route of Conductance Mains. Project Affected Persons (PAP) were highlighted during preliminary visit of the site. People from WTP Sites, IPS Ranial, Water Works of Akbar Chowk, Chakra and Adiala were consulted where population density is little high and the impact due to construction activity is envisaged. As the project will be executed within existing ROW and the number of APs (in terms of displacement and involuntary resettlement) are negligible, therefore, random consultation was carried out. With reference to the consultation of Government Stakeholders, all the relevant departments were invited for consultation meeting at DC Office.

Information on positive and negative impacts associated with constructional and operational phase of the proposed project were discussed with the participants along with mitigations measures based on Best Available Techniques (BAT). Questionnaires for conducting FGDs and Surveys are attached as **Annexure-XIV**. The attendance sheets of these FGDs are attached as **Annexure-XV**.

5.2 PROPONENTS' ENVIRONMENT MANAGEMENT TEAM

As stated in earlier sections, the following project is in its planning phase. Once the project comes in its construction phase, a team with representatives from key management functions will be developed to assess issues, aspects, opportunities and existing manufacturing process w.r.t environment. Therefore, it is too early to substantiate the stated inscription.

5.3 THE RESPONSIBLE AUTHORITY

Proponent is responsible for the environmental impacts of this project and has taken commitment to implement the mitigation measures proposed in the Environmental

Management Plan with subsequent review and approval conditions. Proponent ensured to use all practicable means consistent with other essential considerations to protect and preserve environmental quality.

5.4 OTHER DEPARTMENT & AGENCIES

As part of environmental assessment, detailed meetings were held with the institutional stakeholders in the form of one-to-one meetings with Rawalpindi WASA and CIU Rawalpindi and collective consultative session under the chairmanship of Additional Deputy Commissioner (Finance & Planning) Rawalpindi District. Different Government departments were invited at DC Office Rawalpindi and the detail of the project was shared with stakeholders for their understanding of the project activities and geographical location.

Officials from office of RDA Rawalpindi, RWASA, Irrigation Department, District officer Rawalpindi, Small Dam project Rawalpindi, MC Rawalpindi, Forest Department, Fisheries Department, Program Director PMU, Deputy Program Director PMU and Team Lead of EDCM participated in this meeting held on 3rd December, 2022 at DC Office Rawalpindi. Details of consultation meetings with official stake holders and photographs are mentioned in **Table 5.1** and pictorial representation are shown in **Figure 5.1**.

Although the project is at its feasibility stage, at some point before or during the construction phase EPA Punjab, as well as other government departments will be deeply involved regarding their suggestions and requirements of NOCs from the respective departments.

Table 5. 1: Finding of Consultation with Government Stakeholders

Sr. No.	Department	Name (FGD)	Comments
Venue: PMU Office Date : 30-11-2022			
1	PMU/CIU	Mr. Ali Qunanin [Infrastructure Engineer]	According to the target timeframe, feasibility studies and comprehensive engineer designs will be finished in December 2022, and by the third quarter of 2023, all tender documents and approvals will be complete," explained by infrastructure engineer CIU, Rawalpindi.
2		Mam Sehrish Khurshid [Project Officer]	

Venue: WASA Office **Date : 30-11-2022**			
1	WASA	Mr. Azizullah Khan [Deputy Director]	The meeting concluded that the project will serve the residents of Quaid-e-Azam colony, Chak Jalal DIN, and Kalyal using the 30 MGD water available at Chauhan dam. WASA will currently receive 6 MGD of water, and the irrigation department sought an extra 6 MGD.
2		Mr. Sami Ullah [Social]	
3		Mr. Ali Qunaian [Infrastructure Engineer]	
4		Mam. Sehrish Khurshid	
5		Mr. Sher Zaman [Environmentalist]	
6		Mr. Sairas Ali [Environmentalist]	
Venue: Committee Room of Deputy Commissioner (DC), Rawalpindi **Date : 03-12-2022**			
1	DC Office	Mr. Umer Razzaq [P & D]	People from different departments suggested that plan for this project should be shared with their stakeholders so that they can provide effective input. Also asked that this project is doable for the government and for local residents. In fact recommended that new societies are emerging that future population along with this project should also be served with the clean water supply. The Chahan dam was finished in June 2022, and ponding is present in the reservoir, so this project needs to be started right away, according to XEN Small Dams. Fish will not be affected after ingesting water from the reservoir since the dead storage level is sufficient for the species. As the new societies are forming at the Chakri road, and the forest department conservator advised that these populations, along with those already living in the areas closest to the Chahan dam, should also be served because they have the priority to be served. The PRF team clarified that it has already been thought about.
2		Mr. Azizullah Khan [Ex. Deputy Director]	
3		Mr. Amir Mumtaz [XEN Small Dam Islamabad]	
4		Mr. Abid Hussain Abid [Forest Conservator Rawalpindi]	
5		Mr. Jawad Arshad [AD (Engineer)]	
6		Mr. M. Haseeb [AD(M & E)]	
7		Mr. Muazzam Mukhatar [Social Safeguard]	
8		Mam Sehrish Khursheed [Project Officer]	
9		Mam Sana Urooj [DDF Rawalpindi]	
10		Mam Rizwana Aziz [ADW Rawalpindi]	
11		Mam Arifa Batool [DDW Rawalpindi]	
12		Mr. M. Farooq [DTL EDCM]	
13		Mr. Aziz Karim [Environmental Specialist]	
14		Mr. Ali Qunain [IE, CIU Rawalpindi]	
15		Mr. Ahmad Afzal	

		[AD (Eng) PRF]	
16		Mr. M. Shahzad [MD reservoir MCR]	
17		Mr. Mujahid [Environmental Consultant]	



Consultation Meeting with Deputy Director, Rawalpindi WASA



Consultation Meeting with CIU – Rawalpindi





Consultative Meeting with Government Departments at DC Office Rawalpindi

Figure 5. 1: Photographs of Consultations with Institutional Stakeholders

5.5 ENVIRONMENTAL PRACTITIONERS & EXPERTS

The Environmental Experts has been informed with briefing on project interventions including its benefits. All of consulted experts asked questions to get information about different components of project. About 6 experts were consulted and their recommendations have been mentioned below.

1. **M. Rafiq** Assistant Director EPA Rawalpindi
2. **Adeel Pervaiz** Sr. Manager Landfill LWMC
3. **Dr. Fariha Arooj.** Assistant Professor UVAS
4. **Dr. Mehwish Mumtaz** Assistant Professor PU
5. **Dr. Abdul Qadir Senior** Associate Professor PU

6. **Dr. Asim Mehmood** Environmental Consultant

Table 5. 2: Environmental Experts and their recommendations

Environmental Experts Date: 03-12-22			
1.	Assistant Director EPA Rawalpindi	M. Rafiq	- No construction, preliminary or otherwise relating to the project shall be started until and unless the Environmental Approval has been issued by EPA.
2.	Sr. Manager Landfill LWMC	Adeel Pervaiz	- The environmental reports must be available for better understanding to comment.
3.	Assis. Prof UVAS	Dr. Fariha Arooj	- All mitigation measures must ensure by proponent while development of this project.
4.	Assistant Professor PU	Dr. Mehwish Mumtaz	- Good Initiative to solve the water-related issues in the area. Follow compliance guidelines to finish the construction on schedule.
5.	Senior Associate Professor PU	Dr. Abdul Qadir	- Solid Waste should be handled properly on daily basis. This waste can be used for land filling.
6.	Environmental Consultant	Dr. Asim Mehmood	- The big problem that we faced during construction are the lack of skilled workers, they do not only delay the work but sometimes also responsible to destroy the work so hire skilful person to complete the work without any obstacle.

5.6 AFFECTED & WIDER COMMUNITY

Stakeholders are considered to be individuals or organizations which have an interest in the proposed project or knowledge that will provide insight into issues or affect decision making related to the proposed project. On the basis of interest and role criteria there are two types of stakeholders for the proposed project as described below.

The primary stakeholders are primarily the Project Affected Persons (PAPs) and general public including women residing in the project area - for example, people living in the project area particularly those affected by the footprint of proposed project "Augmentation of Water Supply to Rawalpindi based of Chan Dam". These are the people who are directly exposed to the project’s impacts though in most cases they may not be receiving any direct benefit from the project.

The secondary stakeholders are typically general public including women residing in the project area - for example, people living in the project area particularly those affected by the footprint of proposed project Augmentation of Water Supply to Rawalpindi based on Chahan Dam. They also include institutional stakeholders, for instance, related government department / agencies, local government, and organizations that may not be directly affected by the project; however, they may influence the project and its design. They include project proponent, execution agency that is Rawalpindi WASA, other concerned departments that may have a role during various phases of the project, regulatory agencies such as EPA, other relevant departments such as Forest and Wildlife department, non-governmental organizations (NGOs), the broader interested communities including academia and journalists, and general public.

As part of the present environmental and social assessment, detailed consultations were carried out through meetings and focus group discussions (FGDs) with the communities, including women in the project area. As the project will be executed within existing ROW and the number of APs (in terms of displacement and involuntary resettlement) are negligible therefore random consultation was carried out. Separate meetings were held with the institutional stakeholders in the form of combine consultative meetings at DC Rawalpindi Office. One to one meeting with WASA Rawalpindi and CIU was carried out. Details of this consultation process are described below;

Consultation with Project Affected Peoples

The consultation with project affected peoples was carried out during the various site visits. All data of group discussion, individual discussion and FGDs was recorded. Total 12 FGDs were conducted for the proposed project of Augmentation of Water Supply to Rawalpindi based on Chahan Dam including the consultative session with Government Department. Further, public consultations were carried out with individuals and focus groups of community from project area who have direct impacts of the project and falls under project affected people. Total 174 persons were consulted in these FGDs and individual consultations including 31 females (17.8%) and 143 males (82.2%). The consultation was carried out around the proposed WTP site, sites for IPS and water works and along the route of Conductance Mains. Project Affected Persons (PAP) were highlighted during preliminary visit of the site. People

from WTP Sites, IPS Ranial, Water Works of Akbar Chowk, Chakra and Adiala were consulted where population density is little high and the impact due to construction activity is envisaged. As the project will be executed within existing ROW and the number of APs (in terms of displacement and involuntary resettlement) are negligible, therefore, random consultation was carried out. With reference to the consultation of Government Stakeholders, all the relevant departments were invited for consultation meeting at DC Office. Details of stakeholder consultations are given in **Table 5.3** and **Table 5.4** while **Figure 5.2** shows Pictorial evidence of the consultation.

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Table 5. 3: Consultation with Project Affected People

Sr.#	Date	Location/ Address	Specifics of Participant	Feedback/ Concerns	EDCM/ Social Environmental Advisor Reply
Public Consultation					
1.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mr. M. Tajjamal Sadiq [Bykea Delievery Servant]	Since it's a first step towards livelihood, I have no objections to this endeavour. It's also a good initiative to provide clean water at an affordable price.	
2.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mr. M. Omer [Taxi Driver]	Each month, we must set aside Rs. 10–15 K solely for the purchase of drinking water. As stated, this project will give us access to clean water at an affordable price, so I am very satisfied with the implementation of this project.	
3.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mr. Pervez Khan [Farmer]	Clean water will be provided so it will be a good initiative towards the livelihood. Requested to use the non-residential sites for distributing the pipelines.	EDCM and Social Environmental Advisor will ensure to avoid offending the villagers by leveraging their property to spread the pipes.

4.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mam Raisham Yaqoob [Housewife]	I am happy regarding this project. Probably, the project will be helpful in providing water with ease.	EDCM and Social Environmental Consultants will make sure to provide water with ease at your homes.
5.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mam Hamida [Housewife]	I am satisfied with this initiative; the project will be helpful in providing clean water at an affordable price.	
6.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mam Aziza Begum [Housewife]	Water is the basic necessity; it should be accessible in every home. Hopefully, this project will be helpful to provide safe drinking water in our homes.	EDCM and Social Environmental Advisor will make sure to provide clean water with ease at your homes.
7.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mam Laiba Azhar [Housewife]	It's a good initiative to solve the water issues in the community. Although during construction we have to face dust and noise related issues, it's still worth it if we'll have clean water for drinking, after construction.	EDCM and Social Environmental Advisor will ensure to provide clean water.
8.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mr. Mir Afzal [Islamic educationist]	I have no issue regarding this project. We'll be able to get water with ease.	
9.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mam Naseem Akhtar [Housewife]	There is no proper channel to access water in our area. The project seems beneficial for us in provision of water and job facilities.	

10.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mr. Ikhlaq Hanif [Soldier]	This project will augment the standard of living in the area and provide us the direct access to water at an affordable price. Satisfied with the stated project.	
11.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Miss. Rahat Gul [Student]	This is a worthwhile idea to provide clean water in our area. Requested to overcome dust and noise pollution during construction.	EDCM and Social Environmental Advisor will make sure to adhere to the correct processes for resolving dust and noise-related construction problems.
12.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mam Shakeela Begum [Housewife]	This initiative appears to be worthwhile. This will deliver better-quality water to our houses.	
13.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mr. Rafiq [Cycle Puncture Shop]	Bore and clean water is reducing day by day, it seems a good initiative to solve this problem.	
14.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mr. Zain [Unemployed]	No objection, the following project will be helpful to provide clean water.	
15.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mr. M. Javed [Karyana Store]	We have no access to clean water due to which water borne disease are increasing. It seems like a good project to reduce this issue.	

16.	30-11-2022	Bank Colony, Ranial, Rawalpindi	Mr. Abdul Basit [Student]	Content with the project's provision of clean water. Hope the construction work will be handled carefully.	EDCM and Social Environmental Advisor will make sure that construction work is handled according to suitable PEQs.
17.	30-11-2022	Bank Colony, Rawalpindi	Mr. Abdullah [Student]	This is a good thing that the stated project is being implemented, as this will benefit locals by solving water related issues.	
18.	30-11-2022	Bank Colony, Rawalpindi	Mr. Bilal Ahmad [Scrap Dealer]	Proper monitoring of water treatment plant and service pipelines shall be carried out on a regular basis.	EDCM and Social Environmental consultant will make sure to fulfill the regular maintenance of the treatment plant and pipelines.
19.	30-11-2022	Bank Colony, Rawalpindi	Mr. Azan Nasir [Shopkeeper]	Requested to hire the skilful labours to complete the work without any obstacle.	EDCM and Social Environmental Advisor will ensure that labour is employed in accordance with appropriates guidelines and laws.
20.	30-11-2022	Bank Colony, Rawalpindi	Mr. Rehan [Shopkeeper]	I have no objection in the implementation of this project. Locals should be preferred in provision of job opportunities.	EDCM and Social Environmental Advisor will ensure to prefer locals for jobs facilities available, if any.
21.	30-11-2022	SS Model Town, Rawalpindi	Mam Shaila Shaheen [Housewife]	The project seems beneficial for the local residents of this town. It is requested to give access to clean water to everyone.	EDCM and Social Environmental Advisor will make sure that every home in the area has access to clean water.

22.	30-11-2022	SS Model Town, Rawalpindi	Mr. M. Shafiq [Shopkeeper]	No issue regarding this project. Bores get dried in summer. I hope the project will be helpful in the summer. There will be more opportunities for business as well.	EDCM and Social Environmental Advisor will ensure the provision of water in summer as well.
23.	30-11-2022	SS Model Town, Rawalpindi	Mam Hajran Gul [Housewife]	It seems a good project. Hopefully, we'll also have access to clean water for drinking. Requested to provide water in the homes through proper channels.	EDCM and Social Environmental Advisor will ensure to provide clean water access to every home in the area.
24.	30-11-2022	SS Model Town,, Rawalpindi	Mam Rabia Ameen [Housewife]	I am satisfied with the implementation of this project as there is no water in summer using water-bores and tankers are unaffordable.	
25.	30-11-2022	SS Model Town, Rawalpindi	Mr. Afhan Abdul Majeed [Driver]	I have no issue with the development of this project, as water tankers are too much expensive. Daily wagers like us can't afford it.	
26.	30-11-2022	SS Model Town, Rawalpindi	Mr. Wajid Ali [Ward Boy]	No issue regarding this project. It is requested to provide clean water and job facilities to locals.	EDCM and Social Environmental Advisors will ensure that locals have access to clean water and job facilities.

27.	30-11-2022	SS Model Town, Rawalpindi	Mr. Nazir [Fruit Stall]	The low quality of our neighbourhoods' drinking water is a major contributor to the rise in diarrhoea. It is requested that clean water be provided.	EDCM and Social Environmental Advisor will make sure to provide clean water access to locals.
28.	30-11-2022	SS Model Town, Rawalpindi	Mr. Ayan Zafar [Unemployed]	I have no issue as it seems to be a useful project. Try to fix the pollution problems while the project is in its construction phase.	EDCM and Social Environmental Advisor will make sure to adhere the correct processes for resolving pollution related issues.
29.	30-11-2022	SS Model Town, Rawalpindi	Mr. Liaqat Hussain [Scrap Dealer]	Satisfied with the project in provision of clean water.	
30.	30-11-2022	SS Model Town, Rawalpindi	Mr. Raza [Shopkeeper]	Water quality issues are leading us to various diseases. The stated project will be helpful to provide and manage the life better with the provision of clean water.	
31.	30-11-2022	SS Model Town, Rawalpindi	Mr. Ibrar Abdullah [Unemployed]	People in our area have many water borne diseases. As stated, this project will be helpful to enhance the water quality, so I am satisfied.	

32.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mam Riaz BiBi [Housewife]	The good initiative, especially for the people who cannot afford tankers. There will be more job prospects for residents.	
33.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mam Shabnum [Housewife]	We are using water tankers, which are very expensive. We will be able to get an easy access to water at an affordable price.	
34.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mam Wahida [Housewife]	The project seems beneficial. This initiative will be helpful to provide water in our homes. Locals should be preferred for job opportunities.	EDCM and Social Environmental Advisor will make sure to give preference to locals for any employment or job facilities.
35.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mr. Tahir Iqbal [Driver]	This seems good initiative for the local residents of colony. Locals will have more job opportunities and easier access to water.	
36.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mr. Ahmad Ullah [Driver]	It appears to be a worthwhile effort for providing clean water. I support this initiative because there is a need for more clean water in our colony.	
37.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mr. Waqas [Mechanic]	It is requested to provide clean water through proper channels. No issue with the implementation of the project.	EDCM and Social Environmental Advisor will ensure the provision of clean water through proper channels.

38.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mr. Zain [Labour]	No issue, requested to provide safe and clean water for drinking purposes.	
39.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mr. Sher Ali [Scrap Dealer]	The project seems to provide safe drinking water. The job opportunities will also increase, so I do not have any issue regarding this project.	
40.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mr. Mujahid [Labour]	No issue regarding the project. It is requested to provide good quality water.	EDCM and Social Environmental Advisor will ensure to provide good quality water.
41.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mr. Taimoo r Ahmed [Labour]	It seems a good project and hope it will bring more job opportunities for locals.	EDCM and Social Environmental Advisor will make an effort to give locals preference for any available positions or job resources.
42.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mr. Haider Ali [Labour]	Satisfied with the project. Locals should be given job opportunities.	EDCM and Social Environmental Advisor will make sure to give preference to locals if there are employment or job facilities available.
43.	30-11-2022	Bata Colony, Chakra, Rawalpindi	Mr. Amir [Shopkeeper]	The project seems beneficial to improve water quality. Job opportunities should be provided to locals.	EDCM and Social Environmental Advisor will ensure that locals are given priority if there are any work opportunities available.

44.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mr. Rehan [Own Business]	I have no issue with the development of this project. It is requested to monitor the maintenance of filtration plant and pipeline on regular basis.	EDCM and Social Environmental Advisor will make sure to prevent disturbing the residents due to the utilization of land for spreading the pipelines.
45.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mam Rahat Ali [Housewife]	No issue, it's a good initiative for local residents by increasing their employment opportunities and providing the quality water. Requested to handle the construction work properly.	EDCM and Social Environmental Advisor will make sure to manage the construction work in accordance with appropriate PEQs.
46.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mam Nadia Jameel [Housewife]	It seems a decent project for the provision of quality water, so I have no issue regarding this project.	
47.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mam Mehwish Mumtaz [Housewife]	I have no objections to this initiative as the quality of water will increase.	

48.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mr. Ishtiaq [Farmer]	No objection and satisfied with this project as the project seems beneficial to improve water quality.	
49.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mr. Akbar [Farmer]	No issue regarding this project. It seems a good initiative to fulfil the amount of water required.	
50.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mr. Ahmad [Unemployed]	We are facing water deficiency in our homes. Hopefully, this initiative will assist in resolving this problem.	EDCM and Social Environmental Advisor will ensure that water is provided to each household in the area, reducing water deficiency-related issues.
51.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mr. Wajahat [Farmer]	I have no objection. Requested to use the barren land to expand the water supply pipelines.	EDCM and Social Environmental Advisor will ensure to avoid offending the locals by using their property to disseminate the pipes.
52.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mam. Shubnam [Housewife]	It seems a decent project for the provision of quality water, as well as job facilities for locals.	

53.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mam Sakeena [Housewife]	I have no objections to this project's execution because it looks like an excellent concept to address the local water problems.	
54.	30-11-2022	Kashmiri Abadai, Raniyal Village, Rawalpindi	Mr. Abid [Farmer]	I have no issue about the initiative of this project, as we'll be able to receive quality water.	
55.	18-01-2023	Akbar Chowk, Rawalpindi	Mr. Naseer Ahmad [Shopkeeper]	I am happy with how this project was carried out. Reduce the problems caused by construction as much as possible.	EDCM and Social Environmental Advisor will make sure to follow suitable PEQs for construction to reduce the problems caused by construction.
56.	18-01-2023	Akbar Chowk, Rawalpindi	Mr. M. Billa [Plumber]	I have no issue with the implementation of this project. It is demanded that the construction be carefully observed to avoid any hiccups.	EDCM and Social Environmental Advisor will make sure to regulate the construction activities with appropriate procedures to avoid any mishaps.
57.	18-01-2023	Akbar Chowk, Rawalpindi	Mr. Akram Rafeeq [Vegetable Seller]	Satisfied with the implementation of this project. Hope it will be helpful to solve water related issues.	EDCM and Social Environmental Advisor will make sure to provide clean water so that water-related concerns are resolved.

58.	18-01-2023	Akbar Chowk, Rawalpindi	Mr. Farman Khan [Data Analyst]	It was requested to hire sufficiently skills workers to maintain an orderly workplace both during and after construction.	EDCM and Social Environmental Advisor will ensure that skilled workers are hired in order to keep the workplace organized.
59.	18-01-2023	Akbar Chowk, Rawalpindi	Mr. Zahir Shah [School Teacher]	There is no proper water supply and sewerage system in the area; the following project will be helpful to solve this issue so I am satisfied.	
60.	18-01-2023	Chakra, Rawalpindi	Mr. Chaudhary Khurram [Shopkeeper]	No issue and I am satisfied with how this project is coming along. Locals should be given preference when offering employability.	EDCM and Social Environmental Advisor will make sure to prefer locals in case of any job facility available.
61.	18-01-2023	Chakra, Rawalpindi	Mr. M. Yaseen Shah [Dry Clean Shop]	I have no objections to this project; only make sure the construction activity is appropriately managed.	EDCM and Social Environmental Advisor will make sure to supervise the construction activities in conformity with the appropriate procedures.
62.	18-01-2023	Chakra, Rawalpindi	Mr. M. Akram [Vegetable Seller]	No issue regarding this project. It was demanded that local water-related problems be resolved.	EDCM and Social Environmental Advisor will make sure to fulfil the water demands of the locals.
63.	18-01-2023	Malikabad Chakra Road, Rawalpindi	Mr. Shoaib [Student]	As stated, this project will result to solve water scarcity issue rising in the area. It was recommended to keep the water quality high.	EDCM and Social Environmental Advisor will ensure that the provided water quality is high.

64.	18-01-2023	Malikabad Chakra Road, Rawalpindi	Mr. Iftikhar Ahmad [Fruit Seller]	I don't object because it sounds like a good effort to address the water situation.	
65.	18-01-2023	Malikabad Chakra Road, Rawalpindi	Mr. Naseer Ahmed [Butcher Shop]	No objections because addressing the issues with the water deficit seem like a good idea. To prevent any inconvenience, it is urged that the construction work be managed correctly.	EDCM and Social Environmental Advisor will make sure to oversee the construction operations according to the necessary protocols.
66.	19-01-2023	Girja Village, Rawalpindi	Mr. Ismaeel Jahangir [Service Shop]	There are a lot of water-borne infections rising in the area. I hope, this initiative will assist to improve the quality of the water.	EDCM and Social Environmental Advisor will ensure to provide high quality water.
67.	19-01-2023	Girja Road, Rawalpindi	Mam Zareen Khan [Housewife]	Content with the project in provision of high quality water.	
68.	19-01-2023	Girja Road, Rawalpindi	Mam Aziza [Housewife]	With the delivery of clean water, the aforementioned project will assist to provide and manage life more effectively.	
69.	19-01-2023	Girja Road, Rawalpindi	Mam Haneefa [Housewife]	No difficulties with the project's execution since the project will be helpful solve our water related concerns.	

70.	19-01-2023	Girja Road, Rawalpindi	Mr. Rashid Tanveer [Shopkeeper]	I am pleased with the execution of this project as project will help us to address the local water scarcity problem.	
71.	19-01-2023	Girja Road, Rawalpindi	Mr. Shahrukh Tanveer [Shopkeeper]	I'm hoping that the initiative will help to improve the water quality and that it will expand locals' employment prospects.	
72.	19-01-2023	Kashmir Colony, Girja Road, Rawalpindi	Mr. Mirza Rehmat Ullah [Data Entry Freelancer]	It was suggested that the project development be kept under check and balance even after construction to avoid any mishaps.	EDCM and Social Environmental Advisor will make sure that the project development be kept under check and balance even after construction.
73.	19-01-2023	Kashmir Colony, Girja Road, Rawalpindi	Mr. Zaheer Abbas [Shopkeeper]	I support this initiative as it initially seemed like a project or initiative to address water-related difficulties.	
74.	19-01-2023	Kashmir Colony, Girja Road, Rawalpindi	Mr. Hasan Ali [Pvt. Job]	Water depletion, particularly during the summer, is one of the major issues we face in our area. The proposed approach seems to be helpful for overcoming this problem.	EDCM and Social Environmental Advisor will make sure to resolve water related concerns arising in the summer.

75.	19-01-2023	Purani Police Cowki, Rawalpindi	Mr. Abdul Razaq [Pvt. Employee]	In the summer, we experience a water deficit in our homes. Hopefully, this initiative will assist in resolving this problem.	EDCM and Social Environmental Advisor will ensure the availability of water in order to address summertime water-related issues.
76.	19-01-2023	New Lalazad Caltex Road, Rawalpindi	Mr. M. Sarwar [Driver]	I have no objection regarding this initiative. It is requested that construction activities not interfere with their daily lives.	EDCM and Social Environmental Advisor will make sure to follow appropriate rules for construction activities so that they do not affect the daily lives of locals.
77.	19-01-2023	New Lalazad Caltex Road, Rawalpindi	Mr. Arsha Iqbal [Hotel Employee]	Due to the use of bore water in our area, we frequently experience water shortages, particularly during the summer. I'm hoping that the suggested endeavour would be effective in resolving this problem	EDCM and Social Environmental Advisor will ensure the accessibility of water in order to overcome obstacles relevant to water throughout the summer.
78.	19-01-2023	Hassan Street Defence Road, New Lalazae	Mr. Nabeel Rashid [Driver]	There was no confrontation. It was asked to work cautiously and to handle the construction materials properly.	EDCM and Social Environmental Advisor will ensure that all construction regulations are followed.
79.	19-01-2023	Hassan Street Defence Road, New Lalazae	Mam Rehana Khan [Housewife]	We are suffering a severe water deficit. This project will perhaps help find a solution to this issue.	EDCM and Social Environmental Advisor will make sure to resolve water deficit concerns that arise.

80.	19-01-2023	Hassan Street Defence Road, New Lalazae	Mr. Sheharyar [Student]	No opposition. It was requested that the construction materials be handled carefully so as not to interfere with our daily lives.	EDCM and Social Environmental Advisor will make sure that construction material be handled according to proper protocols.
81.	19-01-2023	Hassan Street Defence Road, New Lalazae	Mr. M. Nabeel [Mechanic]	I don't have any issues with this proposal; Hope, it will help to conveniently deliver clean water.	EDCM and Social Environmental Advisor will make sure that clean water is provided through the appropriate channels.
82.	19-01-2023	Defence Road, Rawalpoindi	Mr. Fateh Muhammad [Saloon Worker]	I don't have any issues with the execution of this project because it seems like a good idea to improve water availability and quality in the area.	
83.	19-01-2023	Khwaja Corporation Chowk, Adiala Road	Mr. Naseeb Khan [Saloon Owner]	It seems a decent project to enhance the water supply and its quality in the area so I have no issue regarding this project.	
84.	19-01-2023	Dhama Mor, Adiala Road, Rawalpindi	Mr. Faizan Lodhi [Driver]	It's a terrific idea that will benefit the locals by offering them more work opportunities and raising the water standard they receive.	
85.	19-01-2023	Dhama Mor, Adiala Road, Rawalpindi	Mr. M. Idrees [Wedding Hall Employee]	I am satisfied with the implementation of this project.	

86.	19-01-2023	Sadiq Town, Dhama Syeddan, Rawalpindi	Mr. Tanveer [Rickshaw Driver]	Hopefully, this programme will help us find solutions to our water-related issues.	EDCM and Social Environmental Advisor will make sure to deal with issues relating to water.
87.	19-01-2023	Sadiq Town, Dhama Syeddan, Rawalpindi	Mr. Zohaib [Freelancer]	I have no objection with the execution of this project. The project seems good to resolve our water related concerns.	
88.	19-01-2023	Biscuit Factory Area, Kotha Mor	Mr. Mudassir [Mechanic Shop]	It sounds like a smart idea to address the water crisis concerns that are emerging in the area.	
89.	19-01-2023	Biscuit Factory Area, Kotha Mor	Mr. Jameel [Car Service Shop]	Considering that the project would improve water quality, I have no issues with its execution.	
90.	19-01-2023	Biscuit Factory Area, Kotha Mor	Mr. Haji Abdul Rasheed [Pvt. Employee]	We have problems with both the amount and quality of the water in our region, which is causing us to contract a number of ailments; therefore I am happy with the implementation of this project.	
91.	19-01-2023	Biscuit Factory Area, Kotha Mor	Mr. M. Shafique [Flower Seller]	This initiative appears to be a worthwhile attempt to solve the problems with water's quality and depletion.	

92.	19-01-2023	Biscuit Factory Area, Kotha Mor	Mr. Rawaiz Khan [Shopkeeper]	It was requested to maintain an orderly workplace after construction to avoid any mishaps.	EDCM and Social Environmental Advisor will make sure to follow appropriate procedures to maintain an orderly workplace even after construction.
93.	19-01-2023	Chakri Road, Near Ranial WW, Rawalpindi	Mr. Kala [Waiter]	One of the biggest problems we deal with in our area is the depletion of water, especially during the summer. The suggested strategy appears to be effective in resolving this issue.	
94.	19-01-2023	Chakri Road, Near Ranial WW, Rawalpindi	Mr. Nawaz [Fruit Seller]	I don't have any issues with the implementation of this project because it seems like a good idea to improve the water issues arising in the area.	
95.	19-01-2023	Chakri Road, Near Ranial WW, Rawalpindi	Mam Shamasa [Student]	No issues with the project implementation because the water supply and quality problems in our neighbourhood are causing us to contract a variety of illnesses. The project mentioned will help to provide and manage life more effectively with the supply of clean water.	

96.	19-01-2023	Dhamiyal Road, Rawalpindi	Mr. Sarhad [Rickshaw Driver]	I am pleased with the way this project is going to implement. As much as feasible, lessen the issues brought on by construction.	EDCM and Social Environmental Advisor will make sure to adhere to the correct PEQs for reducing the problems caused by construction.
97.	19-01-2023	Dhamiyal Road, Rawalpindi	Mr. M. Zulafqar [Dry Clean Shop]	These initiatives ought to be carried out because water is a basic requirement. The initiative will be useful in resolving summertime water concerns.	
98.	19-01-2023	Dhamiyal Road, Rawalpindi	Miss Salma Nasir [Student]	The loss of water, particularly during the summer, is one of the main issues we face in our region. The proposed approach seems to be successful in fixing this problem.	
99.	19-01-2023	Muhalla Jaal Giran Raniyal, Rawalpindi	Mr. Sikandar [Pvt. School Teacher]	With the supply of clean water, the mentioned project would assist to provide and manage life better.	
100.	19-01-2023	Muhalla Jaal Giran Raniyal, Rawalpindi	Mr. Faisal [Pvt. Employee]	Bore water is widely used in our area, yet we frequently experience water shortages, especially in the summer. I believe the suggested project will be successful in resolving this issue.	EDCM and Social Environmental Advisor will ensure to resolve water deficit issues in the area.

101.	19-01-2023	Muhalla Jaal Giran Raniyal, Rawalpindi	Mr. Irfan [Book Seller]	I support this plan since it will help to improve the quality of the water.	
102.	19-01-2023	Raniyal Stop, Mashrot Road, Dong Chakri, Rawalpindi	Mam Tariqa Mehmood [Pvt. Employee]	It sounds like a decent idea to supply the area with the sufficient amount of water.	
103.	19-01-2023	Raniyal Stop, Mashrot Road, Dong Chakri, Rawalpindi	Mam Shahida [Housewife]	No issue, as explained about the project, this initiative will help to address the local water shortage problem so I am satisfied. Maintaining excellent water quality was advised.	EDCM and Social Environmental Advisor will ensure to maintain high quality of water.
104.	19-01-2023	Raniyal Stop, Mashrot Road, Dong Chakri, Rawalpindi	Mam Salma [Housewife]	We are facing both water deficit and water quality related issues. This project seems like a good initiative to solve these problems.	EDCM and Social Environmental Advisor will ensure that all water related concerns are resolved, such as the maintenance of high quality water and the availability of water in the area.

