WATER AND SANITATION AGENCY (WASA), LAHORE

CONSTRUCTION OF WASTEWATER TREATMENT PLANT AT BABU SABU











Environmental Impact Assessment (EIA)

(EIA Report)

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CONSTRUCTION OF WASTEWATER TREATMENT PLANT AT BABU SABU

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

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LIST OF ABBREVIATONS

ALGAS	Asia Least Cost Greenhouse Gases Abatement Strategy
ASTM	American Society of Testing Materials
AFD	Agence Française de Développement
ASP	Activated Sludge Process
APC	Affected Person Committee
BDL	Below Detection Limits
BMP	Best Management Practices
BOD5	Biochemical Oxygen Demand
BOD	Board of Directors
CBO	Community Based Organizations
CBD	Convention on Biological Diversity
CMS	Convention on the Conservation of Migratory Species
CC	Construction Contractor
CDGL	City District Government Lahore
COD	Chemical Oxygen Demand
CO	Carbon Monoxide
DC	Design Consultant
DCR	District Census Report
DRR	Disaster Risk Reduction
DMD	Deputy Managing Director
DO	Dissolved Oxygen
EAAS	Extended Aeration Activated Sludge
EC	Environmental Committee
EIA	Environmental Impact Assessment
EMMP	Environmental Management and Monitoring Plan
EPA	Environmental Protection Agency
EPD	Environment Protection Department
ESIA	Environmental & Social Impact Assessment
FGDs	Focused Group Discussions
FPs	Facultative Ponds
GBV	Gender Based Violence
GHGs	Green House Gases
GOP	Government of Punjab
GOP	Government of Pakistan
GRC	Grievance Redress Committee
IEE	Initial Environmental Examination
IFC	International Finance Corporation
JICA	Japan International Cooperation Agency
LAA	Land Acquisition Act
LARP	Land Acquisition and Resettlement Plan
LDA	Lahore Development Authority
LGO	Local Government Ordinance
LESCO	Lahore Electric Supply Company
LAC	Land Acquisition Collector
MDGs	Millennium Development Goals
MSDS	Material Safety Data Sheets

MSL	Mean Sea Level
NA	Not Applicable
NCS	National Conservation Strategy
ND	Not Detected
NEP	National Environmental Policy
NEQS	National Environmental Quality Standards
NESPAK	National Engineering Services Pakistan
NGO	Non-Government Organization
NOC	No Objection Certificate
NO	Nitric oxide
OHSAS	Occupation Health and Safety Assessment Series
NO_x	Oxides of Nitrogen
PAPs	Project Affected Persons
P&D	Planning and Development
PEPA	Pakistan Environmental Protection Act
PEPC	Pakistan Environmental Protection Council
PEQS	Punjab Environmental Quality Standards
PST	Primary Sedimentation Tanks
PS	Policy Statement
PGA	Peak Ground Acceleration
PM	Particulate Matter
POPs	Persistent Organic Pollutants
PPE	Personal Protective Equipment
SC	Supervision Consultant
SEP	Stake Holder Engagement Plan
SO_2	Sulphur Dioxide
SP	Sedimentation Ponds
SSTs	Secondary Sedimentation Tanks
STDs	Sexually-transmitted diseases
SPM	Suspended Particulates
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UNDP	United Nation Development Program
USEPA	United States Environmental Protection Agency
UNFCCC	The United Nations Framework Convention on Climate Change
UASBR	Up flow Anaerobic Sludge Blanket Reactors
WAPDA	Water and Power Development Authority
WB	World Bank
WBG	World Bank Group
WASA	Water and Sanitation Agency
WHO	World Health Organization
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

ES-1 Introduction

Lahore is the capital city of the Punjab Province with a population about 13 million[1] and is the country's second-most populous city after Karachi. Currently, all the wastewater generated in Lahore City (domestic and industrial) is being discharged untreated into River Ravi through different discharge points (via disposal stations and drains). An estimated 640 MGD (1000 Cusec) of untreated domestic sewage is being disposed of into River Ravi. Therefore, Water and Sanitation Agency (WASA), Lahore, has planned to construct Wastewater Treatment Plant (WWTP) at Babu Sabu with the funding of Agence Française de Développement (AFD). This report presents findings of "Environmental Impact Assessment (EIA) Study of the construction and operation of wastewater treatment plant at Babu Sabu, Lahore" carried out by NESPAK.

The proposed project involves construction of WWTP and allied facilities. To comply with IEE/EIA regulations as per Punjab Environmental Protection (Amendment) Act, 2017, WASA has entrusted National Engineering Services Pakistan (NESPAK) Pvt. Limited with the assignment to carry out Environmental and Social Impact Assessment of the proposed project.

ES-2 Policy, Legal & Administrative Framework

The Government of Pakistan (GOP) has promulgated laws/acts, regulations and standards for the protection, conservation, rehabilitation and improvement of the environment. Applicable regulations and standards are Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, (2022); Pakistan Penal Code (1860); Punjab Environmental Protection Act (Amended) 2012 and 2017; Punjab Environmental Quality Standards (PEQS), 2016; The Punjab Flood Plain Regulation Act 2016; Building Code of Pakistan; Hazardous Substance Rules 2003 etc. Applicable international policies include Environmental and Social Risk Management Policy for AFD-funded Operations; World Bank's Environment and Social Framework; World Bank Group Gender Strategy (2016-2023); WBG Environmental, Health & Safety Guidelines etc. Applicable International Conventions and Treaties referred in this report include UNESCO Convention on the Protection of the World's Cultural and Natural Heritage, 1972; The Rio Declaration, 1992; Convention on Biological Diversity, 1994; The Basel Convention, 1989; Stockholm Convention on Persistent Organic Pollutants (POPs), 2004; United Nations Framework Convention on Climate Change (UNFCCC); Paris Agreement, 2016.

LWASA will be responsible for the implementation of environmental mitigation measures at various stages of the project whereas, Environmental Protection Department, Punjab will be responsible for reviewing the EIA report and issuing environmental approval.

[1] Population Census 2023

ES-3 Description of the Project

The proposed project site for the wastewater treatment plant is located in south west of Lahore. The proposed site is 1.5 Km away from Babu Sabu interchange.

The component of the proposed project includes two major components 1) Wastewater Treatment Plant including allied structures & buildings and 2) Collector Channel from cantonment drain to proposed influent station within WWTP Site and upgradation of Disposal Stations.

The project is divided in two stages. In Babu Sabu Stage-1 (BSS1), design horizon is year 2035 and for Babu Sabu Stage-2 (BSS2), design horizon is up to year 2045. Technical design has been carried out for design horizon of year 2045, however, this project mainly focuses BSS1 (year 2035).

For 2035 the to-be-served-population and inflow were set to 2,000,000 PE and 400,000 m^3/d, respectively. For 2045 and BSS2 the population served was estimated to be 6,000,000 PE and 1,000,000 m^3/d inflow.

After the flood risk assessment, it turned out clear that large parts of the location are under risk of flooding. To avoid construction costs for needed dikes or embankments the WWTP for Phase 1 has been only designed on the non-flood-prone area.

Treatment technology for treatment plant was adopted Preliminary Sedimentation / Conventional Activated Sludge- Medium Load (CAS) Process after a detailed study.

ES-4 Analysis of Alternatives

Various technical alternatives for biological treatment, which is the main treatment process in WWTP. The proposed alternatives are:

- Alternative 1: Conventional Activated Sludge- Extended Aeration Activated Sludge (EAAS)
- Alternative 2: Preliminary Sedimentation / Conventional Activated Sludge- Medium Load (CAS) with sludge digestion

The conventional activated-sludge (CAS) process with or without primary treatment is still the most widely used biological treatment process for reducing the concentration of organic pollutants in wastewater.
In principle, this process involves enhancing the auto-purification that occurs naturally in water bodies. Influent, made up of organic matter, nitrogen and phosphorus comes into contact with bacteria in the presence of oxygen. Biomass develops due to the nutrients in the influent (carbon, nitrogen, and phosphorus). This development of biomass is called sludge production, and this sludge must be separated from treated water. A culture of microorganisms is

concentrated in the tanks and oxygen is injected artificially to accelerate auto-purification. In addition to oxygenation, artificial mixing is required for the microorganisms to remain suspended in the biological tank and thus facilitate the contact of pollutants with existing biomass.

The idea for Preliminary Sedimentation / Conventional Activated Sludge, Medium Load (CAS) with sludge digestion is to treat all incoming wastewater with a primary treatment, but to reduce costs by only treating a part of the incoming wastewater biologically. As the effluent standards are not so strict for this project, only 50% of the primarily treated wastewater needs to be further treated in a biological second stage in order to achieve the discharge standards in the mixed effluent. This option is the most complicated in terms of different treatment stages and internal flow management. As only 50% of the incoming wastewater is supposed to be treated in a biological treatment, two wastewater streams would exist after the primary sedimentation tanks. The large amounts of sludge from the primary settling tanks and the excess sludge from the CAS process are merged in the gravity thickeners and afterwards anaerobically processed in the sludge digesters. The effluent sludge would be stabilized and largely mineralized through the degradation of organic matter. Afterwards it could be safely applied onto the drying beds.