Table 5. 4: Response of Stakeholder during FGDs

Sr. #	Name (FGD) & Profession	Location	Feedback/Concerns	Reply
Bank Colny, Rawalpindi Date: 01-12-2022				
1	Mr. M. Tajammal [Shopkeeper]	Bank Colony, Rawalpindi	According to the following FGD, this initiative seems worthwhile as they will receive water of higher quality as a result. Water borne illnesses are on the rise as a result of the shortage of clean water. They believe that this project will help lessen this problem. Additionally, they hope that the construction will be done carefully. It was requested to use strategies to reduce construction-related issues such as noise and dust pollution.	EDCM and Social Environmental Advisor will make sure to adhere to the correct processes for resolving dust and noise-related construction problems and will also ensure the provision of clean water through proper channels.
2	Mr. Mir Afzal [Shopkeeper]			
3	Mr. Gulam Rubani [Shopkeeper]			
Kashmiri Abadai, Raniyal Village, Rawalpindi Date: 01-12-2022				
1	Mr. Abbasi [Unemployed]	Raniyal Village, Rawalpindi	A supportive attitude towards the implementation of this project was observed as the majority of the population in the area lacks access to a reliable water source. Water bores are their sole supply of water; they used to share them, but during the summer, the bores dried up. FGD claims to be	EDCM and Social Environmental Advisor will make sure to give preference to locals for any employment or job facilities.
2	Mr. Malik Shabir Awan [Farmer]			
3	Mr. Shaukat [Farmer]			
4	Mr. Asif Bhatti [Farmer]			

5	Mr. Jawad Akhtar [Farmer]		satisfied as the project will help them increase their water capacity. This project will also result in raising the area's standard of living and giving residents direct access to water at a reasonable cost. They anticipate locals will be given preference if there are any employment opportunities.	
FGD at Bata Colony, Chakra, Rawalpindi Date: 01-12-2022				
1	Mr. Anwar [Shopkeeper]	Bata Colony, Chakra, Rawalpindi	The FGD participants appear to be happy with the project, given the necessity of such projects in the present. It was suggested that the construction activities be carefully monitored to avoid disruption. Additionally, they believe that the initiative will be helpful during the summer, when water levels drop. It was suggested that compliance criteria be followed to finish the construction work on schedule. It was also suggested to offer locals employment options.	EDCM and Social Environmental Advisor will ensure that labour is employed in accordance with appropriate guidelines and laws. They will make sure to regulate the construction activities with appropriate procedures to avoid any mishaps. EDCM and Social Environmental Advisor will also make sure to give preference to locals for any employment or job facilities.
2	Mr. Rehman Khan [Shopkeeper]			
3	Mr. M. Arshid [Worker]			
4	Mr. Basit Ali [Worker]			
SS. Model Town, Rawalpindi Date: 01-12-2022				
1	Mr. Abdul Rafay		No one in the FGD objected to this	EDCM and Social Environmental

	[Labour]	SS. Model Town, Rawalpindi	project because it would aid in the delivery of clean water. They suggested taking adequate measures to manage the construction activity. This initiative will be beneficial in addressing the area's drinking water issues. It was requested that the scheduling of transit during construction be controlled to avoid obstructing their work hours. It was suggested to discover solutions to problems associated with construction, such as dust, traffic, and machine noise. They were pleased that the project would be able to provide clean water. Additionally, it was advised to hire skilled workers to complete the task without any issues. They anticipate that the project will be completed as soon as possible so that their concerns about the availability of water can be addressed.	Advisor will ensure that construction labors are employed in compliance with the necessary standards and regulations. To prevent any accidents, they will make sure to control the construction activities using the appropriate protocols. They will guarantee that the required procedures are followed to address construction-related issues with dust and noise, and they will also make sure that clean water is provided through the appropriate channels.
2	Mr. Hamad [Shopkeeper]			
3	Mr. Zulfiqar Khan [Vegetable seller]			
4	Mr. Asad [Vegetable seller]			
5	Mr. Bilal [Shopkeeper]			
6	Mr. Shahan [Shopkeeper]			
7	Mr. Hassan [Shopkeeper]			
8	Mr. Asif [Shopkeeper]			
FGD at Chak Jalal Din, New Abadi # 2, Chakri Road, Rawalpindi Date: 18-12-2022				
1	Mr. Zaheer Akhtar [Food Stall]	Chak Jalal	The FGD participants seemed content with the proposal, as the said project will be helpful in dealing with the	The EDCM and Social Environmental Advisor will ensure that construction operations are governed by
2	Mr. Noveed Khan			

	[General Store]	Din, Rawalpindi	water depletion issues. It was recommended that the construction operations be tightly controlled to minimize damage. Additionally, it was also recommended to provide work opportunities for locals.	appropriate procedures in order to minimize damage. EDCM and Social Environmental Advisor will also make sure to give precedence to locals for any job opportunities.
3	Mr. Noor [Worker]			
4	Mr. Tayyab [Worker]			
5	Mr. Israr [Shopkeeper]			
FGD at Awan Town, Girja Road, Rawalpindi Date: 18-12-2022				
1	Mr. Amjad Mehmood [Shopkeeper]	Awan Town, Girja Road, Rawalpindi	This focus group discussion is in favor of the project's initiative because the project will help resolve the water concerns arising in the area. Despite having a water supply system, they are having problems with water depletion and contamination. The aforementioned initiative will contribute to an improved, higher-quality water supply system. It was requested to regularly conduct the necessary monitoring of water treatment facilities and service pipes after the execution of the project.	EDCM and Social Environmental Consultant will ensure routine maintenance of the treatment plant and pipelines after the execution of the project.
2	Mr. Malik Khwaja [Wedding Shop]			
3	Mr. M. Riaz [Hardware Shop]			
4	Mr. Yasir Mehmood [Shopkeeper]			
5	Mr. Haji Muhammad Younas [Shopkeeper]			
FGD at Imtiaz Market, Chakra Road (Akbar Chowk), Rawalpindi Date: 18-12-2022				
1	Mr. Shahid Abbasi [Hotel Owner]		The FGD participants appeared pleased with the manner in which this	EDCM and Social Environmental Advisors will ensure completion of the

2	Mr. M. Ramzan [Shopkeeper]	Imtiaz Market, Chakra Road, Rawalpindi	project was implemented because it would give them cheap and convenient access to water. They will have access to a reliable source of drinking water. They also believe that carrying out the project will make it easier to fight the local ailments. It was requested that transit schedules be restricted while construction is underway to prevent interfering with their working hours. They also requested to find solutions for construction-related problems like dust, traffic, and machine noise. They are hoping that the project will be skillfully developed. In essence, they agreed with the project's terms.	requests raised by FGD participants. There will be proper schedule to control the traffic issues. Proper construction related protocols will also be followed.
3	Mr. Zafar [Tea Stall]			
4	Mr. M. Shahid [Hotel Worker]			
5	Mr. Basheer Abbasi [Shopkeeper]			
6	Mr. Javed Abbasi [Hotel Worker]			
7	Mr. Farhan [Shopkeeper]			
FGD at Girja Village- Basic Health Unit, Chakra, Rawalpindi Date: 18-12-2022				
1	Mr. Farhad Ali [Govt. Employee]	Girja Village, Rawalpindi	They encourage the development and implementation of the project since it will aid in the solution of the water-related issues. Usually, they experience a water deficit in the summer as they are using bore water. Despite the fact that tankers are too expensive, some of the participants	EDCM and Social Environmental Advisors will ensure the provision of clean water to everyone.
2	Mr. Hashim [Govt. Employee]			
3	Mr. Nouman [Govt. Employee]			
4	Mr. Muneeb [Govt. Employee]			

5	Mr. Abdul Rehman [Govt. Employee]		need to purchase tankers. This project would increase the water supply. The project is about maintaining the purity of the water and building the water supply system, so they were encouraging the idea. It was requested that everyone have easy access to water.	
FGD at New Lalazar Caltex Road (Adiala WW), Rawalpindi Date: 19-12-2022				
1	Mr. Abbass Ali [Truck Driver]	Caltex Road	The FGDs support the execution of this project since it will assist in resolving the water difficulties that are now plaguing the area. The majority of them use bore water. In the summer, it dries out. With the delivery of clean water, the aforementioned project will help provide and manage life more effectively. It was asked to minimize construction-related problems as much as possible. It was also requested to carry out the proper monitoring of water treatment plant and service pipelines on a regular basis.	EDCM and Social Environmental Consultant will ensure routine maintenance of the treatment plant and pipelines after the execution of the project. Proper construction related protocols will also be followed.
2	Mr. Muhammad [Driver]			
3	Mr. Saif Ur Rehman [Driver]			
4	Mr. Shahzaib [Helper]			
5	Mr. SamiUllah [Assistant]			
6	Mr. Ali Abbas [Worker]			
7	Mr. Bilal Khan [Stall]			
8	Mr. Sarwar Khan [Hotel Waiter]			

Figure 5. 2: Photographs of Stakeholder Consultation

	
EDCM E&S Safeguard team in consultation with stakeholders near Location of Water Intake Structure	EDCM E&S Safeguard team in consultation with stakeholders at proposed WW site of Chakra
	
EDCM E&S Safeguard team in consultation with stakeholders Near propose Water Treatment Plant	EDCM E&S Safeguard team in consultation with stakeholders at Kashmir Colony near IPS Ranial
	
EDCM E&S Safeguard team in consultation with stakeholders	EDCM E&S Safeguard team in consultation with stakeholders at Kashmir Colony near IPS Ranial

	
EDCM E&S Safeguard team in consultation with stakeholders at IPS Ranial	EDCM Social Safeguard team in consultation with stakeholders near WW
	
EDCM Social Safeguard team in consultation with stakeholders at WTP site	EDCM E&S Safeguard team in consultation with stakeholders at IPS
	
EDCM Social Safeguard team in consultation with stakeholders at Ranial	EDCM Social Safeguard team in consultation with stakeholders at Ranial

CHAPTER-6

SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

6.1 GENERAL

This chapter identifies the beneficial as well as the potentially significant adverse environmental and social impacts during design/pre-construction, construction and operation phases of the proposed project on the physical, ecological and socio-economic domains of the environment. The appropriate mitigation and remedial measures are proposed in this chapter. A project impact evaluation matrix has been developed to evaluate the potential impacts of the proposed Project. A brief qualitative description of each aspect and the affected environment in both RoW and the project's corridor of impact is presented below.

6.2 METHODOLOGY FOR IMPACT IDENTIFICATION

The methodology for assessing the risk level associated with each potential impact is presented below.

Risk is assessed as the likelihood that the activity will have an effect on the environment as well as the consequence of the effect occurring. It is often described like this:

Risk = Likelihood × Consequence

Likelihood Scale

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

Consequence Scale

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

Risk Score Table

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

Total Risk: Significant: 15-25

Medium: 6-10

Low 1-5

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

6.3 IMPACT CHARACTERIZATION

Subsequent to the impact screening, various characteristics of the potential impacts including project siting (dense, heavy with development activities), environmentally sensitive areas (Cultural heritage site, protected area, wet land etc), temporal extent (temporary, permanent), and significance of impacts were determined. There are some potential adverse environmental and social impacts on the local environment. The proposed Project is divided into three (03) stages i.e.

- Pre-construction / Planning and Design Stage,
- Construction Stage and
- Operation and Maintenance (O&M) Stage.

The Pre-Construction Stage includes all stages before the construction Stage (i.e. site investigation work i.e. topographical, seismic studies etc.); Construction Stage includes all stages from mobilization of Contractor to the completion of Project; and Operation Stage starts after the Construction Stage which includes the inspection and repair works.

Adverse impacts envisaged at these three (03) stages of the proposed water supply project along with their proposed remedial or mitigation measures are given in the following section.

6.4 DESIGN/PRE CONSTRUCTION PHASE

Impact Screening Matrix

The 'activity wise' screening of potential impacts during the design/pre-construction phase is provided in **Table 6.1** below.

Table 6. 1: 'Activity Wise' screening of possible Impacts during Design/Pre-Construction phase

Sr. No.	Potential Issue	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)	Residual Impact (Short term, Long Term)
1	Improper selection of intake source and reduce ecological flows Impacts	2 / Likely	5 / Moderate	10 / Medium	Low / Long Term
2	Improper design of water treatment plant and distribution networks including transmission main	2 / Likely	5 / Moderate	10 / Medium	Low / Long Term
3	Lack of integration of IEE/EMP requirements into Construction bid documents	2 / Likely	3 / Moderate	6 / Medium	Low / Short Term
4	Impacts on existing utilities	2 / Likely	3 / Moderate	6/ Medium	Low residual Impact
5	Impacts of Labor Camps and Ancillary Facilities	3 / Likely	2 / Moderate	6 / Medium	Medium / Short Term
6	Traffic Issues/ Traffic Management Plan	3 / Likely	2 / Moderate	6 / Medium	Low / Short Term
7	Land acquisition and resettlement impacts	5 / Unlikely	2 / Moderate	10 / Medium	Low residual Impact
8	Topographic Impact due to Excavation	2 / Unlikely	2 / Moderate	Low	Low residual Impact
9	Seismic Impacts	2 / Unlikely	2 / Moderate	Low	Low residual Impact

Critical Risk Level

Significant Risk Level

Medium Risk Level

Low Risk Level

6.5 ADVERSE IMPACTS DURING PLANNING AND DESIGN PHASE

Potential adverse impacts during the planning and design stage of the Project are given below:

6.5.1 Improper Designing of Distribution Networks and Conductance Main

Impacts

Improper selection of intake sources may lead to impacts which may have long lasting impact on hydraulics and environmental flows of streams. Reduced downstream water availability shall have deprived end user or it may disrupt environmental/ecological characteristics of streams. Further streams are the sources of ground water charging in the vicinity and downstream of catchment area.

Furthermore, if source water availability is not analyzed during design it may disrupt uninterrupted raw water supply to WTP.

Mitigation Measures

Detailed Catchment studies shall be conducted as part of designing intake flow from sources.

- Runoff volume calculations shall be carried on periodic basis to ensure water supplies from intake structure.
- Periodic flow measurement shall be carried out to ascertain the continuous water availability for the project.
- PMU LG&CD will ensure that design of intake structure is carried out with minimal impact of aquatic life and ecological flows.

Residual Impact

Provided the proposed mitigation measures are implemented, no significant adverse residual environmental effects are likely to occur. However, in case improper selection of intake source, the residual impact will be low adverse in nature.

6.5.2 Improper design of water treatment plant and distribution networks including transmission main

Impacts

The possibility exists that in case the project is not designed in accordance with international standards and guidelines[10] for water and sanitation it could result in multiple potential impacts that could adversely affect the settlements of project area.

If water intake structures are not designed to minimize impacts on aquatic life e.g. higher intake velocity through intake screen may entrap aquatic life and fish if intake

[10] https://www.ifc.org/wps/wcm/connect/83217cd8-b9a5-4383-97b5-

structure is not designed adequately and raw water contain high sediment load shall foul the WTP and increase maintenance cost of WTP.

If WTP is not designed properly and filtered water will not meet NEQS it will not fulfill the ultimate purpose of project to provide safe drinking water to the residents of the area. If Distribution mains and supply network is not designed properly it will increase chances of pipe bursting, leakages, reduce water delivery to particular residents resulting in social issues.

Mitigation Measures

The following design related measures will be implemented to ensure the project activities does not result in unanticipated, long term and potentially irreversible impacts:

- The design criteria are mainly based on the standards and specifications of WASA Lahore. Where required, international best practices were also considered in establishing the design criteria for the proposed water supply system and water treatment plant.
- Limit maximum through-screen design intake velocity to limit entrance of aquatic organisms
- Avoid construction of water intake structures in sensitive ecosystems
- Intake structure shall be designed adequately to reduce sediment load and uninterrupted raw water supply to WTP.
- The treatment process will be employed that biological contaminants and suspended solids are brought in the limits set forth in Pakistan Standards and WHO Guideline values for Drinking Water.
- A SCADA system has been proposed to check compliance and monitoring of WTP components.
- 1.2-meter cover has been proposed from the top of pipe to reduce chances theft and pipe bursting due to traffic loads.
- Before commissioning water supply network shall be tested on 1.5 times the designed pressure to check leakages.
- Water metering system shall be proposed to reduce theft and water wastage.

Residual Impact

Provided the proposed mitigation measures are implemented, no significant adverse residual environmental effects are likely to occur. However, in case improper designing of Water Treatment Plant and distribution network, the residual impact will be low adverse in nature.

6.5.3 Lack of Integration of IEE/EMP Requirements into Construction Bid Documents

Impacts

The bidding documents must reflect the requirement to select a qualified and experienced Contractor from the perspective of ensuring implementation of required safeguards during project development.

Mitigation Measures

The Environmental staff of PMU will be assigned the task to check that design and bid documents are responsive to key environmental, social and safety considerations, and that the proposed method of work reflects the boundaries defined in the EMP. The bid documents must include the EMP and its implementation cost must be reflected in the BOQ.

IEE/EMP implementation and monitoring requirements must be part of bidding documents and necessary contractual binding must be agreed by project contractors before award of contract. Project contractors shall have qualified and experienced environmental staff to plan, arrange, implement, monitor and report IEE/EMP requirements.

Residual Impact

Upon integration of EMP requirements into construction contract agreement, and upon implementation of EMP in true letter and spirit, the residual environmental effects are expected to be low in magnitude and short term.

6.5.4 Impacts of Existing Utilities

Utility services such as sewerage lines and telephone lines lying along the project alignment may need to be relocated temporarily or permanently to prevent damage to them.

Mitigation Measures

Detailed filed surveys will be conducted to assess any sub-surface utilities that

might be present under the proposed project alignment within the right of way of the project, shall be relocated prior to the commencement of the work.

- Based on the utilities that are identified during the detailed surveys, a relocation plan of those utilities will be developed by the respective line agencies in close coordination.
- In case any utilities can be allowed to remain in place and avoidance of their damage is possible, the contractor will need to be aware of the location of these services so that disruptions are not caused. In such scenario, the responsibility for any repair of damaged services will lie with the contractor.

Residual Impact

Provided the proposed mitigated measures are implemented, the magnitude and extent of the environmental effects will be low. Therefore, no significant adverse residual environmental effects are likely to occur.

6.5.5 Impacts of Labor Camps and ancillary facilities

Impacts

The duration of the construction activity for the proposed project is expected to be 2-3 years and a considerable amount of work force will be engaged. As a result, worker camps will need to be developed and ancillary facilities will need to be provided such as electricity, washrooms for labor with suitable effluent and sewage disposal facilities as well as water for their everyday use for drinking and bathing etc.

Mitigation measures

- In order to prevent a nuisance, specific locations shall be designated for development of the labor camps. All necessary facilities and amenities shall be provided in these camps such as resting area, drinking water, electricity, supply of water.
- Solid and liquid effluent waste disposal facilities shall also be designed to cater waste of administration/office building etc.
- The use of proper planning while identifying locations for the labor camps will ensure there is minimal disturbance to all key receptors and the traffic is

not disrupted by labor camps being set up roadside next to the construction sites.

- A comprehensive Construction Camp Management Plan will be prepared as part of Site Specific Environmental Management Plan (SSEMP) by the contractor and approved by the Executing Agency.

Residual Impact

No residual effects are expected.

6.5.6 Traffic Issues

Impacts

In particular, the lying of water pipelines could result in heavy congestion due to the movement of construction heavy machinery and equipment with significant delays for traffic apart from posing a significant risk for vehicles.

Mitigation Measures

A comprehensive traffic management plan shall be developed by the contractor and approved by the Executing Agency or the Project Management Unit that will contain the traffic diversion onto alternate routes and management of traffic flows to minimize the congestion and the possibility of accidents. This plan shall be dependent to the EMP and will be implemented by the contractor.

Residual Impacts

After implementing the traffic management plan, the residual impacts will be low.

6.5.7 Land Acquisition and Resettlement Impacts

Impacts

The proposed project involves the distribution of the water supply network. This water distribution network or pipes will be laid within the existing network of water pipes, so no land acquisition is involved in this proposed project.

Mitigation Measures

No mitigation measures are required.

Residual Impacts

No residual impacts so it will remain low.

6.5.8 Topographic Impacts due to excavation

Potential Impacts

The project area has plain topography and land acquisition is involved for the proposed project for construction of Water Treatment Plant, Intermediate Pumping Station at Ranial and Water Works at Akbar Chowk, Chakra and Adiala. These constructions will change the topography of the area, especially due to construction of overhead water reservoirs. Further, excavation of land is involved for the proposed Project. A minor physical change in the topography due to excavation of land is expected in the project area. This adverse impact is low in nature.

Mitigation Measures

Mitigation measures will involve adoption of best engineering design measures keeping in view of the aesthetics of the project area and provision of green areas for the landscape in design. The proposed design has tried to minimize these impacts.

Residual Impact

No residual effects from this component of the project are anticipated as no significant topographical change is anticipated.

6.5.9 Seismic Impacts

Potential Impact

In Building Code of Pakistan (Seismic Provisions, 2007), the whole region of Pakistan is classified into five main Seismic Hazard zones i.e., i) Zone-1, ii) Zone-2A, iii) Zone-2B, iv) Zone-3, v) Zone-4 based on the peak horizontal ground acceleration and its ultimate tendency to damages during seismic events. The proposed Project Area falls in the seismic zone classified as “Zone-2B” with g-value 0.16 to 0.24, and is considered as Moderate Hazard seismicity zone.

As the project is located under the active seismic region with g-value 0.16 to 0.24. Therefore, care shall be taken in design of all buildings under this project, specially the construction of overhead reservoirs at all water works. The proposed project will not have any impact on the seismology of project are as none of the project activity

will have that much magnitude to cause seismic disturbance in the project area. This adverse impact is medium in nature.

Mitigation Measures

The proposed structure should be designed and constructed keeping in consideration high intensity earthquakes. For seismic hazard analysis, updated structural and seismic evaluations should be conducted by the design engineer/consultant. Moreover, geo-technical investigations must be conducted prior to construction phase.

Residual Impacts

Upon implementation of mitigation measures suggested above, no significant residual impact is anticipated.

6.6 ADVERSE IMPACTS DURING CONSTRUCTION PHASE

6.6.1 Impact Screening Matrix

The screening of potential impacts during the construction phase is provided in **Table 6.2** below.

Table 6. 2: Screening of Possible Impacts during Construction Phase

Sr. No.	Potential Issue	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)	Residual Impact (Short term, Long term)
1	Site Accessibility Issues	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
2	Traffic Issues	3 / Likely	3 / Moderate	9 / Medium	Low / Short term
3	Impact on local Resource	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
4	Community Health & Safety	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
5	Occupational Health & Safety	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
6	Impacts due to Construction Camps/ Camp Site	3 / Likely	2 / Moderate	6 / Medium	Low / Short term

7	Waste water generation	3 / Likely	3 / Moderate	9 / Medium	Low / Short term
8	Solid Waste Generation	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
9	Impacts of Natural and Man-Made Disaster	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
10	Degradation of air quality due to construction works	3 / Likely	3 / Moderate	9 / Medium	Low / Short term
11	Noise/ Vibration	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
12	Flora	3 / Likely	3 / Moderate	9 / Medium	Low / Short term
13	Fauna	3 / Likely	3 / Moderate	9 / Medium	Low / Short term
14	Social and Cultural Conflicts	3 / Likely	2 / Moderate	6 / Medium	Low / Short term
15	Communicable diseases	3 / Likely	2 / Moderate	6 / Medium	Low / Short term

Critical Risk Level

Significant Risk Level

Medium Risk Level

Low Risk Level

6.6.2 Construction of Water Distribution Networks and Conductance Mains

Potential environmental impacts during construction phase of the project are given below.

6.6.2.1 Site Accessibility during Construction

Potential Impact

The proposed project can be approached through various roads. The construction material, equipment and machinery will be arrived at proposed workshop area and construction camps sites. From the camp, the material, equipment and machinery will be transferred to work site.

Mitigation Measures

- Selection of access roads/tracks should be based upon certain criteria to ensure high stability, no or minimum tree cutting and crop damage, minimum disturbance to nearby settlements and other social amenities;
- The approach roads should be selected to avoid any soil degradation and erosion impacts;

- Special care should be taken for known sensitive area to ensure that all interested parties are aware of the type and location of working. Measures should be taken where necessary to protect such areas physically; and
- Mitigations for the loss of trees and crops, soil erosion, soil contamination, air and noise pollution, waste generation, and loss of agricultural land provided in below sections will be adopted.

Residual Impacts

Provided the proposed mitigative measures are implemented, the environmental effects will have low magnitude and will be reversible. Therefore, no significant adverse residual effects are expected.

6.6.2.2 Degradation of Ambient Air Quality

Potential Impact

Air quality will be affected by fugitive dust emissions from construction machinery; dust from the unpaved surface and construction vehicles. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability.

- Potential impacts on the air quality during the construction stage will be due to the fugitive dust and the exhaust gases generated in and around the construction site. Dust is a major component of air pollution, generated mainly from the following construction activities:
- Site clearance and use of heavy vehicles and machinery/equipment etc. at construction site;
- Procurement and transport of construction materials such as sand, cement, etc. to the construction site;
- Other Gaseous emissions during construction result from operating of construction vehicles, plant and equipment;

The sensitive receptors identified within or near the project length are educational institutions and religious and cultural places etc. which may be affected during construction phase, due to emission of air pollutants. The construction activities will also result in increased air pollution in the area. The overall impact on the quality of air during the construction phase will, however, be temporary and limited to the project's implementation phase only. This impact is high adverse in nature.

Mitigation Measures

The major source of air emission is fugitive dust emitted from construction machinery and movement of vehicles. The impacts construction phase of the proposed project could be effectively mitigated by the implementation of simple procedures by the contractor including but not limited to the following:

- All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions;
- Open burning of solid waste from the Contractor's camps and at construction site should be strictly banned;
- Preventive measures against dust should be adopted for on-site mixing and unloading operations;
- Construction and spoil materials will be transported trucks covered with tarpaulins and all vehicles (e.g., trucks, equipment, and other vehicles that support construction works) will comply with the PEQS (as amended) for carbon emissions and noise;
- Contractors shall comply with submitted work schedule, keeping emission operations away from sensitive receptors and residential areas;
- Regular water sprinkling of the site should be carried out to suppress excessive dust emission(s);
- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions;
- Construction equipment is generally left idling while the operators are on break or waiting for the completion of another task. Emissions from idling equipment tend to be high. Existing idling control technologies, which automatically shut the engine off after a pre-set time can reduce emissions, without intervention of the operators;
- Along the project alignment with water pipelines and trunk sewer being laid, water will be sprinkled at high frequency especially during summer season at all construction sites to suppress dust emissions;

- Vehicles carrying construction material or mucking material will be covered with tarpaulin sheets to avoid dust emission ultimately to avoid degradation of ambient air quality;
- Stock piles will also be covered with tarpaulin sheet to avoid dust emission;
- Construction workers should be provided with masks for protection against the inhalation of dust;
- Vehicles used for construction should be tuned properly and regularly to control emission of exhaust gases; and
- Regular monitoring of air quality in accordance with PEQS 2016 and WHO Guidelines; and
- Dust Management plan has been developed and will be implemented by contractor to manage dust emission. Dust management plan is attached as Annexure-X of this report.

Residual Impact

It is anticipated that air emissions will not exceed the ambient air quality standards after implementation of the suggested mitigation measures.

6.6.2.3 Noise

Potential Impact

The laying of water pipelines will result in different construction equipment and machinery being used which will generate high noise levels at the project sites and in the project areas.

The noise will be produced due to the operation of construction machinery and equipment. Sources of noise and vibration during construction are heavy machinery such as bulldozers, excavators, concrete mixing plant, pneumatic drills and other equipment's. Noise and vibration are perceived as one of the most undesirable consequences of construction activity. The above machinery is expected to generate noise levels that would be severe in the project area.

The cumulative effects from several machines can be significant and may cause significant nuisances. However, these increased noise levels will prevail only for a short duration during the construction stage. The noise produced by construction equipment is presented in

, as reference.

Table 6. 3: Noise Produced by Construction Equipment

Sr. No.	Equipment	Noise dB(A) at 15ft from Source
1	Wheeled loading	90
2	Grader	90
3	Bulldozer	86
4	Sprayer	87
5	Power generator	98
6	Impact drill	87
7	Truck	92
8	Concrete mixer	91
9	Concrete pump	85
10	Pneumatic hammer and rock crusher	98
11	Breaker	84
12	Pneumatic spanner	95

**Source: Quagliata, A., et al (2018),Transit Noise and Vibration Impact Assessment Manual(No. FTA Report No. 0123).*

The likely impacts due to noise are:

- Psychological effects of distraction of attention, irritation and short temperedness in the exposed persons due to persistently higher noise levels; and
- Noisy settings and higher background levels can cause temporary threshold shift and the consequent habit of speaking loud, which may cause damage to vocal cords in the persons exposed.
- The sensitive receptors identified within or near the RoW are educational institutions and religious and cultural places etc. Which may affect during construction phase, due to noise and vibration.
- Though the construction method has not been determined yet, however it is believed that the adopted method of construction shall produce less noise and vibration if the suggested mitigation measures are adopted. This impact is high adverse in nature.

Mitigation Measures

Noise and Vibration management plan has been developed for the guidance of construction contractor. The management plan is attached as Annexure-XI of the report. There are a variety of ways by which construction equipment and worksite noise can be controlled. The following is a list of ways to control noise level at the worksite of the proposed project:

Quieter Equipment: A cost-effective way to reduce noise at a construction worksite is to buy quiet equipment. In addition, equipment in use should be the most suitable for the job. Avoid using equipment that is over-powered and, conversely, avoid using under powered equipment. Whenever possible the quietest equipment alternative should be used. In general, electronic powered equipment is quieter than diesel powered equipment and hydraulically powered equipment is quieter than pneumatic power.

Modifying Existing Old Equipment: The most common way to reduce the noise levels of common construction equipment is through worksite modifications. Some common worksite modifications consist of retro-fitting existing equipment with damping materials and mufflers.

Barrier Protection: An effective way of reducing noise is to locate noisy equipment behind purpose-built barriers. The barriers can be constructed on the work site from common construction building material (plywood, block, stacks or spoils) or the barriers can be constructed from commercial panels which are lined with sound absorbing material to achieve the maximum shielding effect possible. To be effective, the length of the barrier should be greater than its height. The noise source should not be visible and barrier should be located as close as possible to either the noise source or the receiver.

Work Activity Scheduling: Work activity scheduling are administrative means to control noise exposure. Planning how noise sources are sited and organized on a work site can reduce noise hazards. Jobs can be rotated so that exposure time is limited. Transferring workers from a high exposure task to a lower exposure task could make the employee's daily noise exposure acceptable.

Maintenance

Increased attention to maintenance of tools and equipment will reduce worksite noise levels. Maintaining plant and equipment in good order not only increases its life, but

makes it safer to use and quieter. Loose and worn parts should be fixed as soon as possible. Ideally, the worksite should have a system in place for checking and servicing the various machines and power tools.

- Use of low noise machinery, or machinery with noise shielding and absorption;
- Contractors shall comply with submitted work schedule, keeping noisy operations away from sensitive receptors, residential areas; implement regular maintenance and repairs; and employ strict implementation of operation procedures;

The Contractor shall comply with PESQ, 2016.

Residual Impact

Provided the proposed mitigative measures are implemented as suggested, the environmental effects due to noise will have a low magnitude. Therefore, no significant adverse residual impacts on the acoustic environment are likely to occur. Therefore, the residual impacts due to noise and vibration will be low.

6.6.2.4 Vibrations

Potential Impact

Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, should be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure. Limits for vibration and action values. Exposure levels should be checked on the basis of daily exposure time and data provided by equipment manufacturers.

Mitigation Measures

- All vibration producing machinery will be identified by the contractor and vibration producing machinery will be operated at low frequency to reduce the vibration impacts.
- Vibration monitoring will be carried out in accordance with German Standard DIN 4150 (heritage structures) and BS 7385: Part 2 – 1993 (other structures).
- vibration monitoring will be undertaken at the nearest buildings to the construction sites during times of vibration intensive works

- Where exceedances of the criteria are recorded, corrective actions would be implemented where soils at risk of vibration induced settlement are identified.
- A regular programme of vibration monitoring shall be implemented as a minimum in accordance with of this document.
- The Contractor will submit the proposed method, the frequency and the location of monitoring site to the Planning **Authority for agreement prior to commencing works.**

Residual Impact

Provided the proposed mitigative measures are implemented, no significant adverse residual impacts are likely to occur and the residual impact is envisaged as low in nature.

6.6.2.5 Wastewater Generation

Potential Impact

One (01) construction camp will be proposed to be established during construction period for the subject project.

Wastewater will be generated at the construction camp and from construction activities. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources such as nullahs, drains, water channels etc. apart from soil contamination. Water from dewatering activities (during rainy season) has the potential to contain suspended solids and oil and grease and if disposed of untreated may affect the soil quality. The **Table 6.4** shows anticipated composition and estimate of the wastewater to be generated by construction workers during the course of the construction phase of the project assuming that on average the water demand per person is 100 liters per day and that 80% of the water demand will become wastewater.

Table 6.4: Estimated Wastewater Generated by Workers in Construction Camps11

Sr. No.	No. of Workers*	Estimated Total Water Demand** (liters/day)	Estimated Wastewater Generated (liters/day)***
1	150	15,000	12,000

[11] Source: Design Criteria of Public Health Engineering for Water Supply, Sewerage and Storm Water Drain

* "Tentative Work Force Requirements Including Client and Contractor Staff"

** = (150) x (100) = 15,000 liters/day

*** = (15,000) x (80%) =12,000 liters/day

This 12,000 liters/day of wastewater is from the construction camp. This impact can be categorized as medium adverse in nature.

Mitigation Measures

- To dispose the liquid waste generated from the construction activities, the following steps will be taken by the contractor:
- Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks.
- Proper monitoring to check the compliance of PEQS will be carried out; and
- Sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit.
- The contractor(s) will be responsible to submit details of site-specific wastewater management plan along with details of wastewater collection, transportation and its disposal**.**

Residual Impacts

Provided the proposed mitigative measures are implemented, no significant adverse residual environmental impacts are likely to occur and the residual impact is low.

6.6.2.6 Solid Waste Generation

Potential Impact

Considering the labourers (about 150 in numbers) residing in the construction camp and the locally available labour, an average solid waste generation rate of 0.55 kg/capita/day is adopted for the estimation of solid waste generation. Based on this assumption, a total of about 82.5 kg of solid waste will be generated from construction camp on daily basis. The major components of the labour camp waste will be garbage, putrescible waste, rubbish and small portion of ashes and residues. Other type of wastes may include inorganic construction wastes including hazardous waste.

The estimated quantity of excavation material for ROW clearance cannot be provided at design stage. The contractor will provide the estimated quantity of excavation

material during the construction phase. These wastes will be generated due to the construction activities and the materials used for construction. This waste would require proper disposal to minimize land and water contamination. This impact can be categorized as medium adverse in nature.

Mitigation Measures

- All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. The contractor will coordinate with local representatives and administration of the concerned solid waste management department for the disposal of solid waste;
- The construction waste, produced due to excavation, will be reused. Almost 80% of this waste will be reused in backfilling of excavations/trenches. While the leftover will be landfilled. However, it is important to mention here that this waste shall be reused by making contract with private housing societies for backfilling of low laying areas.
- The contractor must develop a plan of action with the help of concerned solid waste management department for transporting the waste to the disposal site;
- Toxic waste will be handled, stored, transported and disposed separately;
- The waste will be properly sealed in containers with proper labels indicating the nature of the waste; and
- Solid waste will be segregated at source so that it can be re-used or recycled.
- Waste Management Plan will be developed to implement an efficient and responsive solid waste management system during construction phase. Recyclable wastes e.g. steel bars will be sold to waste vendors;
- Reusable material will be used as a filling material during ground levelling;
- Solid waste generated during construction will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; and
- The site will be restored back to its original conditions after construction completion.

Residual Impact

Upon implementation of the proposed mitigation measures, no significant adverse residual effects are anticipated and the residual impacts will be low.

6.6.2.7 Traffic Issues

Potential Impact

The construction phase of the proposed project, the laying of the water supply pipelines, could result in heavy congestion due to the movement of construction heavy machinery and equipment's with significant delays for the traffic apart from posing a significant accident risk for vehicles.

The efficient management of traffic once the construction activity commences will be critical in order to minimize the risk of possible road accidents and construction related hazards.

Mitigation Measures

To minimize traffic problems in the proposed project area, following measures will be considered:

- Movement of vehicles carrying construction materials and equipment/machinery will be restricted during the daytime to reduce traffic load and inconvenience to the local population;
- Construction vehicles, machinery and equipment will be parked at designated areas (at construction camps site) to avoid un-necessary congestions on roads;
- The speed of the vehicles will be controlled (at 20 to 25 km/hr.) to reduce the probability of severe accidents, soil erosion, debris flows due to vibrations and dust emission;
- Damages of roads due to construction vehicles will be instantly repaired and/or compensated after the completion of work;
- Proper sign boards will be provided for smooth flow of traffic;
- Period of construction and area / location of construction site shall be informed to public in general and specifically to local residents; and
- Any closure of the roads (especially main roads) and deviations / diversions proposed should be informed to the riders through standard signs and displays.
- Traffic Management Plan will be implemented to avoid traffic accidents, jams/public inconvenience. Guideline for Traffic Management Plan has been prepared and given as Annexure-VI.

Residual Impacts

Upon implementation of the proposed mitigation measures, no significant adverse residual effects are anticipated. Further, traffic management plan has been developed and after implementation of Traffic Management Plan the residual impact will be low.

6.6.2.8 Flora

Potential Impact

The project has no impact on destruction of vegetation. No tree cutting is anticipated during the construction phase of the project. Labor camp area will be selected away from the residential by keeping in view that movement of vehicle does not disturb the flora of the area.

Mitigation Measures

- The proponent shall implement the program with the help of Forest Department and with the consultation of concerned consultant ecologist;
- Open fires should be banned in the area to avoid hazards of fire in the area;
- However, if such type of land is not available, it shall be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth;
- Construction vehicles, machinery and equipment will remain confined within their designated areas of movement;
- The Contractor's staff and labor shall be strictly directed not to damage any vegetation such as trees or bushes; and
- Contractor shall provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel shall be strictly prohibited.

Residual Impacts

Given the type of vegetation involved, and the presence of type of land adjacent to the Project Site, the residual effects on vegetation are considered not significant.

6.6.2.9 Fauna

Potential Impact

During construction phase the existing population of birds, mammals and reptiles of the construction areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery and vehicular traffic, movement of labor, camping, etc. The existing fauna will leave the directly affected areas due to construction activities and human intervention. Some animals particularly

reptiles may get killed during the earthworks operations. Moreover, the movements of the mammals and reptiles will be restricted during the construction phase.

Birds as well, will tend to move away from the construction areas and find shelter and food elsewhere due to the activities mentioned above for fear of being hunted / trapped.

Noise generated from machinery particularly during the night hours will even scare the wildlife residing in habitats located at some distance from the construction areas. Food and refuse at the Contractor's camps may attract animals that might in turn be hunted by the workers. This impact is indirect, site-specific, temporary, reversible, possible and medium significant.

Mitigation Measures

- Care shall be taken during construction activities for avoiding purposely or chance killing of animals;
- If any wild species and habitat is found during construction, it must be dealt carefully and local wildlife department officials should be informed;
- Hunting, poaching and harassing of wild animals shall be strictly prohibited, and Contractor shall be required to instruct and supervise its labor force accordingly and clear orders should be given in this regard;

The Contractor must be held responsible for instructing his work force accordingly and for enforcing this restriction. In addition, this shall have to be controlled by the Wildlife Department.

- Special measures shall be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding;
- Noise generating activities shall not be carried out during the night by the work force;
- Wastes of the camps shall be properly disposed of to prevent it being eaten by animals, as it may be hazardous to them; and
- Noise produced due to construction activities may be kept to acceptable level.

Residual Impacts

The residual, after implementation of suggested mitigation measures, will be low.

6.6.2.10 Impacts due to Construction Camps/Camp Sites

Potential Impact

Approximately one (01) construction camp is proposed to be established during construction period for the subject project. Due to the proposed camp site, loss of vegetation and dissatisfaction of rehabilitation measures during and after completion of construction phase may occur. This may include waste, soil pollution, groundwater pollution, dust, etc. However, the impact will be medium adverse in nature. For these impacts, mitigation measures have been developed to minimize the likelihood, extent or duration of their occurrence and any associated adverse effects. Summarizes potential impacts and proposed mitigation measures associated with construction camps.

Mitigation Measures

Environmental

Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas.

Implement landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures.

Operate equipment in a manner sympathetic to the ambient noise environment. Do not leave equipment idling unnecessary.

Provide adequate warnings of impeding works to all potential receptors within a 1 km corridor surrounding the RoW via public notices and local news.

Social

State land will be a first preference for worker camp location, followed by land where there is a willing lessee.

Employment policies which aim to maximize job opportunities for local people will help to minimize tensions caused by different socio-cultural values.

Training will be provided to all staff on camp management rules and overall discipline and cultural awareness. This will include, in appropriate languages:

A briefing on camp rules

A community relations orientation to increase awareness about the local area, cultural sensitivities and the project Code of Conduct

Awareness-raising on health considerations, including sexually transmitted diseases (STDs).

The construction contractor is required to develop a Construction Camp Management Plan to address:

- Discipline;
- Community liaison;
- Ethnic tensions and;
- Communicable diseases.

A Code of Conduct and Camp Rules will be required within the Construction Camp Management Plan, which provides policies and a disciplinary framework with respect to worker behavior.

Camp Location

The construction contractor will be required to assess the environmental/social sensitivity of any additional or alternative sites prior to their approval for adoption.

- Some additional mitigation measures should include:
- The contractor(s) should provide plan to the Proponent for removal & rehabilitation of site upon completion;
- Photographical and botanical inventory of vegetation before clearing the site; and
- Compensatory plantation to be scheduled when construction works near end.

Residual Impacts

The residual impacts are envisaged to be low after implementation of suggested preventive and mitigatory measures.

6.6.2.11 Impacts on Local Resource

Potential Impact

During the construction, overburden on local resources (energy, water etc.) is possible if construction facilities such as workers camp and construction camp built near rural areas and can create problems for local communities. There are possibilities of conflict for resources between workers and local community.

Mitigation:

Resource Conservation Plan has been developed for the proposed project and attached as Annexure-VII.

Residual Impact

Provided the proposed mitigative measures are implemented as suggested, the environmental impacts will have low magnitude on resource conservation. Therefore, low residual impacts due to the project are anticipated.

6.6.2.12 Impacts on Health and Safety of Community

Potential Impact

Community health and safety issues during the construction of proposed project may include dust, noise, and vibration from construction vehicle transit, and communicable disease associated with the influx of temporary construction labor. Significant community health and safety issues associated with the projects may also include:

Pedestrian safety;

Traffic safety; and

Emergency preparedness.

Further, the laying of water supply pipelines, will require the digging of trenches for laying these lines will pose a risk of community members falling into these trenches. The construction areas located near the, settlements, may cause accident for the people moving near to these areas. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.

Mitigation Measures

The World Bank/IFC EHS Guidelines, 2007, defines community health and safety in terms that guarantee as-built infrastructure conforms to acceptable standards (structural safety, flood and fire risk), water supply sources are of suitable potable quality, emergency response planning is in place for built environments, traffic safety provisions are enforced alongside transport hazard assessment and mitigation, and disease prevention measures are taken. The Contractor will prepare the site specific community health and safety plan in compliance with relevant sections of the IFC General Environmental Health and Safety Guidelines (WB/IFC 2007), Pakistan Labor Laws, Punjab Occupational Safety and Health Act (2019);

The Contractor will clearly barricade work areas to prevent access by the public, while ensuring passage by providing safe pathways for pedestrians around construction zones;

The Contractor will exclude parking, waiting vehicles and vendors from areas adjacent to the work by means of clearly marked barricades and posted signage;

The Contractor will remove excavated earth, spoil, rubble, cut vegetation and refuse whether generated by the project or discarded by third parties from areas within the construction zone, where it has potential to interfere with the public or generate dust;

The Contractor will provide temporary lighting to facilitate construction during night time;

The Contractor will remove hazardous conditions on construction sites that cannot be controlled effectively with site access restrictions and will barricade any excavations and materials placed near the public place (if applicable);

The Contractor will promptly reinstate any services and reinstall any physical facilities that are cut, disconnected or damaged during construction, and maintain or provide temporary services that are interrupted by construction. The Supervisory Consultant will inspect and certify the adequacy of all reinstated services and facilities;

Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas especially near the settlements;

An Emergency Preparedness and Response Plan (EPRP) in coordination with the local emergency responders to provide timely first aid response in the event of accidents and hazardous materials response in the event of spills;

Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites;

Timely public notification on planned construction works;

Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity and social links;

Any environmental condition that is disagreeable to the public and causes an avoidable nuisance can be addressed with additional provisions over and above those described above, as determined necessary by the supervisory consultant.

These requirements will be incorporated into the bidding specification and contract documents, and will be binding on the contractor, at risk of penalty for noncompliance, as charges to be recovered from contractor for unsafe act or condition.

Residual Impacts

Upon implementation of the proposed mitigation measures suggested above, and also upon implementation of the proposed Health and Safety Plan, no residual impacts are anticipated.

6.6.2.13 Impacts on Occupational Health and Safety

Potential Impact

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

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

In addition, disasters such as earthquakes and fires may occur. Lack of Emergency Response Plan (ERP) or an inefficient response plan may lead to an accident or critical injury. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.

Mitigation Measures

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

Hard barrication shall be applied to all excavation deeper than 6feet.

Warning taps shall be applied to trenches which are around 3 feet deep.

Isolation of area must be done during excavation activities to control accidents.

Damping down of area to control fugitive dust.

Where necessary, apply green sheet to control fugitive dust, especially during high wind season.

Material shall be stored at least 3 feet away from the edges of excavations.

If any confined space encounters (excavation deeper than 10 feet or any main hole etc.), procedure for confined space entry shall be followed.

For further details, framework for OH&S management plan has been developed to handle any health and safety issues of workers and community. Mitigation Measures to prevent and control physical hazards include:

Moving Equipment and Traffic Safety

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

Routing of traffic to alternative roads when possible;

Where worker exposure to traffic cannot be completely eliminated, use of protective barriers to shield workers from traffic vehicles, or installation of channeling devices (e.g. traffic cones and barrels) to delineate the work zone;

Regulation of traffic flow by warning lights, avoiding the use of flaggers if possible;

Reduction of maximum vehicle speeds in work zones; and

Training of workers in safety issues related to their activities, such as the hazards of working on foot around equipment and vehicles; and safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination for the work space (while controlling glare so as not to blind workers and passing motorists).

Provide appropriate PPE in conjunction with training, use, and maintenance of the PPE.

Furthermore, the noise reduction options that should be considered which include:

Selecting equipment with lower sound power levels;

Installing suitable mufflers on engine exhausts and compressor components;

Installing vibration isolation for mechanical equipment;

Providing noise protection PPEs (ear plugs/ear muffs) to the construction workers;

Re-locating noise sources to fewer sensitive areas to take advantage of distance and shielding;

Developing a mechanism to record and respond to complaints; and

Regular monitoring of noise levels at active sites or near noise producing equipment/machinery and compare it to the available occupational noise standards.

Monitoring of OHS Activities:

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

Regular inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used;

Surveillance of the working environment: The contractors should document compliance using an appropriate combination of portable and stationary sampling and monitoring instruments. Monitoring and analyses should be conducted according to internationally recognized methods and standards. Monitoring methodology, locations, frequencies, and parameters should be established individually for each project following a review of the hazards;

Continuous and efficient surveillance of worker's health during the entire construction phase by the nominated officials of contractors; and

Training: Training activities for employees (construction contractor & supervision consultant staff) and visitors should be adequately monitored and documented (curriculum, duration, and participants). Emergency exercises, including fire drills, should be documented adequately. Service providers and contractors should be contractually required to submit to the employer adequate training documentation before start of their assignment.

Contractor(s) shall prepare a comprehensive OHS Plan as part of Site Specific Environmental Management Plan (SSEMP) including work method statements for all

hot works to avoid incidents during construction stage. A guideline OHS Plan is provided in Annexure-VIII.

Residual Impacts

Upon implementation of the proposed mitigation measures suggested above, and also upon implementation of the Occupation Health and Safety Plan (Attached as Annexures), low residual impacts are anticipated.

6.6.2.14 Impacts of Natural and Man-Made Disasters

Potential Impact

Natural disasters (earthquakes & floods) and man-made disasters like excavation collapse, structural damage due to deep excavations and fire accidents may result in injuries, financial losses and may even lead to deaths. Release of natural gas, due to damage to gas pipelines may also occur during excavations operations. Incidence of collapse of any nearby structure due to deep excavation can also take place during the construction activities which needs to be avoided. This impact is medium adverse in nature.

Mitigation Measures

Mitigation measures include the following:

Development of and implementation of Emergency Response Plan (ERP) for earthquakes and manmade disasters should be developed by the contractor, in coordination with CSC and the PMU, should be implemented in close consultation with the PDMA, RDMA, Civil Defence and Punjab Emergency Services Rescue 1122 and other concerned departments;

Training of the contractor staff and employees regarding the emergency procedures and plans should be regularly conducted;

In case of excavation near to the existing structure is required, then the appropriate controls measures must be taken before start of excavation;

Bracing / Wall strengthening/support for deep excavation need to be placed to avoid collapse;

Emergency numbers should be clearly pasted at all disposal stations; and

Minor incidents and near miss should be reported and investigated to assess the root causes of these incidents

Preventive measures should be formulated accordingly by the PMU / WASA Management.

All potential and actual emergencies must be included in the SSEMP.

Contractor must conduct risk assessment before start of excavation, especially where the distance between excavation and nearby structure is less than 2 meters.

Residual Impact

The mitigation measures suggested above will keep the risk of natural disasters to low category.

6.6.2.15 Social and Cultural Conflicts

Potential Impact

During the construction phase of the proposed project, conflicts may arise between labor force and local community. Use of local resources and products by the construction workers can generate stress on the local resources. Furthermore, difference in cultural values may also cause discomfort to local residents. This impact is negative, local, low, short-term and probable.

Mitigation Measures

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

Careful planning and training of work force to minimize disturbance to the local people;

Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and

Adequate training especially for the transitive workforce of the station (involved both in the construction process and in the commissioning) to regard the customs of the area so that the locals do not feel insecure.

Residual Impacts

Implementation of mitigation measures will reduce the risk of conflicts in society and will results into short term and low residual impacts.

6.6.2.16 Communicable Diseases

Potential Impact

The laborers in the Contractor Camp, truck drivers and like personnel who interact with each other have the potential for the spread of COVID-19 and HIV/AIDS if the incidence exists. Majority of the people living in the surrounding of the Project, and potential Labor are not aware of the source, mode of communication or consequences of COVID-19 & HIV/AIDS. Although their religious and cultural value system, to a large extent excludes the outbreak or rapid communication of HIV/AIDS, yet its occurrence in such a situation cannot be precluded. It is necessary that awareness and preventive campaigns are run from time to time in the Labor camps and the field offices of the Project to prevent the communicable diseases like Cholera, Typhoid and Tuberculosis.

There is a chance of spreading of an epidemic of Coronavirus disease (COVID-19) due to close interaction of the labor force during construction not only among the workers but also in the area. This impact is high adverse in nature.

Mitigation Measures

The Contractor shall:

Arrange to run an active campaign, in the labour camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS;

Latest / Updated SOPs by WHO, national and provincial Government related to the construction industry to control spreading of COVID-19, should be implemented by the contractor and should be strictly monitored.

Strengthen the existing local health & medical services for the benefit of labour as well as the surrounding villages;

Ensure cleanliness and hygienic conditions at the labour camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by the Health Department;

Locating a labour camp at least away from the villages (local settlement), and

Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents.

Residual Impacts

Successful implementation of suggested mitigation measures in above section in implementation of WHO guidelines will reduces the chances of spread of

communicable diseases among workers and nearby community. Therefore, the impact will be low.

6.6.2.17 Impacts during Site Restorations

Potential Impacts

After completion of construction activities, the project facilities will be restored as close to its original condition as possible. One of the important tool is the photographic record of project facilities e.g., campsite(s) prior to set-up will be taken and will be compared after site restoration.

Unattended construction waste and excavated material along the RoW of transmission and water supply mains will be source of bad aesthetics within city. Before closure of typical construction day area need to be cleared from all type of waste and construction material.

Following measures/actions will be adopted to restore the site:

Demobilization of all equipment and machinery;

Disposal of any waste material remaining at the time of completion of the operation;

Backfilling of all excavation followed by compactions;

Dismantling and removal of fence or barriers surrounding the campsite area;

General restoration of the site area including landscaping and restoration of drainage where required.

PMU through Contractor will ensure that restoration of construction works at water transmission and supply mains will be carried out by contractors.

PMU will ensure periodic monitoring of such restorations.

Contractors will develop site restoration protocols and will submit to PMU for review and approval.

Construction site restoration protocols will be part of bidding documents and constructions contracts.

Construction contractor will add restorations costs into BOQs.

6.7 IMPACTS DURING OPERATIONAL PHASE

The anticipated impacts related to the proposed project have been studied for the operational phase and discussed hereunder. The potential impacts from operation phase are provided as **Table 6.5** below.

Table 6. 5: Screening of Possible Impacts during Operation Phase

Sr./No.	Potential Issues	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)	Residual Impact (Short term, Long term)
1	Generation of Sludge and Wash Water	5 / Certain	2 / Moderate	10 / Medium	Low / long Term
2	Water system leaks and water discharges during flushing	2 / Unlikely	3 / Major	6 / Medium	Low / Short Term
3	Handling of Hazardous Chemicals and Chlorine Release	2 / Unlikely	5 / Catastrophic	10 / Medium	Low / Long Term
4	Impacts on Landscape	2 / Unlikely	3 / Major	6 / Medium	Low / Long Term
5	Impacts on Aquatic life of Chahan Dam due to uncontrolled abstraction of water	2 / Unlikely	5 / Catastrophic	10 / Medium	Low / Long Term
6	Impacts on Aquatic life of Chahan Dam due to change in quality of water	2 / Unlikely	5 / Catastrophic	10 / Medium	Low / Long Term
7	Impact on the Proposed Project due to Climate Change	2 / Unlikely	3 / Major	6 / Medium	Low / Long Term
8	Improved drinking water availability	Positive impacts expected			Long term positive
9	Impacts on Public Health	Positive impacts expected			Long term positive

Critical Risk Level

Significant Risk Level

Medium Risk Level

Low Risk Level

Positive Impacts

6.7.1 Generation of Sludge and Wash Water

Impacts

During the operation phase of proposed WTP the residual waste includes sludge which will be drained out from the plain sedimentation tanks and clarifiers; and wash water produced from backwashing of rapid sand filters.

About 90% suspended particles and turbidity will be removed in the clarifiers. The sludge is formed due to (i) suspended solid particles which coalesce together on the mixing of coagulants and (ii) the coagulant themselves add to the sludge concentration in terms of solids. The solid concentration of clarified sludge ranges from 1 to 2% of the sludge volume while the total sludge volume is in the range of 2 to 3 % of the product water; and

The solid concentration in the wash water of filter beds generally ranges from 0.05 to 0.5% and these solids are only 10% of the total solids generated due to turbidity and coagulants.

Mitigation Measures:

The residual disposal is carried out through:

Settled Sludge

Two circular sludge holding tanks (one for each train) have been proposed with a diameter of 10 m. The sludge of plain sedimentation tanks and clarifiers shall be discharge to the sludge holding tanks. A detailed strategy will be developed on management and disposal of the sludge to be produced as a by-product of the operations of the WWTP. Licensed third party vendors will be contracted on long term arrangements to manage the disposal of the sludge in an environmentally beneficial manner in accordance with international good practices. The sludge from the holding tanks shall be used as soil conditioning agent for crops.

Wash Water

The wash water received from filter beds, contains a little number of solids. The wash water shall be discharged into drain.

Residual Impacts

Implementation of mitigation measures will reduce the risk of generation of sludge and will results into short term and low residual impacts.

6.7.2 Water system leaks and water discharges during flushing

Impacts

Water system leaks can reduce the pressure of the water system compromising its integrity and ability to protect water quality (by allowing contaminated water to leak into the system) and increasing the demands on the source water supply, the quantity

of chemicals, and the amount of power used for pumping and treatment. Leaks in the distribution system can result from improper installation or maintenance, inadequate corrosion protection, settlement, stress from traffic and vibrations, frost loads, overloading, and other factors.

Water supply lines may be periodically flushed to remove accumulated sediments or other impurities that have accumulated in the pipe. Flushing is performed by isolating sections of the distribution system and opening flushing valves or, more commonly, fire hydrants to cause a large volume of flow to pass through the isolated pipeline and suspend the settled sediment. The major environmental aspect of water pipe flushing is the discharge of flushed water, which may be high in suspended solids, residual chlorine, and other contaminants that can harm surface water bodies. Recommended measures to prevent, minimize, and control impacts from flushing of mains include:

Mitigation Measures

- Ensure construction meets applicable standards and industry practices;
- Conduct regular inspection and maintenance;
- Implement a leak detection and repair program (including records of past leaks and unaccounted-for water to identify potential problem areas);

Consider replacing mains with a history of leaks of with a greater potential for leaks because of their location, pressure stresses, and other risk factors.

- Discharge the flush water into a municipal sewerage system with adequate capacity;
- Discharge the flush water into a separate storm sewer system
- Minimize erosion during flushing, for example by avoiding discharge areas that are susceptible to erosion and spreading the flow to reduce flow velocities

Residual Impact

The implementation of suggested mitigation measures will reduce impacts on the environment and the residual impacts will be low.

6.7.3 Handling of Hazardous Chemicals and Chlorine Release

Impacts

The proposed water treatment involves the use of chemicals for coagulation and disinfection. Chemical used for coagulation will be Alum (Al2SO4.14H2O) while for chlorination sodium hypochlorite shall be used.

Alum may cause eye/skin irritation and Prolonged or repeated contact with Alum dust may cause redness, dryness Over-exposure and itching of the skin (dermatitis) while dusts of aluminum sulfate hydrate if inhaled may probably cause irritation of the nose, throat and respiratory tract based on pH.

Vapors of Sodium Hypochlorite may irritate the respiratory system and cause coughing, asthmatic breathing and breathlessness. It is also corrosive to skin and eyes. The product contains a substance which is very toxic to aquatic organisms.

Possible air emissions from water treatment plant can be accidental chlorine release when sodium hypochlorite accidentally mixed with any acid but in proposed WTP sodium hypochlorite shall be mixed with water therefore chances of air emission is not envisaged.

Mitigation measures

Chemical building has been proposed to house the facilities like storage of Alum, Lime and polymer, dose preparation facilities and dosing pumps

A chemical house will be provided to accommodate the solution tanks, Alum Bags and other chemicals (if required). Monorail and overhead crane have been provided for handling of the chemicals.

For chlorination Sodium Hypochlorite (NaOCl) will be stored in chlorination building, in which sodium hypochlorite will be mixed with water, and the solution of sodium hypochlorite and water will be fed in the chlorine contact tank through dosing pumps.

Store sodium hypochlorite in cool, dry, and dark conditions for no more than one month, and use equipment constructed of corrosion-resistant materials

Minimize the amount of chlorination chemicals stored on site while maintaining a sufficient inventory to cover intermittent disruptions in supply;

Mandatory health and medical check-ups for all employees especially workers working at chemical building as they shall be exposed to Alum and Sodium Hypochlorite Provision of PPEs to the workers working in chemical building.

Use corrosion-resistant piping, valves, metering equipment, and any other equipment coming in contact with gaseous or liquid chlorine, and keep this equipment free from contaminants, including oil and grease.

Accidental Release Measures (Alum)

Small spill and leak: Shovel into clean, dry, labelled containers and cover. Flush area with water. Do not get water inside containers or on spilled material

Large spill and leak Prevent solids from mixing with water or entering sewers or waterways. Shovel into clean, dry, labelled containers and cover. If liquid is present, dike with inert material (sand, earth, etc.). Consider in situ neutralization and disposal. Ensure adequate decontamination of tools and equipment following clean up. Comply with Federal, Provincial/State and local regulations on reporting releases. Deactivating Chemicals: Lime, limestone, soda ash, sodium bicarbonate, dilute sodium hydroxide, dilute aqua ammonia

- Accidental Release Measures (Sodium Hypochlorite)
- Flush away small spillages with plenty of water.
- Large Spillages: Absorb with sand or other inert absorbent. Pick up with vacuum or absorbent solid, store in closed container for disposal.

Residual Impact

The implementation of suggested mitigation measures will reduce impacts on the environment and the residual impacts will be low.

6.7.4 Impacts on Landscape

Potential Impact

During the operation stage, new saplings of different plants and trees would be planted to enhance the aesthetics and compensate the loss of affected trees. This will have a positive impact of permanent nature. The presence of adequate flora at available spaces along the proposed alignment will help in absorbing flue gases, emitting from a large number of vehicles and public transport passing through the project area, which shall help improve the air quality. The impact is medium positive in nature.

Mitigation Measures

The saplings planted in the project area, against the trees affected should be properly maintained throughout their growth.

Residual Impact

The implementation of suggested mitigation measures will reduce impacts on the environment and the residual impacts will be low.

6.7.5 Impacts on Aquatic Life of Chahan Dam due to Uncontrolled Abstraction of Water

Potential Impact

Uncontrolled abstraction of water will lead to depletion of water source of Chahan Dam. This will have negative impact on the aquatic and other faunal and floral species which are relying on the water of Chahan Dam. Controlled fish farming in carried out in Chahan Dam by Irrigation and Fisheries Department. It is also important to mention here that the construction of Chahan Dam is recently completed and the ecosystem of Chahan Dam is still in development phase. However, the abstraction of water for irrigation and for water supply can reduce the water level where, aquatic life of Chahan Dam may be disturbed. The impact is medium adverse in nature.

Mitigation Measures

The level of Chahan Dam after utilization of water for irrigation and water supply purposes will be maintained where aquatic life will not be disturbed. Irrigation Department has installed measuring gauges on the dam to read the difference from dead level of the dam. Even at the dead storage level, Chahan dam will have surplus water to sustain aquatic life because the dead storage level of Chahan dam is high enough to retain sufficient water for aquatic life including fish population.

- The existing water intake structure of Irrigation Department will be utilized to extract raw water for proposed project. The intake of this water pipeline has been provided with screens to avoid entering of fish species into the pipeline.
- The raw water, through T-junction will be supplied to Raw Water storage ponds of treatment plant where further screens will be provided before the entrance of this water into treatment plant to control the entering of fish species into treatment plant.

Residual Impact

The implementation of suggested mitigation measures will reduce impacts on the environment and the residual impacts will be very low.

6.7.6 Impact on Aquatic Life due to change in water quality

Potential Impact

Change in water quality due to addition of pollutants and chemicals from the treatment plant may lead to deterioration of water quality for aquatic life. This will lead to death of fish population and other organisms.

Mitigation Measures

No direct discharge from the WTP will be allowed in the Chahan Dam. Further, the water intake structure is shifted from dam to already existing discharge point of irrigation department. No chemical addition due to project will be carried out. Quarterly monitoring will be carried out to keep track of quality of water in Chahan dam.

Residual Impact

The implementation of suggested mitigation measures will reduce impacts on the environment and the residual impacts will be very low.

6.7.7 Impact on the Proposed Project due to Climate Change

Potential Impact

Project area features a humid subtropical climate with long and hot summers, a monsoon and short, mild and wet winters. Its climate is classified as very similar to its twin city Islamabad, but the geographical location and extreme urbanization of Rawalpindi especially in project area (PP-12) has led to weather and climatic conditions that are notably different from its surrounding region. Rawalpindi's weather has historically been known to change rather quickly due to its proximity to Himalayas and the Pir Panjal Range. Following impacts may occur on the proposed project due to climate change:

Water Source

- Increased water turbidity after heavy storm and flood events
- Shifts in river morphology from increased erosive capacity of river during storm events may affect water withdrawal

- Need for dredging to remove sediment, rocks and debris deposited after storm and flood events

Treatment Facility

- Physical damage to structures from flooding Water
- Lower treatment effectiveness due to higher than normal turbidity or disrupted/shorter treatment operation

Storage Tanks

- Contamination due to flooding for cisterns
- Physical damage due to landslides

Pipelines

- Corrosion of metal pipes weaken structures over time
- Physical damage to pipes from flooding and landslides
- Network contamination from pipes damaged by flooding or landslides

Mitigation Measures

- Pipe material and protection selection must be design by considering the unseen event of floods.
- Metering system for controlling the unauthorized use of water.
- A climate change resilience plan or climate change adaptation measure will be adopted to avoid any such impacts.

Residual Impact

The implementation of suggested mitigation measures will reduce impacts on the environment and the residual impacts will be very low.

6.7.8 Cumulative Impacts

Based on the scoping exercise of the site and based on discussions with the public sector agencies responsible for development in the project area. No other infrastructure works are planned to be conducted in the project area while during the construction period of this project. Thus, no cumulative impacts are expected.

6.7.9 Improved Drinking Water Availability

Impacts

The continued supply of treated quality water by proposed project will be an indispensable facility in Rawalpind0 especially in the area of PP-12. The proposed water supply system will facilitate the domestic as well as commercial water requirements of people living in Rawalpindi. Moreover, the proposed project will provide improved and sustainable potable water availability to citizens of for next fifty years. The project will reduce abstraction of ground water from tube wells and water bores omitting chances of ground water depletion and reduce operation cost for RWASA.

Furthermore, project implementation will also create job opportunities during operation, thereby improving the socioeconomic condition of the local people and help in improving their quality of life. Thus, the 'no project' option is not a viable option.

Mitigation measures

No measures required.

Residual Impact

No residual impacts.

6.7.10 Improvements in Public Health

Impacts

The clean potable water will reduce water borne disease, improve public health and ultimately reduced pressure on health care system.

Mitigation measures

No measures required.

Residual Impacts

No residual impact

6.8 POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

Besides the concrete measures to be adopted as described above, the quality of environment will further be enhanced through the running of project in complete accordance with the 5RS Principles- Reduce, Reuse, Recycle, Refurbish and Retrofit.

The project will provide sustainable and clean water source in serving areas. Access to clean water will improve the general health status of the area and reduce exposure to waterborne diseases; ultimately, health budget of the project area will be decreased.

The project will result in improved access to nearby communities and other major settlements. Accessibility of the corridor will increase the frequency of private entities locating their businesses in the area, hence increasing overall investment in and along the water source and distribution network.

The sale of food and other services to immigrant workers during the construction phase of the project will lead to some direct incomes as a form of project impact. However, the accessibility will lead to better transport services, hence increasing income of operators in that business.

The communities may be presented in form of temporary employment, when engaged to assist surveyors. Also, experts involved in feasibility studies and other pre-project consultations may lead to some level of purchases of items from petty traders and farmers during their presence in the communities.

Some form of temporary employment would be generated for community members during the construction phase by the project directly.

However, completion of the project and its related structures may lead to the increase in the movement of business concerns to the area surrounding the dam and other intake structures, paved access roads etc, hence enhancing the employment possibilities of inhabitants

Tourist sites, which may be located in the larger project area could get higher patronage due to easy access which would be created after completion of the project, hence enhancing their economic value e.g., Murat National Forest/Park situated at few kilometers upstream of the dam. Moreover, the dam itself may serve as a tourists spot as many resorts can be built in the vicinity of and dam play a significant role in promoting tourism to those areas. Many types of water sports could be held there, such as parasailing, paragliding, and scuba diving, which increase the excitement of the tourists.

CHAPTER-7

ENVIRONMENTAL MANAGEMENT & MONITORING PLAN

7.1 ENVIRONMENTAL MANAGEMENT

The EIA has identified potential impacts that are likely to arise during proposed project in detail, both negative and positive impacts at each stage of the project. To minimize the effects of adverse impacts the EIA has recommended mitigation measures in the EMP. The proposed mitigation measures have been based on the understanding of the sensitivity and behavior of environmental receptors in the project area, the legislative controls that apply to the project and a review of good industry practices for projects of similar nature. For residual impacts (impacts remaining after applying the recommended mitigation measures) and for impacts in which there can be a level of uncertainty in prediction at the EIA stage, monitoring measures have been recommended to ascertain these impacts during the course of the project activities.

The Environmental Management Plan (EMP) is developed to eliminate and/or mitigate the impacts envisaged at the design, construction and operation stages.

The detailed EMP provided in this document as **Table 7.1** ensures that "Augmentation of Water Supply to Rawalpindi City based on Chahan Dam" project has no detrimental effect on the surrounding environment. The plan shall act as a guideline for incorporating environmental measures to be carried out by the contractors engaged for the proposed project. It shall also be used for other parties concerned for mitigating possible impacts associated with each project and will form part of the contract documents to be considered alongside the specifications. This plan shall act as the Environmental Management and Monitoring Plan during the construction and operation phase of the project and will allow for prompt implementation of effective corrective measures.

The EMP attached with this report ensures the following:

Delivery of the prescribed environmental outcomes during all phases of this sub-project;

Formulating a system for compliance with applicable legislative requirements and obligations and commitments for this sub-project.

Ensure that project design process incorporates best practice environmental design and sustainability principles to minimize potential impacts of construction and operation on the environment and community.

Ensure that the construction and operation work procedures minimize potential impacts on the environment and community.

Develop, implement and monitor measures that minimize pollution and optimize resource use.

Objectives of EMP

The EMP provides a delivery mechanism to address potential impacts of the project activities, to enhance project benefits and to outline standardized good practice to be adopted for all project works. The EMP has been prepared with the objectives of:

Defining the roles and responsibilities of the project proponent for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project;

- Outlining mitigation measures required for avoiding or minimizing potential negative impacts assessed by environmental study;
- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the study;
- Defining the requirements for communication, documentation, training, monitoring, management and implementation of the mitigation measures.

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

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

- The number of inspections carried out by QA/QC Consultant per month.
- The number of non-compliances observed by QA/QC Consultant.
- Availability of environmental, and OHS specialists in QA/QC Consultant.

- Availability of environmental, and OHS specialists with Contractors.
- Timely reporting of documents (as defined in EMMP and monitoring plan).
- Number of training imparted to stakeholders/other capacity building initiatives.
- Number of grievances received.
- Number of grievances resolved.
- Number of constructions related accidents.

7.2.INSTITUTIONAL CAPACITY

7.2.1 Environmental Committee and its Responsibilities

The environmental management plan will require involvement of the following organizations for its implementation during construction and operation phases of the project:

The PMU will:

- Provide support to ADB missions;
- Coordinate activities with all stakeholders, review consultants, proposals, and provide overall guidance during various stages of project preparation;
- Manage and ensure safeguard due diligence and disclosure requirements including resettlement and environmental safeguards in accordance with ADB's Safeguard Policy Statement (2009) and PUNJAB government requirements;
- Manage and ensure effective implementation of the gender action plan;
- Preparation of Semi Annual Environmental Monitoring Reports (SAEMR's);
- Ensure submission of all IEE/EIA requirements as per law by responsible entities; and
- Monitoring of activities of the entire project.

The ADB will:

- Ensure project compliance with ADB SPS 2009;
- Support the coordination and administration of the project;
- Provide guidance to PMU and R-WASA on implementation issues and project design;
- Disclose all safeguards documents, and monitor safeguards implementation;
- Monitor and report project performance;

- Conduct periodic review of the project;

The CSC will be responsible for the following items:

- Incorporates into the project design the environmental protection and mitigation measures identified in the EMP for the design stage;
- Hire qualified and experienced staff to monitor and ensure implementation of mitigation measures suggested in the EMP.
- Addition of one international consultant to supervise the implementation process.
- Assists PMU to ensure that all environmental requirements and mitigation measures from the IEE/EIA and EMP are incorporated in the bidding and contracts documents.
- Assist in preparation of SWEMR's and review and approve the contractor's Site Specific Environmental Management Plan (SSEMP) with consent of ADB Environmental Team**.**

Undertakes environmental management capacity building activities for relevant project focal staff.

The Punjab EPA will have the following responsibilities with regards to this landfill project:

- Provides regulatory compliance works for the project.
- Reviews and approves environmental assessment report of landfill, submitted by PMU.
- Issues environmental clearance certification for the project based on their mandate and regulations.
- Undertakes monitoring of the project's environmental performance based on their mandate.

The project contractor will be responsible for following items:

- Implementation of, or adherence to, all provisions of the IEE/EIA and EMP;
- Preparation of site specific EMPs (SSEMPs) as required. SSEMPs will be prepared by Contractor's Environment Specialist, site in charge, HSE staff and project technical team before their mobilization and it will be submitted to Engineer of construction supervision consultant/PMU for review and

approval. Site Specific EMP (SSEMP) template for guidance of contractors is provided as Annexure-XIII.

- Contractor's environmental performance will rest with the person holding the highest management position within the contractor's organization. Reporting to their management, the contractor's site managers will be responsible for the effective implementation of the EMP.
- Preparation of monthly environmental monitoring reports.
- The Contractor will be required to have qualified and experienced Environmental Specialists in their team to ensure all mitigation measures are implemented during the different development phases of the project.

The RWASA will be responsible for following items:

- Implementation of, or adherence to, all provisions of the IEE/EIA and EMP
- Preparation of site specific EMPs for operations phase
- RWASA would be responsible to ensure that contractors engaged during operation phase of the project are executing activities in compliance to EIA/IEE/EMP.
- RWASA will be required to have qualified Environmental Specialist designated to ensure all mitigation measures are implemented in true letter and spirit.

EMP Legend

CSC	Construction Supervision Consultant
BC	Before Construction
DC	During Construction
PMU	Project Management Unit
DO	During Operation

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Table 7. 1: Environmental Management Plan

Project Phases	Section	Aspects	Impacts	Mitigation Measures Recommended	Responsibility		Timing
					Execution	Monitoring	
Design/Pre-Construction Phase	1.1	Impacts due to Improper selection of intake source and reduce ecological flows Impacts	Improper selection of intake sources may lead to impacts which may have long lasting impact on hydraulics and environmental flows of streams. Reduced downstream water availability shall have deprived end user or it may disrupt environmental/ecological characteristics of streams. Further streams are the sources of ground water charging in the vicinity and downstream of catchment area. Furthermore, if source water availability is not analyzed during design it may disrupt uninterrupted raw water supply to WTP.	Detailed Catchment studies shall be conducted as part of designing intake flow from sources. Runoff volume calculations shall be carried on periodic basis to ensure water supplies from intake structure. Periodic flow measurement shall be carried out to ascertain the continuous water availability for the project. PMU LG&CD will ensure that design of intake structure is carried out with minimal impact of aquatic life and ecological flows.	Design Consultant	PMU, LG&CD	BC: during detailed designing of the project
	1.2	Improper design of water treatment plant and distribution networks including	The possibility exists that in case the project is not designed in accordance with international standards and guidelines[12] for water and sanitation it could result in multiple potential	The design criteria are mainly based on the standards and specifications of WASA Lahore. Where required, international best practices were also considered in establishing			

[12] https://www.ifc.org/wps/wcm/connect/83217cd8-b9a5-4383-97b5-

		transmission main (replacement and New Distribution Lines)	impacts that could adversely affect the settlements of project area. If water intake structures are not designed to minimize impacts on aquatic life e.g. higher intake velocity through intake screen may entrap aquatic life and fish if intake structure is not designed adequately and raw water contain high sediment load shall foul the WTP and increase maintenance cost of WTP. If WTP is not designed properly and filtered water will not meet NEQS it will not fulfill the ultimate purpose of project to provide safe drinking water to the residents of the area. If Distribution mains and supply network is not designed properly it will increase chances of pipe bursting, leakages, reduce water delivery to particular residents resulting in social issues.	the design criteria for the proposed water supply system and water treatment plant. Limit maximum through-screen design intake velocity to limit entrance of aquatic organisms Avoid construction of water intake structures in sensitive ecosystems. Intake structure shall be designed adequately to reduce sediment load and uninterrupted raw water supply to WTP. The treatment process will be employed that biological contaminants and suspended solids are brought in the limits set forth in Pakistan Standards and WHO Guideline values for Drinking Water. A SCADA system has been proposed to check compliance and monitoring of WTP components. 1.2-meter cover has been proposed from the top of pipe to reduce chances theft and pipe bursting due to traffic loads. Before commissioning water			

				supply network shall be tested on 1.5 times the designed pressure to check leakages. Water metering system shall be proposed to reduce theft and water wastage			
	1.3	Lack of integration of IEE/EIA/EMP requirements into Construction bid documents	The bidding documents must reflect the requirement to select a qualified and experienced Contractor from the perspective of ensuring implementation of required safeguards during project development.	The Environmental staff of PMU will be assigned the task to check that design and bid documents are responsive to key environmental, social and safety considerations, and that the proposed method of work reflects the boundaries defined in the EMP. The bid documents must include the EMP and its implementation cost must be reflected in the BOQ. IEE/EIA/EMP implementation and monitoring requirements must be part of bidding documents and necessary contractual binding must be agreed by project contractors before award of contract. Project contractors shall have qualified and experienced environmental staff to plan, arrange, implement, monitor and report IEE/EIA/EMP	Design Consultant	PMU, LG&CD	BC: during detailed designing of the project

				requirements.			
	1.4	Impacts on Existing Utilities	Utility services such as sewerage lines and telephone lines lying along the project alignment may need to be relocated temporarily or permanently to prevent damage to them.	Detailed filed surveys will be conducted to assess any sub-surface utilities that might be present under the proposed project alignment within the right of way of the project, shall be relocated prior to the commencement of the work. Based on the utilities that are identified during the detailed surveys, a relocation plan of those utilities will be developed by the respective line agencies in close coordination. In case any utilities can be allowed to remain in place and avoidance of their damage is possible, the contractor will need to be aware of the location of these services so that disruptions are not caused. In such scenario, the responsibility for any repair of damaged services will lie with the contractor.	Design Consultant	PMU, LG&CD	BC: during detailed designing of the project
	1.5	Impacts of Labor Camps and ancillary facilities	The duration of the construction activity for the proposed project is expected to be 2-3 years and a considerable amount of work	In order to prevent a nuisance, specific locations shall be designated for development of the labor camps. All necessary	Design Consultant	PMU, LG&CD	BC: during detailed designing of the project

			force will be engaged. As a result, worker camps will need to be developed and ancillary facilities will need to be provided such as electricity, washrooms for labor with suitable effluent and sewage disposal facilities as well as water for their everyday use for drinking and bathing etc.	facilities and amenities shall be provided in these camps such as resting area, drinking water, electricity, supply of water. Solid and liquid effluent waste disposal facilities shall also be designed to cater waste of administration/office building etc. The use of proper planning while identiing locations for the labor camps will ensure there is minimal disturbance to all key receptors and the traffic is not disrupted by labor camps being set up roadside next to the construction sites.			
	1.6	Traffic Issues	In particular, the lying of water pipelines could result in heavy congestion due to the movement of construction heavy machinery and equipment with significant delays for traffic apart from posing a significant risk for vehicles.	A comprehensive traffic management plan shall be developed by the contractor and approved by the Executing Agency or the Project Management Unit that will contain the traffic diversion onto alternate routes and management of traffic flows to minimize the congestion and the possibility of accidents. This plan shall be dependent to the EMP and will be implemented	Constructi on Contractor	CSC, PMU	During Construction / Prior to Operations

				by the contractor.			
	1.7	Topographic Impacts due to Excavation	The project area has plain topography and land acquisition is involved for the proposed project for construction of Water Treatment Plant, Intermediate Pumping Station at Ranial and Water Works at Akbar Chowk, Chakra and Adiala. These constructions will change the topography of the area, especially due to construction of overhead water reservoirs. Further, excavation of land is involved for the proposed Project. A minor physical change in the topography due to excavation of land is expected in the project area. This adverse impact is low in nature.	Mitigation measures will involve adoption of best engineering design measures keeping in view of the aesthetics of the project area and provision of green areas for the landscape in design. The proposed design has tried to minimize these impacts.	Design Consultant	PMU, LG&CD	BC: during detailed designing of the project
	1.8	Seismic Impacts	In Building Code of Pakistan (Seismic Provisions, 2007), the whole region of Pakistan is classified into five main Seismic Hazard zones i.e., i) Zone-1, ii) Zone-2A, iii) Zone-2B, iv) Zone-3, v) Zone-4 based on the peak horizontal ground acceleration and its ultimate tendency to damages during seismic events.	The proposed structure should be designed and constructed keeping in consideration high intensity earthquakes. For seismic hazard analysis, updated structural and seismic evaluations should be conducted by the design engineer/consultant. Moreover, geo-technical investigations	Design Consultant	PMU, LG&CD	BC: during detailed designing of the project