After detailed analysis Alternative 2 was selected as it is relatively cheaper than option 1. Considering that sludge digestion will allow to electricity production significant savings can be considered on the long term (while it will require high O&M skills). The main risk related to Alternative 2 is an inadequate management of sludge digestion that would, as a consequence, reduce energy production and produce un-stabilized sludge which might then not be disposed properly.

ES-5 Environmental and Social Baseline Profile

The existing environment in and around the project area has been studied with respect to the physical, biological and socio-economic conditions.

Physical Environment

The topography of the project area is flat. The General height of the area is approximately 220 meters above the Mean Sea Level (MSL). Lahore district is divided into two parts. The low lying alluvial soil is along the Ravi River, where the project is located and the upland in the east.

The project area has extreme climate. It has hot summer and cold winters. The summer starts from April and lasts till September. May, June, and July are the hottest months. The mean maximum and minimum temperature ranges from 40.4 °C and 27.3 °C respectively for these months. The winter seasons lasts from November to March. December, January and February are the coldest months. The mean maximum and mean minimum temperature ranges from 21.1°C to 7.2 °C in January.

The study area forms the upper part of Punjab plain, which is a part of the Indo-Gangetic depression. This depression is of a synclinal nature. Synclinal depression is a fore deep downward of the Himalayan foreland of variable depth, converted into flat plains by simple process of alluvial deposition.

In Lahore, 76 collecting drains are connected to eight major drains including: Sattukatla drain, Mian Mir drain, Lakshami drain, Suk Nehar drain, Upper Chotta Ravi drain, Lower chotta Ravi drain, SiddiquePura drain, and shahdradran, which discharge polluted water in to Hudyara drain. Hudyara Drain ultimately discharge into River Ravi.

The effluent from proposed WWTP is proposed to be discharged in cantonment drain. Currently untreated wastewater is being discharged into cantonment drain which ultimately discharge wastewater into River Ravi. River ravi is almost a dying river as construction of Thein dam and flow diversion at Madhopur in India has drastically reduced the river flows. The river flows drop to almost zero in winter and may rise as high as 17,000 m3 sec-1 during monsoon floods in summer.

Environmentally sensitive receptors were identified during site visits. Sensitive receptors include Educational Institute (Schools & Mudrasa), Mosque, Shahmsham Ghatt, Shrine and Graveyard.

Environmental monitoring for ambient air and noise level was conducted at WWTP site, Multan Road Disposal Station Sabzazar and Saggian wala Bypass Road. Samples of surface water was taken from river Ravi while for drinking water, samples were taken from Shadwal, Jhugian Nagra, Multan Road Disposal Station Sabzazar and Saggian wala Bypass Road. Wastewater samples were taken from Multan Road Disposal Station Sabzazar, Saggian wala Bypass Road and Cantonment drain near WWTP effluent discharge point.

All the test results have been compared with the stringent value from PEQS 2016 and WB/IFC limits. Ambient Air monitoring results show that all the parameters were within the permissible limits except Sulphur Dioxide (SO_2) at all four locations, particular matter (PM_{10}) and particular matter ($PM_{2.5}$) at all four locations, which is higher than the limits of WB/IFC standards. Carbon Monoxide (CO) was found to be higher than the PEQS 2016 limits at Saggian Wala bypass road. Main causes of high values of Sophur Dioxide, Particulate matter & Carbon Monoxide are industrial activities in nearby areas and inefficient burning of fuel in vehicles which use substandard fuel as well as require maintenance.

The surface water monitoring test results have been compared with PEQS 2016 and WHO Class V. The results show that the value of pH is higher than the WHO class V. The results also show presence of total Coliform, Fecal Coliform & E.Coli. The addition of chemicals and pollutants in river Ravi are responsible for high pH values. The positive bacterial values are due to discharge of wastewater effluents into River Ravi.

The drinking water test results have been compared with the stringent value from PEQS 2016 and WHO standards. The test results show that all the parameters were within the permissible

limits except arsenic value at all three locations (compared with WHO standards). Biological contamination was found at Shadiwal and Jhuglan Nagra. At Shadiwal and Jhuglan Nagra, ground water samples were collected from hand pumps which may be at shallow depth and some sewage portion may be mixed at this depth. Remaining samples were taken from tap water which comes from municipal water supply pipelines.

The wastewater monitoring test results have been compared with PEQS 2016 and IFC standards. All samples had high organic contamination with chemical oxygen demand and biological oxygen demand values higher than PEQS and IFC standards. TSS value was higher at all the locations as compared to IFC standards. However as compared to PEQS, it was higher at one point i.e. Cantonment Drain. This may be due to addition of sewage waste, industrial wastewater as well as other multiple sources of toxic water pollutants being dumped into water canals which end up in River Ravi.

Ecological Environment

As climate of Lahore is semi-arid and subtropical, the vegetation of the area falls under scrub dry, tropical thorn forest type as per phyto-geographical classification of the area.

Dharek, Mesquite, Ber, Kharbbal, Aak, Mulberry, Shisham, Banyan/ Bohr, Sukh chain, Jamun, Poplar Parkinsonia, Paper mulberry, Aak are natural flora found in the project area. Commonly found fauna found in the project area include Jackal, Porcupine, Squirrel, Mouse, Mongoose. No terrestrial endangered species of flora and fauna listed under IUCN and local Pakistan list of endangered/ threatened/ near threatened categories are found in the project area. In the project area, no protected areas and forest are reported. The 'Shadharwali Forest Reserve-3' is closest sensitive area which is around 04 KMs away from the project area.

River Ravi receives wastewater from various drain including Hydera Drain which discharge industrial wastewater. Higher concentrations of metals found in the water and plankton samples collected from the river Ravi and its tributaries receiving wastewater discharges of industries and urban areas have adversely affected the phyto- and zooplankton genera residing in metal polluted ecosystem. However in effluent received at Babu Sabo, concentration of metal was not high as evident from wastewater monitoring results.

Socio-economic Environment

The present population of Lahore is about 13 million as per digital census 2023. According to Census of 2017, total population of the district was 11.13 million[2], with an annual growth rate of 4.07 percent since 1998. Gender-wise, 52.33% of the population is male, while 47.64% is female, and transgender people make only 0.01% of the population[3].

Punjabi is the predominant language being spoken by majority (86.2 percent) of the population of the district followed by Urdu, Pushto and Siraiki being spoken by 10.2, 1.9, and 0.4 percent

[2] Pakistan Bureau of Statistics

[3] District Wise Population by Sex and Rural/Urban, Census 2017-Pakistan Bureau of Statistics

Sindhi is spoken by 0.1 percent. The main castes and groups of the Lahore district are Arain, Jat, Rajput, Pathan, Mughal, Sheikh, Kamboh and Gujar.

A socio-economic survey of 230 respondents and a separate gender situation survey of 95 females was carried out in the project area of influence to get the response about the perceived impacts and preferences towards the project implementation. 230 responcents included shop keepers, residents, labor/worker, business man, agriculturist and property dealer etc. while 95 women were interviewed for Gender situation survey at various locations in study area to record views of the females and issues related to the project implementation. Gender situation survey revealed that females in the areas perceived the project beneficial but they highlighted various issues faced in the area which were poor quality of drinking water, poor sewerage and drainage in the area, lack of health facilities in the nearby health centres, and insufficient educational facilities in nearby schools.

Socio-economic profile of affected people due to installation of proposed Waste Water Treatment Plant at Babu Sabu site was studied under Resettlement Action Plan.

E3-6 Stakeholder Engagement Plan & Public Consultation

The consultation process was held with the objectives of sharing information with stakeholders on proposed improvement works and expected impacts on the physical, biological and socio-economic environment of the project corridor, understanding stakeholders' concerns regarding various aspects of the project; providing an opportunity to the public to influence project design in a positive manner, and creating a sense of ownership of the proposal in the mind of the stakeholders.

The methods used for public consultation with project stakeholders in order to ascertain their stakes regarding project implementation were focused group discussion, scoping sessions, formal group meetings and informal group meetings. Stakeholder Consultations were carried in August, 2018 and in September, 2021. Different categories of stakeholders were contacted including officials of various departments including Agriculture, Forest and wildlife, EPA etc., farmers, residents, business/ shop owners, drivers, pedestrians& vendors.

The major stakes of the concerned people were procurement of efficient equipment, dust and noise, health &safety issues, water pollution, odour problem, loss of livelihood/ crops etc.

E3-7 Anticipated Environmental Impacts & Mitigation Measures

The overall impacts of pre-construction/design, construction and operational phase of the proposed project were identified on the basis of literature review, site surveys and expert opinion on prevailing site conditions and sensitive receptors. Identified impacts were evaluated through Environmental and Social impact matrix.