			The proposed Project Area falls in the seismic zone classified as "Zone-2B" with g-value 0.16 to 0.24, and is considered as Moderate Hazard seismicity zone. As the project is located under the active seismic region with g-value 0.16 to 0.24. Therefore, care shall be taken in design of all buildings under this project, specially the construction of overhead reservoirs at all water works. The proposed project will not have any impact on the seismology of project are as none of the project activity will have that much magnitude to cause seismic disturbance in the project area. This adverse impact is medium in nature.	must be conducted prior to construction phase.			
Construction Phase	2.1	Construction of water treatment plant and other structures not in accordance with finalized design	If the proposed WTP, intake structures and water supply networks is not constructed in accordance with the finalized design and its corresponding design parameters, it could lead to a number of unanticipated impacts such as inadequate water supply, degraded water quality	Method statements must be prepared by the Contractor and approved by the Construction Supervision Consultant (CSC) prior to commencement of construction works. The CSC must closely monitor the construction works being conducted by the Contractor to	Construction Contractor	CSC, PMU	During Construction

			and choking of water distribution networks or ground water contamination due to mishandling wastage (sludge/solid waste) from WTP etc.	ensure the finalized design is implemented in full and the WTP design is developed completely in compliance of the approved finalized designs. Any deviation by the Contractor from following the finalized design must be immediately highlighted and corrective measures must be implemented to ensure full compliance with the finalized design of the WTP. PMU LG&CD shall ensure that construction activities are being carried out in compliance to project design following best international practices. It will closely review and monitor the activities of CSC and contractors involved in construction activities.			
	2.2	Site Accessibility Issues during Construction	The proposed project can be approached through various roads. The construction material, equipment and machinery will be arrived at proposed workshop area and construction camps sites. From the camp, the material.	Selection of access roads/tracks should be based upon certain criteria to ensure high stability, no or minimum tree cutting and crop damage, minimum disturbance to nearby settlements and other social amenities;	Construction Contractor	CSC, PMU	During Construction

				The approach roads should be selected to avoid any soil degradation and erosion impacts; Special care should be taken for known sensitive area to ensure that all interested parties are aware of the type and location of working. Measures should be taken where necessary to protect such areas physically; and Mitigations for the loss of trees and crops, soil erosion, soil contamination, air and noise pollution, waste generation, and loss of agricultural land provided in below sections will be adopted.			
	2.3	Traffic Issues	The construction phase of the proposed project, the laying of the water supply pipelines, could result in heavy congestion due to the movement of construction heavy machinery and equipment's with significant delays for the traffic apart from posing a significant accident risk for vehicles. The efficient management of	To minimize traffic problems in the proposed project area, following measures will be considered: Movement of vehicles carrying construction materials and equipment/machinery will be restricted during the daytime to reduce traffic load and inconvenience to the local population;	Construction Contractor	CSC, PMU	During Construction

			traffic once the construction activity commences will be critical in order to minimize the risk of possible road accidents and construction related hazards.	Construction vehicles, machinery and equipment will be parked at designated areas (at construction camps site) to avoid un-necessary congestions on roads; The speed of the vehicles will be controlled (at 20 to 25 km/hr.) to reduce the probability of severe accidents, soil erosion, debris flows due to vibrations and dust emission; Damages of roads due to construction vehicles will be instantly repaired and/or compensated after the completion of work; Proper sign boards will be provided for smooth flow of traffic; Period of construction and area / location of construction site shall be informed to public in general and specifically to local residents; Any closure of the roads (especially main roads) and deviations / diversions proposed should be informed to the riders through standard signs and			

				displays; and Traffic Management Plan will be implemented to avoid traffic accidents, jams/public inconvenience.			
	2.4	Impacts on Local Resource	During the construction, overburden on local resources (energy, water etc.) is possible if construction facilities such as workers camp and construction camp built near rural areas and can create problems for local communities. There are possibilities of conflict for resources between workers and local community.	Resource Conservation Plan has been developed for the proposed project and attached as Annexure-VII	Construction Contractor	CSC, PMU	During Construction
	2.5	Impacts on Health and Safety of Community	1. Community health and safety issues during the construction of proposed project may include dust, noise, and vibration from construction vehicle transit, and communicable disease associated with the influx of temporary construction labor. Significant community health and safety issues associated with the projects may also include: Pedestrian safety; Traffic safety; and	The World Bank/IFC EHS Guidelines, 2007, defines community health and safety in terms that guarantee as-built infrastructure conforms to acceptable standards (structural safety, flood and fire risk), water supply sources are of suitable potable quality, emergency response planning is in place for built environments, traffic safety provisions are enforced alongside transport hazard assessment and	Construction Contractor	CSC, PMU	During Construction

			Emergency preparedness. 2. Further, the laying of water supply pipelines, will require the digging of trenches for laying these lines will pose a risk of community members falling into these trenches. The construction areas located near the, settlements, may cause accident for the people moving near to these areas. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.	mitigation, and disease prevention measures are taken. The Contractor will prepare the site specific community health and safety plan in compliance with relevant sections of the IFC General Environmental Health and Safety Guidelines (WB/IFC 2007), Pakistan Labor Laws, Punjab Occupational Safety and Health Act (2019); The Contractor will clearly barricade work areas to prevent access by the public, while ensuring passage by providing safe pathways for pedestrians around construction zones; The Contractor will exclude parking, waiting vehicles and vendors from areas adjacent to the work by means of clearly marked barricades and posted signage; The Contractor will remove excavated earth, spoil, rubble, cut vegetation and refuse whether generated by the project or discarded by third parties from areas within the construction zone, where it has			

				potential to interfere with the public or generate dust; The Contractor will provide temporary lighting to facilitate construction during night time; The Contractor will remove hazardous conditions on construction sites that cannot be controlled effectively with site access restrictions and will barricade any excavations and materials placed near the public place (if applicable); Hard Barricades will be provided at the excavation deeper than 1.5 meter as per "NZS 3845:1999 Road safety barrier systems"; The Contractor will promptly reinstate any services and reinstall any physical facilities that are cut, disconnected or damaged during construction, and maintain or provide temporary services that are interrupted by construction. The Supervisory Consultant will inspect and certify the adequacy of all reinstated services and facilities;			

				Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas especially near the settlements; An Emergency Preparedness and Response Plan (EPRP) in coordination with the local emergency responders to provide timely first aid response in the event of accidents and hazardous materials response in the event of spills; Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites; Timely public notification on planned construction works; Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity and social links; Any environmental condition that is disagreeable to the public and causes an avoidable nuisance can be addressed with additional provisions over and above those described above, as			

				determined necessary by the supervisory consultant. These requirements will be incorporated into the bidding specification and contract documents, and will be binding on the contractor, at risk of penalty for noncompliance, as charges to be recovered from contractor for unsafe act or condition.			
	2.6	Impacts on Occupational Health and Safety	Occupational Health and Safety (OH&S) related impacts will arise during construction stage activities including clearing of earth, levelling, compaction, foundations, finishing, testing & commissioning. In nutshell, occupational health and safety issues associated with the construction of proposed project will primarily include physical hazards; chemical hazards; and noise. Noise: Construction and maintenance personnel may be potentially exposed to high levels of noise from heavy equipment operation and from working in proximity to	Complying with the safety precautions for the construction workers as per International Labour Organization (ILO) Convention No. 62, as far as applicable to the Project Contract; Formulation of layout plan for camp site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents; Work safety measures and good workmanship practices are to be followed by the contractor to	Construction Contractor	CSC, PMU	During Construction at Active Construction Site

			vehicular traffic. As most of these noise sources can be prevented, by using noise barriers, new machinery and by using personal hearing protection by exposed personnel and implementation of work rotation programs to reduce cumulative exposure. In addition, disasters such as earthquakes and fires may occur. Lack of Emergency Response Plan (ERP) or an inefficient response plan may lead to an accident or critical injury. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.	ensure no health risks for labourers; Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction; Proper maintenance of facilities for workers shall be monitored; Provision of protective clothing for labourers handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves, etc. Ensure strict use of wearing these protective clothing during work activities; Contractor will ensure the provision of medicines, first aid kits, ambulance etc. at the camp site; Provision of proper safety and diversion signage, particularly at sensitive/accident-prone spots; and Disasters such as earthquakes, flooding, due to heavy rain and other manmade disasters such as fires may occur, and that			

				must be considered for minimizing their impacts. Therefore, an Emergency Response Plan for earthquakes and manmade disasters should be developed by the construction contractor; and Contractor(s) shall prepare a comprehensive OHS Plan including work method statements for all hot works to avoid incidents during construction stage. A guideline OHS Plan is provided in Annexure-VIII. The Contractor will prepare the site specific occupational health and safety plan in compliance with relevant sections of the IFC General EHS Guidelines (WB/IFC 2007), Pakistan Labor Laws and Punjab Occupational Safety and Health Act (2019).			
	2.7	Impacts due to Construction Camps/Camp Sites	Approximately one (01) construction camp is proposed to be established during construction period for the subject project. Due to the proposed camp site, loss of vegetation and dissatisfaction of	Environmental Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas. Implement landscaping plan for all facilities in areas where high			

			rehabilitation measures during and after completion of construction phase may occur. This may include waste, soil pollution, groundwater pollution, dust, etc. However, the impact will be medium adverse in nature. For these impacts, mitigation measures have been developed to minimize the likelihood, extent or duration of their occurrence and any associated adverse effects. Summarizes potential impacts and proposed mitigation measures associated with construction camps.	landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures. Operate equipment in a manner sympathetic to the ambient noise environment. Do not leave equipment idling unnecessary. Provide adequate warnings of impeding works to all potential receptors within a 1 km corridor surrounding the RoW via public notices and local news. Social State land will be a first preference for worker camp location, followed by land where there is a willing lessee. Employment policies which aim to maximize job opportunities for local people will help to minimize tensions caused by different socio-cultural values. Training will be provided to all staff on camp management rules and overall discipline and cultural awareness. This will include, in appropriate languages:			

				A briefing on camp rules A community relations orientation to increase awareness about the local area, cultural sensitivities and the project Code of Conduct Awareness-raising on health considerations, including sexually transmitted diseases (STDs). The construction contractor is required to develop a Construction Camp Management Plan to address: Discipline; Community liaison; Ethnic tensions and; Communicable diseases. A Code of Conduct and Camp Rules will be required within the Construction Camp Management Plan, which provides policies and a disciplinary framework with respect to worker behavior. Camp Location The construction contractor will be required to assess the environmental/social sensitivity of any additional or alternative			

				sites prior to their approval for adoption. Some additional mitigation measures should include: The contractor(s) should provide plan to the Proponent for removal & rehabilitation of site upon completion; Photographical and botanical inventory of vegetation before clearing the site; and Compensatory plantation to be scheduled when construction works near end.			
	2.8	Wastewater Generation	Potential Impact One (01) construction camp will be proposed to be established during construction period for the subject project. Wastewater will be generated at the construction camp and from construction activities. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources such as nullahs, drains, water channels etc. apart from soil contamination. Water from dewatering activities (during rainy season) has the	To dispose the liquid waste generated from the construction activities, the following steps will be taken by the contractor: Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks. Proper monitoring to check the compliance of PEQS will be carried out; and Sewage from construction camps will be disposed of after proper pre-treatment and	Constructi on Contractor	CSC, PMU	During Construction

			potential to contain suspended solids and oil and grease and if disposed of untreated may affect the soil quality. Estimate of the wastewater to be generated by construction workers during the course of the construction phase of the project assuming that on average the water demand per person is 100 liters per day and that 80% of the water demand will become wastewater. This 12,000 liters/day of wastewater is from the construction camp. This impact can be categorized as medium adverse in nature.	processes such as soakage pit. The contractor(s) will be responsible to submit details of site-specific wastewater management plan along with details of wastewater collection, transportation and its disposal.			
	2.9	Solid Waste Generation	Considering the labourers (about 150 in numbers) residing in the construction camp and the locally available labour, an average solid waste generation rate of 0.55 kg/capita/day is adopted for the estimation of solid waste generation. Based on this assumption, a total of about 82.5 kg of solid waste will be generated from construction camp on daily basis. The major components of the labour camp	All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. The contractor will coordinate with local representatives and administration of the concerned solid waste management department for the disposal of solid waste; The contractor must develop a	Constructi on Contractor	CSC, PMU	During Construction

			waste will be garbage, putrescible waste, rubbish and small portion of ashes and residues. Other type of wastes may include inorganic construction wastes including hazardous waste. The estimated quantity of excavation material for ROW clearance cannot be provided at design stage. The contractor will provide the estimated quantity of excavation material during the construction phase. These wastes will be generated due to the construction activities and the materials used for construction. This waste would require proper disposal to minimize land and water contamination. This impact can be categorized as medium adverse in nature.	plan of action with the help of concerned solid waste management department for transporting the waste to the disposal site; Toxic waste will be handled, stored, transported and disposed separately; The waste will be properly sealed in containers with proper labels indicating the nature of the waste; Solid waste will be segregated at source so that it can be re-used or recycled; Waste Management Plan will be developed to implement an efficient and responsive solid waste management system during construction phase. Recyclable wastes e.g. steel bars will be sold to waste vendors; Reusable material will be used as a filling material during ground levelling; and Solid waste generated during construction will be safely disposed in demarcated waste disposal sites and the contractor			

				will provide a proper waste management plan.			
	2.10	Degradation of Ambient Air Quality	3. Air quality will be affected by fugitive dust emissions from construction machinery; dust from the unpaved surface and construction vehicles. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. Potential impacts on the air quality during the construction stage will be due to the fugitive dust and the exhaust gases generated in and around the construction site. Dust is a major component of air pollution, generated mainly from the following construction activities: Site clearance and use of heavy vehicles and machinery/equipment etc. at construction site; Procurement and transport of construction materials such as sand, cement, etc. to the construction site;	All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions; Open burning of solid waste from the Contractor's camps and at construction site should be strictly banned; Preventive measures against dust should be adopted for on-site mixing and unloading operations; Construction and spoil materials will be transported trucks covered with tarpaulins and all vehicles (e.g., trucks, equipment, and other vehicles that support construction works) will comply with the PEQS (as amended) for carbon emissions and noise; Contractors shall comply with submitted work schedule, keeping emission operations	Construction Contractor	CSC, PMU	During Construction

			Other Gaseous emissions during construction result from operating of construction vehicles, plant and equipment; The sensitive receptors identified within or near the project length are educational institutions and religious and cultural places etc. which may be affected during construction phase, due to emission of air pollutants. The construction activities will also result in increased air pollution in the area. The overall impact on the quality of air during the construction phase will, however, be temporary and limited to the project's implementation phase only. This impact is high adverse in nature.	away from sensitive receptors and residential areas; Regular water sprinkling of the site should be carried out to suppress excessive dust emission(s); Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions; Construction equipment is generally left idling while the operators are on break or waiting for the completion of another task. Emissions from idling equipment tend to be high. Existing idling control technologies, which automatically shut the engine off after a pre-set time can reduce emissions, without intervention of the operators; Along the project alignment with water pipelines and trunk sewer being laid, water will be sprinkled at high frequency especially during summer			

				season at all construction sites to suppress dust emissions; Construction workers should be provided with masks for protection against the inhalation of dust; Vehicles used for construction should be tuned properly and regularly to control emission of exhaust gases; and Regular monitoring of air quality in accordance with PEQS, 2016.			
	2.11	Noise	4. The likely impacts due to noise are: Psychological effects of distraction of attention, irritation and short temperedness in the exposed persons due to persistently higher noise levels; and Noisy settings and higher background levels can cause temporary threshold shift and the consequent habit of speaking loud, which may cause damage to vocal cords in the persons exposed. The sensitive receptors identified within or near the RoW are	Quieter Equipment: A cost-effective way to reduce noise at a construction worksite is to buy quiet equipment. In addition, equipment in use should be the most suitable for the job. Avoid using equipment that is over-powered and, conversely, avoid using under powered equipment. Whenever possible the quietest equipment alternative should be used. In general, electronic powered equipment is quieter than diesel powered equipment and hydraulically powered equipment is quieter than	Construction Contractor	CSC, PMU	During Construction at Active Construction Site

			educational institutions and religious and cultural places etc. Which may affect during construction phase, due to noise and vibration. Though the construction method has not been determined yet, however it is believed that the adopted method of construction shall produce less noise and vibration if the suggested mitigation measures are adopted. This impact is high adverse in nature.	pneumatic power. Modifying Existing Old Equipment: The most common way to reduce the noise levels of common construction equipment is through worksite modifications. Some common worksite modifications consist of retro-fitting existing equipment with damping materials and mufflers. Barrier Protection: An effective way of reducing noise is to locate noisy equipment behind purpose-built barriers. The barriers can be constructed on the work site from common construction building material (plywood, block, stacks or spoils) or the barriers can be constructed from commercial panels which are lined with sound absorbing material to achieve the maximum shielding effect possible. To be effective, the length of the barrier should be greater than its height. The noise source should not be visible and barrier should be located as close as possible to			

				either the noise source or the receiver. Work Activity Scheduling: Work activity scheduling are administrative means to control noise exposure. Planning how noise sources are sited and organized on a work site can reduce noise hazards. Jobs can be rotated so that exposure time is limited. Transferring workers from a high exposure task to a lower exposure task could make the employee's daily noise exposure acceptable. Maintenance Increased attention to maintenance of tools and equipment will reduce worksite noise levels. Maintaining plant and equipment in good order not only increases its life, but makes it safer to use and quieter. Loose and worn parts should be fixed as soon as possible. Ideally, the worksite should have a system in place for checking and servicing the various machines and power tools.			

				Use of low noise machinery, or machinery with noise shielding and absorption; Contractors shall comply with submitted work schedule, keeping noisy operations away from sensitive receptors, residential areas; implement regular maintenance and repairs; and employ strict implementation of operation procedures; The Contractor shall comply with PESQ, 2016.			
	2.12	Vibrations	Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, should be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure. Limits for vibration and action values. Exposure levels should be checked on the basis of daily exposure time and data provided by equipment manufacturers.	All vibration producing machinery will be identified by the contractor and vibration producing machinery will be operated at low frequency to reduce the vibration impacts. Vibration monitoring will be carried out in accordance with German Standard DIN 4150 (heritage structures) and BS 7385: Part 2 – 1993 (other structures). vibration monitoring will be undertaken at the nearest buildings to the construction sites during times of vibration			

				intensive works Where exceedances of the criteria are recorded, corrective actions would be implemented where soils at risk of vibration induced settlement are identified. A regular programme of vibration monitoring shall be implemented as a minimum in accordance with of this document. The Contractor will submit the proposed method, the frequency and the location of monitoring site to the Planning Authority for agreement prior to commencing works.			
	2.13	Flora	The project has no impact on destruction of vegetation. No tree cutting is anticipated during the construction phase of the project. Labor camp area will be selected away from the residential by keeping in view that movement of vehicle does not disturb the flora of the area.	Cutting and / or disturbance of trees shall be avoided, as far as possible; A tree plantation program shall be implemented with the recommendations and technical support of Punjab, Forest Department for the enhancement ecological condition of the area; Final and actual plantation and trees plantation cost will be	Constructi on Contractor	CSC, PMU	During Construction

				finalized after assessment by Punjab, Forest Department. All the activities will be executed as per agreement/MOU between proponent and Punjab, Forest department while strictly considering law of land. Open fires should be banned in the area to avoid hazards of fire in the area; Clearing of vegetation cannot be avoided at the areas specified for project structures, but damage to the natural vegetation may be minimized by establishing camp sites, workshops and concrete mixing plants on waste/barren land rather than on forested or green land. However, if such type of land is not available, it shall be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth; Construction vehicles, machinery and equipment will remain confined within their designated areas of movement; The Contractor's staff and labor			

				shall be strictly directed not to damage any vegetation such as trees or bushes; and Contractor shall provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel shall be strictly prohibited.			
	2.14	Fauna	During construction phase the existing population of birds, mammals and reptiles of the construction areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery and vehicular traffic, movement of labor, camping, etc. The existing fauna will leave the directly affected areas due to construction activities and human intervention. Some animals particularly reptiles may get killed during the earthworks operations. Moreover, the movements of the mammals and reptiles will be restricted during the construction phase.	Care shall be taken during construction activities for avoiding purposely or chance killing of animals; If any wild species and habitat is found during construction, it must be dealt carefully and local wildlife department officials should be informed; Hunting, poaching and harassing of wild animals shall be strictly prohibited, and Contractor shall be required to instruct and supervise its labor force accordingly and clear orders should be given in this regard; The Contractor must be held responsible for instructing his work force accordingly and for enforcing this restriction. In addition, this shall have to be	Construction Contractor	CSC, PMU	During Construction

				controlled by the Wildlife Department. Special measures shall be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding; Noise generating activities shall not be carried out during the night by the work force; Wastes of the camps shall be properly disposed of to prevent it being eaten by animals, as it may be hazardous to them; and Noise produced due to construction activities may be kept to acceptable level.			
	2.15	Impacts of Natural and Man Made Disasters	Natural disasters (earthquakes) and accidents such as fire, falls, slips and trips may result in injuries, financial losses and may even lead to deaths. The workers shall be trained and facilitated to cope with such disasters. This impact is medium adverse in nature.	An ERP for earthquakes and manmade disasters should be developed by the contractor, in coordination with SC and the proponent (WASA), should be implemented in close consultation with the RESCUE 1122 Services and other concerned departments; Training of the contractor and WASA staff and employees regarding the emergency	Construction Contractor	CSC, PMU	During Construction

				procedures and plans should be regularly conducted; Emergency numbers should be clearly posted at all disposal stations; and Minor incidents and near misses should be reported, and preventive measures should be formulated accordingly by the WASA Management.			
	2.16	Social and Cultural Conflicts	During the construction phase of the proposed project, conflicts may arise between labor force and local community. Use of local resources and products by the construction workers can generate stress on the local resources. Furthermore, difference in cultural values may also cause discomfort to local residents. This impact is negative, local, low, short-term and probable.	Local labor especially from nearby communities should be given preference for the construction works; Careful planning and training of work force to minimize disturbance to the local people; Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and Adequate training especially for the transitive workforce of the station (involved both in the construction process and in the commissioning) to regard the customs of the area so that the locals do not feel insecure.	Constructi on Contractor	CSC, PMU	During Construction
	2.17	Communicable	The laborers in the Contractor	Arrange to run an active	Constructi	CSC, PMU	During

		Diseases	Camp, truck drivers and like personnel who interact with each other have the potential for the spread of COVID-19 and HIV/AIDS if the incidence exists. Majority of the people living in the surrounding of the Project, and potential Labor are not aware of the source, mode of communication or consequences of COVID-19 & HIV/AIDS. Although their religious and cultural value system, to a large extent excludes the outbreak or rapid communication of HIV/AIDS, yet its occurrence in such a situation cannot be precluded. It is necessary that awareness and preventive campaigns are run from time to time in the Labor camps and the field offices of the Project to prevent the communicable diseases like Cholera, Typhoid and Tuberculosis. This impact is high adverse in nature.	campaign, in the labour camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS; Latest / Updated SOPs by WHO, national and provincial Government related to the construction industry to control spreading of COVID-19, should be implemented by the contractor and should be strictly monitored; Strengthen the existing local health & medical services for the benefit of labour as well as the surrounding villages; Ensure cleanliness and hygienic conditions at the labour camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by the Health Department; Locating a labour camp at least away from the villages (local settlement), and Keep all the camps, offices, material depots, machinery	on Contractor		Construction at Active Construction Site/ Camps

				yards and work sites open for the inspection of health and safety measures and related documents.			
	2.18	Impacts during Site Restoration	After completion of construction activities, the project facilities will be restored as close to its original condition as possible. One of the important tool is the photographic record of project facilities e.g., campsite(s) prior to set-up will be taken and will be compared after site restoration. Unattended construction waste and excavated material along the RoW of transmission and water supply mains will be source of bad aesthetics within city. Before closure of typical construction day area need to be cleared from all type of waste and construction material.	Demobilization of all equipment and machinery; Disposal of any waste material remaining at the time of completion of the operation; Backfilling of all excavation followed by compactions; Dismantling and removal of fence or barriers surrounding the campsite area; 5. General restoration of the site area including landscaping and restoration of drainage where required. 6. PMU through Contractor will ensure that restoration of construction works at water transmission and supply mains will be carried out by contractors. 7. PMU will ensure periodic monitoring of such restorations. 8. Contractors will develop site restoration protocols and will submit to			

				PMU for review and approval. 9. Construction site restoration protocols will be part of bidding documents and constructions contracts. 10. Construction contractor will add restorations costs into BOQs.			
Operational Phase	3.1	Generation of Sludge and Wash Water	11. During the operation phase of proposed WTP the residual waste includes sludge which will be drained out from the plain sedimentation tanks and clarifiers; and wash water produced from backwashing of rapid sand filters. 12. About 90% suspended particles and turbidity will be removed in the clarifiers. The sludge is formed due to (i) suspended solid particles which coalesce together on the mixing of coagulants and (ii) the coagulant themselves add to the sludge concentration in terms of solids. The solid concentration of clarified sludge ranges from 1 to 2% of the sludge volume while the total sludge volume is in the range of 2 to 3 % of the	Settled Sludge Two circular sludge holding tanks (one for each train) have been proposed with a diameter of 10 m. The sludge of plain sedimentation tanks and clarifiers shall be discharge to the sludge holding tanks. A detailed strategy will be developed on management and disposal of the sludge to be produced as a by-product of the operations of the WWTP. Licensed third party vendors will be contracted on long term arrangements to manage the disposal of the sludge in an environmentally beneficial manner in accordance with international good practices. The sludge from the holding tanks shall be used as soil	WASA, Rawalpindi	Env. Expert/ EPAs	During Operations

			product water; and 13. The solid concentration in the wash water of filter beds generally ranges from 0.05 to 0.5% and these solids are only 10% of the total solids generated due to turbidity and coagulants.	conditioning or transported into nearby landfill/ waste disposal site. Wash Water The wash water received from filter beds, contains a little number of solids. The wash water shall be discharged into drain.			
	3.2	Water system leaks and water discharges during flushing	Water system leaks can reduce the pressure of the water system compromising its integrity and ability to protect water quality (by allowing contaminated water to leak into the system) and increasing the demands on the source water supply, the quantity of chemicals, and the amount of power used for pumping and treatment. Leaks in the distribution system can result from improper installation or maintenance, inadequate corrosion protection, settlement, stress from traffic and vibrations, frost loads, overloading, and other factors. Water supply lines may be periodically flushed to remove	Ensure construction meets applicable standards and industry practices; Conduct regular inspection and maintenance; Implement a leak detection and repair program (including records of past leaks and unaccounted-for water to identify potential problem areas); Consider replacing mains with a history of leaks of with a greater potential for leaks because of their location, pressure stresses, and other risk factors. Discharge the flush water into a municipal sewerage system with adequate capacity; Discharge the flush water into a	WASA, Rawalpindi	Env. Expert/ EPAs	During Operations

			accumulated sediments or other impurities that have accumulated in the pipe. Flushing is performed by isolating sections of the distribution system and opening flushing valves or, more commonly, fire hydrants to cause a large volume of flow to pass through the isolated pipeline and suspend the settled sediment. The major environmental aspect of water pipe flushing is the discharge of flushed water, which may be high in suspended solids, residual chlorine, and other contaminants that can harm surface water bodies.	separate storm sewer system Minimize erosion during flushing, for example by avoiding discharge areas that are susceptible to erosion and spreading the flow to reduce flow velocities.			
	3.3	Handling of Hazardous Chemicals and Chlorine Release	The proposed water treatment involves the use of chemicals for coagulation and disinfection. Chemical used for coagulation will be Alum (Al2SO4.14H2O) while for chlorination sodium hypochlorite shall be used. Alum may cause eye/skin irritation and Prolonged or repeated contact with Alum dust may cause redness, dryness Over-exposure and itching of the	Chemical building has been proposed to house the facilities like storage of Alum, Lime and polymer, dose preparation facilities and dosing pumps A chemical house will be provided to accommodate the solution tanks, Alum Bags and other chemicals (if required). Monorail and overhead crane have been provided for handling of the chemicals.	WASA, Rawalpindi	Env. Expert/ EPAs	During Operations

			skin (dermatitis) while dusts of aluminum sulfate hydrate if inhaled may probably cause irritation of the nose, throat and respiratory tract based on pH. Vapors of Sodium Hypochlorite may irritate the respiratory system and cause coughing, asthmatic breathing and breathlessness. It is also corrosive to skin and eyes. The product contains a substance which is very toxic to aquatic organisms. Possible air emissions from water treatment plant can be accidental chlorine release when sodium hypochlorite accidentally mixed with any acid but in proposed WTP sodium hypochlorite shall be mixed with water therefore chances of air emission is not envisaged.	For chlorination Sodium Hypochlorite (NaOCl) will be stored in chlorination building, in which sodium hypochlorite will be mixed with water, and the solution of sodium hypochlorite and water will be fed in the chlorine contact tank through dosing pumps. Store sodium hypochlorite in cool, dry, and dark conditions for no more than one month, and use equipment constructed of corrosion-resistant materials Minimize the amount of chlorination chemicals stored on site while maintaining a sufficient inventory to cover intermittent disruptions in supply; Mandatory health and medical check-ups for all employees especially workers working at chemical building as they shall be exposed to Alum and Sodium hypochlorite Provision of PPEs to the workers working in chemical building. Use corrosion-resistant piping,			

				valves, metering equipment, and any other equipment coming in contact with gaseous or liquid chlorine, and keep this equipment free from contaminants, including oil and grease. Accidental Release Measures (Alum) Small spill and leak: Shovel into clean, dry, labelled containers and cover. Flush area with water. Do not get water inside containers or on spilled material Large spill and leak Prevent solids from mixing with water or entering sewers or waterways. Shovel into clean, dry, labelled containers and cover. If liquid is present, dike with inert material (sand, earth, etc.). Consider in situ neutralization and disposal. Ensure adequate decontamination of tools and equipment following clean up. Comply with Federal, Provincial/State and local regulations on reporting			

				releases. Deactivating Chemicals: Lime, limestone, soda ash, sodium bicarbonate, dilute sodium hydroxide, dilute aqua ammonia Accidental Release Measures (Sodium Hypochlorite) Flush away small spillages with plenty of water. Large Spillages: Absorb with sand or other inert absorbent. Pick up with vacuum or absorbent solid, store in closed container for disposal.			
	3.4	Landscape	During the operation stage, new saplings of different plants and trees would be planted to enhance the aesthetics and compensate the loss of affected trees. This will have a positive impact of permanent nature. The presence of adequate flora at available spaces along the proposed alignment will help in absorbing flue gases, emitting from a large number of vehicles and public transport passing through the project area, which shall help improve the air quality. The impact is medium	The saplings planted in the Project area against the trees affected should be properly maintained throughout their growth.	WASA, Rawalpindi	Env. Expert/ EPAs	During Operations

			positive in nature.				
	3.5	Impacts on Aquatic Life of Chahan Dam	Uncontrolled abstraction of water will lead to depletion of water source of Chahan Dam. This will have negative impact on the aquatic and other faunal and floral species which are relying on the water of Chahan Dam. Controlled fish farming in carried out in Chahan Dam by Irrigation and Fisheries Department. It is also important to mention here that the construction of Chahan Dam is recently completed and the ecosystem of Chahan Dam is still in development phase. However, the abstraction of water for irrigation and for water supply can reduce the water level where, aquatic life of Chahan Dam may be disturbed. The impact is medium adverse in nature.	The level of Chahan Dam after utilization of water for irrigation and water supply purposes will be maintained at level where aquatic life will not be disturbed. The existing water intake structure of Irrigation Department will be utilized for the proposed project which has been provided with screens to avoid entering of fish species into the channel.	WASA, Rawalpindi	Env. Expert/ EPAs	During Operations
	3.6	Impacts on the Proposed Project due to Climate Change	Project area features a humid subtropical climate with long and hot summers, a monsoon and short, mild and wet winters. Its climate is classified as very similar to its twin city	Pipe material and protection selection must be design by considering the unseen event of floods. Metering system for controlling the unauthorized use of water.	WASA, Rawalpindi	Env. Expert/ EPAs	During Operations

			Islamabad, but the geographical location and extreme urbanization of Rawalpindi especially in project area (PP-12) has led to weather and climatic conditions that are notably different from its surrounding region. Rawalpindi's weather has historically been known to change rather quickly due to its proximity to Himalayas and the Pir Panjal Range. Following impacts may occur on the proposed project due to climate change: Water Source Increased water turbidity after heavy storm and flood events Shifts in river morphology from increased erosive capacity of river during storm events may affect water withdrawal Need for dredging to remove sediment, rocks and debris deposited after storm and flood events Treatment Facility Physical damage to structures from flooding Water Lower treatment effectiveness	A climate change resilience plan or climate change adaptation measure will be adopted to avoid any such impacts.			

			due to higher than normal turbidity or disrupted/shorter treatment operation Storage Tanks Contamination due to flooding for cisterns Physical damage due to landslides Pipelines Corrosion of metal pipes weaken structures over time Physical damage to pipes from flooding and landslides Network contamination from pipes damaged by flooding or landslides.				

7.3. TRAINING SCHEDULES

Capacity building and training programs are necessary for the project staff in order to control the negative impacts resulting from the project construction and during its operation phase. They will also require trainings on monitoring and inspecting of such a project for environmental impacts and for implementation of mitigation measures.

The details of this capacity building and training program are presented in the **Table 7.2.**

Table 7. 2: Capacity Development and Training Programme

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

Provided by	Organized by	Contents	Target Audience	Venue	Duration
Operation Phase 3rd party trainer	WASA & PMU	Short seminars on Environmental risks associated with operation phase. Development of Environmental Performance Indicators/ Occupational Health and Safety (OHS) issues	O&M contractor	WASA Rawalpindi Office	One day long training seminar including group exercise/workshop

7.4. IMPACTS & MITIGATION MEASURES

A monitoring plan for the pre-construction/design, construction and operation phases of the project, indicating environmental parameters, mitigation measures of the negative environmental impacts, responsible authority and frequency is provided below as **Table 7.2**, **Table 7.3** and **Table 7.4**, respectively.

An environmental management and monitoring plan (EMMP) establishes the linkages between the environmental and social impacts, mitigation strategy, and the agencies responsible for execution. Thus, the EMMP covers:

- A comprehensive listing of mitigation measures (actions).
- The institution(s)/ person(s) responsible for implementation of specific actions.
- The parameters to be monitored to ensure the effective implementation of the actions.
- A timescale for the implementation of actions has been indicated subject to the project life cycle and indicated as Design Phase, Construction and During Operations.

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

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

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

payment milestones must be linked to environmental performance, Vis a Vis the carrying out of the EMP.

The effective implementation of the EMP will be audited as part of the loan conditions by ADB, and as part of regulatory/NOC compliance by Federal and Punjab EPA. In this regard, the PMU/CSC will guide the design engineers and Contractors on the environmental aspects and necessary EMP documentation. Monitoring during operation phase of water supply system will be carried out by WASA Rawalpindi with support from PMU.

Table 7. 3: Pre-Construction' Environmental Monitoring for Baseline Development

Parameter to be measured	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Ambient Air Quality	To establish baseline air quality levels	CO,NO_2 & PM_{10} (particulate matter smaller than 10 microns) concentration at receptor level, $PM_{2.5}$	1-hr and 24-hr concentration levels	At least two random receptor locations	Once	PMU / Design Consultant
Ambient Noise	To establish baseline noise levels	Ambient noise level near receptors in project area	A-weighted noise levels 24 hours, readings taken at 15 s intervals over 15 min. every hour, and then averaged	At two random receptor locations in the project area	Once	PMU / Design Consultant
Water Quality in vicinity of project area and water of Chahan Dam	To establish water quality in project area	water quality in project area	Water samples for comparison against NEQS parameters	At two locations within the project area	Once	PMU / Design Consultant

Table 7. 4: Construction Phase Monitoring Requirements

Project Activity and Potential Impact	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Noise Disturbance due to noise from construction activity	To determine the effectiveness of noise abatement measures on sound pressure levels	Ambient noise level at different locations in project area	A-weighted noise levels 24 hours, readings taken at 15 s intervals over 15 min. every hour at 15 m from receptors, and then averaged	At Two random receptor locations in project area	Quarterly basis on a typical working day	Contractor's Environmental officer, CSC
Air Quality Dust emissions from construction vehicles and equipment	To determine the effectiveness of dust control program on dust at receptor level	CO,NO_2 & PM_{10} (particulate matter smaller than 10 microns), PM 2.5 concentration at receptor level	1-hr and 24-hr concentration levels	At two random receptor locations in project area	Quarterly basis on a typical working day	Contractor's Environmental officer, CSC
		Visible dust	Visual observation of size of dust clouds, their dispersion and the direction of dispersion	Construction site	Once daily during peak construction period	Contractor's Environmental officer, CSC
Water Quality Monitoring for Surface water, ground water and Wastewater	To determine the effectiveness of mitigation measures	As per WHO/NEQS	Water samples for comparison against PEQS parameters	Workers camp and active construction site	Quarterly basis on a typical working day	Contractor's Environmental officer, CSC
Safety precautions by Safety workers	To prevent accidents for workers and general public	Number of near miss events and accidents taking place	Visual inspections	Construction site	Once Daily	Contractor's Environmental officer, CSC

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

Table 7. 5: Operation Phase Environmental Monitoring Plan

Parameter to be measured	Objective of monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Waste Water Quality	To determine the effectiveness of mitigation measures	As per WHO/PEQS	Water samples for comparison against NEQS parameters	upstream and downstream locations of Intake Structure of Chahan Dam	Annual basis on a typical working day	WASA Rawalpindi
Water Quality	To assess whether provided portable water is within limits of PEQS.	As per PEQS	Water samples for comparison against NEQS parameters	At storage tanks and few samples will be taken from users taps	Monthly	WASA Rawalpindi

7.5. ENVIRONMENTAL MANAGEMENT COST

The **Table 7.6** below provides cost estimates for 'Pre-Construction phase' monitoring while **Table 7.7** and **Table 7.8** provides cost estimates for 'Construction phase' and 'Operation phase' monitoring of key environmental parameters.

The costs associated with implementation of the EMP and the necessary mitigation measures are provided as **Table 7.9** below.

Cost of Capacity Development and Training Program for Project Contractor(s) is given below in **Table 7.10**.

Table 7. 6: Cost Estimates for 'Pre-Construction Phase'

Monitoring Component	Parameters	Quantity	Amount PKR	Details
Air Quality[13]	CO, NO_2, SO_2, O_3 PM_{10}	2 (Once only at 2 locations)	140,000	2 readings @ PKR 70,000 per sample
Noise Levels[14]	dB(A)	2 (Once only at 2 locations)	60,000	2 readings @ PKR 30,000 per reading
Groundwater Quality	PEQS /NEQS	2 (Once only at 2 locations)	60,000	2 readings @ PKR 30,000 per sample
Contingencies			13,000	5% of monitoring cost
Total (PKR)			**273,000**	

Table 7. 7: Annual Cost Estimates for 'Construction Phase' Environmental Monitoring

Monitoring Component	**Parameters**	**Quantity**	**Amount PKR**	**Details**
Wastewater Quality	PEQS / WHO	24 (Monthly at 2 locations)	720,000	24 readings @ PKR 30,000 per sample
Air Quality	CO, NO_2, PM_{10}	24 (Monthly basis at 2 Locations)	1,680,000	24 readings @ PKR 70,000 per sample
Noise Levels	dB(A)	24 (Monthly basis at 2 locations)	240,000	24 readings @ PKR 10,000 per reading
Contingencies			132,000	5% of monitoring cost
Total (PKR)			**2,772,000***	

**: Subject to monitoring requirements of EPA's as per Conditions of Environmental Approval for construction phase*

[13] For air quality monitoring: 'Passive samplers' such as test tubes can be used or 'Active samplers' with sorbent tubes can also be used

[14] For noise monitoring: sampling equipment with duration greater than 1 hour can be used.

Table 7. 8: Annual Cost Estimates for 'Operation Phase' Environmental Monitoring

Monitoring Component	Parameters	Quantity	Amount PKR	Details
Drinking Water Quality	PEQS/WHO	12	360,000	12 readings @ PKR 30,000 per sample
Ground Water Quality	PEQS/WHO	4 (Quarterly)	120,000.0	4 reading @ 30,000 per sample
Surface Water Quality of Chahan Dam	PEQS/WHO	4 (Quarterly)	120,000.0	4 reading @ 30,000 per sample
Contingencies			30,000	5% of monitoring cost
Total (PKR)			**630,000***	

**: Subject to monitoring requirements of EPA's as per Conditions of Environmental Approval for operational phase*

Table 7. 9: Estimated Costs for EMP Implementation

Item	Sub-Item	Estimated Total Cost (PKR)
Staff, audit and monitoring cost	1 person for 24 months (@ 200,000 per month)	4,800,000
Monitoring Activities	Provided separately in Tables 7.7 and 7.8.	-
Mitigation Measures	As prescribed under EMP and EIA/IEE.	4,000,000
(i) Water sprinkling	To suppress dust emissions	1,000,000
(ii) Solid waste collection & disposal (including hazardous waste)	From construction sites (based on initial estimates)	1,500,000
(iii) Plantation around project	To plant vegetation all along the route of Conductance Main and at Water works	1,500,000
(iv) Hard Barricades, shoring, restoration and noise barriers	Provision of hard barricades in case the trench is 1.5 meter deep	4,000,000
Contingencies	5% of EMP implementation cost	690,000
Total Estimated Cost (PKR)		**17,490,000**

Table 7. 10: Cost of Capacity Development and Training Programme for Project Contractor(s)

Provided by	Organized by	Contents	No. of training events	Duration	Cost (PKR)
Pre-construction Phase Monitoring Consultants / Organizations offering specialized services in environmental management and monitoring	CSC & PMU	Short seminars and courses on: Environmental Management Plan and Environmental Monitoring Plan	Two seminars for Contractor management staff and project staff	1 day	100,000/Training
Construction Phase Monitoring Consultants / Organizations offering specialized services in environmental management and monitoring	CSC & PMU	Short seminars on Environmental risks associated with construction phase. Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues	Two seminars for Contractor management staff and project staff dealing in environment and social issues	1 day	100,000/Training
Operation Phase* 3rd party trainer	WASA Rawalpindi	Short seminars on Environmental risks associated with operation phase. Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues	Bi-annual seminars	1-2 Day	600,000/Year
Total			**800,000 (PKR 0.8 million)**		

** = The cost for operational phase is proposed for 3 years*

CHAPTER-8

RECOMMENDATIONS & CONCLUSIONS

8.1 RECOMMENDATIONS

Obtain statutory clearances prior to award of contract and ensure conditions/requirements are incorporated in the project design and documents;

- Upon mobilization of the contractors, PMU to provide a safeguards orientation on EIA/IEE and project administration manual;
- Contractor to appoint environmental safeguards person responsible for environmental safeguards compliance, occupational health and safety and core labor standards;
- The project will generate employment opportunities during the construction and operation phases of the project. Employment opportunities shall be given to local community as per plans discussed in the EIA report.
- The project is located in an area where there are several socio-economic and health problems for which the project will provide appropriate solutions.
- PMU will have the right to suspend works or payments if the Contractor is in violation of any of his obligations under the EMP and SSEMP.
- The templates for different management plans are attached as annexures. However, detailed plans shall be developed by the contractor before mobilization of construction teams.
- Site Specific Environmental Management Plan shall be developed and implemented by the contractor during the construction phase. PMU will supervise the implementation status through Construction Supervision Consultant (CSC).
- Prior approval for setting up of construction camps shall be obtained by the contractor from PMU

8.2 CONCLUSION

The EIA Report of Augmentation of Water Supply to Rawalpindi City based on Chahan Dam, District Rawalpindi – Pakistan is made to fulfill the legal requirement of Punjab Environmental Protection Act, 1997 [Amendment, 2012].

The provision of water treatment plant and water supply system for the residents of Ranial, Akbar Chowk, Chakra etc. (or residence of PP-12) is of high significance

considering the urgent need for improving sustainable water supply system of Rawalpindi city.

Primary and secondary data has been collected and used to assess the environmental impacts of the Project. This EIA report highlights all potential environmental impacts associated with the project and recommends mitigation measures. Any environmental impacts associated with the project need to be properly mitigated, through the existing institutional arrangements described in this report.

The majority of the environmental impacts are associated with the distribution networks including transmission main and generation of solid waste, sludge and waste water during water treatment plant operation. Major impacts during construction phase will be related to traffic congestion and community health and safety issues during laying of water supply system in populated areas.

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

The EMP contained within this EIA/IEE document is considered sufficient for issuance as part of the contracts to the successful bidder(s) and for subsequent use during the project works. It should be mentioned that prior to the commencement of works, this EMP must be further updated by the contractor into site specific EMPs (SSEMPs) for review and approval of EPA/ADB. In these SSEMPs, aspects such as a detailed traffic management plan, identification of locations for disposal of debris and spoil and any other details which shall become available later must be included for efficient implementation of all proposed mitigation measures and the subsequent monitoring of these measures.

Based on the above, this report concludes that there are no potential adverse environmental impacts from proposed project. Impacts of less significance can be mitigated to an acceptable level by adequate implementation of the mitigation measures identified and suggested, hence, no significant or unacceptable change in the baseline environmental conditions will occur. Similarly, the project will have a visible positive impact on the socio-economic conditions of the local residents in

terms of uninterrupted treated water supply and it will fix the issue of portable water availability in the project area.

Mitigation measures to help alleviating potential identified impacts have been recommended and an EMP has been provided for implementation of these mitigation measures. Further PMU LG&CD and WASA will ensure that selected construction contractor has contractual obligation with respect to EMP implementation. Also contractor will ensure appropriate staffing and budgeting for effective implementation and monitoring of project EMP.

Based on the findings of the EIA/IEE, the project is unlikely to cause any significant, irreversible or unprecedented environmental impacts. The potential impacts localized, temporary in nature and can be addressed through proven mitigation measures. Hence, the classification of the project as Category B as per ADB SPS, 2009 is confirmed and Initial Environmental Examination has been submitted to ADB. Further, EIA Report has been completed for the said project so the project of 'Augmentation of Water Supply to Rawalpindi City based on Chahan Dam, District Rawalpindi' is recommended for the Environmental Approval and issuance of NOC from the EPA, Punjab.

LIST OF REFRENCES

The following documents, reports were consulted during the preparation of this report.

- Data & information provided by the **Project Management of Augmentation of Water Supply to Rawalpindi City based on Chahan Dam**.
- Project location/ layout maps etc.
- Guidelines for the preparation and review of Environmental Reports, Pakistan Environmental Protection Agency, Government of Pakistan, October, 1997/2000.
- Sectoral Guidelines for Environmental Reports-Major Chemical and Manufacturing Plants, Pakistan Environment Protection Agency, October 1997.
- Pakistan Environment Protection Agency (Review of IEE and EIA) Regulations, 2000.
- Hazardous Substances Rules, 2003, Pakistan Environment Protection Agency.
- Handbook of Environmental Impact Assessment Vol. 1 & 2, Edited by Judith Petts, Blackwell Publishing, Ist Indian Edition, 2005.
- Punjab Environmental Protection Act, 1997 [Amendment, 2012].
- Ahmed, M. and Suphachalasai, S. (2014). Assessing the Cost of Climate Change and Adaptation in South Asia. Manila: ADB
- Anjum, B. F. et al. (2005). Climate Change Perspective in Pakistan. Pakistan Journal of Meteorology. 2(2). pp. 11–21
- Asian Development Bank (2017a): Mainstreaming Climate Risk Management into Urban Infrastructure Investments through Urban Resilience Assessments (URAs), Peshawar City, Khyber Pakhtunkhwa, Pakistan (UCCRTF TA-8913 PAK).
- Asian Development Bank (2017b). Climate Change Operational Framework 2017-2030: Enhancing Actions for Low Greenhouse Gas Emissions and Climate-Resilient Development, Retrieved from: https://www.adb.org/sites/default/files/institutional-document/358881/ccof-2017-2030.pdf
- WMO/GWP Associated Programme on Flood Management Pakistan: Lai Nullah basin flood problem, Islamabad – Rawalpindi cities by Ahmed Kamal Federal Flood Commission, Government of Pakistan.

- Quagliata, A., Ahearn, M., Boeker, E., Roof, C., Meister, L., & Singleton, H. (2018). Transit Noise and Vibration Impact Assessment Manual (No. FTA Report No. 0123).
- ADB, Safeguards Unit for Central & West Asia Department, Environmental Management for Construction Handbook.
- Asian Development Bank (2017c). Climate Change Profile of Pakistan. ISBN 978-92-9257- 721-6 (Print), 978-92-9257-722-3 (e-ISBN). Publication Stock No. TCS178761. DOI: http://dx.doi.org/10.22617/TCS178761. Retrieved from: https://www.adb.org/sites/default/files/publication/357876/climate-change-profile-pakistan.pdf
- Asian Development Bank (2014). Midterm Review of Strategy 2020: Meeting the Challenges of a Transforming Asia and Pacific
- National Disaster Management Authority 2008: Seismic Zoning Map of Pakistan
- EIA for Priority Projects for Urban Development in Sialkot
- https://www.worldbank.org/en/news/press-release/2022/10/28/pakistan-flood-damages-and-economic-losses-over-usd-30-billion-and-reconstruction-needs-over-usd-16-billion-new-assessme
- 2017 District census report of Rawalpindi. Census publication. Islamabad: Population Census Organization, Statistics Division, Government of Pakistan.
- Chaudhry, Q. Z. et al. (2009). Climate Change Indicators of Pakistan. Technical Report. No. 22. Islamabad: Pakistan Meteorological Department.
- IPCC (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Rehman, N., Adnan, M. and Ali, S. (2018) ‘Assessment of CMIP5 climate models over South Asia and climate change projections over Pakistan under representative concentration pathways’, Int. J. Global Warming, Vol. 16, No. 4, pp.381–415.

ANNEXURE-I

Layout Plan

ANNEXURE-II

Location Map

ANNEXURE-III

Environmental Monitoring Reports

ENVIRONMENTAL SERVICES PAKISTAN

ESPAK

CHEMICAL ANALYSIS TEST REPORT (AMBIENT AIR)

Reference Number: ESPAK/644P/22/AA/5618/00577 **Date:** 05/12/2022

Name of Industry/Client: Chahan Dam Water Supply Project

Address: Chahan Dam Water Supply Project Chakri Road, District Rawalpindi

Validation Officer: Amin Baig, Research Officer

Nature of Sample: Ambient Air

Monitoring Location: Water Intake and Water Treatment Plant Site (GPS: 33.459747°N 72.886223°E)

Date of Sample Collection: 29/11/2022

Sample Collected/Sent By: Farhan Ali, Analyst (Field), ESPAK

Grab / Composite: Continuous 24-Hours

Date of Completion of Analysis: 30/11/2022

S. No	Parameters	Limit Values (PEQS-24 Hours)	Concentration	Method / Equipment Used	Remarks
1	Carbon Monoxide (CO)	5 mg/m³ (8 Hours)	1.6 mg/m³	Non Dispersive Infrared Absorption (NDIR)	Within Prescribed Limits
2	Sulfur Dioxide (SO_2)	120 µg/m³	20 µg/m³	UV Fluorescence (UVF)	Within Prescribed Limits
3	Ozone (O_3)	130 µg/m³ (1 Hour)	13 µg/m³	Non Dispersive UV Absorption	Within Prescribed Limits
4	Oxides of Nitrogen as NO	40 µg/m³	13 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
5	Oxides of Nitrogen as NO_2	80 µg/m³	21 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
6	Particulate Matter $PM_{2.5}$	35 µg/m³	34 µg/m³	Particulate Sensor	Within Prescribed Limits
7	Particulate Matter PM_{10}	150 µg/m³	139 µg/m³	Particulate Sensor	Within Prescribed Limits
8	Suspended Particulate Matter (SPM)	500 µg/m³	404 µg/m³	Particulate Sensor	Within Prescribed Limits

PEQS: Punjab Environmental Quality Standards for Ambient Air, 2016

· Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

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- **The values represent sample conditions when monitoring/testing was carried out.**
- **The report data is not intended to be used legally by the client.**
- **Only parameters marked with asterisk (*) are ISO 17025:2017 accredited.**

1. **Sample Analyzed By:** Farhan Ali, Analyst (Field)
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

Name: Imran Malik
General Manager
Date: 05/12/2022

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NOISE MONITORING REPORT

Reference Number:	ESPAK/644P/22/N/5620/00552	**Date:**	05/12/2022
Name of Industry/Client:	Chahan Dam Water Supply Project		
Address:	Chahan Dam Water Supply Project Chakri Road, District Rawalpindi		
Validation Officer:	Amin Baig, Research Officer		
Nature of Sample:	Noise		
Date of Sample Collection:	29/11/2022	**Grab / Composite:**	Continuous 24-Hours
Sample Collected/Sent By:	Farhan Ali, Analyst (Field), ESPAK		
Date of Completion of Analysis:	30/11/2022		
Method/Equipment Used:	Sound Level Meter		

S. No	Measurement Point	Limit Values (PEQS)	Noise Level in dB(A) Leq	Remarks
1	Water Intake and Water Treatment Plant Site (GPS: 33.459747°N 72.886223°E)- Day time	65 dB(A)	59 dB(A)	Within Prescribed Limits
2	Water Intake and Water Treatment Plant Site (GPS: 33.459747°N 72.886223°E)- Night time	55 dB(A)	54 dB(A)	Within Prescribed Limits

PEQS: Punjab Environmental Quality Standards for Noise in Commercial Area, 2016 Day Time Hours (6:00 am to 10:00 pm) Night Time Hours (10:00 pm to 6:00 am)

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Reference Number: ESPAK/644P/22/DW/5623/01285 **Date:** 07/12/2022

Name of Industry / Client: Chahan Dam Water Supply Project

Address: Chahan Dam Water Supply Project Chakri Road, District Rawalpindi

Validation Officer: Amin Baig, Research Officer

Nature of Sample: Tap Water from Rawal Lake GPS:(33.534561°N 72.977173°E)

Date Sample Received: 01/12/2022 **Grab / Composite:** Grab

Date of Sample Collection: 30/11/2022

Sample Collected / Sent By: Farhan Ali, Analyst (Field), ESPAK

Date of Completion of Analysis: 07/12/2022

S. No	Parameters	Limit Values (PEQS)	Concentration	Method / Equipment Used	Remarks
1	Total Coliforms	----	>8.0 MPN/100m	SMWW 9221 B	---
2	Fecal Coliform Bacteria	Must not be detectable in any 100mL sample	>8.0 MPN/100mL	SMWW 9221 F	Exceeding Limits
3	E. Coli	Must not be detectable in any 100mL Sample	>8.0 MPN/100mL	SMWW 9221 F	Exceeding Limits
4	Color	≤15 TCU	ND	SMWW 2120 C	Within Limits
5	Odor	Non Objectionable / Acceptable	Acceptable	Organoleptic	Within Limits
6	Turbidity	<5 NTU	10 NTU	SMWW 2130B	Exceeding Limits
7	Total Hardness as $CaCO_3$*	<500 mg/L	336 mg/L	SMWW 2340C	Within Limits
8	Total Dissolved Solids (TDS)*	<1000 mg/L	604 mg/L	SMWW 2540C	Within Limits
9	pH*	6.5-8.5	7.3	SMWW 4500H+B	Within Limits
10	Chloride (as Cl^-)*	<250 mg/L	32 mg/L	SMWW 4500Cl-B	Within Limits
11	Cyanide (CN^-)	≤0.05 mg/L	ND	SMWW 4500 CN^- F	Within Limits
12	Fluoride (F^-)*	≤1.5 mg/L	0.4 mg/L	U.S. EPA 9214	Within Limits
13	Nitrate (NO_3^-)	≤50 mg/L	28.4 mg/L	SMWW 4500NO_3^-B	Within Limits
14	Nitrite (NO_2^-)	≤3 mg/L	ND	SMWW 4500NO_2^-B	Within Limits
15	Residual Chlorine	0.2-0.5 mg/L	ND	SMWW 4500-Cl B	---
16	Aluminum (Al)	≤0.2 mg/L	0.1 mg/L	U.S. EPA-200.7	Within Limits
17	Antimony (Sb)	≤0.005 mg/L	ND	U.S. EPA-200.7	Within Limits
18	Arsenic (As)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
19	Barium (Ba)	0.7 mg/L	0.1 mg/L	U.S. EPA-200.7	Within Limits
20	Boron (B)	0.3 mg/L	0.1 mg/L	U.S. EPA-200.7	Within Limits
21	Cadmium (Cd)	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
22	Copper (Cu)	2.0 mg/L	ND	U.S. EPA-200.7	Within Limits
23	Lead (Pb)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Reference Number: ESPAK/644P/22/DW/5623/01285 **Date:** 07/12/2022

Name of Industry / Client: Chahan Dam Water Supply Project

S. No	Parameters	Limit Values (PEQS)	Concentration	Method / Equipment Used	Remarks
24	Manganese (Mn)	≤0.5 mg/L	0.1 mg/L	U.S. EPA-200.7	Within Limits
25	Mercury (Hg)	≤0.001 mg/L	ND	U.S. EPA-200.7	Within Limits
26	Nickel (Ni)	≤0.02 mg/L	ND	U.S. EPA-200.7	Within Limits
27	Selenium (Se)	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
28	Chromium (Cr)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
29	Zinc (Zn)	5.0 mg/L	0.1 mg/L	U.S. EPA-200.7	Within Limits
30	Phenolic Compounds (as Phenols)	NGVS	ND	SMWW 5530 C	---

PEQS: Punjab Environmental Quality Standards for Drinking Water, 2016
SMWW: Standard Methods for the Examination of Water and WasteWater 23rd Edition, American Public Health Association, American Water Works Association, Water Environment Federation USA (2017)
USEPA: United States Environmental Protection Agency
NGVS: No Guideline Value Set
ND: Not Detected
Laboratory tests and measurements were carried out at 25 ± 2 °C and 50 ± 10 % Relative Humidity conditions unless stated otherwise.
Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

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1. **Sample Analyzed By:** Waqas Ahmad (Analyst (ICP-AES)); Javeria Abid (Analyst (Chemical)); Sana Ashraf (Analyst (Chemical)); M.Shahid (Analyst (Chemical)); Khizra Bano (Analyst(Microbiology))
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

Name: Imran Malik
General Manager
Date: 07/12/2022

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CHEMICAL ANALYSIS TEST REPORT (AMBIENT AIR)

Reference Number: ESPAK/644P/22/AA/5619/00579 **Date:** 05/12/2022
Name of Industry/Client: Chahan Dam Water Supply Project
Address: Chahan Dam Water Supply Project Chakri Road, District Rawalpindi
Validation Officer: Amin Baig, Research Officer
Nature of Sample: Ambient Air **Monitoring Location:** IPS Ranial (GPS: 33.53412°N 72.976822°E)
Date of Sample Collection: 30/11/2022 **Grab / Composite:** Continuous 24-Hours
Sample Collected/Sent By: Farhan Ali, Analyst (Field), ESPAK
Date of Completion of Analysis: 1/12/2022

S. No	Parameters	Limit Values (PEQS-24 Hours)	Concentration	Method / Equipment Used	Remarks
1	Carbon Monoxide (CO)	5 mg/m³ (8 Hours)	1.8 mg/m³	Non Dispersive Infrared Absorption (NDIR)	Within Prescribed Limits
2	Sulfur Dioxide (SO_2)	120 µg/m³	22 µg/m³	UV Fluorescence (UVF)	Within Prescribed Limits
3	Ozone (O_3)	130 µg/m³ (1 Hour)	12 µg/m³	Non Dispersive UV Absorption	Within Prescribed Limits
4	Oxides of Nitrogen as NO	40 µg/m³	13 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
5	Oxides of Nitrogen as NO_2	80 µg/m³	23 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
6	Particulate Matter $PM_{2.5}$	35 µg/m³	34 µg/m³	Particulate Sensor	Within Prescribed Limits
7	Particulate Matter PM_{10}	150 µg/m³	146 µg/m³	Particulate Sensor	Within Prescribed Limits
8	Suspended Particulate Matter (SPM)	500 µg/m³	447 µg/m³	Particulate Sensor	Within Prescribed Limits

PEQS: Punjab Environmental Quality Standards for Ambient Air, 2016

· Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

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1. **Sample Analyzed By:** Farhan Ali, Analyst (Field)
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

Name: Imran Malik
General Manager
Date: 05/12/2022

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NOISE MONITORING REPORT

Reference Number: ESPAK/644P/22/N/5621/00554 **Date:** 05/12/2022

Name of Industry/Client: Chahan Dam Water Supply Project

Address: Chahan Dam Water Supply Project Chakri Road, District Rawalpindi

Validation Officer: Amin Baig, Research Officer

Nature of Sample: Noise

Date of Sample Collection: 30/11/2022 **Grab / Composite:** Continuous 24-Hours

Sample Collected/Sent By: Farhan Ali, Analyst (Field), ESPAK

Date of Completion of Analysis: 01/12/2022

Method/Equipment Used: Sound Level Meter

S. No	Measurement Point	Limit Values (PEQS)	Noise Level in dB(A) Leq	Remarks
1	IPS Rania (GPS: 33.53412°N 72.976822°E)- Day time	65 dB(A)	63 dB(A)	Within Prescribed Limits
2	IPS Ranial (GPS: 33.53412°N 72.976822°E)- Night time	55 dB(A)	58 dB(A)	Exceeding Prescribed Limits

PEQS: Punjab Environmental Quality Standards for Noise in Commercial Area, 2016 Day Time Hours (6:00 am to 10:00 pm) Night Time Hours (10:00 pm to 6:00 am)

· Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

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- The report data is not intended to be used legally by the client.
- Only parameters marked with asterisk (*) are ISO 17025:2017 accredited.

1. Sample Analyzed By: Farhan Ali, Analyst (Field)
2. Name of Chief Analyst with Seal: Muhammad Arfan
3. Signature of Incharge of the Environmental Laboratory:

Name: Imran Malik
General Manager
Date: 05/12/2022

---------- End of Report ----------

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ESPAK

CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Reference Number: ESPAK/644P/22/DW/5622/01284 **Date:** 07/12/2022

Name of Industry / Client: Chahan Dam Water Supply Project

Address: Chahan Dam Water Supply Project Chakri Road, District Rawalpindi

Validation Officer: Amin Baig, Research Officer

Nature of Sample: Water from Rawal Lake GPS:(33.460186°N 72.885823°E)

Date Sample Received: 01/12/2022 **Grab / Composite:** Grab

Date of Sample Collection: 29/11/2022

Sample Collected / Sent By: Farhan Ali, Analyst (Field), ESPAK

Date of Completion of Analysis: 07/12/2022

S. No	Parameters	Limit Values (PEQS)	Concentration	Method / Equipment Used	Remarks
1	Total Coliforms	----	**1.1 MPN/100mL**	SMWW 9221 B	---
2	Fecal Coliform Bacteria	Must not be detectable in any 100mL sample	**1.1 MPN/100mL**	SMWW 9221 F	Exceeding Limits
3	E. Coli	Must not be detectable in any 100mL Sample	**1.1 MPN/100mL**	SMWW 9221 F	Exceeding Limits
4	Color	≤15 TCU	ND	SMWW 2120 C	Within Limits
5	Odor	Non Objectionable / Acceptable	Acceptable	Organoleptic	Within Limits
6	Turbidity	<5 NTU	**10.6 NTU**	SMWW 2130B	Exceeding Limits
7	Total Hardness as $CaCO_3$*	<500 mg/L	136 mg/L	SMWW 2340C	Within Limits
8	Total Dissolved Solids (TDS)*	<1000 mg/L	302 mg/L	SMWW 2540C	Within Limits
9	pH*	6.5-8.5	7.6	SMWW 4500H*B	Within Limits
10	Chloride (as Cl^-)*	<250 mg/L	25 mg/L	SMWW 4500Cl^-B	Within Limits
11	Cyanide (CN^-)	≤0.05 mg/L	ND	SMWW 4500 CN^- F	Within Limits
12	Fluoride (F^-)*	≤1.5 mg/L	0.7 mg/L	U.S. EPA 9214	Within Limits
13	Nitrate (NO_3^-)	≤50 mg/L	1.5 mg/L	SMWW 4500NO_3^-B	Within Limits
14	Nitrite (NO_2^-)	≤3 mg/L	0.3 mg/L	SMWW 4500NO_2^-B	Within Limits
15	Residual Chlorine	0.2-0.5 mg/L	ND	SMWW 4500-Cl B	---
16	Aluminum (Al)	≤0.2 mg/L	ND	U.S. EPA-200.7	Within Limits
17	Antimony (Sb)	≤0.005 mg/L	ND	U.S. EPA-200.7	Within Limits
18	Arsenic (As)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
19	Barium (Ba)	0.7 mg/L	0.1 mg/L	U.S. EPA-200.7	Within Limits
20	Boron (B)	0.3 mg/L	ND	U.S. EPA-200.7	Within Limits
21	Cadmium (Cd)	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
22	Copper (Cu)	2.0 mg/L	ND	U.S. EPA-200.7	Within Limits
23	Lead (Pb)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits

Page 1 of 2

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Reference Number: ESPAK/644P/22/DW/5622/01284 **Date:** 07/12/2022

Name of Industry / Client: Chahan Dam Water Supply Project

S. No	Parameters	Limit Values (PEQS)	Concentration	Method / Equipment Used	Remarks
24	Manganese (Mn)	≤0.5 mg/L	ND	U.S. EPA-200.7	Within Limits
25	Mercury (Hg)	≤0.001 mg/L	ND	U.S. EPA-200.7	Within Limits
26	Nickel (Ni)	≤0.02 mg/L	ND	U.S. EPA-200.7	Within Limits
27	Selenium (Se)	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
28	Chromium (Cr)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
29	Zinc (Zn)	5.0 mg/L	ND	U.S. EPA-200.7	Within Limits
30	Phenolic Compounds (as Phenols)	NGVS	ND	SMWW 5530 C	---

PEQS: Punjab Environmental Quality Standards for Drinking Water, 2016
SMWW: Standard Methods for the Examination of Water and WasteWater 23rd Edition, American Public Health Association, American Water Works Association, Water Environment Federation USA (2017)
USEPA: United States Environmental Protection Agency
NGVS: No Guideline Value Set
ND: Not Detected

Laboratory tests and measurements were carried out at 25 ± 2 °C and 50 ± 10 % Relative Humidity conditions unless stated otherwise.
Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

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1. **Sample Analyzed By:**

Waqas Ahmad	Javeria Abid	Sana Ashraf	M.Shahid	Khizra Bano
Analyst (ICP-AES)	Analyst (Chemical)	Analyst (Chemical)	Analyst (Chemical)	Analyst(Microbiology)

2. **Name of Chief Analyst with Seal:** Muhammad Arfan

3. **Signature of Incharge of the Environmental Laboratory:**

Name: Imran Malik
General Manager
Date: 07/12/2022

---------- End of Report ----------

Page 2 of 2

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ANALYTICAL REPORT LHR-22-0814/11

Sample No.			C&P-LHR-22-0814/11-01		
Client ID			Drain near Moorat Village		
Sampled By			As Supplied		
Parameter	Units	LOR	Results	Limit as per PEQS for Drinking Water	Remarks
Turbidity based on APHA 2130 B 23rd Edition					
Turbidity	NTU	1.0	47	<5 NTU	NC
pH based on APHA 4500H+ B 23rd Edition					
*pH @ 25^{0}C	pH unit	0.1	7.50	6.5—8.5	C
Color based on APHA 2120 B & C 23rd Edition (Lovibond Mth No. 203)					
Color	Pt-Co	5.0	66	≤15 TCU	NC
Odour In House (Organoleptic)					
Odour	-	-	Non Objectionable	Non Objectionable	C
Taste In House (Physical)					
Taste	-	-	Non Objectionable	Non Objectionable	C
Total Dissolved Solid based on APHA 2540 C 23rd Edition					
*Solids, Total Dissolved (TDS)	mg/L	5.0	546	<1000	C
Total Suspended Solid based on APHA 2540 D 23rd Edition					
*Solids, Total Suspended (TSS)	mg/L	5.0	60	-	-
Total Hardness based on APHA 2340 C 23rd Edition					
*Hardness, Total as $CaCO_3$	mg/L	1.0	200	<500	C
*Hardness, Carbonate	mg/L	1.0	200	-	-
Nitrate, Nitrogen (NO_3) based on APHA 4500-NO_3-B 23rd Edition					
(NO_3-N)	mg/L	1.0	<1.0	≤50	C
Nitrite Nitrogen (NO_2^-) based on APHA 4500-NO_2-B 23rd Edition					
*(NO_2^--N)	mg/L	0.01	0.71	≤3	C
Ammonium calculated based on APHA-4500NH_3 C 23rd					
NH_4	mg/L	0.1	1.18	-	-
Total Phenols based on APHA 5530 D 23rd Edition					
Phenols, Total (Phenolic Compounds)	mg/L	0.01	<0.01	-	-
Cyanide, based on APHA 4500 CN- E 23rd Edition					
Cyanide (CN^-)	mg/L	0.05	<0.05	≤0.05	C
Chloride, based on APHA-4500Cl- B 23rd Edition					
*Chloride	mg/L	0.5	64.58	<250	C
Chlorine residual based on APHA Cl G / DPD-Lovibond					
Chlorine (Residual)	mg/L	0.01	<0.01	0.2 – 0.5***	C
Fluoride based on APHA 4500 F- B,D 23rd Edition					
Fluoride F^-	mg/L	1.0	<1.0	≤1.5	C
Total Phosphate based on APHA 2540 E 23rd Edition					
Total Phosphate	mg/L	0.1	3.23	-	-
Biochemical Oxygen Demand (BOD_5) based on APHA-5210 D 23rd Edition					
*(BOD_5) @ 20 ^{0}C	mg/L	3.0	18	-	-
Chemical Oxygen Demand (COD) based on APHA-5220 D 23rd Edition					
*COD	mg/L	5.0	50	-	-

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ANALYTICAL REPORT LHR-22-0814/11

Sample No.			C&P-LHR-22-0814/11-01		
Client ID			Drain near Moorat Village		
Sampled By			As Supplied		
Parameter	Units	LOR	Results	Limit as per PEQS for Drinking Water	Remarks
Organic Carbon, Total (TOC) based on HACH Method 10129					
^Organic Carbon, Total (TOC)	mg/L	0.3	12	-	-
Total Dissolved Organic Carbon, Total (DOC) based on HACH Method 10129					
^Dissolved Organic Carbon, Total (DOC)	mg/L	0.3	08	-	-
Metals by AAS/ ICP-OES based on APHA 3111 B /3120 B 23rd Edition					
^Arsenic (As)	mg/L	0.005	<0.005	≤0.05	C
^Antimony (Sb)	mg/L	0.005	<0.005	≤0.005	C
^Aluminum (Al)	mg/L	0.005	1.2	≤0.2	NC
^Barium (Ba)	mg/L	0.005	0.088	0.7	C
^Boron (B)	mg/L	0.005	0.069	0.3	C
*Cadmium (Cd)	mg/L	0.01	<0.01	0.01	C
*Chromium (Cr)	mg/L	0.02	<0.02	≤0.05	C
*Copper (Cu)	mg/L	1.0	<1.0	2	C
*Lead (Pb)	mg/L	0.05	<0.05	≤0.05	C
*Iron (Fe)	mg/L	1.0	1.60	-	-
*Manganese (Mn)	mg/L	0.5	<0.5	≤0.5	C
*Nickel (Ni)	mg/L	0.02	<0.02	≤0.02	C
^Selenium (Se)	mg/L	0.005	<0.005	0.01	C
*Zinc (Zn)	mg/L	1.0	<1.0	5.0	C
Calcium (Ca)	mg/L	1.0	47.38	-	-
Mercury by ICP-OES based on APHA 3112 B 23rd Edition					
^Mercury (Hg)	mg/L	0.001	<0.001	≤0.001	C
Pesticides EPA 3510 + USEPA 8081					
^Pesticides	mg/L	0.001	<0.001	-	-
Poly nuclear Aromatic / Aromatic Hydrocarbon (PAH) USEPA 8100					
^ Total PAH	mg/L	0.01	<0.01	-	-
Total coliform Membrane Filtration Technique APHA 9222 B 23rd Edition					
*Total coliform	CFU/100ml	-	89	0 CFU / 100ml	NC
Faecal coliform (*E. coli*) Membrane Filtration Technique APHA 9222 D 23rd Edition					
* Faecal coliform (*E. coli*)	CFU/100ml	-	67	0 CFU / 100ml	NC
***E. coli* Membrane Filtration Technique/Biochemical Test APHA 9225 D 23rd Edition**					
E. coli	CFU/100ml	-	64	0 CFU / 100ml	NC

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ANALYTICAL REPORT LHR-22-0814/11

Sample No. Client ID Sampled By Parameter	Units	LOR	C&P-LHR-22-0814/11-02 Dam (Chahan) Capital smart city As Supplied Results	Limit as per PEQS for Drinking Water	Remarks
Turbidity based on APHA 2130 B 23rd Edition					
Turbidity	NTU	1.0	06	<5 NTU	NC
pH based on APHA 4500H+ B 23rd Edition					
*pH @ 25^{0}C	pH unit	0.1	7.34	6.5—8.5	C
Color based on APHA 2120 B & C 23rd Edition (Lovibond Mth No. 203)					
Color	Pt-Co	5.0	18	≤15 TCU	NC
Odour In House (Organoleptic)					
Odour	-	-	Non Objectionable	Non Objectionable	C
Taste In House (Physical)					
Taste	-	-	Non Objectionable	Non Objectionable	C
Total Dissolved Solid based on APHA 2540 C 23rd Edition					
*Solids, Total Dissolved (TDS)	mg/L	5.0	232	<1000	C
Total Suspended Solid based on APHA 2540 D 23rd Edition					
*Solids, Total Suspended (TSS)	mg/L	5.0	<5.0	-	-
Total Hardness based on APHA 2340 C 23rd Edition					
*Hardness, Total as $CaCO_3$	mg/L	1.0	100	<500	C
*Hardness, Carbonate	mg/L	1.0	100	-	-
Nitrate, Nitrogen (NO_3) based on APHA 4500-NO_3-B 23rd Edition					
(NO_3-N)	mg/L	1.0	<1.0	≤50	C
Nitrite Nitrogen (NO_2) based on APHA 4500-NO_2-B 23rd Edition					
*(NO_2-N)	mg/L	0.01	0.03	≤3	C
Ammonium calculated based on APHA-4500NH_3 C 23rd					
NH_4	mg/L	0.1	0.29	-	-
Total Phenols based on APHA 5530 D 23rd Edition					
Phenols, Total (Phenolic Compounds)	mg/L	0.01	<0.01	-	-
Cyanide, based on APHA 4500 CN- E 23rd Edition					
Cyanide (CN^-)	mg/L	0.05	<0.05	≤0.05	C
Chloride, based on APHA-4500Cl- B 23rd Edition					
*Chloride	mg/L	0.5	25.44	<250	C
Chlorine residual based on APHA Cl G / DPD-Lovibond					
Chlorine (Residual)	mg/L	0.01	<0.01	0.2 – 0.5***	C
Fluoride based on APHA 4500 F- B,D 23rd Edition					
Fluoride F^-	mg/L	1.0	<1.0	≤1.5	C
Total Phosphate based on APHA 2540 E 23rd Edition					
Total Phosphate	mg/L	0.1	<0.1	-	-
Biochemical Oxygen Demand (BOD_5) based on APHA-5210 D 23rd Edition					
*(BOD_5) @ 20 ^{0}C	mg/L	3.0	07	-	-