Major environmental and Social impacts associated with the proposed project during design phase include land acquisition, loss of livelihood / economic displacement, improper design

consideration leading to improper treatment, surface/ground water contamination, soil contamination, susceptibility to floods and heat events impacting WWTP, pumping stations and associated facilities. Major impacts during construction phase include soil erosion & contamination, surface water contamination, air & noise pollution, ecological impacts, health & safety issues, traffic congestion and social and environmental issues due to construction camps. Anticipated major impacts during operational phase include disposal of sludge, contamination of groundwater due to poor maintenance, wastewater generation, occupational health & safety issues, odour problem and soil contamination due to improper handling of sludge.

Positive impacts of the proposed project are improved water quality, improvement in public health, hygiene and sanitation, reuse of treated effluent.

Mitigation measures to mitigate the adverse impacts during design phase of the proposed project include proper design; preparation of Resettlement Action Plan (RAP) in the light of World Bank guidelines, judicious compensation as per land acquisition act and international standards; proper design of WWTP on projected wastewater flows for the design period, siting of WWTP in unflooded zone area, selection of equipment to withstand extreme heat event , selection of lining material for ponds on the basis of soil permeability, adequate planning for treated effluent disposal and sludge disposal. Proposed mitigation measures during construction phase include safe storage of oil, lubricants, chemical and other hazardous substances, removal of left-over material from site, avoid use of heavy machinery on wet soil to prevent damage to soil structure, provision of temporary runoff collection system to contain the construction runoff, use of Personal Protective Equipment (PPEs) like masks, goggles and gloves, Regular water sprinkling, restrict construction vehicles movement during night time, prohibition of hunting, poaching and harassing of animals and birds, adoption of Work safety measures and good workmanship practices. Mitigation measures proposed to be adopted during operational phase include disposal of sludge in an efficient way such as landfilling of sludge after drying in a properly designed landfill site, regular monitoring of treated wastewater, proper maintenance of WWTP, use of PPEs by the staff etc.

ES-8 Environmental Management Plan

The Environmental Management Plan (EMP) describe the management and mitigation measures to address the environmental and social issues during design, construction and operational phases of the proposed project. Proposed mitigation measures will be implemented by Design Consultant (DC) and WASA during design phase, by Construction Contractor (CC), Supervision Consultant (SC) and Environmental and Social Committee (ESC), Project Management Unit (PMU) during construction phase and PMU, WASA during operational phase.

The environmental monitoring plan has also been prepared as a part of EMP which details the monitoring mechanism of a specific receptor/item, its frequency and parameters to be considered. Environmental monitoring/testing has been proposed for construction and operation phase of the project. During construction phase, Construction Contractor will be responsible for monitoring/testing of all environmental parameters (ambient air, drinking water,

waste water and noise level) biannually throughout the construction period. One (1) environmental monitoring report will be prepared on monthly basis and one (1) comprehensive report will be prepared at the end of the construction phase and will be submitted to WASA and EPA-Punjab. Annual monitoring of air and noise, drinking water and surface/wastewater will be carried out during operation phase of the project. One (1) comprehensive environmental monitoring report will be prepared and submitted to the EPA-Punjab.

A suitable training program is proposed to train the Contractor(s) staff who will be involved during construction stage and the professional staff from the PMU. The EMP implementation cost has been worked out as Rs. 300 Million.

ES-9 Conclusions

The implementation of the proposed project will have beneficial impacts on population of the project area. Construction of proposed WWTP will have overall positive impact on the surface water by discharging treated wastewater into the River Ravi. It will result in improving the water quality of River Ravi to a great extent and will decrease the pollution load. Apart from the beneficial impacts of the project, the proposed project has potential adverse environmental and social impacts during the construction and operational phases. Most of the adverse impacts during construction are of a temporary nature. However, during operational phase proper disposal of sludge would be a major issue especially during medium and long term for which a feasibility study is planned to be conducted to adopt workable solution for sludge disposal.

Proper implementation of EMP, containing mitigation measures for anticipated potential impacts along with monitoring program, should be ensured during all three phases of the proposed project. All personnel, staff, employees and contractors should undertake appropriate training prior to construction to ensure they are aware of the on-site responsibilities in respect of all environmental and social issues. Moreover, the cost for environmental management, monitoring and training has been estimated which should be included in the PC-I or overall Project Cost.

1 INTRODUCTION

1.1 PROJECT BACKGROUND

Lahore is the capital city of the Punjab Province with a population about 13 million* and is the country's second-most populous city after Karachi. The city is located in the north-eastern end of the province, near the international border with the Indian State of Punjab. Major portion of the city lies towards east and south of River Ravi, a tributary of mighty River Indus. The average elevation of the city is 700 ft. above mean sea level (AMSL). The city is situated on the flood plain of river Ravi which has a gradual slope towards south west.

Water and Sanitation Agency (WASA), Lahore, is the subsidiary agency of Lahore Development Authority (LDA), Government of the Punjab created under Section 10 (2) of the LDA Act, 1975 to perform all functions and exercise all powers with regard to water supply, sewerage and drainage including collection of fees and charges. It is one of the largest water and sanitation utility provider of Pakistan operating in the area of more than 360-Sq.Km and operating and maintaining approximately 600 tubewells, about 5,403-Km water supply lines, about 4000-Km sewerage network, 16 Major sewage disposal stations and 86 intermediate lift stations.

Currently, all the wastewater generated in Lahore City (domestic and industrial) is being discharged untreated into River Ravi through different discharge points (via disposal stations and drains). An estimated 540 MGD (1000 Cusec) of untreated domestic sewage is being disposed of into River Ravi. Therefore, WASA Lahore, has planned to construct Wastewater Treatment Plants (WWTPs) in the city on priority basis.

WASA Lahore hired consultancy services of M/s NESPAK for preparation of Design, PC-I & Tender Documents for construction of Wastewater Treatment Plant (WWTP) for Babu Sabu which will ultimately improve the environmental conditions of River Ravi. Due to budgetary limitations, WASA Lahore has arranged financing from Agence Française de Développement (AFD).

This document presents findings of the Environmental Impact Assessment (EIA) study of the construction of Wastewater Treatment Plant (WWTP) at Babu Sabu, Lahore, carried out by M/s NESPAK.

1.2 NEED FOR EIA STUDY OF THE PROPOSED PROJECT

EIA is mandatory according to the Punjab Environmental Protection (Amendment) Act, 2017. Section 12 (1) of the Act states that:

* Population Digital Census 2023

"No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof."

According to the Punjab Environmental Protection Agency (Review of IEE and EIA) Regulations 2022, the proposed project falls under category F (Water Supply, Sewerage System and Treatment) of Schedule II, which requires EIA before commencement of construction.

The project is being financed by AFD. AFD Financing is conditional upon the implementation by the client of continuous and systematic environmental and social assessment procedures.

AFD has developed operating procedures to identify, prevent or mitigate environmental and social risks and impacts, as well as any human rights violation that could result from AFD-funded activities. AFD is applying the WB E&S management Framework to assess and manage E&S risks in AFD funded project.

AFD analyzes and classifies all potential projects into High – Substantial – Moderate – Low environmental and social risks, depending on the extent of the potential risks borne by the operation. The classification takes into account the nature and scale of the operation, the location and sensitivity of the affected area, the severity of the potential environmental and social risks and impacts, as well as the client's capacity to manage them[4]. As per these categorization, the project falls under High Risk Category. The objectives of AFD to conduct ESIA are:

- To help WASA to design a project which respects the environment and populations by jointly defining activities and measures which need to be implemented in order to improve the environmental and social quality of the project.
- To inform AFD Group's decision-making process by verifying the social and environmental viability of projects put forward for its financing and thus limit legal, financial and reputation risks; and
- To allow stakeholders to be informed and participate in project design.

1.3 NATURE, SIZE AND LOCATION OF THE PROJECT

The proposed project site for the WWTP is located in south west of Lahore. The proposed site is 1.5 Km away from Babu Sabu Interchange. The site is surrounded by two settlements named as Jhuggian Nagra at north east having co-ordinates 31° 31' 29.75" N & 74° 16' 19.73" E and Shadewal at south west having co-ordinates 31° 30' 29.54" N & 74° 14' 39.38" E. In the west of the proposed site, River Ravi flows. M2 (Lahore-Islamabad) Motorway passes parallel to the proposed site. Figure 1.1 provides location map of the project area.