SGS ANALYTICAL REPORT LHR-22-0814/11

Sample No.			C&P-LHR-22-0814/11-02		
Client ID			Dam (Chahan) Capital smart city		
Sampled By			As Supplied		
Parameter	Units	LOR	Results	Limit as per PEQS for Drinking Water	Remarks
Chemical Oxygen Demand (COD) based on APHA-5220 D 23rd Edition					
*COD	mg/L	5.0	22	-	-
Organic Carbon, Total (TOC) based on HACH Method 10129					
^Organic Carbon, Total (TOC)	mg/L	0.3	07	-	-
Total Dissolved Organic Carbon, Total (DOC) based on HACH Method 10129					
^Dissolved Organic Carbon, Total (DOC)	mg/L	0.3	06	-	-
Metals by AAS/ ICP-OES based on APHA 3111 B /3120 B 23rd Edition					
^Arsenic (As)	mg/L	0.005	<0.005	≤0.05	C
^Antimony (Sb)	mg/L	0.005	<0.005	≤0.005	C
^Aluminum (Al)	mg/L	0.005	0.037	≤0.2	C
^Barium (Ba)	mg/L	0.005	0.072	0.7	C
^Boron (B)	mg/L	0.005	0.048	0.3	C
*Cadmium (Cd)	mg/L	0.01	<0.01	0.01	C
*Chromium (Cr)	mg/L	0.02	<0.02	≤0.05	C
*Copper (Cu)	mg/L	1.0	<1.0	2	C
*Lead (Pb)	mg/L	0.05	<0.05	≤0.05	C
*Iron (Fe)	mg/L	1.0	<1.0	-	-
*Manganese (Mn)	mg/L	0.5	<0.5	≤0.5	C
*Nickel (Ni)	mg/L	0.02	<0.02	≤0.02	C
^Selenium (Se)	mg/L	0.005	<0.005	0.01	C
*Zinc (Zn)	mg/L	1.0	<1.0	5.0	C
Calcium (Ca)	mg/L	1.0	33.79	-	-
Mercury by ICP-OES based on APHA 3112 B 23rd Edition					
^Mercury (Hg)	mg/L	0.001	<0.001	≤0.001	C
Pesticides EPA 3510 + USEPA 8081					
^Pesticides	mg/L	0.001	<0.001	-	-
Poly nuclear Aromatic / Aromatic Hydrocarbon (PAH) USEPA 8100					
^ Total PAH	mg/L	0.01	<0.01	-	-
Total coliform Membrane Filtration Technique APHA 9222 B 23rd Edition					
*Total coliform	CFU/100ml	-	33	0 CFU / 100ml	NC
Faecal coliform (*E. coli*) Membrane Filtration Technique APHA 9222 D 23rd Edition					
* Faecal coliform (*E. coli*)	CFU/100ml	-	19	0 CFU / 100ml	NC
***E. coli* Membrane Filtration Technique/Biochemical Test APHA 9225 D 23rd Edition**					
E. coli	CFU/100ml	-	18	0 CFU / 100ml	NC

SGS ANALYTICAL REPORT LHR-22-0814/11

Sample No.			C&P-LHR-22-0814/11-03		
Client ID			Dam Chahan Inlet ((Motorway Side Drain)		
Sampled By			As Supplied		
Parameter	Units	LOR	Results	Limit as per PEQS for Drinking Water	Remarks
Turbidity based on APHA 2130 B 23rd Edition					
Turbidity	NTU	1.0	15	<5 NTU	NC
pH based on APHA 4500H+ B 23rd Edition					
*pH @ 25^{0}C	pH unit	0.1	7.61	6.5—8.5	C
Color based on APHA 2120 B & C 23rd Edition (Lovibond Mth No. 203)					
Color	Pt-Co	5.0	20	≤15 TCU	NC
Odour In House (Organoleptic)					
Odour	-	-	Non Objectionable	Non Objectionable	C
Taste In House (Physical)					
Taste	-	-	Non Objectionable	Non Objectionable	C
Total Dissolved Solid based on APHA 2540 C 23rd Edition					
*Solids, Total Dissolved (TDS)	mg/L	5.0	254	<1000	C
Total Suspended Solid based on APHA 2540 D 23rd Edition					
*Solids, Total Suspended (TSS)	mg/L	5.0	16	-	-
Total Hardness based on APHA 2340 C 23rd Edition					
*Hardness, Total as $CaCO_3$	mg/L	1.0	108	<500	C
*Hardness, Carbonate	mg/L	1.0	108	-	-
Nitrate, Nitrogen (NO_3) based on APHA 4500-NO_3-B 23rd Edition					
(NO_3-N)	mg/L	1.0	<1.0	≤50	C
Nitrite Nitrogen (NO_2) based on APHA 4500-NO_2-B 23rd Edition					
*(NO_2-N)	mg/L	0.01	0.09	≤3	C
Ammonium calculated based on APHA-4500NH_3 C 23rd					
NH_4	mg/L	0.1	0.59	-	-
Total Phenols based on APHA 5530 D 23rd Edition					
Phenols, Total (Phenolic Compounds)	mg/L	0.01	<0.01	-	-
Cyanide, based on APHA 4500 CN- E 23rd Edition					
Cyanide (CN^-)	mg/L	0.05	<0.05	≤0.05	C
Chloride, based on APHA-4500Cl- B 23rd Edition					
*Chloride	mg/L	0.5	27.39	<250	C
Chlorine residual based on APHA Cl G / DPD-Lovibond					
Chlorine (Residual)	mg/L	0.01	<0.01	0.2 – 0.5***	C
Fluoride based on APHA 4500 F- B,D 23rd Edition					
Fluoride F^-	mg/L	1.0	<1.0	≤1.5	C
Total Phosphate based on APHA 2540 E 23rd Edition					
Total Phosphate	mg/L	0.1	<0.1	-	-
Biochemical Oxygen Demand (BOD_5) based on APHA-5210 D 23rd Edition					
*(BOD_5) @ 20 ^{0}C	mg/L	3.0	08	-	-

SGS ANALYTICAL REPORT LHR-22-0814/11

Sample No.			C&P-LHR-22-0814/11-03		
Client ID			Dam Chahan Inlet ((Motorway Side Drain)		
Sampled By			As Supplied		
Parameter	Units	LOR	Results	Limit as per PEQS for Drinking Water	Remarks
Chemical Oxygen Demand (COD) based on APHA-5220 D 23rd Edition					
*COD	mg/L	5.0	23	-	-
Organic Carbon, Total (TOC) based on HACH Method 10129					
^Organic Carbon, Total (TOC)	mg/L	0.3	<0.3	-	-
Total Dissolved Organic Carbon, Total (DOC) based on HACH Method 10129					
^Dissolved Organic Carbon, Total (DOC)	mg/L	0.3	<0.3	-	-
Metals by AAS/ ICP-OES based on APHA 3111 B /3120 B 23rd Edition					
^Arsenic (As)	mg/L	0.005	<0.005	≤0.05	C
^Antimony (Sb)	mg/L	0.005	<0.005	≤0.005	C
^Aluminum (Al)	mg/L	0.005	0.076	≤0.2	C
^Barium (Ba)	mg/L	0.005	0.073	0.7	C
^Boron (B)	mg/L	0.005	0.050	0.3	C
*Cadmium (Cd)	mg/L	0.01	<0.01	0.01	C
*Chromium (Cr)	mg/L	0.02	<0.02	≤0.05	C
*Copper (Cu)	mg/L	1.0	<1.0	2	C
*Lead (Pb)	mg/L	0.05	<0.05	≤0.05	C
*Iron (Fe)	mg/L	1.0	<1.0	-	-
*Manganese (Mn)	mg/L	0.5	<0.5	≤0.5	C
*Nickel (Ni)	mg/L	0.02	<0.02	≤0.02	C
^Selenium (Se)	mg/L	0.005	<0.005	0.01	C
*Zinc (Zn)	mg/L	1.0	<1.0	5.0	C
Calcium (Ca)	mg/L	1.0	38.99	-	-
Mercury by ICP-OES based on APHA 3112 B 23rd Edition					
^Mercury (Hg)	mg/L	0.001	<0.001	≤0.001	C
Pesticides EPA 3510 + USEPA 8081					
^Pesticides	mg/L	0.001	<0.001	-	-
Poly nuclear Aromatic / Aromatic Hydrocarbon (PAH) USEPA 8100					
^ Total PAH	mg/L	0.01	<0.01	-	-
Total coliform Membrane Filtration Technique APHA 9222 B 23rd Edition					
*Total coliform	CFU/100ml	-	66	0 CFU / 100ml	NC
Faecal coliform (*E. coli*) Membrane Filtration Technique APHA 9222 D 23rd Edition					
* Faecal coliform (*E. coli*)	CFU/100ml	-	41	0 CFU / 100ml	NC
***E. coli* Membrane Filtration Technique/Biochemical Test APHA 9225 D 23rd Edition**					
E. coli	CFU/100ml	-	39	0 CFU / 100ml	NC

SGS ANALYTICAL REPORT LHR-22-0814/11

Sample No.			C&P-LHR-22-0814/11-04		
Client ID			Chahan Dam camp (Fisher man side)		
Sampled By			As Supplied		
Parameter	Units	LOR	Results	Limit as per PEQS for Drinking Water	Remarks
Turbidity based on APHA 2130 B 23rd Edition					
Turbidity	NTU	1.0	13	<5 NTU	NC
pH based on APHA 4500H+ B 23rd Edition					
*pH @ 25^{0}C	pH unit	0.1	7.32	6.5—8.5	C
Color based on APHA 2120 B & C 23rd Edition (Lovibond Mth No. 203)					
Color	Pt-Co	5.0	20	≤15 TCU	NC
Odour In House (Organoleptic)					
Odour	-	-	Non Objectionable	Non Objectionable	C
Taste In House (Physical)					
Taste	-	-	Non Objectionable	Non Objectionable	C
Total Dissolved Solid based on APHA 2540 C 23rd Edition					
*Solids, Total Dissolved (TDS)	mg/L	5.0	236	<1000	C
Total Suspended Solid based on APHA 2540 D 23rd Edition					
*Solids, Total Suspended (TSS)	mg/L	5.0	21	-	-
Total Hardness based on APHA 2340 C 23rd Edition					
*Hardness, Total as $CaCO_3$	mg/L	1.0	104	<500	C
*Hardness, Carbonate	mg/L	1.0	104	-	-
Nitrate, Nitrogen (NO_3) based on APHA 4500-NO_3-B 23rd Edition					
(NO_3-N)	mg/L	1.0	<1.0	≤50	C
Nitrite Nitrogen (NO_2) based on APHA 4500-NO_2-B 23rd Edition					
*(NO_2-N)	mg/L	0.01	0.04	≤3	C
Ammonium calculated based on APHA-4500NH_3 C 23rd					
NH_4	mg/L	0.1	0.44	-	-
Total Phenols based on APHA 5530 D 23rd Edition					
Phenols, Total (Phenolic Compounds)	mg/L	0.01	<0.01	-	-
Cyanide, based on APHA 4500 CN- E 23rd Edition					
Cyanide (CN^-)	mg/L	0.05	<0.05	≤0.05	C
Chloride, based on APHA-4500Cl- B 23rd Edition					
*Chloride	mg/L	0.5	27.39	<250	C
Chlorine residual based on APHA Cl G / DPD-Lovibond					
Chlorine (Residual)	mg/L	0.01	<0.01	0.2 – 0.5***	C
Fluoride based on APHA 4500 F- B,D 23rd Edition					
Fluoride F^-	mg/L	1.0	<1.0	≤1.5	C
Total Phosphate based on APHA 2540 E 23rd Edition					
Total Phosphate	mg/L	0.1	1.02	-	-
Biochemical Oxygen Demand (BOD_5) based on APHA-5210 D 23rd Edition					
*(BOD_5) @ 20 ^{0}C	mg/L	3.0	05	-	-

SGS ANALYTICAL REPORT LHR-22-0814/11

Sample No.			C&P-LHR-22-0814/11-04		
Client ID			Chahan Dam camp (Fisher man side)		
Sampled By			As Supplied		
Parameter	Units	LOR	Results	Limit as per PEQS for Drinking Water	Remarks
Chemical Oxygen Demand (COD) based on APHA-5220 D 23rd Edition					
*COD	mg/L	5.0	19	-	-
Organic Carbon, Total (TOC) based on HACH Method 10129					
^Organic Carbon, Total (TOC)	mg/L	0.3	10	-	-
Total Dissolved Organic Carbon, Total (DOC) based on HACH Method 10129					
^Dissolved Organic Carbon, Total (DOC)	mg/L	0.3	03	-	-
Metals by AAS/ ICP-OES based on APHA 3111 B /3120 B 23rd Edition					
^Arsenic (As)	mg/L	0.005	<0.005	≤0.05	C
^Antimony (Sb)	mg/L	0.005	<0.005	≤0.005	C
^Aluminum (Al)	mg/L	0.005	0.096	≤0.2	C
^Barium (Ba)	mg/L	0.005	0.097	0.7	C
^Boron (B)	mg/L	0.005	0.048	0.3	C
*Cadmium (Cd)	mg/L	0.01	<0.01	0.01	C
*Chromium (Cr)	mg/L	0.02	<0.02	≤0.05	C
*Copper (Cu)	mg/L	1.0	<1.0	2	C
*Lead (Pb)	mg/L	0.05	<0.05	≤0.05	C
*Iron (Fe)	mg/L	1.0	<1.0	-	-
*Manganese (Mn)	mg/L	0.5	<0.5	≤0.5	C
*Nickel (Ni)	mg/L	0.02	<0.02	≤0.02	C
^Selenium (Se)	mg/L	0.005	<0.005	0.01	C
*Zinc (Zn)	mg/L	1.0	<1.0	5.0	C
Calcium (Ca)	mg/L	1.0	36.65	-	-
Mercury by ICP-OES based on APHA 3112 B 23rd Edition					
^Mercury (Hg)	mg/L	0.001	<0.001	≤0.001	C
Pesticides EPA 3510 + USEPA 8081					
^Pesticides	mg/L	0.001	<0.001	-	-
Poly nuclear Aromatic / Aromatic Hydrocarbon (PAH) USEPA 8100					
^ Total PAH	mg/L	0.01	<0.01	-	-
Total coliform Membrane Filtration Technique APHA 9222 B 23rd Edition					
*Total coliform	CFU/100ml	-	47	0 CFU / 100ml	NC
Faecal coliform (*E. coli*) Membrane Filtration Technique APHA 9222 D 23rd Edition					
* Faecal coliform (*E. coli*)	CFU/100ml	-	13	0 CFU / 100ml	NC
***E. coli* Membrane Filtration Technique/Biochemical Test APHA 9225 D 23rd Edition**					
E. coli	CFU/100ml	-	14	0 CFU / 100ml	NC

ANNEXURE-IV

Calibration Certificates of Monitoring Equipment

Unitech Calibration Services
296, Business Center,
G11 Markaz, Islamabad
051-8869514
info@unitechcal.com

CALIBRATION CERTIFICATE

Certificate Number	00805-21
Instrument Manufacturer:	Environment S.A
Instrument Type:	Ambient Air Quality Monitoring Station
Model Number:	AC32e
Serial Number:	2229e
Calibration Date:	August 16, 2022
Calibration Due Date:	August 15, 2023

Calibration Procedure

The instrument detail above has been calibrated to the published test and calibration data as detailed in the instrument handbook, using the techniques recommended in the latest versions of the international standards
EN ISO/IEC 17025
CISPR-11 Radiated RF emission measurements
CISPR-11 Mains Terminal RF emission measurements
IEC-61000-3-3 Mains Terminal voltage fluctuation measurements
IEC-61000-3-2 where applicable.

Calibration Climate Conditions

The climate test conditions were all maintained within the permitted limits of EN ISO/IEC 17025

Temperature	24.4 ˚C ± 0.1˚C	**Relative Humidity**	39.2% ± 1 %rH
Static Pressure:	998 hPa	**Ambient Noise level:**	53 dB

Measurement Results

Sr.	Parameter(s)	Reference Value	Actual Value	Signal Source/Equipment
1-	NO Gas	5.0 PPB	5.0 PPB	Gas Diluter + Cylinder
		10.0 PPB	10.3 PPB	Gas Diluter + Cylinder
		50.0 PPB	53.6 PPB	Gas Diluter + Cylinder
		100.0 PPB	106.1 PPB	Gas Diluter + Cylinder
2-	NO2 Gas	5.0 PPB	4.11 PPB	Gas Diluter + Cylinder
		10.0 PPB	9.9 PPB	Gas Diluter + Cylinder
		50.0 PPB	50.2 PPB	Gas Diluter + Cylinder
		100.0 PPB	96.7 PPB	Gas Diluter + Cylinder

Note:
The measuring instrument is adjusted by a Calibrator 4 levels of adjustment by a Gas Diluter.

Calibrator Details

Manufacturer	Serial	Description
Teledyne	0564	Gas Diluter Model T700
Honeywell Gases	776317	NO Gas Cylinder 10 PPM
Honeywell Gases	400357	NO2 Gas Cylinder 5 PPM

Calibration by:

Unitech Calibrations

Unitech Calibration Services
296, Business Center,
G11 Markaz, Islamabad
051-8869514
info@unitechcal.com

CALIBRATION CERTIFICATE

Certificate Number	00804-21
Instrument Manufacturer:	Environment S.A
Instrument Type:	Ambient Air Quality Monitoring Station
Model Number:	AF22e
Serial Number:	7504e
Calibration Date:	August 16, 2022
Calibration Due Date:	August 15, 2023

Calibration Procedure

The instrument detail above has been calibrated to the published test and calibration data as detailed in the instrument handbook, using the techniques recommended in the latest versions of the international standards
EN ISO/IEC 17025
CISPR-11 Radiated RF emission measurements
CISPR-11 Mains Terminal RF emission measurements
IEC-61000-3-3 Mains Terminal voltage fluctuation measurements
IEC-61000-3-2 where applicable.

Calibration Climate Conditions

The climate test conditions were all maintained within the permitted limits of EN ISO/IEC 17025

Temperature	24.4 ˚C ± 0.1˚C	**Relative Humidity**	39.2% ± 1 %rH
Static Pressure:	998 hPa	**Ambient Noise level:**	53 dB

Measurement Results

Sr.	Parameter(s)	Reference Value	Actual Value	Signal Source/Equipment
1-	SO2 Gas	20.1 PPB	19.4 PPB	Gas Diluter + Cylinder
		50.2 PPB	48.1 PPB	Gas Diluter + Cylinder
		99.8 PPB	95.7 PPB	Gas Diluter + Cylinder
		502.0 PPB	482.4 PPB	Gas Diluter + Cylinder

Note:

The measuring instrument is adjusted by a Calibrator 4 levels of adjustment by a Gas Diluter.

Calibrator Details

Manufacturer	Serial	Description
Teledyne	0564	Gas Diluter Model T700
Honeywell Gases	776394	SO2 Gas Cylinder 10 PPM

Calibration by:

Unitech Calibrations



Unitech Calibration Services
296, Business Center,
G11 Markaz, Islamabad
051-8869514
info@unitechcal.com

CALIBRATION CERTIFICATE

Certificate Number	00803-21
Instrument Manufacturer:	Environment S.A
Instrument Type:	Ambient Air Quality Monitoring Station
Model Number:	O342e
Serial Number:	8189e
Calibration Date:	August 16, 2022
Calibration Due Date:	August 15, 2023

Calibration Procedure

The instrument detail above has been calibrated to the published test and calibration data as detailed in the instrument handbook, using the techniques recommended in the latest versions of the international standards
EN ISO/IEC 17025
CISPR-11 Radiated RF emission measurements
CISPR-11 Mains Terminal RF emission measurements
IEC-61000-3-3 Mains Terminal voltage fluctuation measurements
IEC-61000-3-2 where applicable.

Calibration Climate Conditions

The climate test conditions were all maintained within the permitted limits of EN ISO/IEC 17025

Temperature	24.4 ˚C ± 0.1˚C	**Relative Humidity**	39.2% ± 1 %rH
Static Pressure:	998 hPa	**Ambient Noise level:**	53 dB

Measurement Results

Sr.	Parameter(s)	Reference Value	Actual Value	Signal Source/Equipment
1-	O3 Gas	25.0 PPB	25 PPB	Ozone Generator
		48.0 PPB	48.6 PPB	Ozone Generator
		81.0 PPB	82.4 PPB	Ozone Generator
		100.0 PPB	101.9 PPB	Ozone Generator

Note:

The measuring instrument is adjusted by a Calibrator 4 levels of adjustment by an Ozone Generator Model T703.

Calibrator Details

Manufacturer	Serial	Description
Teledyne	0182	Ozone Generator Model T703

Calibration by:

Unitech Calibrations

Unitech Calibration Services
296, Business Center,
G11 Markaz, Islamabad
051-8869514
info@unitechcal.com

CALIBRATION CERTIFICATE

Certificate Number	00802-21
Instrument Manufacturer:	Environment S.A
Instrument Type:	Ambient Air Quality Monitoring Station
Model Number:	CO12e
Serial Number:	5891e
Calibration Date:	August 16, 2022
Calibration Due Date:	August 15, 2023

Calibration Procedure

The instrument detail above has been calibrated to the published test and calibration data as detailed in the instrument handbook, using the techniques recommended in the latest versions of the international standards
EN ISO/IEC 17025
CISPR-11 Radiated RF emission measurements
CISPR-11 Mains Terminal RF emission measurements
IEC-61000-3-3 Mains Terminal voltage fluctuation measurements
IEC-61000-3-2 where applicable.

Calibration Climate Conditions

The climate test conditions were all maintained within the permitted limits of EN ISO/IEC 17025

Temperature	24.4 ˚C ± 0.1˚C	**Relative Humidity**	39.2% ± 1 %rH
Static Pressure:	998 hPa	**Ambient Noise level:**	53 dB

Measurement Results

Sr.	Parameter(s)	Reference Value	Actual Value	Signal Source/Equipment
1-	CO Gas	500.0 PPB	499.9 PPB	Gas Diluter + Cylinder
		5.1 PPM	5.0 PPM	Gas Diluter + Cylinder
		10.4 PPM	10.1 PPM	Gas Diluter + Cylinder
		20.0 PPM	19.7 PPM	Gas Diluter + Cylinder

Note:

The measuring instrument is adjusted by a Calibrator 4 levels of adjustment by a Gas Diluter.

Calibrator Details

Manufacturer	Serial	Description
Teledyne	0564	Gas Diluter Model T700
Honeywell Gases	778361	CO Gas Cylinder 100 PPM

Calibration by:

Unitech Calibrations

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ISO 9001-2015 CERTIFIED COMPANY

DEALS IN | Instrumentation | Calibration | Environmental Testing | LiftingEquipments | Inspection | Automation

CALIBRATION CERTIFICATE

CERTIFICATE NO: ESP-104 PAGE NO: 1 OF 1

CUSTOMER NAME: Environmental Services Pakistan. ADDRESS: Office # 731 Block # 2, Sector D-1, Near Riaz Chowk Town Ship, Lahore, Pakistan.	DOC NO. IT-003	
	DOC REV. DATE	REV. NO
	03-03-2018	00

HISTORY OF THE INSTRUMENT:

EQUIPMENT:	Digital Sound Level Meter	PHYSICAL CONDITION:	OK
MAKE/MODEL:	GM 1356	LOCATION:	Field Section
MANUFACTURER:	BENETECH	CODE:	N/A
RANGE:	30 ~ 130 dB	CALIBRATION CONDITION:	23±3°C
UNIT:	dB	HUMIDITY:	45±10%RH
LEAST COUNT:	0.1 dB	CALIBRATIION DATE:	13-08-2022
SERAIL NO:	KI2358262	NEXT CALIBRATION DATE:	12-08-2023

REFERANCE STANDARD INSTRUMENT TRACIBILITY:

Reference Standard Sound Calibrator & Digital Sound Meter. Calibration Certificate No: IT9850-05. Traceable to PMEL APF PAC KAMRA. Which in turn is traceable to International Standards of measurement in accordance with the metrology rule and regulation. Which is in compliance with relevant clauses of ISO/IEC 17025: 2017 Standard requirements.

CALIBRATION RESULTS: (All results in dB)

NOMINAL READING ON INSTRUMENT UNDER CALIBRATION	AVERAGE OBSERVED READING ON THE REFERENCE STANDARD	DEVIATION
94.0	94.1	-0.1
114.0	114.0	0.0

These are test results, not a specification

REMARKS:

The instrument is fit for use.

CALIBRATED BY:		LAB MANAGER :
SIGNATURE: Mohit.	IICE TECH Q.C IICE TECH	SIGNATURE:

END

| Office ||Flat No 206, 2nd Floor,142 Ahbab Colony Multan Road Lahore|
|Cell: 0301-6234840, 0331-5696706 | |Email:iice.tech@hotmail.com| iice.tech@yahoo.com |

ANNEXURE-V

Chance Find Procedure

Chance Find Procedure

Project may involve deep excavation. Therefore, the possibility of chance find is not ignorable. In case of any chance find, the contractor will immediately report through Supervision Consultant to Directorate General (DG) of Archeological Department, Government of Pakistan to take further suitable action to preserve those antique or sensitive remains. Representative of the DG will visit the site and observed the significance of the antique, artifact and cultural (religious) properties and significance of the project. The report will be prepared by representative and will be given to the DG. The documentation will be completed and if required suitable action will be taken to preserve those antiques and sensitive remains.

In case any artifact, antiques and sensitive remains are discovered, chance find procedures should be adopted by contractor workers as follows:

- Stop the construction activities in the areas of chance find;
- Delineate the discovered site or area;
- Consult with the local community and provincial Archeological Department
- The suggestion of the local communities and the concerned authorities will be suitably incorporated during taking the preventive measures to conserve the antique, artifact and cultural (religious) properties;
- Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remain, a night guard shall be arranged until the responsible local authorities take over; and
- After stopping work, the contractor must immediately report the discovery to the Supervision Engineer.

The contact Address of Archeology Department is given below:

Archeology Department

19 Ataturk Ave, Shakar Parian,

Islamabad, Islamabad Capital Territory, Pakistan

ANNEXURE-VI

Traffic Management Plan

1. Objectives of TMP

One of the prime objectives of this TMP is to ensure the safety of all the road users along the work sites, and to address the following issues:

- Safety of pedestrians, bicyclists, and motorists travelling through the construction sites;
- Protection of workers from hazards associated with moving traffic;
- Mitigation of the adverse impact on road capacity and delays to the road users;
- Maintenance of access to adjoining properties; and
- Addressing issues and concerns that may delay the implementation of the proposed project.

2. Operating Policies for TMP

The following policies will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around project sites, while reasonably protecting workers and equipment.

- Make traffic safety and temporary traffic control an integral and high-priority element of project from planning through design, construction, and maintenance;
- Inhibit traffic movement as little as possible;
- Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic routes;
- Inspect traffic control elements routinely, both day and night, and make modifications when necessary;
- Pay increased attention to roadside safety in the vicinity of temporary traffic routes;
- Train all persons that select, place, and maintain temporary traffic control devices;
- Keep the public well informed; and
- Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

  Policy steps for the TMP are shown in **Figure 1.** However, operating policy for TMP for the construction of the proposed project along various types of roads is shown in Figures 2 to 7.



Figure 1: Policy Steps for the TMP

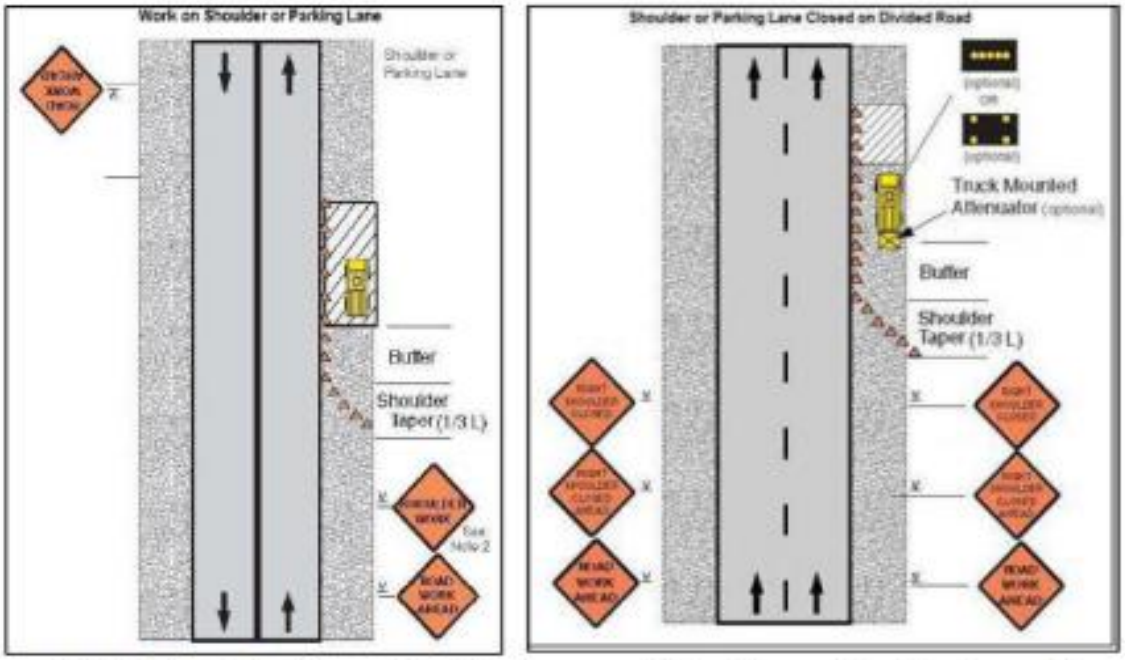


Figure 2: Work on Shoulder and Parking Lane and Shoulder and Parking Lane Closed Divided Road

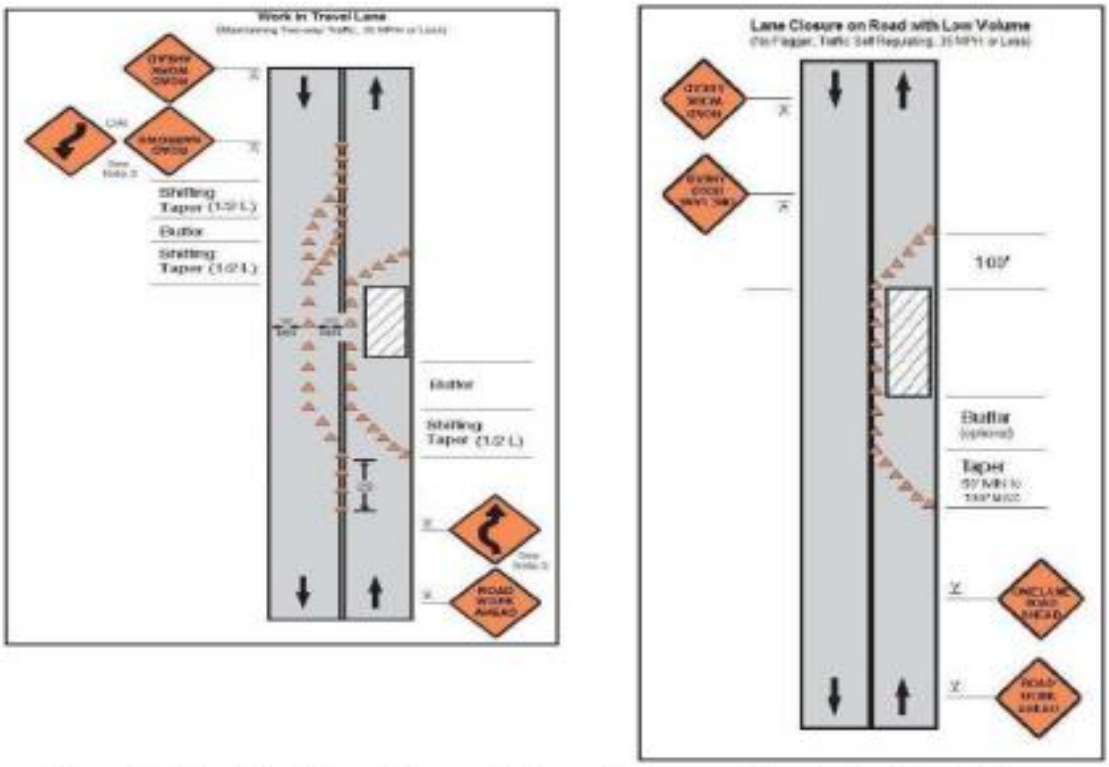


Figure 3: Work in Travel lane and Lane Closure on Road with Low Volume

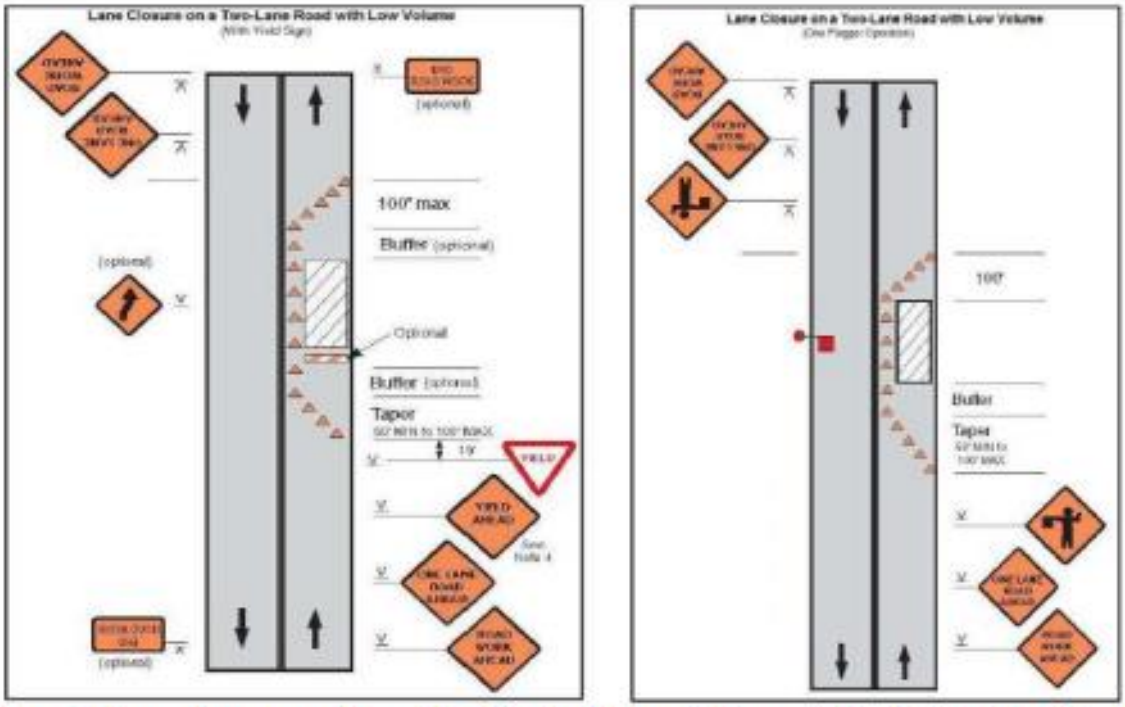


Figure 4: Lane closure on a Two-Line Road with Low Volume (with yield sign) and Lane Closure on a Two-Line Road with Low Volume (one flagger operation)

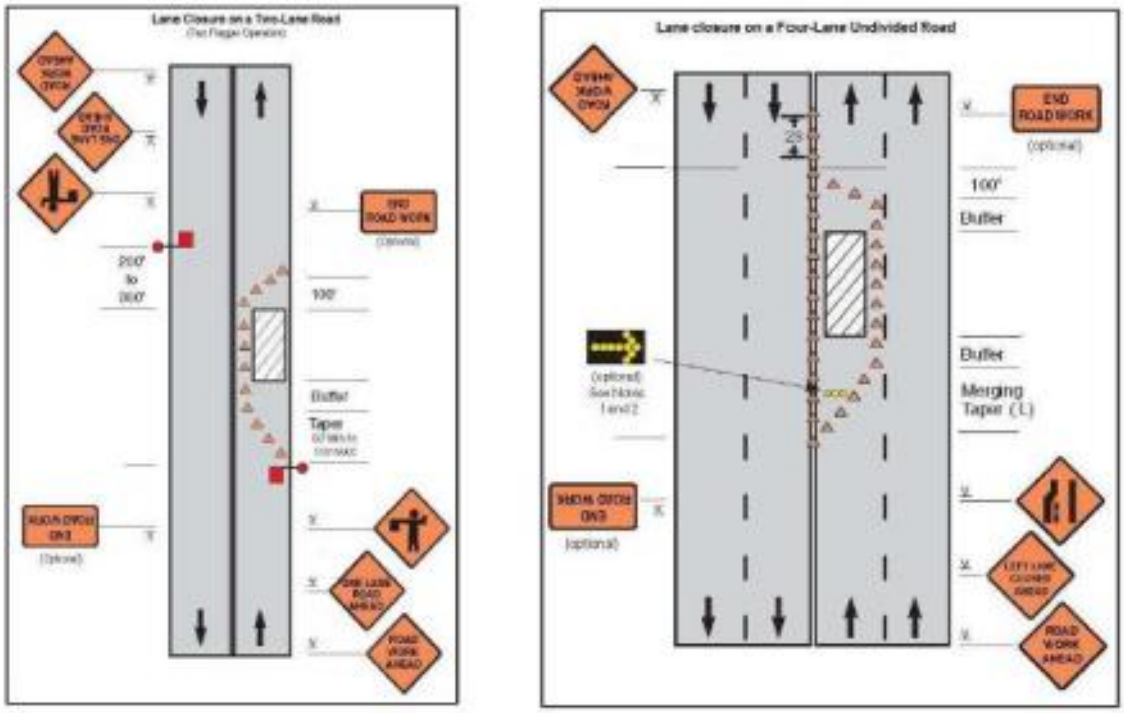


Figure 5: Lane Closure on a Two Lane Road (two flagger operation) and Lane Closure on a Four Lane Undivided Road

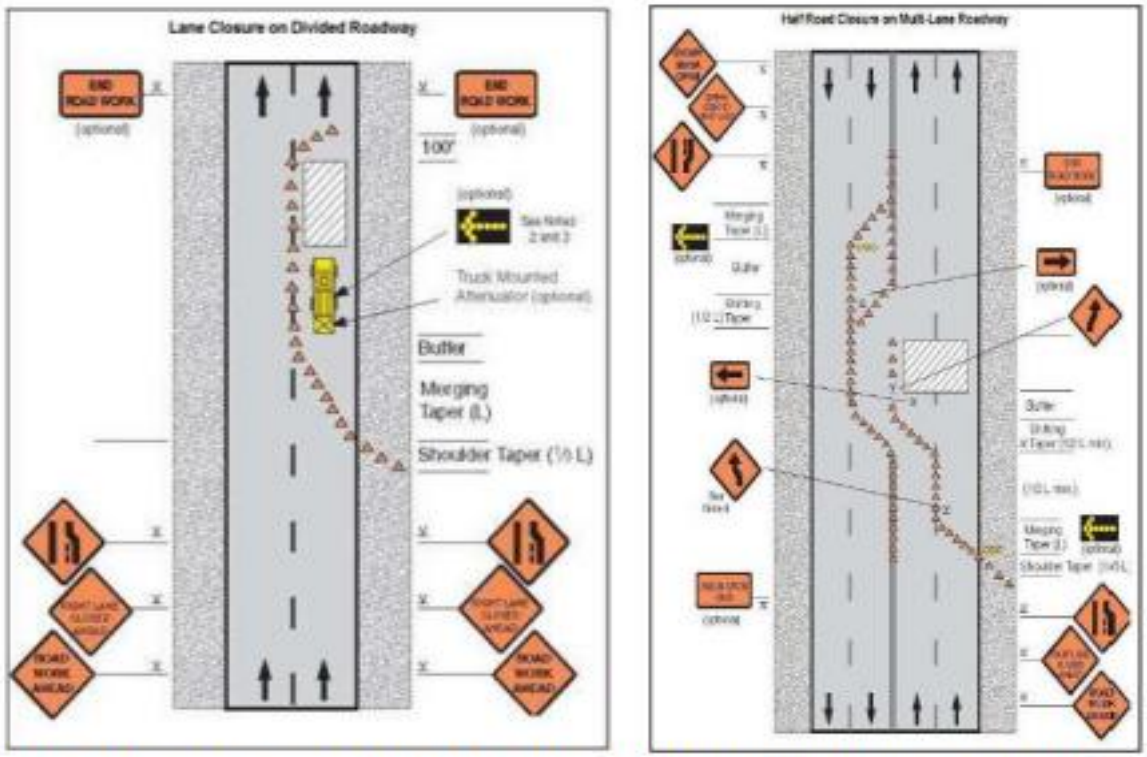


Figure 6: Lane Closure on Divided Roadway and Half Road Closure on Multi-Lane Roadway

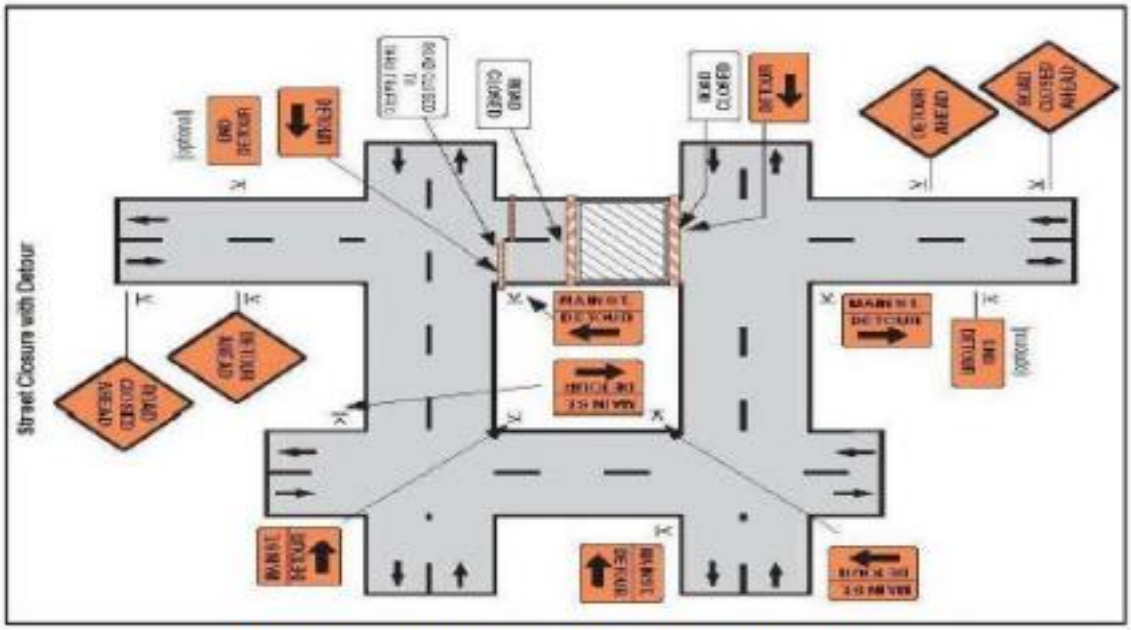


Figure 7: Street and Road Closure with Detour

3. Analyze the Impact Due to Street and Road Closure

Apart from the capacity analysis, final decisions to temporary close a particular street and road and divert the traffic should involve the following steps:

- Approval from the Traffic Police to use the local streets and roads as detours;

- Consultation with businesses, community members, residents, road users and traffic police regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
- determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
- determining if additional traffic control or temporary improvements are needed along the detour route;
- considering how access will be provided to the worksite;
- Contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
- Publish a notice through print and electronic media about road closure to avoid hindrance to public. As part of this notice, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

If full road-closure of certain routes within the proposed project area is not feasible due to inadequate capacity of the Detour Street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

4. Public Awareness and Notifications

As per discussions in the previous sections, there will be travel delays during the construction, as is the case with most construction projects, although on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets and roads in the proposed project sites lack sufficient capacity to accommodate additional traffic from diverted traffic, as a result of street and road closure to accommodate the construction activities.