[4]Environmental and Social Risk Management Policy for AFD-funded Operations

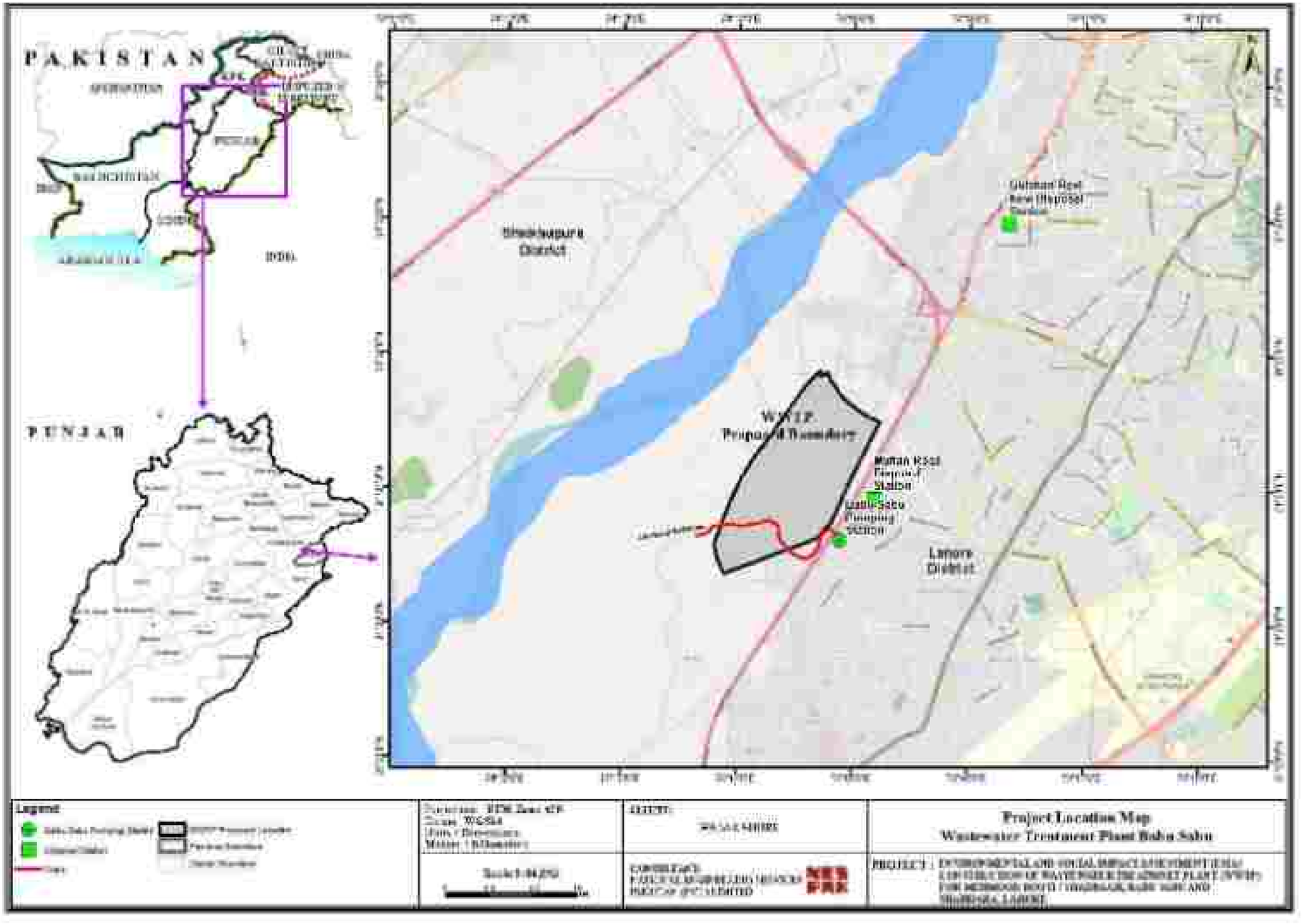


Figure 1-1: Location Map of the Project Area

Construction of Wastewater Treatment Plant (WWTP) at Babu Sabu, Lahore includes two components: Wastewater Treatment Plant including allied structures & buildings and Conveyance System to transport sewage from disposal stations to proposed WWTP site through collector channels including upgradation of existing disposal stations.

1.4 OBJECTIVE OF EIA

The major objective of this EIA study is the identification of the possible and induced direct and indirect impacts of the proposed Project on both short and long-term bases. The impact identification process focuses particularly on biophysical, socio-economic and cultural aspects of the environment. Based on the level and nature of these observations the EIA then delineates proper mitigation measures. As a planning tool, the EIA aims to ensure that environmental, socio-economic and cultural issues throughout the entire project lifecycle are anticipated and considered by the project proponent. It also serves as a framework for establishing project controls to reduce or prevent adverse environmental or socio-economic impacts.

The specific objectives of this EIA are:

- To assess the existing environmental and socioeconomic conditions of the Project Area of influence;
- To identify potential impacts of the proposed Project on the physical, ecological and social aspects of the Project Area and to predict and evaluate these impacts and determine their significance;
- To propose appropriate mitigation measures that should be incorporated in the design of the Project to avoid or minimize if not eliminate the potentially adverse impacts;
- To provide institutional, monitoring, reporting and documentation measures for environmental safeguards compliance.
- To aid decision makers to take informed decisions.

1.5 THE PROPONENT AND CONSULTANT

The proponent of the project is Water & Sanitation Agency (WASA), Lahore while the Consultant is NESPAK. The details are given as under:

a) **Proponent Contact/Address**
Deputy Managing Director (DMD), Engineering
Water & Sanitation Agency (WASA), Lahore
31-E Zahoor Elahi Road, Block B Gulberg II, Lahore
Tel: (042) 8926314-35

b) **Consultant Contact/Address**
Head ERSD Section, GT & GE Division
National Engineering Services Pakistan Private Limited (NESPAK)

1-C, Block – N, Model Town Extension, Lahore
Tel: (042) 99090000

1.6 STUDY TEAM

A multidisciplinary team conducted the EIA study. The team consisted of environmentalists, ecologist and sociologist. Detail of EIA team members are given below.

Mr. Muhammad Shariq Ahmed	:	Environmental and Resettlement Expert
Ms. Uzma Iqbal	:	Senior Environmental Scientist
Mr. Muhammad Sajjad	:	Senior Sociologist/ Resettlement Expert
Mr. Malik Pervaiz	:	Senior Sociologist
Mr. Ibatullah Khan	:	Senior Ecologist
Ms. Adeera Nasir	:	Junior Sociologist

1.7 Study Approach & Methodology

1.7.1 Study Approach

The study has been conducted in accordance with Environmental Protection Agency (EPA), Government of Pakistan (GOP) guidelines, 2000, World Bank Standards (applied by AFD) and Environmental and Social Risk Management Policy for AFD-funded Operations. The study is based on both primary and secondary data and information. The primary data includes data collected from field. The secondary data includes a review of relevant information from literature. Discussions were held with stakeholders including government officials, community representatives and a wide range of dwellers residing around the project area of influence. The main purpose of this approach was to obtain a fair impression on the people's perceptions of the project and its environmental impacts.

1.7.2 Methodology

The following methodology was adopted for carrying out the EIA study.

a) Literature Review

Prior to mobilization, 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 Legislation, Environmental and Social Risk Management Policy for AFD-funded Operations, World Bank Environmental and Social Framework and relevant WB Health and Safety Guidelines etc.; (b) Google Earth Satellite Imagery; (c) Relevant District Census Reports (DCR) and any other relevant documents/drawings; and (d) Reference similar project EIA documents.

b) Delineation of Area of Influence (AoI)

As per the national regulations along with the requirements of AFD Policy, impacts and risks

have been analyzed within the project AoI. The AoI includes the area in which construction will be carried out as well as the surrounding areas where positive and adverse, direct and indirect impacts may be foreseen due to the implementation of the proposed project. AoI of the proposed project was taken as an area of radius of 500m from WWTP including all the drains discharging wastewater into WWTP and the drain where effluent is being discharged after treatment. Furthermore discharge point of treated wastewater to River Ravi was also included in AOI. In addition to this area, surrounding settlements in the catchment area were also studied with the AOI to study social impacts.

c) Survey of AoI and Surrounding Settlements in the Catchment Area

A team of environmental and social experts, including environmental scientist, sociologist, gender specialist, ecologists, enumerators etc. carried out the environmental and social survey of the AoI and surrounding settlements in the catchment area to familiarize themselves with the local conditions and the environmental settings. During the survey, the information regarding the topography, soils, rock, surface water, groundwater, flora and fauna, social settings and villages/towns was observed.

d) Analysis of Alternatives

It is a mandatory requirement for EIA study to analyze each potential alternative available that could have been developed to meet the objectives and recommend the most environmentally and economically feasible option.

The analysis of different alternatives was carried out for the selection of the most feasible option for treatment of wastewater, in order to select the most viable route keeping in view the environmental, economic and social constraints. This exercise confirmed the justification for the need of the proposed Project.

e) Environmental Baseline Survey of the Project

After the selection of the most feasible option for treatment of wastewater based on satellite images and the delineation of AoI, detailed environmental survey was carried out within the AoI. Detailed investigations/surveys were carried out for environmental parameters on which any adverse or positive impacts were envisaged by the implementation of the proposed project. Prior to the start of field activities, comprehensive checklists, proformas and maps were developed covering the following main parameters:

Physical Environment

The information acquired for the establishment of physical environment baseline included the following main parameters:

- Land resources (including landuse pattern, soil composition, contamination of soil and soil erosion etc.);

- Water resources (including available surface and groundwater resources, hydrology, water supply, water contamination etc.);
- Details regarding surface water and drinking water quality;
- Climate data (including temperature, rainfall, humidity, wind speed and direction etc.);
- Ambient air quality and noise level monitoring data;
- Existing solid waste management and effluents disposal practices and storm water drainage;
- Buildings and infrastructure details, including residential, commercial and animal shed for complete/partial relocation;
- Religious, cultural and heritage information (mosques, shrines, graveyards); and
- Other private/public infrastructures such as roads, telephone poles, hand pumps, tube wells etc.

Ecological Environment

- Flora (trees, herbs, shrubs, grasses and overall vegetation including valuable or rare trees and their loss due to implementation of the Project etc.);
- Fauna (Wildlife (Mammals, reptiles, amphibians and avifauna));
- Aquatic Ecology;
- Agriculture and livestock;
- Reserved forests, Guzara forests, Community forests, Private forests and wildlife sanctuaries or notified areas in AoI;
- Migratory bird corridors; and
- Endangered species (both flora and fauna).

Socio-Economic Environment

A sample survey was carried out within the AoI and surrounding settlement in order to develop the socio-economic baseline information of the general settled population. Based on the sampling methodology, in total 230 households were interviewed within these villages/settlements located along the AoI for the collection of baseline socio-economic data. Gender situation survey was also carried out by consultation with 95 females.

The following major aspects were covered in the socio-economic baseline survey of the sample population settled along the AoI:

- Demographic characteristics;
- Literacy status/ education;
- Nature of business/occupation;
- Level of income;
- Living standard of the population;
- Access to credit;
- Social infrastructure available;
- Pressing needs of the people;
- Community perception about the Project etc.; and
- Other aspects.

f) Stakeholder Consultations

The Consultants identified project stakeholders and held meetings with them during the surveys to receive feedback on the expected environmental issues related to the project execution and suggested mitigation measures. Meetings were carried out with the general public, relevant departments including EPD Punjab, Forest, Wildlife, Agriculture, Livestock, Irrigation, Health, Revenue, WASA, WAPDA etc. to discuss the issues/constraints and get their views and feedback to mitigate the potential environmental impacts associated with the implementation and operation of the project.

The proceedings of the consultations meetings along with the photographs and list of participants are documented in Section 6.

g) Impact Assessment and Mitigation Measures

The data collected from the field was analyzed and the impacts of the proposed project on the physical, ecological and socio-economic environment prevalent in the project area were identified and characterized with respect to significance and probability of occurrence at the design, construction, operation and decommissioning phases. Possible mitigation measures and implementation mechanisms are proposed so that the impacts can be avoided/ mitigated/ offset and the project implementation remains sustainable.

h) Environmental Management Plan (EMP)

An EMP for the proposed project activities was prepared. The EMP provides a plan for implementing and managing the mitigation and monitoring measures. The EMP includes the following:

- Mitigation and monitoring plan;
- Definition of roles and responsibilities of the proponent, contractors and monitoring teams;
- Monitoring Mechanism
- Requirements for communication, documentation and training during the project; and
- Change Management Plan to cover unforeseen events / environmental conditions during the project.

i) Gender mainstreaming in the EIA

To meet the objectives of AFD regarding gender mainstreaming in the projects, all steps were performed with a gender perspective from the literature review to the identification of impacts and proposal of mitigation measure passing by consultations and baseline analysis.

Gender Action Plan (GAP) has been prepared through an iterative process to be consistent with other documentation surrounding the project and to be specifically tailored for the project.

2 LEGAL FRAMEWORK

This section outlines the current environmental policy as well as legal and administrative framework related to carrying out the Environmental and Social Impact Assessment (ESIA) of Wastewater Treatment Plant at Babu Sabu. All the pertinent environmental policies and guidelines of the Agence Française de Développement (AFD), national and provincial guidlines and legal frameworks have been duly conferred. In addition, the roles and responsibility of the proponent as well as the Environmental Protection Agency (EPA) Punjab have been discussed in this section.

The purpose of this EIA is to ensure that the proposed project complies with all national environmental legislations as well as the environmental and social requirements of the AFD which are World Bank E&S Standards.

2.1 KEY NATIONAL LAWS, REGULATIONS AND POLICIES

The following description presents a brief overview of the relevance of various existing national policies, legislation and guidelines.

2.1.1 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 affecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.

2.1.2 National Conservation Strategy 1992

NCS 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. Part 3 of NCS provides action agenda & implementation strategy of 14 program areas for priority implementation. Those relevant to the proposed project are mainly preventing/abating pollution, managing urban wastes, conserving biodiversity, increasing energy efficiency, supporting institutions for common resources, integrating population and environment programs and preserving the cultural heritage.

2.1.3 National Environmental Policy (NEP), 2005

In March 2005, Government of Pakistan (GOP) launched its National Environmental Policy which provides an overarching framework for addressing the environmental issues. Section 3

of the policy commits for integration of environment into development planning as instrument for achieving the objectives of National Environmental Policy. It further states in clause (b) of subsection 5.1 that EIA/IEE related provisions of Environmental Protection Act, 1997, will be thoroughly enforced for all developmental projects. 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.

Management of proposed project will ensure that the project will not add to the aggravation of the environmental issues identified in NEP and mitigation measures would be adopted to minimize or avoid any contribution of the project in these areas.

2.1.4 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.

With an overall goal to ensure that climate change is mainstreamed in the economically and socially vulnerable sectors of the economy and to steer Pakistan towards climate resilient development', the Policy puts forward comprehensive policy objectives of sustained economic growth, integration of climate change into litter-related national policies, pro-poor gender sensitive adaptation and cost-effective mitigation, water, food and energy security, disaster risk reduction (DRR), effective decision making and coordination, creating awareness, building capacities, and conservation of natural resources and long term sustainability. It also seeks effective use of financial opportunities and public and private sector investment in adaptation measures.

This policy emphasis the need of taking necessary measures to integrate climate change concerns into Initial Environmental Assessment and Environmental Impact Assessment (EIA) processes. It further reinforce the need to ensure that IEE/EIA and other mechanisms are strictly observed in all development projects, particularly infrastructure projects, by the concerned agencies.

In this regards, climate change and flood assessment study has been performed by Grouphelt Consultant (hired by AFD) under this project and anticipated risk has been taken into account while assessing impact and defining mitigation measures.

2.1.5 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 therewith and ancillary thereto.

2.1.6 National Water Policy

The National Water 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.

2.1.7 Pakistan Environmental Protection Act (PEPA), 1997

Pakistan Environmental Protection Act, 1997 (PEPA) is the basic legislative tool empowering the Government of Pakistan to frame and enforce regulations for the protection of environment. The PEPA 1997 is broadly applicable to air, water, soil, marine and noise pollution and handling of hazardous wastes. However, after the 18th amendment, environment has become a provincial subject therefore, the Punjab law will govern the proposed project.

2.1.8 Environmental Assessment Guidelines

Pak-EPA has also published environmental assessment procedures and guidelines in October, 1997, which contains the following sets of information relevant to the proposed project:

i) *Guidelines for Policy and Procedures for Filing, Review and Approval of Environmental Assessment Reports*

It describes environmental policy and administrative procedures to be followed for filing of environmental assessment reports by the proponents and its review and approval by the concerned environmental protection agency/department.

ii) *Guidelines for the Preparation and Review of Environmental Reports*

These guidelines are developed to facilitate both the proponents and decision makers to prepare reports (inclusive of all the information contained therein) and carry out their review so as to take informed decisions.

iii) *Sectoral Guidelines: Major Sewerage Schemes*

Pakistan Environmental Assessment Procedure deals with general guidelines as well as sectoral guidelines for environmental assessment studies. The sectoral guidelines have been given for some categories of projects including wastewater management. This includes

guidelines to: strictly enforce NEQS and Self-Monitoring and Reporting System, make the installation of wastewater treatment plants an integral part of all sewerage schemes and devise and implement a master plan for the treatment of municipal and industrial wastewater in urban and rural areas.

These guidelines embody issues/impacts commonly arising due to sewage, the mitigations to reduce/eliminate these impacts and the need for environmental management plan and monitoring plan to protect the environment.

iv) Guidelines for Public Consultation

These guidelines deal with possible approaches to public consultation and techniques for designing an effective programme of consultation that involves all major stakeholders and ensures that their concerns are incorporated in any impact assessment study.

2.1.3 Land Acquisition Act, 1894 Including Later Amendments

In Pakistan, LAA 1894 regulates the land acquisition process and enables the federal and provincial governments to acquire private land for public purposes through the exercise of the right of eminent domain. Land acquisition is a provincial responsibility and each province has its own province specific amendments in the Law and interpretation of the Act. Some provinces also have their own province specific implementation rules. The LAA and its implementation rules require that following an impact identification and valuation exercise, land and crops are compensated in cash at the current market rate to the titled landowners. The LAA mandates that land valuation is to be based on the last 3 to 5 years average registered land-sale rates. However, in several recent cases, the median rate over the past 1 year, or even the current rates, has been applied with an added 15% compulsory acquisition surcharge according to the provision of the law. In addition to the provisions of LAA, related regulations setting out the procedures for land acquisition have been provided in province specific rules.