The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time, when the roadblocks or traffic diversions take place at the particular streets and roads. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project

will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings, and city level meeting with the elected representatives.

The Project Management Unit (PMU) comprising staff members of WASA, Supervision Consultant and Contractor will also conduct an awareness campaign to educate the public about the following issues:

- Traffic control devices in place at the construction sites (signs, traffic cones, and barriers);
- Defensive driving behavior along the construction sites; and
- Reduced speeds enforced at the construction sites and traffic diversions

It may be necessary to conduct the awareness programs and campaigns on road safety during construction.

The campaign will cater to all types of target groups i.e. children, adults, disabled and drivers.

Therefore, these campaigns will be conducted in schools and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the proposed project area and will also be available at the PIU, and the Contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

- Explain why the brochure was prepared, along with a brief description of the proposed project;
- Advise the public to expect the unexpected delays or roadblocks;
- Educate the public about the various traffic control devices and safety measures adopted at the construction sites;
- Educate the public about the safe road user behavior to emulate at the construction sites;
- Inform the public how to stay informed or where to inquire about road safety issues at the construction sites (name, telephone and mobile number of the contact person); and
- Indicate the office hours of authorized representatives.

5. Install Traffic Control Devices at the Construction Sites and Traffic Diversion Routes

The purpose of installing traffic control devices at the construction sites is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the construction sites. The following traffic control devices are used in construction sites:

- Signs;
- Pavement Markings;
- Channelizing Devices;
- Arrow Panels; and
- Warning Lights.

Procedures for installing traffic control devices at any construction sites vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal the roads are narrow but carry traffic. However, regardless of where the construction takes place, all the construction sites should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

Figures 2 to 7 illustrates a typical set-up for installing traffic control devices at the construction sites of the area, depending on the location of work on the road way, and road geometrics:

- Work on shoulder or parking lane;
- Shoulder or parking lane closed on divided road;
- Work in travel lane;
- Lane closure on road with low volume;
- Lane closure on a two-line road with low volume (with yield sign);
- Lane closure on a two-line road with low volume (one flagger operation);
- Lane closure on a two lane road (two flagger operation);
- Lane closure on a four lane undivided road;
- Lane closure on divided roadway;

- Half road closure on multi-lane roadway; and
- Street closure with detour.

The construction sites should take into consideration, for the space required for a buffer zone between the workers and the traffic (lateral and longitudinal), and the transition space required for delineation, as applicable. For the construction works, a 30 centimeter clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 centimeter is necessary to install the temporary traffic signs and cones.

Traffic police should regulate traffic away from the construction sites and enforce the traffic diversion outcome from full street closure in certain areas during construction. Flaggers and personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

In addition to the delineation devices, all the construction workers should wear fluorescent safety, vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

ANNEXURE-VII

Resource Management Plan

1. INTRODUCTION

The most of the resources in this world are finite and non-renewable in nature. We are completely dependent on these resources to fulfill all our daily requirements. Therefore, sustainable development calls for the need to conserve resources in a way that meet our needs of present generation as well as future generation, especially the non-renewable resources.

2. OBJECTIVE OF THE PLAN

The Resource Conservation Plan is intended to make an effort towards achieving sustainable development. The objective of the resource conservation plan is to:

- Minimize the use of natural resources; and
- Mitigate and prevent pollution contaminating the natural resources.

3. PLANNING

Careful estimations of quantities of material, fuel, water and energy required directly or indirectly shall be done to avoid excessive or unnecessary wastage of these materials. In addition to this, pollution prevention strategies shall also be devised to prevent contamination of resources. The estimations include the following:

- Estimation of construction material required for the project;
- Estimation of fuel consumption for construction machinery, construction vehicles and generators;
- Estimations of the energy requirements during all the stages of the project; and
- Estimations of water consumption for construction activities and construction camp sites.
- Strategies shall be planned to reduce loads on the identified resources to be consumed;
- Best management practices shall be devised to control or reduce pollution resulting from the activities during different stages of the project; and
- An inspector shall be assigned responsibility to oversee the ongoing activities to check the compliance of the planned strategies.

4. EXECUTION OF THE PLAN

The planned strategies shall be implemented to conserve the natural resources including but not limited to the following:

Material

- Material supplied shall be in conformance with the estimated quantities and excess material shall be returned to the supplier;
- Material wastage shall be avoided by using best management practices;
- Waste produced during the project execution shall be disposed of safely to the designated disposal sites through approved contractors; and
- Reuse of the materials shall be appreciated.

Energy

- Reduce trips and optimize routes to and from the construction site for all kinds of activities;
- Regular maintenance of equipment and vehicles to avoid leaks and sustain efficient fuel consumption;
- Switch off idle equipment and vehicles to avoid wastage of fuel;
- Minimize warm up time, unnecessary acceleration and deceleration of the construction equipment and vehicles;
- Avoid unnecessary burning of fuel for cooking in construction camps;
- Avoid unnecessary use of heating and cooling systems during extreme weathers events;
- Construction shall start in early hours of the day to avoid heat in summers and utilization of day light; and
- Alternate energy sources shall be considered for electricity generations during construction and operation to conserve fossil fuel as it is non-renewable resource.

Water

- Avoid using potable water for sprinkling, curing and washing of equipment and vehicles.
- Surface water or treated effluent can be used instead;
- Wastage of water should be controlled through providing proper valves and through controlling pressure of the water;
- Unnecessary equipment washings should be avoided;
- Awareness amongst workers shall be raised to conserve water and immediately report for any leaks detected; and
- Ensure protection of canal water from contamination resulting from construction

activities.

Pollution

- Emissions shall be reduced and controlled as far as possible and direct discharges to air shall be avoided by strictly adhering to the mitigation measures outlined in EIA report;
- Waste water shall not be discharged directly into the canal and must be managed as per the recommendations presented in EIA report; and
- Construction waste, and municipal solid waste shall not be dumped and burnt openly, and shall be handled according to the preventative measure given in EIA report.

5. CHECKING AND CORRECTIVE ACTIONS

The R-WASA shall bind the construction contractor through contract agreement to comply with the strategies outlined in the Resource Conservation Plan. The Environmental Committee shall also appoint an Inspector who shall monitor the daily onsite activities and shall report any issues and concerns raised in relation to Resource Conservation Plan. The inspector shall recommend adequate corrective actions to mitigate the issues raised.

ANNEXURE-VIII

Occupational Safety and Health Management Plan

1. Framework for Occupational Health and Safety Management Plan

It is required that all personnel working on the project attend the Health and Safety site induction briefing prior to commencing any work on the site.

The General Site Rules shall act as the main agenda and content of the induction briefing. Additionally, any information specific to the project shall be included in the induction. The induction briefing should be, as far as possible, two-way communication with attendees invited to contribute, comment and ask questions regarding health and safety. Other rules are as follows:

- All attendees of the induction briefing will be recorded.
- High visibility jacket/vests, safety helmets and safety footwear (incorporating steel toe- caps and mid-sole) must be worn at all times.
- Safety goggles for protection during all cutting, grinding and drilling operations or where there is risk from impact, dust, chemicals or hot metal.
- Dust masks for protection from dust.
- Ear protection during all operations which produce noise above the level at which you need to raise your voice to be heard. Gloves during concreting work.
- On this site, formal permits must be in place before any of the following operations may be carried out: Permit to Excavate, Hot Work Permit & Confined Spaces Permit. (Where Applicable), thoroughly understand it and get permission from area supervisor (If required).
- Follow the messages and instructions displayed on HSE boards installed on site.
- Be aware of emergency muster (assembly) points and escape routes. In the event of an emergency do not panic, follow the site emergency response procedures.
- Report promptly all accidents to your supervisor and HSE officer at site. Immediately provide first aid for the injured and call for the medic.
- While working alone or in a confined space make sure that your nearby colleague and supervisor are well informed or use a banksman where appropriate.
- Ensure adequate lighting is in place for work on night shifts or for emergency response.
- All Scraps, waste materials and garbage must be disposed of in accordance with the construction waste management Strategy.
- Always clean your work site after completing the job or your shift.
- Maintain appropriate barricades as required.

- Never tamper with electric cables and appliances. Never insert direct cables into sockets, rather use proper plugs.
- Do not enter scaffold that is not tagged safe for access.
- Tools or materials must not be carried while climbing up or down scaffolding or ladders.
- Use pouches or ropes for this purpose.
- Do not smoke or produce naked flame in NO SMOKING area. Use of open fire is prohibited.
- Keep all gangways and aisles clear and clean at work sites.
- Vehicles must be driven at a safe speed, observing speed limits. Drivers must have a valid driving license for the class of vehicle they are operating.
- Vehicles shall only be parked in designated parking areas. Never travel in a vehicle unless in seating equipped with a seatbelt.

Site HSE Roles and Responsibilities

1.1 Project Manager (PM)

i. Develop and disseminate policies for occupational health and safety management systems and environmental management systems

ii. Provide resources for the management and implementation of occupational health and safety management systems and environmental management systems

iii. Responsible for ensuring the implementation of occupational health, safety and environmental policies

iv. Aware of the relevant maters of environment, health and safety.

v. Allocate Budget and Provide resources for the implementation of HSE Plan in its true spirit.

vi. Attend meetings regarding the Health Safety and Environment.

vii. Report Health Safety and Environment matters to the management of the company as required.

1.2 Construction Manager (CM)

- Responsibilities include, but not limited to:
- Well conversant with international & local, Health, Safety & Environmental rules, regulations and current legislation.
- Ensure that all senior site staff is also conversant with the relevant requirements of current legislations and EPC contractor HSE plan.

- Ensure that site personnel are assigned appropriate duties and responsibilities accordingly to assist in the effective implementation of this HSE Plan.
- Ensure no job is carried on without supervision.
- Approve work methods statements; ensure safety procedures are established and undertaken.
- Funds for essential HSE facilities, equipment and personnel are made available.
- His own personal behavior supports, strengthens and confirms the site's HSE management program.

1.3 Environmentalist/HSE Officer

i. Carry out safety inspection of Work Area, Work Method, Men, Machine & Material and other tools and tackles.

ii. Facilitate inclusion of safety elements into Work Method Statement.

iii. Highlight the requirements of safety through Tool-box/other meetings.

iv. Conduct investigation of all incident/dangerous occurrences & recommend appropriate safety measures.

v. Advice & co-ordinate for implementation of HSE plan in its true spirits.

vi. Convene HSE meeting & minute the proceeding for circulation & follow-up action.

vii. Plan procurement of PPE & Safety devices and inspect their healthiness.

viii. Report to Project Manager (PM) and Resident Director EPC contractor on all matters pertaining to status of safety and promotional program at site level.

ix. Facilitate administration of First Aid

x. Facilitate screening of workmen and safety induction.

xi. Conduct fire and other emergency Drills and facilitate emergency preparedness

xii. Design campaigns, competitions & other special emphasis programs to promote safety in the workplace.

xiii. Recommend to Site In charge, immediate discontinuance of work until rectification, of such situations warranting immediate action in view of imminent danger to life or property or environment.

xiv. To decline acceptance of such PPE / safety equipment that do not conform to specified requirements.

xv. Encourage raising Near Miss Report on safety along with, improvement initiatives on safety.

xvi. Ensuring that all injuries, accidents, incidents/near misses and hazards are positively and timely reported.

xvii. Assisting Engineers/Area Supervisors in accident/incident investigations, where required Attending and positively contributing in the HSE Committee Meetings.

1.4 Workers

- Use the proper tools and equipment when operating. According to the requirement of operation and different hazard sources using the PPE and protective clothing provided by company, such as, helmets, safety harness, goggles, safety vest, and other personal protective equipment
- Maintain the tool and keep the tool clean after job completion.
- Report to the site supervisor or on-site project manager for the equipment damage and hidden danger.
- Develop personal safety awareness - including workers themselves and others, especially new employees and young people.
- Avoid unnecessary risk generation.
- For known sources of danger, remind new employees to stay away from these hazards.
- It will strictly be forbidden to play in the construction area or to damage the public utilities.
- Provide advice on how to eliminate hazards.

1.5 Sub-Contractor HSE Management

i. Sub-contractor's employees shall immediately correct all unsafe conditions & acts as directed by Contractor Direct supervision. Unsafe acts by any personnel may be grounds for immediate removal and permanent banning from the project site.

ii. Only properly trained employees shall be authorized by sub-contractor to operate equipment, machinery, vehicles & tools.

iii. All Sub-contractors are required to follow safe work practices, and meet the requirements clearly identified in field HSE PLAN.

iv. The Sub-contractor shall erect & maintain safeguards for the protection of workers, any other sub-contractors & the public and eliminate or mitigate HSE hazards created by or otherwise resulting from performance of the work.

2 Communication and HSE Meetings

2.1 HSE Targets and Goals

Pursuant to the Policy Statement, the following HSE Targets and Goals are identified in order to create a positive approach to health, safety, and protection of the environment during all activities of the project; this will be achieved by employing competent and motivated staff:

i. To avoid all personal injuries during the execution of the Project,
ii. To ensure that all personnel employed on the Project are competent to carry out their designated tasks safely.
iii. To create positive health, safety and environment attitudes and perceptions at all levels of the Project organization, and to raise health safety and environmental awareness in general.
iv. To implement a training program that supports the achievement of personnel competency in relation to Health, Safety, and the Environment.
v. To complete the Project without incurring any significant property damage to permanent equipment, or temporary facilities.
vi. To complete the Project with minimum avoidable impact upon the surrounding environment.
vii. To implement a hierarchy of communication forums that ensure that HSE concerns can be raised and addressed at all levels of the organization. To continually monitor and improve HSE performance.

2.2 HSE Score Board

Environmentalist/HSE Officer will arrange a HSE score board and display at the key location of the project site facilities. Information on the HSE Score Board will be updated on daily basis.

2.3 HSE Awareness Sign Boards

HSE awareness signboards shall be displayed at key locations around the site to create and maintain awareness and ownership of HSE issues.

2.4 Internal Site HSE Committee Meeting

Internal HSE Committee Meetings chaired by the Site Manager/Construction Manager, will be held monthly with all Area Supervisors and nominated Engineers,

Supervisors and support staff. HSE committee meetings will allow communication of HSE performance and corrective actions. All-important HSE matters of the site as well as the non-compliance reported in the current month will be discussed in these meetings.

1.3 Performance Monitoring

1.3.1 Performance Review in Site HSE Committee Meetings

Performance reviews shall be held on monthly basis in the Internal Site HSE Committee Meetings. The objective of the review is to gather information from monitoring, inspection and site working activities and to assess the effectiveness of the implementation of HSE procedures on site. The key performance indicators are:

a. Compliance with Health, Safety and Environment standards

b. Identification of areas not addressed in the HSE Plan

c. Achievement of specified HSE objectives

d. HSE statistics, root cause and trend analysis of the statistics

1.3.2 HSE Inspections of Equipment and Tools

a. The Site Manager will ensure that no Civil, Electrical or Mechanical equipment will go to the working area without HSE inspection.

b. Environmentalist/HSE Officer will co-ordinate with Equipment and Plant Department for the inspection of all Civil, Electrical and Mechanical equipment or the inspection of Civil, Electrical and mechanical equipment,

c. If during inspection, any equipment is found sub-standard, Manager Site HSE is authorized to reject this equipment and inform the Site Manager.

1.4 Incident / Accident Reporting and Investigation

1.4.1 Objective

The objective of incident reporting, investigation & analysis is to identify the cause(s) of an incident to allow for preparation of recommendations, to avoid recurrence of such incident(s) in future.

1.4.2 Incident Reporting and Investigation

Any work-related incident, accident, injury, illness, exposure, or property loss must be reported to your supervisor, the SS, and within 1 hour. Motor vehicle accidents must also be reported. A report must be filed for the following circumstances:

a) Accident, injury, illness, or exposure of an employee;

b) Injury of a subcontractor;

c) Damage, loss, or theft of property; and/or

d) Any motor vehicle accident regardless of fault, which involves a company vehicle, rental vehicle, or personal vehicle while the employee is acting in the course of employment.

e) HSE Officer shall brief the Management about the lost time injury/fatal cases and serious incidents/near-misses.

f) Project Manager and Construction Manager will review the incident report and comments on the recommendations of the Site HSE Staff. They will then assign corrective actions accordingly.

g) Occupational accidents resulting in employee injury or illness will be investigated by the SS. This investigation will focus on determining the cause of the accident and modifying future work activities to eliminate the hazard.

h) All employees have the obligation and right to report unsafe work conditions, previously unrecognized safety hazards, or safety violations of others. If you wish to make such a report, it may be made orally to your supervisor or other member or management, or you may submit your concern in writing, either signed or anonymously.

i) The Site HSE Staff shall carry out a follow up of the recommendations/corrective actions from time to time where he identifies ongoing non-compliance he shall inform the Project Manager Construction Manager.

1.5 Orientation, Site HSE Induction and Other Training Activities

1.5.1 Initial HSE Orientation Program

Each and every person will undergo a HSE orientation program. On completion of orientation he will be issued an Organizational Identity card. Contractor Site HSE Staff shall perform the initial orientation based on but not limited to the following:

- Explaining Organizational HSE Policy and Standards.
- General HSE rules and regulations for working in a Construction Site, Batching plant, Excavation Area, Mechanical and Electrical work including use of Personal Protective Equipment, incident reporting, getting first aid, emergency response, (HSE inspection, housekeeping, etc.
- Hazards at construction site, works, offices, or any miscellaneous work.
- Specific hazards like height, open excavations, electrical, fire, Fumes (including spray painting) and vehicle safety etc.
- Environmental hazard.

1.5.2 Daily Tool Box Talk by Supervisors/HSE Officer

HSE tool Box talk shall be conducted by Supervisor/HSE Officer for specific work groups prior to the start of work. The tool box is a forum for two- way communication between management and the employees. Tool box talk is focused on a specific job. The agenda shall consist of the following:

- Details of the jobs being intended for immediate execution.
- The relevant hazards and risks involved in executing the job and their control and mitigating measures.
- Specific site condition to be considered while executing the job like high temperature, humidity, unfavorable weather etc.
- Recent non-compliances observed.
- Appreciation of good work done by any person.
- Feedback from employees
- Any doubt clearing session at the end.
- Record of Tool box talk shall be maintained as per format attached.
- Incidents, which may occur in the site/works, shall also be discussed in “tool box talks”.
- Daily tool box talk record format is attached as Annex. “A”.

1.5.3 HSE Training During Project Execution

HSE training shall be arranged by contractor as per the need of the project execution and recommendation of HSE committee of site.

1.5.3.1 Site-Specific Training

Prior to working at this site, an initial site-specific training session or briefing shall be conducted prior to commencement of work activities. During this initial training session, employees shall be instructed on the following topics:

- Personnel responsibilities;
- Content and implementation of the HASP;
- Description of assigned tasks/scope of work;
- Site hazards and controls;
- Site-specific hazardous procedures (e.g., lining activities, etc.);
- Coordination of Site activities;
- Training requirements;
- PPE requirements;
- Emergency information, including local emergency response team phone numbers,
- route to nearest hospital, accident reporting procedures, evacuation routes and procedures, location of assembly points, and emergency response procedures;
- Instruction in the completion of required inspections and forms; and
- Location of safety equipment (e.g., portable eyewash, first aid kit, fire extinguishers, etc.).
- The various components of the project HASP will be presented followed by an opportunity to ask questions to ensure that each attendee understands the HASP. Personnel will not be permitted to enter or work in potentially contaminated areas of the Site until they have completed the Site-specific training session.

1.5.3.2 Safety Meeting/Health and Safety Plan Review

"Tailgate" safety meetings will take place each day prior to beginning the day's work. All Site personnel will attend these safety meetings, which may be contracted personnel, subcontractor personnel, or personnel from contractors. The safety meetings will cover specific health and safety issues, Site activities, changes in Site conditions, and a review of topics covered in the Site-specific pre-entry briefing.

1.5.3.3 Management Employees Training Program

- The management employees training program will be conducted during the project to ensure that all management employees are trained.

- An HSE specialist from contractor head office shall conduct the meetings, during his visit to site.
- The duration of this course would be half day.

Annexure Sub-A

HSE TOOL BOX TALK RECORD	Quality Records Forms	
		Doc. Version 1

Project Title: **Augmentation of Water Supply to Rawalpindi City Based upon Chahan Dam**

Project Section:

Topic: _____ **Date** _____

SR. NO.	NAME OF WORKER / STAFF	CRAFT	AREA	CONTRACTOR	REMARKS

Delivered By **SITE HSE OFFICER**

ANNEXURE-IX

Emergency Response Management Plan

Emergency Response Plan

Contractors are committed and obliged to protecting the community, workers, public and concerned company's property and the surrounding environment; in the emergency situations. These situations shall be handled through the implementation of an Emergency Preparedness and Response Plan (EPRP). The construction contractors shall meet with the local emergency service institutions and law enforcement agencies i.e. Fire and rescue 1122, Police, to review and discuss the construction process, including unique construction equipment(s), the overall construction process, and schedule/phasing. This plan will be communicated to all the concerned and personnel who will be responsible for managing the emergency situations, and those who will be effected by the emergencies.

1. Purpose

The purpose of the emergency response plan is to identify the actual and potential hazards and their risks, organize responsibilities, identify the resources and plan to utilize them in order to control and minimize impacts of risks in an efficient way. This plan is applicable to all construction processes and sites, machinery/ equipment and materials. It includes preparation to respond in the event of fires, incidents/ accidents involving personnel injuries, property damages etc., hazardous materials emissions, explosions, and natural disasters i.e. flood, earthquake etc. This plan also includes preparation to respond in the event of riots, arsons, terrorist attacks etc.

1.2 Objectives

The objectives of this plan are;

i. To develop, maintain, implement, check and improve procedures and practices which will ensure efficient utilization of available resources; in order to protect workers and staff from impacts of hazard's risks.
ii. To minimize impacts of emergencies and unplanned happenings.
iii. The plan includes preparedness and response mechanisms.

1.3 Scope

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

i. Construction Accident
ii. Road & Traffic Accident
iii. Hazardous material spills
iv. Structure collapse or failure

v. Trauma or serious illness
vi. Sabotage
vii. Fire
viii. Environmental Pollution
ix. Loss of person
x. Community Accident

1.4 Types of Emergencies

Following is a list of the hazards and emergency situations, which need planning and proper handling to minimize their risks.

- Fire
- Road Traffic Accidents,
- Materials/ effluents spills i.e. asphalt, POL, etc.
- Natural disasters i.e. torrential rains, floods, earthquakes
- Occupational accidents i.e. fall, electrocutions, cave-ins
- Arsons, vandals
- Terrorist attacks, etc.

1.5 Responsibilities

1.5.1 Alerting

The following procedures will be prescribed for internal reporting of emergencies:

i. The Emergency Response Coordinator (ERC) will awaken on-site personnel, including visitors, of the nature of the emergency.
ii. The ERC will activate and deploy the concerned ERTs, and notify and inform the project person in-charge, emergency medical assistance/ Rescue 1122, fire department, Police etc., whoever and whenever needed.
iii. Concerned Project Manager (PM) or whosoever is in-charge of the project shall only be authorized to speak on contractors' behalf to outside agencies (police, fire department, medical services, Media etc.) during an emergency situation.
iv. The ERC will identify any need for security measures at the Project Area during any emergency and will notify the concerned project or security person in-charge.
v. When any person identifies an emergency situation, or the potential for an emergency situation, and reports it to the ERC, the ERC will then activate the Emergency Response Team.
vi. The supervision consultant shall be notified in writing within 24 hours of any emergency situation.

1.5.1 On Site Person In-charge

The Contractor's on-site in-charge shall be responsible for handling emergency situations for concerned site. He will act as Emergency Response Coordinator (ERC) and shall be responsible for ensuring that all subcontractors, staff, on-site visitors and others adhere to the appropriate emergency response procedures as stated in this Plan.

1.5.2 Emergency Response Team (ERT)

Emergency Response Team shall be for matted at all camps, each team comprised of 3 or 5 members including and lead by the ER Coordinator or the concerned person in-charge. All the members of the ER Team shall be trained in basic First Aid, search & rescue and firefighting; that will further provide search& rescue, first aid and arrange transportation in case of accidents and emergencies, and extinguish fires, guide workers and staff to assembly points and other safe places. The ERT shall assist the ER Coordinator in accidents investigation. The contact details of the ERTs shall be posted at prominent places so that all workers are aware of them.

Project Manager	Person In charge (ERT)
Environmentalist/HSE Manager	HSE Coordinator (ERT)
Admin / Labor Team Lead	ERT Team Member

1.5.3 Safety Training

On-site induction, Tool Box Talks (TBT), trainings shall be organized by the Emergency Response Coordinator/ HSE Officer/ Engineer regarding the health & Safety measures from potential and existing hazards, environmental protection, etc. New workers and staff shall be orientated regarding their work and the potential hazards, and safety from them. All trainings shall be recorded and communicated to the Supervision Consultant.

1.5.4 Site Inspections

The concerned HSE Officer/Engineer shall visit and inspect all the worksites, plants, machines, workshops, laboratories, working platforms, safety equipment etc., on regular basis, record and notify findings to the concerned Project Manager/ person in- charge. In- case of any observations i.e., unsafe equipment, un-safe acts, violations, absence of safety equipment, etc. required control and mitigation measures must be communicated to the concerned person in charge and workers/staff must implement those measures immediately.

1.5.5 First Aid Post / Box

First aid post shall be established at all camps & plants or first aid box provided as per the requirement. The concerned ERTs shall be trained in basic first aid. The first aid post/ or the facilities where first aid box are kept shall be indicated prominently.

1.6 Emergency Response Procedures

1.6.1 Fire

Fire is a major cause of deaths, disabilities and deaths at house hold and work-places. Most of ten fires are caused by in appropriate and unsafe use of materials and equipment. All personnel at camp sand plants shall be trained in fire safety and use of fire Extinguishers. Fire extinguishers, no Smoking sings etc. shall be installed at all camps, offices, plants, stores, fueling stations, workshops etc. In case of fire, areas with potential to be affected shall be evacuated immediately and gathered at the assembly point, or any other safe zone. The ERTs shall be activated. The fire if at initial stages shall be extinguished with keeping in view personnel safety of employees/ workers at priority. The emergency services i.e. fire brigade, rescue 1122 shall be called immediately. All the fire safety equipment and signs shall be regularly inspected and maintained. The reasons for accidents shall be recorded; mitigation or control measures designed and communicated to all employees. The situation must be recorded and reported to the Supervision Consultant within 24 hours of the incident.

1.6.2 Road Traffic Accidents (RTA)

All the drivers at site shall be made aware regarding safe driving practices at the active construction site, borrow areas, camps to avoid accidents. All the drivers shall be trained, motivated and enforced in use of seat belt, obeying speed limit and traffic signs i.e. diversion, speed limits, U-turns, etc. which shall be installed at all required locations. In case of any RTA the concerned ERTs shall be activated; first aid shall be provided to injured person (God Forbid) if any on the spot, transported to the nearest emergency medical facility or the first aid post at the nearest concerned camp. The concerned ER Coordinator or the person in-charge shall be informed immediately. The reasons for accidents shall be investigated, recorded; mitigation or control measures designed and communicated to all employees through a series of trainings, orientations. The situation must be recorded and reported to the Assistant to Employer Representative (AER).

1.6.3 Materials / Effluents Spills

Spillage of liquids hazardous to workers' health, wild life and property shall be avoided. Concerned workers shall be trained in proper and safe handling of such materials. PPEs shall be provided and their unseen forced on the concerned workers. In case of liquids and effluents spills the spills must be controlled through spill control kit, collected and properly disposed which does not affect human or wild life. Spillage of significant amount shall be recorded and reported. Concerned workers shall be orientated on the findings of the reasons for spillage and control measures.

1.6.4 Natural Disasters

Since the project area in view of the past weather record is not subject and vulnerable to torrential rains, floods, earthquake; however, the camps shall be established at safe places, and in case of torrential rains, floods workers shall be alerted and mobilized to safe places prior to the impact. In case of earthquake all personnel shall evacuate settlements and gather at the assembly point or any other safe place. The ERTs shall be activated. In case of personnel injuries, first aid shall be provided on the spot and causality(s) transported to the nearest emergency medical facility/ hospital. In case of property damage, its causes shall be recorded and reported to the SC.

1.6.5 Occupational Accidents

All the workers and staff at active construction sites, camps, plants, and workshops shall be trained and orientated on occupational health and safety measures. Tool Box Talks (TBT) shall be organized by the concerned HSE Head/Manager, or site in-charge prior to any new activity or activity potentially hazardous. All such activities shall be recorded and reported accordingly. PPEs shall be provided to all workers and they shall be trained in their proper use and maintenance. All measures needed for the health and safety of workers and staff shall be put in place to a safe and healthy working environment. In case of falls from heights, electrocutions, cave-ins, etc., casualty(s); the ERTs shall be activated; they shall provide first aid and transport causality(s) to the nearest emergency medical facility or the concerned nearest camp/ first aid post. Transportation arrangements must be made immediately and the concerned ER Coordinator or person in-charge must be informed immediately. The happening must be recorded and reported to the Assistant to Employer Representative (AER). The incident must be investigated, findings recorded, control measures devised; and communicated to all concerned, in order to avoid such happenings in future. Daily Tool Box Talk Format and Incident Investigation Format are also formatted for the project.

1.6.6 Arsons / Vandals

All the social disputes among the contractor and workers, subcontractors, and community shall be settled peacefully, with mutual consensus; however, in case of unpleasant situations safety of the workers and staff shall be the priority, and the nearest police station shall be informed to protect employees. Social framework agreements may be signed to sort out the community matters if any.

1.6.7 Terrorist Attacks

Contractor's own security system will be launched to provide the Security to staff workers and labors and visitors and also security for foreigners, who shall escort them at all construction sites, plants and camps or wherever they move. No foreigners shall be allowed to move outside work areas without Police escort. For security, the contractors have also

arranged private security to protect worksites, stores and camps at day and night and prevent, unauthorized trespassing. In case of any terrorist attack (God forbid), safety of the workers and staff shall be the prime priority; however, they shall be trained to protect themselves and seek and move to safe places, moreover the nearest Police/ Elite Force station shall be notified immediately for additional security and further safety.

1.6.8 Emergency Contact Number

Emergency Response personnel/Team will be available during the whole Project and will be utilized to assist during emergency situations or provide first aid as needed.

Project Manager	Person In charge (ERT)
Environmentalist/ HSE Manager	HSE Coordinator (ERT)
Admin / Labor Team Lead	ERT Team Member

In case of any emergency, Safety Manager or designated person will be authorized to Contact the external public safety agencies/emergency services. Following are the contacts of emergency services.

Fire	16
Police	15
Edhi Rescuer	115

1.7 Fire Prevention and Fire Fighting

1.7.1 Purpose

The purpose of this procedure is to highlight the fire hazards, precautions and suppression facilities required for the Projects. The responsibilities of various staff for this purpose are stated in the table below:

Sr. No.	Staff	Responsibilities
1	**Construction Manager**	Ensures that procedure is understood and being applied appropriately.
2	**Site Health, Safety and Environment Staff**	Responsible for the improvement of this procedure and monitoring compliance and introducing whatever training is required for fire teams, fire wardens and personnel.
3	**HSE Supervisors**	Office and Camp "FIRE ACTION" notices are displayed at strategic locations, and that sufficient "Emergency Assembly Points" are set up, and regular practice evacuation drills are performed. A number of office/ camp staff are being assigned with the responsibility to act as fire wardens Office/camp staff (in particular new starts) has been briefed and keeps updated on fire and emergency response procedures. Awareness to control flammable materials being used on the premises. Daily checks of the office to ensure that walkways are not blocked, carpet and other fittings are properly secured, fire doors kept closed and that the means of escape are available. Kitchen areas are being monitored to ensure that electrical fittings have been turned off after use and do not present a fire hazard. Training for the use of fire extinguishers has been to staff/workers and signs have been displayed on various locations indicating the emergency procedures.

		'No Smoking' policy applies in the Meetings/conference rooms. Common social areas, mess halls and toilets, within the camp, are checked before closure of possible ignition sources following each meal time and at end of evening.
4	**E & M (Electrical and Mechanical) Manager**	E & M Manager shall ensure that the following control measures are in place: • Workshops are maintained in a neat and tidy manner and that waste oil, rags and other flammable materials are removed at the end of each shift or as necessary. • Maintenance crews are properly trained for the use of fire extinguishers, raising the alarm and fire hazards on the work place. • Battery recharging will be conducted in well-ventilated separate areas, with no smoking signs and fire extinguishers in place • Areas around pedestal grinders and other hot work type activities are kept free of combustibles. • Welding and burning shall be screened and controlled to prevent fire risk and exposure to personnel • That flammable liquid such as gasoline, diesel etc. are not used for cleaning purposes and their container is marked as per the containment. • Provision of adequate storage areas that are located in places where exits, passage ways and stairways are not adversely affected • Flammable liquids are stored safely, in a neat and tidy manner with adequate HSE signs provided

1.7.2 Cutting and Welding

Particular care will be taken while carrying out hot work operations on the locations where combustibles are available. This will include precautions such as; inspection of the surrounding area, removal of any combustible materials, protection by fire blankets and provision of fire extinguishers.

Compressed gas cylinders shall be closed when not in use, and shall be stored, properly secured and used in an upright position at all times. Protective end caps will be fitted when being moved or transported (unless by cylinder trolleys).

Compressed gas cylinders shall be kept clear of electrical equipment and cabling where they are part of an electrical circuit

1.8 Hazard Analysis and Risk Management

Hazard Analysis and Risk management techniques shall be adopted so that potential hazards are identified and evaluated prior to execution, thereby enabling either substitution or adoption of control techniques.

1.8.1 Purpose

To ensure that all steps are taken to control hazards identified in a job and provide a safe working environment.