The LAA lays down definite procedures for acquiring private land for projects and payment of compensation. For entering private land or carrying out surveys and investigations, specified formalities have to be observed and notifications to be issued. Damage to any crops during survey and investigations has to be compensated. The displaced persons, if not satisfied, can go to the Court of Law to contest the compensation award of the Land Acquisition Collector (LAC).

The Law deals with matters related to the acquisition or temporary occupation of private land and other immovable assets that may exist on it when the land is required for public purpose. The right to acquire land for public purposes is established when Section 4 of the LAA is triggered. The LAA specifies a systematic approach for acquisition and compensation of land and other properties for development projects. It stipulates various sections pertaining to notifications, surveys, acquisition, compensation and apportionment of awards, along with disputes resolution, penalties and exemptions. The surveys of land acquisition are to be

disclosed to the displaced persons. However, the law only recognizes "legal" owners of property supported by records of ownership such as land record title, registered sale deeds, or agreements.

This law is applicable in resettlement of the community and will ensure provision of adequate compensation of land to the affectees.

2.1.10 Protection of Trees and Brushwood Act, 1949

This Act prohibits cutting or lopping of trees and brushwood without permission of the Forest Department. The Forest Department will be approached for permission to cut trees along the proposed project site.

2.1.11 Antiquities Act 1975

The protection of cultural resources in Pakistan is ensured by the Antiquities Act of 1975. Antiquities have been defined in the Act as ancient products of human activity, historical sites or sites of anthropological or cultural interest, national monuments etc. The act is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area, which may contain articles of archaeological significance.

The Antiquities Act, 1975 (amended in 1992) 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.

There are no cultural resources present at the project site; hence this law is not applicable to the project.

2.1.12 Canal and Drainage Act, 1873

This act contains provisions for the prevention of pollution of natural or man-made water bodies. It prohibits the discharge of any solid or liquid or combination of both from any source into any river, canal or drain including natural channels (Sec. 69A (4)). The exceptions are

discharges that do not harm the natural environment of the receiving water body and/or corrupt or foul the water channel so as to render it unfit for the purpose for which it is ordinarily used (Sec 70 (6)). Any person who fails to comply with the provisions shall be incurred with the penalty provided under the act.
The wastewater after treatment will be discharged into Ravi river flowing in close proximity of wastewater treatment plant, which is expected to be used for agriculture purposes by the farmers in downstream areas. According to a provision of this act (Sec 59-A (3)), the applicant shall obtain a certificate of no adverse impact from EPA/Canal Officer before discharging treated wastewater into Ravi River.

2.1.13 Building Code of Pakistan

The provisions of the Building Code of Pakistan shall apply for the engineering design of structures and related components. Designs which are in violation of the building code will not be allowed to be constructed. Moreover, a certificate for the proposed action has to be obtained from the provincial building control authority.

2.1.14 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 in defilement of the Building Code 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 subject project as it includes the formation of structures.

2.1.15 Disaster Management Act, 2010

The Disaster Management Act, 2010 to offer an effective National Disaster Management System and for matters associated therewith or incidental thereto and to overawed unforeseen situations. The act is administered by federal government which provides guidelines for the provision of disaster management plans, offer necessary technical assistance to the Provincial Governments and Provincial Authorities as well for preparing their disaster management plans in case of any mishap. This Act is valid to the subject project in case of any unseen situation.

2.1.16 Draft Solid Waste Management Guidelines (2005)

Draft Guidelines for Solid Waste Management explain the waste generation, discharge and composition. These guidelines will strictly be followed for safe handling and disposal of waste generated during construction and operational stages of the project.

2.1.17 Hazardous Substance Rules, 2003

Hazardous Substance Rules, 2003 deals with handling, storage, transportation and health &

safety procedures to be followed in the workplace. These rules deal with generation and handling of any kind of hazardous substance (solid, liquid & gas) as listed in Schedule I of the rules. These Rules provide Safety plan, waste management plan, transportation of hazardous materials procedures as well as reporting mechanism in case of any accident. Under these rules a license has to be taken from Federal/Provincial Agency for handling and transportation of hazardous material (Schedule II of Rules). This rule will be applicable during construction works (waste management, fuel storage etc. and in operational phase in case of handling of sludge.

2.1.18 International Labor Organization (ILO)

The ILO aims to ensure that it serves the needs of working women and men by bringing together governments, employers and workers to set labor standards develop policies and devise programs.

The ILO has the following four strategic objectives:

- Promote and realize standards and fundamental principles and rights at work
- Create greater opportunities for women and men to decent employment and income
- Enhance the coverage and effectiveness of social protection for all
- Strengthen social dialogue

2.1.19 Labor and Health and Safety Legislation

The Constitution of Pakistan contains a range of provisions with regards to labor rights, in particular:

- Article 11 of the Constitution prohibits all forms of slavery, forced labor and child labor;
- Article 17 provides for a fundamental right to exercise the freedom of association and the right to form unions;
- Article 25 lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone; and
- Article 37(e) makes provision for securing just and humane conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment.

Labor law is controlled with compulsory employment agreements containing the terms set out by the labor laws.

2.1.20 Factories Act, 1934

This law governs the employment of labour, working hours, working conditions and facilities to be provided in the workplace. The Act deals primarily with matters related to labour relations, working conditions and health and safety in the work place. Sections 14 to 33 of the act specifically cover all the issues related to the work environment of labourers including

ventilation (sec14), drinking water conditions (sec) the issues related to working environment of labourers including ventilation (14), drinking water conditions for worsec15), precautions against fire hazards (sec 22) or any other hazardous operation within the working area (sec 33). This will be applicable during the construction and operational stages of the project. Contravention to any of the provisions of this act will lead to penalty against the concerned person.

2.1.21 Employment of Child Act, 1991

This Act prohibits the employment of children in any of the proposed project activities.

2.1.22 National Action Plan for COVID-19 Pakistan

Government of Pakistan has launched the National Action Plan for COVID-19 Pakistan to combat the challenge of prevailing virus, also available at: https://www.nih.org.pk/wp-content/uploads/2020/03/COVID-19-NAP-V2-13-March-2020.pdf. The Government of Pakistan has launched the real-time data portal for COVID-19 http://covid.gov.pk/. These measures are mostly relating to the containment and awareness and capacity building. Besides this COVID-19 daily situation report is also available at https://www.nih.org.pk/wp-content/uploads/2020/04/COVID-19-Daily-Updated-SitRep-03-April-2020.pdf

2.2 PROVINCIAL LAWS, REGULATIONS AND POLICIES

After the 18th amendment to the constitution of Pakistan, many subjects including environmental protection and pollution prevention, have been devolved to the provincial jurisdiction. Therefore, the apex environmental statute governing the proposed project will be the Punjab Environmental Protection Act 2012. However, detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation are still in various stages of formulation and discussion. The following description presents a brief overview of the relevance of various existing provincial policies, legislation and guidelines.

2.2.1 Punjab Environmental Protection Act 1997, (As Amended upto 2017)

Post the adoption of the 18th Constitutional Amendment in 2011, the subject of environment was devolved and the provinces have been empowered for environmental protection and conservation. The Punjab Environmental Protection Act, 1997 (as Amended upto 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 IEE with the Provincial Agency designated by the Provincial EPAs an 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.

2.2.2 Punjab Environmental Protection (Review of IEE and EIA) Regulations, 2022

These Regulations provide the necessary details on the preparation, submission and review of IEE and EIA. The Regulation classifies projects on the basis of expected degree of adverse environmental impacts and lists them in two separate schedules.

In accordance with Schedule II, *Clause F - Water Supply, Sewerage System and Treatment* of these regulations, an EIA for the proposed project needs to be submitted to the Provincial Environmental Protection Agency in order to obtain Environmental Approval for it.

2.2.3 Punjab Environmental Quality Standards (PEQS), 2016

In exercise of the powers conferred under clause (o) of sub-section (1) of section 4 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), the Environmental Protection Council has approved the Punjab Environmental Quality Standards (PEQS), 2016. They endow information on the permissible limits for discharges of municipal and industrial effluent parameters and industrial gaseous emissions in order to regulate environmental pollution.

2.2.4 Punjab Environmental Tribunal Rules, 2012

According to Section-31 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), the Tribunal shall make every effort to dispose of a complaint or an appeal or other proceedings regarding environmental problems associated with construction and development of any project within sixty days from the date of filing of the complaint, appeal or other proceedings but any decision of the Tribunal shall not be rendered invalid by reason of any delay in the disposal of complaint, appeal or other proceedings.

2.2.5 Punjab Local Government Ordinance, 2001

Environmental protection is federalized subject under Punjab Local Government Ordinance (LGO), 2001. Despite any specific provisions, every local government may execute functions conferred by or under the Punjab LGO, 2001 and in performance of such functions may implement such powers, which are necessary and appropriate. Until different provisions, rules, regulations or byelaws are made, the local governments may exercise such powers as

are specified in the Sixth Schedule of Punjab LGO, 2001. Environmental protection is sequential at 48 of the Sixth Schedule.

2.2.6 The Punjab Flood Plain Regulation Act, 2015

This act regulates construction in the flood plains in the Punjab. According to this act, no construction can be carried out in flood plains without prior approval in writing from canal officer.

2.2.7 The Motor Vehicles Rules, 2000

Subject to the provisions of this Act, and the rules and regulations, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the National Environmental Quality Standards, or where applicable the standards customary under clause (g) of sub-section (1) of section 6.

2.2.8 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. The proposed project is semi-urban in nature and no protected forest is situated in and around the Project area.

2.2.9 Punjab Plantation and Maintenance of Trees Act, 1974

The Punjab Plantation and Maintnance 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 (LWASA) of the proposed Project land who would have the physical possession.

2.2.10 The Punjab Wildlife (Protection, Preservation, Conservation & Management) Act, 1974

This act provides for the protection, preservation, conservation and management of wildlife in the Province of Punjab. This act defines the wildlife sanctuary, game reserves, protected areas and national parks. It also defines the rules and responsibilities of the relevant authorities and the relevant personnel to protect the ecological resources. It also describes the penalties and punishments on offenses against the sections given in the act.

2.2.11 Punjab Occupational Safety and Health Act, 2019

This law was enacted to ensure occupational safety and health of the persons at workplace. It aims at protection of workers against risks arising out of the occupational hazards and to

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

2.2.12 Punjab Restriction on Employment of Children Act, 2016

According to the sub-section 11(a) of this act, an occupier who employs or permits a child (person under the age of 15 years) to work in an establishment shall be liable to punishment with imprisonment for a term which may extend to six months, but which shall not be less than seven days, and a mandatory fine between 10,000 and 50,000 rupees. This act will trigger if contract higher skilled and unskilled labour under age 15.

2.2.13 Punjab Protection of Women against Violence Act, 2016

This act counters gender-based discrimination, violence against women, and economic and social empowerment of women. This act will entail if gender based violence observed in the project area during construction phase.

2.2.14 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 law will be applicable to the proposed project mainly due to its provision that any construction activity within 91 meter 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 AFD AND WORLD BANK POLICIES

2.3.1 Environmental and Social Risk Management Policy for AFD-funded Operations

AFD mainstreams corporate social responsibility into its governance system and activities. In this context, AFD takes measures to assess and manage environmental and social risks for all AFD-funded operations. AFD has developed operating procedures to identify, prevent or mitigate environmental and social risks and impacts, as well as any human rights violation that could result from AFD-funded activities. AFD E&S risk management approach is aligned with WB E&S standards.

AFD requires environmental and social assessment procedures to (i) assess the environmental and social impacts of operations, (ii) propose appropriate measures to avoid the negative impacts or, when they are unavoidable, reduce or offset them in an appropriate manner, (iii) monitor the application of such measures during the implementation phase of the operation, and (iv) conduct an ex-post evaluation of the effectiveness of the proposed measures.

AFD's due diligence approach requires analysis of the environmental and social risks and impacts during the ex-ante assessment of the operation, in a manner adapted to the nature

and scale of the operation and proportional to the levels of these risks and impacts. It involves considering the environmental and social issues as early on as possible, right from the design stage and in the implementation of operations, to define appropriate measures to avoid, reduce and, where necessary, offset their significant adverse environmental and social impacts.

Categorization of Project as per AFD Policy

AFD analyses and classifies all potential projects into High – Substantial – Moderate – Low environmental and social risks, depending on the extent of the potential risks borne by the operation. The classification considers the nature and scale of the operation, the location and sensitivity of the affected area, the severity of the potential environmental and social risks and impacts, and the client's capacity to manage them. This classification aims to determine the nature and depth of the environmental and social assessment required, the level of environmental and social standards the project will be required to comply with, the need to engage stakeholders, and the level of information required.

AFD has adopted the World Bank's prevailing environmental and social operational standards. These standards apply to projects with environmental and social risks categorized as High or Substantial. Compliance with the environmental and social standards of World Bank is the objective of the environmental and social performance applied to AFD-funded operations. Under AFD's Environmental and Social Risk Management (ESRM) policy the project owners are required to comply with relevant obligations of the Environmental, Health and Safety Guidelines (EHSGs) of the World Bank Group.

Babu Sabu is categorized as a High Risk project as per AFD and thus need to comply with WB E&S standards.

2.3.2 World Bank's Environment and Social Framework

The World Bank Environmental and Social Framework approved in August 2018, sets out the World Bank's commitment to sustainable development, through a Bank Policy and a set of Environmental and Social Standards that are designed to support Borrowers' projects, with the aim of ending extreme poverty and promoting shared prosperity.

- World Bank Environment and Social Policy for Investment Project Financing

It sets out the mandatory requirements of the Bank in relation to the projects it supports through Investment Project Financing.

The World Bank undertakes environmental screening of each proposed project to define the extent and type of required environmental assessment. The projects are classified by four risk categories/classification based on their type, location, sensitivities and scale:

- High: A Project is classified as High Risk if the project is likely to generate a wide range of significant adverse risks and impacts (preservation areas, cultural heritage

sites, traditional communal lands etc.) and are on human populations or the environment and impact is long term, permanent and/or irreversible, high in magnitude, significant adverse cumulative impacts and a high probability of serious adverse effects to human health and/or the environment.

- **Substantial**: A Project is classified as **Substantial Risk** if the Project may not be as complex as High Risk Projects, its ES scale and impact is large to medium (temporary, predictable and/or reversible and are medium in magnitude), medium to low probability of serious adverse effects to human health and/or the environment and there are known and reliable mechanisms available to prevent or minimize such incidents.
- **Moderate**: A project is classified as **Moderate Risk** if risks and impacts on human populations and/or the environment are not likely to be significant, located away from environmentally or socially sensitive areas, impact is predictable and reversible, duration is short term and low in magnitude, low probability of serious adverse effects to human health and/or the environment and can mitigate easily.
- **Low**: A project is classified as **Low Risk** if it's potential adverse risks to and impacts on human populations and/or the environment are likely to be minimal or negligible. These projects, with few or no adverse risks and impacts and issues, do not require further E&S assessment following the initial screening.

2.4 INTERNATIONAL CONVENTIONS AND TREATIES/ MEAS

As Pakistan is a member of a number of international organizations such as United Nations Organization (UNO), Organization of the Islamic Conference (OIC), South Asian Association for Regional Cooperation (SAARC), Economic Cooperation Organization (ECO) etc., so it has to follow the international protocols and obligations related to the environment. The major protocols, ratification dates by Pakistan and obligations related to the proposed project are provided in the Table 2.1 below:

Table 2.1: International Agreements/Conventions Relevant to the Project

Sr. No.	Agreement/ Convention	Ratification	Description/Relevance
1	UNESCO Convention on the Protection of the World's Cultural and Natural Heritage, 1972 Web Link: http://whc.unesco.org/en/?e20convention%20text	Pakistan ratified this convention on 23rd July 1976.	Convention concerning the Protection of the World Cultural and Natural Heritage - requires parties to adopt a general policy on the protection of the natural and cultural heritage, to set up services for such protection, to develop scientific and technical studies, to take appropriate legal, technical, scientific and administrative measures and to foster training and education for such protection. The proposed project design and EE team paid due attention to archaeological sites and local norms. Both of these factors will also be

Sr. No.	Agreement/ Convention	Ratification	Description/Relevance
			considered during project implementation.
2	The Rio Declaration, 1992 Web Link: http://www.unesco.org/education/pdf/RIO_E.PDF	Pakistan signed the treaty on 13th June 1992 and ratified on 1st June 1994	The Rio Declaration comprises 27 principles which address important issues such as: sustainable development to integrate environmental protection into the development process; common but differentiated responsibilities to conserve, protect and restore the earth's ecosystems; public participation and information access at the national level; reduce and eliminate unsustainable patterns of production and consumption.
3	Kyoto Protocol, 1992 Web Link: https://unfccc.int/kyoto_protocol	Pakistan has ratified Kyoto Protocol in 2005	The Kyoto Protocol is a protocol to reduce Greenhouse gasses that cause climate change. It was agreed on 11th December, 1997 at the 3rd Conference of the countries to the treaty when they met in Kyoto, and entered into force on 16th February, 2005. As of November 2007, 175 countries have ratified the protocol. One hundred and thirty-seven (137) developing countries have ratified the protocol, including Brazil, China, India and Pakistan but have no obligation beyond monitoring and reporting emissions.
4	Convention on Biological Diversity, 1992 Web Link: https://www.cbd.int/	Pakistan signed this treaty in 1992 and it was ratified by cabinet in 1994.	The Convention on the Biological Diversity (CBD) has three main goals: Conservation of biological diversity (or biodiversity); sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources.
5	The Basel Convention, 1989 Web Link: http://www.basel.int/Implementation/LegalMatters/tabid/1271/Default.aspx	Ratified 26th July 1994	Basel Convention on the control of trans-boundary movements of hazardous wastes and their disposal is an international treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to Less Developed Countries (LDCs). It does not, however, address the movement of radioactive waste. The Convention is also intended to minimize