1.8.2 Typical Hazards

Following are examples of typical hazards that can be encountered:

- Falling objects
- Welding
- Gas cutting
- Grinding
- Erection of steel work
- Installation of pipeline etc.
- Transportation / Lifting of heavy equipment
- Excavation Work

1.8.3 Control Hazard

The hierarchy of Risk/Hazard Control is used to determine risk reduction measure in order of their effectiveness, as follows:

- Elimination or substitution of the task / job step or substance.

- Engineering Control Including guarding and mechanical aids such as scaffolding, extraction ventilation and alike.
- Administrative Controls Including permits, training, signage, reduction in time or personnel exposure personal Protective Equipment

1.9 Personal Protective Equipment

1.9.1 Purpose

This procedure has been developed to ensure that all site personnel on the project are provided with, and wear or hold, appropriate Personal Protective Equipment (PPE) to protect them against work related hazards which may endanger their health, safety and environment.

1.9.2 Scope

This procedure applies to all contractor personnel employed including all of Sub- contractor's deployed at the project.

1.9.3 Definitions

Personal Protective Equipment is defined as equipment designed to be worn or held by personnel to protect themselves against work related hazards which may endanger their health and safety.

1.9.4 Instructions

The risks posed in any particular work activity shall be assessed, and adequate PPE selected in accordance with the following criteria:

- Gives protection against risk(s) without itself leading to any increased risk is suitable for the personnel involved in the work including correct fitting. Is compatible with the work activity.

1.9.5 Basic Personal Protective Equipment (PPE)

Basic and minimum PPE requirements for the safe execution of proposed project are as:

- Safety helmet of plastic construction, manufactured in accordance with standard.
- Safety footwear with steel toe protection manufactured in accordance with standard.
- The construction and sole materials shall be chosen in accordance with the activity and adequate for the place of work.

- In addition to above, EPC contractor shall also supply coveralls to employees working in workshops.

1.9.5.1 Eye and Face Protection

Suitable protective goggles, face shield or screens shall be worn by personnel involved in, assisting with or adjacent to any activity where there may be a danger of projected debris, dust, sparks or other particles; corrosive fluids or mists; excessive heat, light or other harmful radiation.

1.9.5.2 Respiratory Protection

Respiratory Protective Equipment shall be available to all persons who are exposed to any situation in which there is a possibility of the atmosphere being or becoming deficient in oxygen or containing any harmful substance, whether particle, dust mist, vapors or gas.

1.9.5.3 Hearing Protection

Hearing protection shall be made available to all workers exposed to noise levels of 85 dB (A) or above. The selection of type of protection shall be in accordance with the type of noise hazard and the work being performed. In all work environments where the noise level is at or above 85 dB (A), prominent signs in English and in local language shall be displayed indicating the need for ear protection. A visual sign in the form of a line drawing of ear muffs shall also be displayed.

1.9.5.4 Hand and Arm Protection

Adequate hand and arm protection shall be available for all manual labor. The type of protection worn shall be selected according to the hazard to be protected against. These include but not limited to:

- Impacts, cuts, abrasions and infections.
- Extreme temperatures.
- Chemical, toxic, corrosive and other hazardous substances.

WORK ACTIVITIES	SUITABLE PPE
Excavators, breakers, Chippers, drillers.	Protective goggles, hand gloves, Safety helmets and Safety shoes.
Mixing cement, concrete, Lime mortar, asphalt material, refractory material.	Safety goggles, gloves and protective foot wears.

Electricians	Insulated tools, Rubber hand gloves and electrical resistant shoes, mat.
Grinders	Protective goggles and leather hand gloves
Gas cutters, welder's helper	Colored goggles, leather hand gloves.
Welders	Welding screen, safety shoes with rubber sole, Leather hand gloves.
Workers engaged in	Dust mask, hand gloves
High noise level area i.e. D.G operator working, near piling work, compressor operator etc.	Ear plug / ear muff
Working in dusty	Dust mask, Safety goggles.

1.9.5.5 Harnesses

Harnesses shall be provided, worn and properly secured in all work situations, when other safeguards such as nets, planking, or scaffolding cannot be used. Such situations include, but are not limited to:

- Working on scaffolding.
- Work on any high structure, whether in construction or batching plant site.

1.9.5.6 Transportation

Only vehicles necessary to the construction operation shall be permitted on site.

- It shall be ensured that only authorized and competent personnel are allowed to drive vehicles.
- Loads shall be within the safe weight limit for the vehicle and shall not project beyond the vehicle body in such a manner as to present a hazard to other vehicles, pedestrians or adjacent structures.
- Passengers shall not be carried unless a proper seat is provided.
- Personnel shall not get on or off any vehicle whilst it is in motion.
- All vehicles shall be parked on level ground with the hand brake applied.
- Keys shall be left in the ignition unless at an authorized car park.

- Vehicles shall not block access or emergency points.
- All drivers of vehicles shall be in possession of a valid license for the class of vehicle.
- All drivers shall go through an orientation before entering the site.
- Vehicle Inspection is attached as Annex “A”.

1.9.5.7 Speed Limits

During the project laid down speed limits for the vehicles will be strictly observed.

1.9.5.8 Drivers’ Responsibilities

Drivers’ responsibilities include:

- Take responsibility for the vehicle, the load and passengers being carried.
- Checking of the vehicle prior to the start of the journey.
- Ensuring that all personnel in the vehicle are wearing seat belts.
- Shall not pick up unauthorized persons.

Sub-Annex-B

MOTOR VEHICLE WEEKLY SAFETY CHECKLIST

Department: _____

Vehicle Make:_____Model:_____V.I.N.#_____

Do not operate any vehicle if an unsafe condition exists.	Inspection Date: / /	Inspection Date: / /	Inspection Date: / /	Inspection Date: / /	Inspection Date: / /
	Inspected By:	Inspected By:	Inspected By:	Inspected By:	Inspected By:
Windshield wipers and washers					
Directional Signals					
Lights					
Horn and Mirrors					
Inspection sticker current					
Tag current					
Check for 4000 mile maintenance					
Tire inflation and safe tread depth					
Power steering fluid					
Antifreeze / Coolant					
Motor oil level					
Brake fluid & Brake operation					
Exterior and Interior condition acceptable					
Transmission Fluid & Hydraulics (if applic.)					

Comments: _____

Sub-Annex-C Template for Accident Reporting Form

ACCIDENT REPORTING FORM

Injured Person Name		**Croft:**	
Date of Birth:		**Contact No.:**	
Address of Injured Person:			
What part of the body was injured? Describe in detail.			
What was the nature of the injury? Describe in detail.			
Describe fully how the accident happened? What was employee doing prior to the event? What equipment, tools being using?			

Witnesses Detail

Name:	Croft:	Contact No.:
Name:	Croft:	Contact No.:
Name:	Croft:	Contact No.:

Date of Event:	Time of Event:	Time of 1st Aid Attendant:
Exact location of event:		
What caused the event?		
Were safety regulations in place and used? If not, what was wrong?		
Doctor's Name:	Hospital Name:	
Recommended preventive action to take in the future to prevent reoccurrence.		

ANNEXURE-X

Dust Management Plan

Dust Management Plan

General

This plan is prepared for the project " Augmentation of Water Supply to Rawalpindi City Based upon Chahan Dam". The purpose of this plan is to describe the measures that the project shall take to ensure that the risk of emissions from dust generated by site operations during construction are minimized and that best practice measures are implemented.

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

- Elimination
- Reduction/Minimization
- Control

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

Methodology

The following methodology will be undertaken for each project section:

Step 1 – Identify the dust generating activities

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

- Haulage Routes, Vehicles and /Concrete Batching Plant
- Roads, surfaces and public highways
- Excavations for lying of new conductance and replacement of distribution pipelines
- Static and mobile combustion plant emissions
- Materials Handling, Storage, Spillage and Disposal
- Storage of material
- Stockpiles
- Spillages
- Storage of Waste
- Site Preparation and Restoration after Completion
- Earthworks, excavation and digging
- Storage of spoil and topsoil
- Demolition
- Construction and Fabrication Processes

Step 2 – Identify Sensitive Receptors

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

Step 3 Implement Best Practice Measures to Control

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

Step 4 – Monitor effectiveness of control

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

Step 5 – Record and report result of monitoring

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

Method Statements and Risk Assessments

The Contractor's Risk Assessments and Method Statements will be required to be approved by the CSC prior to commencing work and will be required to contain environmental aspects of the task, including dust control measures where required.

Where dust has been identified within the risk assessment as a significant issue, the method statement will be required to cover the following:

Methods and materials that will be used to ensure that dust generation is minimized.

The use of pre-fabricated materials where possible.

Optimum site layout:

Dust generating activities to be conducted away from sensitive receptors

Supply of water for damping down.

Good housekeeping and management

All employees will be briefed on the Risk Assessment and Method Statement before starting work.

Training

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

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

Identification of Dust Generating Sources and Control Methods

Haulage Routes, Vehicles and /Concrete Batching Plant	
Dust Source	**Dust Control Methods**
Major haul roads and traffic routes	Haul roads will be dampened down via a mobile bowser, as required.
Public Roads	Road sweeper will be used to clean public roads as required.
Site traffic management	Site traffic will be restricted to constructed access roads as far as possible.

	Site speed limit will be set at 10 mph as this will minimize the production of dust.
Road Cleaning	A mechanical road sweeper will be readily available and used.
Handling, Storage, Stockpiling and Spillage of Dusty materials	
Material handling operations	The number of times a material will have to be handled will be kept to a minimum to prevent double handling and ensure dusty materials are not handled unnecessarily.
Transport of fine dusty materials and aggregates.	Closed tankers will be used or sheeted vehicles.
Vehicle loading/unloading materials on to vehicles and conveyors.	Dusty materials will be dampened down Drop heights will be kept to a minimum and enclosed where possible.
Excavation for Lying new pipelines	
Excavation	Excavation will be carried out by applying green sheets on the edges, especially near Environmental Sensitive Receptors, already highlighted in the IEE report.
Handling of Mucking Material	Mucking material will be stored in bonded area to avoid spillage and generation of fugitive dust
Loading of material on dumpers	Mucking material will be damped down before loading on dumpers to reduce fugitive dust emission.
Storage of Materials	
Bulk cement, bentonite etc.	Bentonite will be delivered in tankers and stored in dedicated enclosed areas. Bulk cement will be transported through tractor trollies or trailers.
Fine dry materials	These will be protected from the weather and by storing in appropriate containers and indoors, where necessary.
Storage location	Material will be stored in dedicated lay-down areas.
Storage of Stockpiles	
Stockpile location	Stockpiles will be placed so as to minimize double handling and facilitate the site restoration.
Building stockpiles	Stockpiles, tips and mounds will not be

	stored at an angle greater than an angle of repose of the material.
Small and temporary stockpiles	Where possible, stockpiles will be placed under sheeting. Dusty material will be damped down. Wind barriers (protective fences) of a similar height to the stockpile will be erected, if required.
Site Preparation and Restoration	
Earthworks, excavation and digging	These activity areas will be kept damp where required and if possible, will be avoided during dry and windy periods.
Completed earthworks	Surfaces will be stabilized by re-vegetation as soon as possible, where applicable.
Construction and Fabrication Process	
Cutting, grinding, drilling, sawing, trimming, planning, sanding	These activities will be avoided wherever possible. Equipment and techniques that minimize dust will be implemented. Water will be used to minimize dust.
Cutting roadways, pavements, blocks	Water sprinkling to be used.
Angle grinders and disk cutters	Best practice measures will be used such as dust extraction.

Monitoring Arrangements

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

ANNEXURE-XI

Noise and Vibration Management Plan

Objective

This management plan defines the measures to control and limit noise emissions and vibration levels, at residential properties and other sensitive receptors in the vicinity of the Project.

General Requirements

Best Practicable Means (BPM) of noise control will be applied during construction works to minimize noise (including vibration) at neighboring residential properties and other sensitive receptors arising from construction activities

The general principles of noise management are given below:

Control at source:

Equipment – noise emissions limit for equipment brought to site.

Equipment – method of directly controlling noise e.g. by retrofitting controls to plant and machinery.

Equipment - indirect method of controlling noise e.g. acoustic screens.

Equipment - indirect method of controlling noise e.g. benefits and practicality of using alternative construction methodology to achieve the objective e.g. vibratory piling techniques or hydro- demolition as opposed to more conventional but noisier techniques; selection of quieter tools/machines; application of quieter processes.

Control across site by:

- Administrative and legislative control,
- Control of working hours,
- Control of delivery areas and times,
- Careful choice of compound location,
- Physically screening site,
- Control of noise via Contract specification of limits,
- Noise Monitoring, to check compliance with noise level limits, cessation of works until alternative method is found.
- Many of the activities which generate noise can be mitigated to some degree by careful operation of machinery and use of tools. This may best be addressed by tool box talks and site inductions**.**

The maintenance of good community relations is vital. Experience shows that construction noise has the potential to cause disturbance but can be tolerated if prior warning and explanation has been given to residents. In particular advice regarding

the nature of construction works, the duration of the works and mitigation measures to be implemented can help to reduce people's reaction to noise.

Contractors will consult local residents/communities regarding works and to give them details of a responsible appointed person on site who will be able to deal with queries.

Construction working hours should be carefully managed. All works should take place between normal working hours 07:30 and 18:30, Monday to Friday with the exception of restricted works.

Noise and Vibration Control Measures

In addition to specific requirements of the Local Authority, the Contractor will be required to adopt the following more specific measures:

Control measures

Without prejudice to the other requirements of this section, the Contractor shall comply with the recommendations set out in BS5228:2009 and in particular with the following requirements:

- Vehicles and mechanical plant will be maintained in a good and effective working order and operated in a manner to minimize noise emissions. The contractor will ensure that all plant complies with the relevant statutory requirements;
- Site vehicles will be equipped with broadband, non-tonal reversing alarms;
- Compressor, generator and engine compartment doors will be kept closed and plant turned off when not in use;
- All pneumatic tools will be fitted with silencers/mufflers;
- Care would be taken when unloading vehicles to avoid un-necessary noise;
- Maintenance operations will be undertaken at distance from noise-sensitive receptors;
- Reduce the speed of vehicle movements;
- Ensure that operations are designed to be undertaken with any directional noise emissions pointing away from noise-sensitive receptors;
- Vehicles should be prohibited from waiting within the site with their engines running or alternatively, located in waiting areas away from sensitive receptors;

Vibration Mitigation

All vibration producing machinery will be identified by the contractor and vibration producing machinery will be operated at low frequency to reduce the vibration impacts.

- Vibration monitoring will be carried out in accordance with German Standard

DIN 4150 (heritage structures) and BS 7385: Part 2 – 1993 (other structures).

- vibration monitoring will be undertaken at the nearest buildings to the construction sites during times of vibration intensive works
- Where exceedances of the criteria are recorded, corrective actions would be implemented where soils at risk of vibration induced settlement are identified.

Noise and vibration monitoring

A regular programme of noise and vibration monitoring shall be implemented as a minimum in accordance with of this document.

The Contractor will submit the proposed method, the frequency and the location of monitoring site to the Planning Authority for agreement prior to commencing works. Noise baseline levels will be agreed prior to commencement of construction.

Reference:

https://proaccionaau.blob.core.windows.net/media/4gbpg4vk/ctp-noise-and-vibration-management-plan.pdf.

ANNEXURE-XII

IBAT Report

IBAT

Integrated Biodiversity Assessment Tool

PROXIMITY REPORT
CHAHAN TP AND CONDUCTANCE

Country: Pakistan

Location: [33.5, 73]

Date of analysis: 01 February 2023 (GMT)

Buffers applied: 1 km | 3 km | 5 km

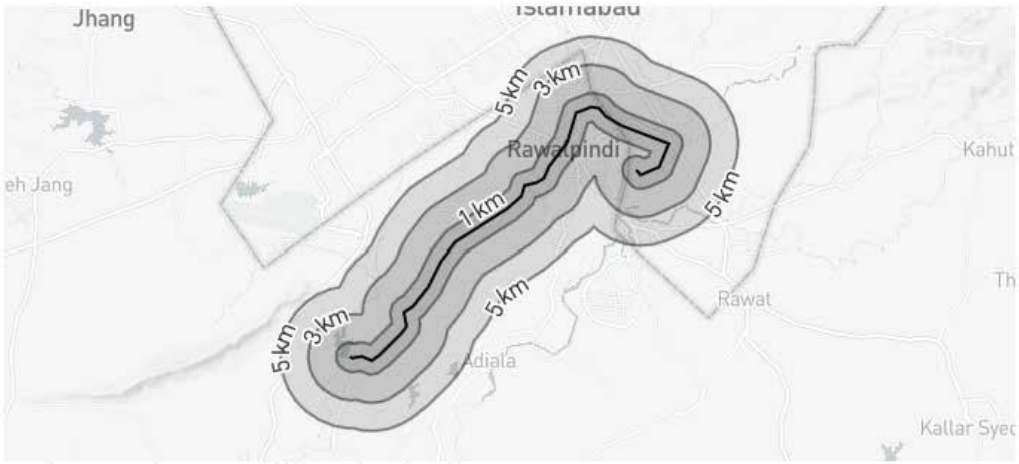
IUCN Red List Biomes: Freshwater, Terrestrial

Generated by: Aziz Karim

Organisation: ADB

Overlaps with:

Protected Areas	1
Key Biodiversity Areas	0
IUCN Red List	49



Displaying project location and buffers: 1 km, 3 km, 5 km

About this report

This report presents the results of [29905-39284] proximity analysis to identify the biodiversity features and species which are located within the following buffers: 1 km, 3 km, 5 km.

This report is one part of a package generated by IBAT on 01 February 2023 (GMT) that includes full list of all species, protected areas, Key Biodiversity Areas in CSV format, maps showing the area of interest in relation to these features, and a 'How to read IBAT reports' document.

WARNING: IBAT aims to provide the most up-to-date and accurate information available at the time of analysis. There is however a possibility of incomplete, incorrect or out-of-date information. All findings in this report must be supported by further desktop review, consultation with experts and/or on-the-ground field assessment. Please consult IBAT for any additional disclaimers or recommendations applicable to the information used to generate this report.

Please note, sensitive species data are currently not included in IBAT reports in line with the Sensitive Data Access Restrictions Policy for the IUCN Red List. This relates to sensitive Threatened species and KBAs triggered by sensitive species.

Data used to generate this report

- UNEP-WCMC and IUCN, 2023. Protected Planet: The World Database on Protected Areas (WDPA)[On-line], Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net - February 2023.
- BirdLife International (on behalf of the KBA Partnership), 2022. Key Biodiversity Areas - November 2022.
- IUCN, 2022. IUCN Red List of Threatened Species - December 2022.
- IUCN. The IUCN Red List of Threatened Species. Version 2019-3. (2019). https://www.iucnredlist.org
- IUCN. Threats Classification Scheme (Version 3.2). (2019)
- Strassburg, B.B.N., Iribarrem, A., Beyer, H.L. et al. Global priority areas for ecosystem restoration. Nature 586, 724–729 (2020). https://doi.org/10.1038/s41586-020-2784-9

IBAT

Protected Areas

The following protected areas are found within 1 km, 3 km, 5 km of the area of interest.
For further details please refer to the associated csv file in the report folder.

Area name	Within buffer of
Ayub 'National Park'	3 km

Key Biodiversity Areas

The following key biodiversity areas are found within 1 km, 3 km, 5 km of the area of interest.
For further details please refer to the associated csv file in the report folder.

No KBAs within buffer distance

IUCN Red List of Threatened Species

The following threatened species are potentially found within 50km of the area of interest.

For the full IUCN Red List please refer to the associated csv in the report folder.

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Glyptothorax kashmirensis		ACTINOPTERYGII	CR	Decreasing	Freshwater
Vanellus gregarius	Sociable Lapwing	AVES	CR	Decreasing	Terrestrial
Gyps bengalensis	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
Sarcogyps calvus	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
Hardella thurjii	Crowned River Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Nilssonia gangetica	Indian Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Nilssonia hurum	Indian Peacock Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Schistura afasciata		ACTINOPTERYGII	EN	Decreasing	Freshwater
Oxyura leucocephala	White-headed Duck	AVES	EN	Decreasing	Terrestrial, Freshwater
Rynchops albicollis	Indian Skimmer	AVES	EN	Decreasing	Terrestrial, Freshwater
Haliaeetus leucoryphus	Pallas's Fish-eagle	AVES	EN	Decreasing	Terrestrial, Freshwater
Neophron percnopterus	Egyptian Vulture	AVES	EN	Decreasing	Terrestrial, Freshwater
Falco cherrug	Saker Falcon	AVES	EN	Decreasing	Terrestrial, Marine, Freshwater
Tor putitora		ACTINOPTERYGII	EN	Decreasing	Freshwater
Glyptothorax punjabensis		ACTINOPTERYGII	EN	Decreasing	Freshwater
Glyptothorax stocki		ACTINOPTERYGII	EN	Decreasing	Freshwater
Glyptothorax sufii		ACTINOPTERYGII	EN	Decreasing	Freshwater
Paraschistura naseeri		ACTINOPTERYGII	EN	Decreasing	Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Manis crassicaudata	Indian Pangolin	MAMMALIA	EN	Decreasing	Terrestrial
Varanus flavescens	Yellow Monitor	REPTILIA	EN	Decreasing	Terrestrial
Aquila nipalensis	Steppe Eagle	AVES	EN	Decreasing	Terrestrial
Picrorhiza kurroa	Picrorrhiza	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Tecomella undulata	Desert Teak	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Atropa acuminata	Indian Belladonna	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Trillium govanianum	Himalayan Trillium	LILIOPSIDA	EN	Decreasing	Terrestrial
Pangshura tecta	Indian Roofed Turtle	REPTILIA	VU	Decreasing	Terrestrial, Freshwater
Wallago attu		ACTINOPTERYGII	VU	Decreasing	Freshwater
Aythya ferina	Common Pochard	AVES	VU	Decreasing	Terrestrial, Marine, Freshwater
Columba eversmanni	Yellow-eyed Pigeon	AVES	VU	Decreasing	Terrestrial, Freshwater
Sterna aurantia	River Tern	AVES	VU	Decreasing	Terrestrial, Marine, Freshwater
Clanga clanga	Greater Spotted Eagle	AVES	VU	Decreasing	Terrestrial, Freshwater

IBAT

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Aquila rapax	Tawny Eagle	AVES	VU	Decreasing	Terrestrial, Freshwater
Aquila heliaca	Eastern Imperial Eagle	AVES	VU	Decreasing	Terrestrial, Freshwater
Lissemys punctata	Indian Flapshell Turtle	REPTILIA	VU	Decreasing	Terrestrial, Freshwater
Barilius naseeri		ACTINOPTERYGII	VU	Unknown	Freshwater
Paraschistura alepidota		ACTINOPTERYGII	VU	Decreasing	Freshwater
Schizothorax plagiostomus	Snow Trout	ACTINOPTERYGII	VU	Decreasing	Freshwater
Allopaa barmoachensis	Barmoach Frog	AMPHIBIA	VU	Decreasing	Terrestrial, Freshwater
Triplophysa hazaraensis		ACTINOPTERYGII	VU	Decreasing	Freshwater
Bagarius bagarius		ACTINOPTERYGII	VU	Decreasing	Freshwater
Acinonyx jubatus	Cheetah	MAMMALIA	VU	Decreasing	Terrestrial
Panthera pardus	Leopard	MAMMALIA	VU	Decreasing	Terrestrial
Ursus thibetanus	Asiatic Black Bear	MAMMALIA	VU	Decreasing	Terrestrial
Catreus wallichii	Cheer Pheasant	AVES	VU	Decreasing	Terrestrial
Saxicola macrorhynchus	White-browed Bushchat	AVES	VU	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Ovis vignei	Urial	MAMMALIA	VU	Decreasing	Terrestrial
Ulmus villosa		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
Paris polyphylla	Love Apple	LILIOPSIDA	VU	Decreasing	Terrestrial
Fritillaria cirrhosa	Yellow Himalayan Fritillary	LILIOPSIDA	VU	Decreasing	Terrestrial

Recommended citation

IBAT Proximity Report. Generated under licence 29905-39284 from the Integrated Biodiversity Assessment Tool on 01 February 2023 (GMT). www.ibat-alliance.org

How to use this report

This report provides an indication of the potential biodiversity-related features - protected areas, key biodiversity areas and species - close to the specified location. It provides an early indication of potential biodiversity concerns, and can provide valuable guidance in making decisions. For example, this information can be helpful when assessing the potential environmental risk and impact of a site, categorising investments/projects, preparing the terms of reference for an impact assessment, focusing attention on key species of conservation concern and sites of known conservation value, and reviewing the results of an impact assessment.

The report does not provide details of potential indirect, downstream or cumulative impacts. Furthermore, the report should be regarded as a "first-step", providing a set of conservation values sourced from global data sets, and is not a substitute for further investigation and due diligence, especially concerning national and/or local conservation priorities.

ANNEXURE-XIII

Framework for Site Specific EMP

GUIDE FOR DEVELOPMENT OF SSEMP

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

Step 1: The project area needs to be clearly defined.

Step 2: The mapping of sensitive receptors has already been conducted and needs to be presented clearly in a map.

Step 3: The tentative construction activities to be conducted are as follows:

- Site Surveying and Vegetation (Trees and plants) Clearance
- Establishment of Work Camp and access roads
- Dismantling of existing structures including Utilities
- Preparation of ground for Landscaping

Step 4: The Risk Assessment matrix template is provided in the table below.

Risk is assessed as the likelihood that the activity will have an effect on the environment as well as the consequence of the effect occurring. It is often described like this:

Risk = Likelihood × Consequence

Likelihood Scale

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

Consequence Scale

Consequence	Definition	Score
Catastrophic	The action will cause unprecedented damage or impacts on the environment or surrounding community e.g. extreme loss of soil and water resources and quality from storm water runoff extreme pollution of soil and water resources including major contamination from hazardous materials widespread effects on ecosystems with deaths of fauna/flora widespread community impacts resulting in illness, injury or inconvenience loss or destruction of archaeological or historical sites Occurrence will almost certainly result in the work being halted and a significant fine.	5
Major	The action will cause major adverse damage on the environment or surrounding communities' e.g. major loss of soil and water resources and quality from storm water runoff major pollution of soil and water resources including contamination from hazardous materials significant effects on ecosystems with isolated deaths of non-vulnerable flora and fauna significant annoyance or nuisance to communities major damage to or movement required to archaeological or historical sites occurrence may result in work being halted and a fine	3
Moderate	No or minimal adverse environmental or social impacts e.g. No measurable or noticeable changes in storm water quality. Water quality remains within tolerable limits little noticeable effect on ecosystems no or isolated community complaints no or unlikely damage to archaeological or historical sites no likelihood of being fined	2
Minor	No or minimal adverse environmental or social impacts e.g. No measurable or noticeable changes in storm water quality. Water quality remains within tolerable limits little noticeable effect on ecosystems no or isolated community complaints no or unlikely damage to archaeological or historical sites no likelihood of being fined	1

Risk Score Table

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

Risk: Significant: 15-25

Medium: 6-10

Low 1-5

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

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

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

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

		Traffic Congestion				
iv	Preparation of Sub-Base	Noise and vibration				
		Dust generation				
		Traffic Congestion				
v	Camping	Noise and vibration				
		Dust generation				
		Traffic Congestion				
		Community safety				
		Labor safety (PPEs)				
vi	Landscaping	Dust generation				
		Sediment runoff				
		Failure of vegetation to take root				

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

The site plan will need to provide the following:

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

Step 7 (if required)[15]: The completed SSEMP provides details of all the environmental management requirements for all stages of the construction process. For individual work teams who are responsible for only a small part of the overall construction works it can be confusing as to what is required for their particular work component. For example, the work team responsible for stripping soil for the construction areas are not going to be interested in the requirements for pouring concrete for footings and foundations. However, it is essential that the soil stripping team knows exactly what to clear and what to leave and where to put stockpiles of soil for later use.

In situations where different work activities are required at different times or at different locations, environmental work plans can be prepared. These are similar to the work method statements that are often produced for major construction projects.

Step 8: A detailed monitoring plan will be provided along with frequency and responsibilities to ensure all key environmental parameters are monitored to ensure compliance with both national and ADB requirements.

Template for SSEMP

- Introduction
- Project Overview
- Scope of SSEMP

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

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

ANNEXURE-XIV

Tool for Socio-economic Survey

SOCIO-ECONOMIC BASELINE SURVEY OF THE PROJECT AREA

Name of Project ______

Name of Interviewer: _____ Date: _____

a) Settlement: _____ (b) Union Council: _____

c) Tehsil: _____ (d) District: _____

_____

_____

1. Name of Respondent _____

2. What is your father's name _____

3. What is your age

Age years 15 – 25 _____

25 – 35 _____

35 – 45 _____

Above 45 _____

4. Marital Status.

1. Married 2. Unmarried

5. What is your caste /ethnic group _____

6. What is your mother tongue? _____

7. What is your qualification?

1. Illiterate 2. Primary 3. Middle

4. Metric 5. Intermediate 6. Above Inter

8. What is your profession _____

9. Which of the following facilities are available in your house

1. Electricity 2. Water Supply

3. Gas 4. Telephone

5. Sewerage

10. What are the sources of water for your domestic use

1. Public Water Supply 2. Hand Pumps

3. Channel 4. Any other

11. In your opinion, should this Project be implemented here

1. Yes 2. No

If yes, then reasons If no, then reasons

_____ _____

_____ _____

_____ _____

12. In your opinion, what will be possible impacts of the construction of this project area project?

During Construction_____

_____

_____

After Construction _____

_____

_____

13. What protective measures do you suggest to safeguard your interests

_____

_____

_____

14. Is there any health institution in this locality

1. Yes 2. No

If yes, then what is that _____

_____

15. Is there any educational institution in this locality

1. Yes 2. No

If yes, then what is that _____

_____

16. Is there any historical /archeological monument in this locality

1. Yes 2. No

If yes, then what is that _____

_____

17. Is there any shrine /mosque /graveyard in this locality

1. Yes 2. No

If yes, then what is that?

Shrine _____

Mosque _____

Graveyard _____

ANNEXURE-XV

Attendance Sheets of FGDs

Focused Group Discussions

Name of Project: Chahan Dam "water Supply Project" Rawalpindi Date: 30-11-2021

Location/Venue: CIU/PMU Sr. No. 1

Sr. no.	Name	Profession	CNIC/ Phone no.	Mouza, Village, UC, Tehsil and District	Signature
1-	Ali Amin	JE, CIU Cwl	0344-6189631	"	
2-	Shoaib Khalid	Project Coordinator	0333-5656597	"	

Focus Group Discussions

Name of Project: Chahan Dam (Water supply) Project - RWP. Date: 30-11-2022

Location/Venue: ~~Was~~ WASA office Rawal Pindi. Sr. No. 2

Sr. No.	Name	Profession / Designation & Department	CNIC / Ph No.	Mouza, Village, UC, Tehsil and District	Signature
1.	Azizullah Khan	Dy Director	61101-2748539-7		
2	Sumaira	Social	0345-9857768		
3	Ali Qamar	Infrastructure Engr. CW Exp	0344-6785632		
4	Sahibzada Nishad	Project support officer	0333-5656593		
5	Sher Zaman	Environmentalist	0341-4889648		
6	Saiyas Ali	Environmentalist	03524222545		

Focus Group Discussions

Name of Project: DREAMS-1 Date: 3-12-2022

Location/Venue: Committee Room of D C office Rawalpindi Sr. No. 3

Sr. No.	Name	Profession	CNIC / Ph. No.	Mouza, Village, UC, Tehsil and District	Signature
1	Umer Razzaq	PED	61101-7239935-1	—	
2	Aziz ullah Khan	Dy Director (Civil)	61101-2748135-7	—	
3	Amir Mumtaz	XEN Small dams Islamabad	36601-6879382-5	—	
4	Abid Hussain Abid	Conservator Forest Rwp.	0331-6306953	—	
5	Jawad Ashraf	AD (Engg)	61101-2764589	—	
6	Kamran Hanif	AD/M&E	37405-7733647-1	—	
7	Mukhtiar Muqaddam	Social Safeguards	0334-767225	—	
8	Kamal Khurshid	Project Engr. PRF	0333-5655493	—	
9	Sana Urooj	DDF(RWP)	03365999282	—	
10	Rizwana Aziz	ADW/PIU Rwp	0333-4643357	—	
11	Aryan Batool	DDW(RWP)	0333 5871232	—	
12	M. Farooq	DTL EDO(W)	0333 9853380		
13	Aziz Karim	Env Specialist	0345-5024102		
14	Ali Ghulam	IE, CIU Rwp	0344-6789632		
15	Ahmed Afzal	AD, Engg. PRF	0304-4866308		
16	Mushtaq Ali	DDO(Services) MCR	0307 3934519		
17	M. Mujahid	Env. Consultant	0334-6144088		
18	Shafqat Ali Tahir	Civil consultant	0303-4610639		
19	Komal Arif	Sociologist	0303-4176826		
20	Sher Zaman	Senior Environmentalist	0341-4239448		

Focus Group Discussions

Name of Project: (Chahan Dam water supply work Project) Rawalpindi Date: 1-12-22

Location/Venue: Bank colony Sr. No. 4

Sr. No.	Name	Profession	CNIC	Mouza, Village, UC, Tehsil and District	Signature
	M Tajamal		0348 1540720		
	Mir Afzal		0341 9455 411		
	G Rakshni		0332 0982392		

Focus Group Discussions

Name of Project: (Chahan Dam water supply projects) Date: 1-12-2021

Location/Venue: Ranyal Village Sr. No. 5

Sr. No.	Name	Profession	CNIC	Mouza, Village, UC, Tehsil and District	Signature
	Kashmir Ali				
	Abbasi	No-work			
	Malik Shabir	Farmj			
	Anwar Shukat	Farmj			
	Asif Batti	//			
	Jawad Akhtar	//			

Focused Group Discussions

Name of Project: Chahan Dam Water Supply Project Rawalpindi Date: 1-12-2022

Location/Venue: Bata Colony chaklala Road Rawalpindi Sr. No. 6

Sr. no.	Name	Profession	CNIC/ Phone no.	Mouza, Village, UC, Tehsil and District	Signature
1-	Mr. Anwar	Shopkeeper		Bata Colony chaklala Rawalpindi	
2-	Rehman Khan	Shopkeeper		"	
3-	M. Arshad	Worker		"	
4-	[illegible]	[illegible]		"	

Focused Group Discussions

Name of Project: Chahan Dam Water Supply Project Rawalpindi Date 01-12-22

Location Venue: SS Model Town Rawalpindi Sr No 7

Sr. no.	Name	Profession	CNIC/ Phone no.	Mouza, Village, UC, Tehsil and District	Signature
1	عبدالرافع	مزدور		SS Model Town	عبدالرافع
2	[illegible]	دکاندار		"	
3	[illegible]	سبزی فروش		"	
4	Asad	vegetable seller		"	
5	Bilal	Shopkeeper		"	
6	Hassan	Shopkeeper		"	
7	Asif Khan	Shopkeeper		"	

Focused Group Discussions

Name of Project: Chahan Dam Water Supply Project (Revised Proj.) Date: 18/1/23

Location/Venue: Chak Jalal Din, Near Mouza 42, Clake Road Sr. No: 8

Sr. no.	Name	Profession	CNIC/ Phone no.	Mouza, Village, UC, Tehsil and District	Signature
1	Zaheer Akhter	Govt Staff	—	Chak Jalal Din	Zaheer
2	Naveed Khan	Govt Staff	0348-5551645	"	
3	M. Noor	Worker	—	"	M. Noor
4	M. Tanveer	Worker	0332-5674423	"	
5	Israr	Shop	—	"	Israr

Focus Group Discussions

Name of Project: Chahan Dam Water Supply Project (Work) Rawalpindi Date: 18/1/23

Location/Venue: Awan Town, Gulja Road Sr. No. 9

Sr. No.	Name	Profession	CNIC	Mouza, Village, UC, Tehsil and District	Signature
1	Amjad Mehmood	Shop	0300-5645261	Awan Town, Gulja Road	Amjad
2	Malik Khawaja	Welding Shop	0301-5346840	"	
3	M. Riaz	Hardware Shop	———	"	
4	Yasir Mehmood	Shop	0313-4140205	"	Yasir. Mehmood
5	Haji M. Yousuf	Shop	———	"	Yousuf

Focus Group Discussions

Name of Project: Chahan Dam Water Supply Project Date: 18/1/23

Location/Venue: Imtiaz Market - Chakra Road (Akbar Chowk) Sr. No 10

Sr. No.	Name	Profession	CNIC / Phone No	Mouza, Village, UC, Tehsil and District	Signature
1	Shahid Abbasi	Hotel	0345 5515776	Imtiaz Market Chakra Road	
2	M. Ramzan	Shop	—	"	
3	Zafar	Tea Stall	—	"	
4	M. Shahid	Hotel	03084744472	"	
5	Basheer Abbasi	Shop	046-5118197	"	
6	M. Javed Abbasi	Hotel	0325-1677051	"	
7	Farhan	Hunter	—	"	
					FARHAN

Focus Group Discussions

Name of Project: Chahan Dam Water Supply Work Project Rawalpindi

Date: 18/1/23

Location/Venue: Girija - Basic Health Unit (Chakla)

Sr. No. 11

Sr. No.	Name	Profession	CNIC / Phone No	Mouza, Village, Tehsil and District UC,	Signature
1	Farhad Ali	Govt - Employee	0335 6516363	Girija	
2	Hashim	"	03102495645	Girija	
3	Nouman	"	03345307222	Girija	
4	M. Muneeb	"	—	Girija	
5	Abdul Rehman	"	0334 844 9913	Girija	

Focus Group Discussions

Name of Project: Chahan Dam Water Supply Project Rawalpindi Date: 19/1/23

Location/Venue: Near Bilal Chowk, Caltex Road (Adiala WC) Sr. No. 12

Sr. No.	Name	Profession	CNIC / Phone No.	Mouza, Village, UC, Tehsil and District	Signature
1	Abbas Ali	Truck Driver	03111552210	Caltex Road	
2	Muhammad	Driver	03116177712	"	Abbas Ali
3	Saif Ur Rehman	Driver	03362443864	"	
4	Shahzaib	Helper	03181865531	"	
5	Sami Ullah	Assistant	—	"	
6	Ali Abbas	Worker	—	"	Sami Ullah
7	Bilal Khan	Stall	—	"	
8	Sawan Khan	Hotel Waiter	—	"	
					Sawan Khan