Sr. No.	Agreement/ Convention	Ratification	Description/Relevance
			the account and toxicity of wastes generated for environmentally sound management as closely as possible to the source of generation, and to assist LDCs in environmentally sound management of the hazardous and other wastes they generate. The provisions of this convention imply to minimize the account of waste generated and its management during construction and O&M phases.
6	Stockholm Convention on Persistent Organic Pollutants (POPs), 2004 Web Link: https://www.un.org/press/en/2004/unep204.doc.htm	The Stockholm Convention on Persistent Organic Pollutants was signed on 22nd May 2001 and entered in to force on 17th May, 2004. Pakistan signed the convention on Dedember,6, 2001.	Convention seeks to protect human health and the environment from POPs as set out in Article 1, which are chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife.
7	Sustainable Development Goals (SDGs) – 2015-2030 Web Link: https://sustainabledevelopment.un.org/focussdgs.html	Pakistan was the first country to adopt SDGs 2030 agenda through a unanimous resolution of the Parliament of Pakistan.	The Sustainable Development Goals (SDGs) are a good collection of 17 global goals set by the United Nations in 2015. Pakistan has recently committed to Agenda 2030 and has become signatory to SDGs where Goal 6 calls, among others, for ensuring availability and sustainable management of water and sanitation for all, water use efficiency and integrated water resources management. The SDG 5 on gender equality and women's empowerment, emphasizes to ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life.
8	United Nation Framework Convention on Climate Change (UNFCCC), 1992 Web Link: https://unfccc.int/process-and-meetings/the-convention/status-of-ratification/status-of-ratification-of-the-	Signed on 13th June 1992 and ratified on 1st June 1994.	The UN Framework Convention on Climate Change (UNFCCC) is a multilateral agreement to address the issue of climate change. The Convention was sets out and opened for signature at the June 1992 UN Conference on Environment and Development (UNCED), also known as the Rio Earth Summit. The UNFCCC entered into force on 21 March 1994.

Sr. No.	Agreement/ Convention	Ratification	Description/Relevance
	convention		Pakistan being signatory of this treaty is bound to control the GHG emissions and climate change. Recent conference of parties (COP) for UNFCCC was held from 3 to 17 Nov, 2017 in Bonn Germany.
3	Paris Agreement, 2015 Web Link: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement	Paris Agreement was signed on 22nd April 2016 and ratified on 10 November 2016.	The Paris Agreement's long-term temperature goal is to keep the increase in global average temperature to well below 2 °C above pre-industrial levels; and to pursue efforts to limit the increase to 1.5 °C, recognizing that this would substantially reduce the risks and impacts of climate change. It also aims to increase the ability of parties to adapt to the adverse impacts of climate change, and make "finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development." Under the Paris Agreement, each country must determine, plan, and regularly report on the contribution that it undertakes to mitigate global warming.

2.5 ADMINISTRATIVE FRAMEWORK

2.5.1 Water and Sanitation Authority (WASA), Lahore

The implementing agency of the proposed Project is Water and Sanitation Authority (WASA), Lahore. The management of WASA will ensure that all the proposed measures are effectively implemented at the design, construction and operational stages. Moreover, LWASA is responsible for ensuring that that all preconstruction requisites, such as permits and clearances are met.

2.5.2 Environmental Protection Agency, Punjab

Implementation of Punjab Environmental Protection Act 1997 (Amended 2012 & 2017) is the mandate of the Punjab-EPA. Punjab-EPA is headed by a Director General and sections are headed by Directors, i.e., Director Technical, Director Administration and Finance, and Director Laboratory. Punjab-EPA has established District Environment Offices at district level.

As the proposed Project falls in Lahore District of Punjab, therefore, Punjab-EPA will be responsible for reviewing the report, issuing environmental approval and overall monitoring of the proposed project activities.

3 DESCRIPTION OF THE PROJECT

3.1 PROJECT BACKGROUND

Due to the urban sprawl, the Lahore city has faced exponential growth in population. Consequently, consumption of water and wastewater generation rate has increased significantly. Currently, the wastewater generated is either disposed of in River Ravi or reused for irrigation purposes without any treatment. The disposal of untreated wastewater deteriorates the water quality of River Ravi and associated aquatic life. In addition, it poses risk to public health by serving as breeding ground for disease vectors. The uptake of the contaminants into the food chain by using raw wastewater for irrigation purpose is another concern.

To overcome this situation the Water and Sanitation Agency (WASA), Lahore, Government of Punjab (GOP) has planned to provide facilities to treat the wastewater before its final disposal or any other intended reuse. For this, WASA, Lahore has engaged National Engineering Services Pakistan (Pvt.) Ltd. (NESPAK) to provide consultancy services for establishment of wastewater treatment facility for Babu Sabu, Lahore.

As per NESPAK initial design, the Project was made of the following components:

Component 1: Construction of the conveyance system to transport wastewater from the existing disposal stations or drains to Babu Sabu WWTP, which includes collector channels and forcemains and WWTP inlet pumping station and the upgrade of existing Disposal Stations and pumping stations.

Component 2: Construction of Babu Sabu WWTP featuring the conventional activated sludge (CAS) process.

The Component 2 was further divided in two phases i.e., Phase-1 (for Year 2020-2035) and Phase 2 (for year 2036-2046).
However, AFD intended to finance only component 2 i.e., construction of wastewater treatment plant. NESPAK design was reviewed by AFD experts and decided to further examine the wastewater flows by installing flow measurement gauges and pollution characterization. AFD hired a consultant "Groupe Huit" for this study. The outcomes of the new studies, namely "Babu Sabu Project, Lahore, Pakistan – Complementary Study" led to preparation of a new PC-1, known as "Babu Sabu Wastewater Project, Stage 1 (BSS1)" Based on the finding of the study, the consultant prepared a conceptual design report which is attached as Annex-I. The project details, presented in this section is taken from the conceptual design report.

3.2 EXISTING CONDITIONS

Existing Sewerage District Areas of Lahore

The existing wastewater collection system of Lahore is a combined system consisting of the primary, secondary and tertiary network. WASA is also responsible for maintaining of the Lahore's water supply system and storm water drainage system. Both secondary sewers and storm water drains carry wastewater flows to the river Ravi. In WASA service area of Lahore, there are twelve (12) Disposal Stations (discharging wastewater flows to either Ravi River or to primary drains that end up in the Ravi River), four (4) Drainage Pumping Stations and ninety-one (91) Lifting Stations. While the Disposal Stations operate throughout the year, the Drainage Pumping Stations are intended to operate only during the monsoon period, i.e. to pump only the generated storm water flows. However, a number of sewer pipelines are connected to the storm water drains and, as a consequence, the Drainage Pumping Stations are presently utilized as disposal stations during the wet weather periods [4] The summary of existing sewerage district areas is given in Table 3.1.

Table 3.1: Summary of Existing Sewerage District Area[4]

Sr. No.	Sewerage District	Area (km^2)	Length of Sewer (km)
1	North East District	59.27	923
2	North District	25.30	532
3	Central District	23.00	386
4	South Civil District	26.69	536
5	South West District	25.51	450
6	South District	218.00	1066
7	South East District	18.82	1.05
8	North West Shalimar District	18.49	240
Total		385	3,725

Sewerage System of Babu Sabu Area

At present, sewerage catchment of Babu Sabu area is mainly served by six (06) disposal station. The wastewater/sewage, from the pumping stations, is directly discharged to the river Ravi from the following six (06) disposal/drainage stations without any treatment:

i. Main Outfall No. 1-3 Disposal Station
ii. Gulshan-e-Ravi Disposal Station
iii. Multan Road Disposal Station
iv. Chotta Ravi Drainage Pumping Station
v. Babu Sabu Drainage Pumping Station
vi. Forest Colony Disposal Station

[4] Final Feasibility Study Report for Mahmood Booti Sharbagat and Shahdara Wastewater Treatment Plants Lahore

[4] Preparation of Master Plan for Water Supply, Sewerage and Drainage System for Lahore, Volume 2.

Initially, drainage pumping stations were provided at the end of main drains of Lahore for purpose of pumping storm water. Currently, these drains receive a huge quantity of the sewage from a number of lift stations and drains flow approximately full even in the dry weathers. Conceptual diagram of the arrangement of lift stations, main drains and disposal/drainage pumping stations is given in Figure 2.1.

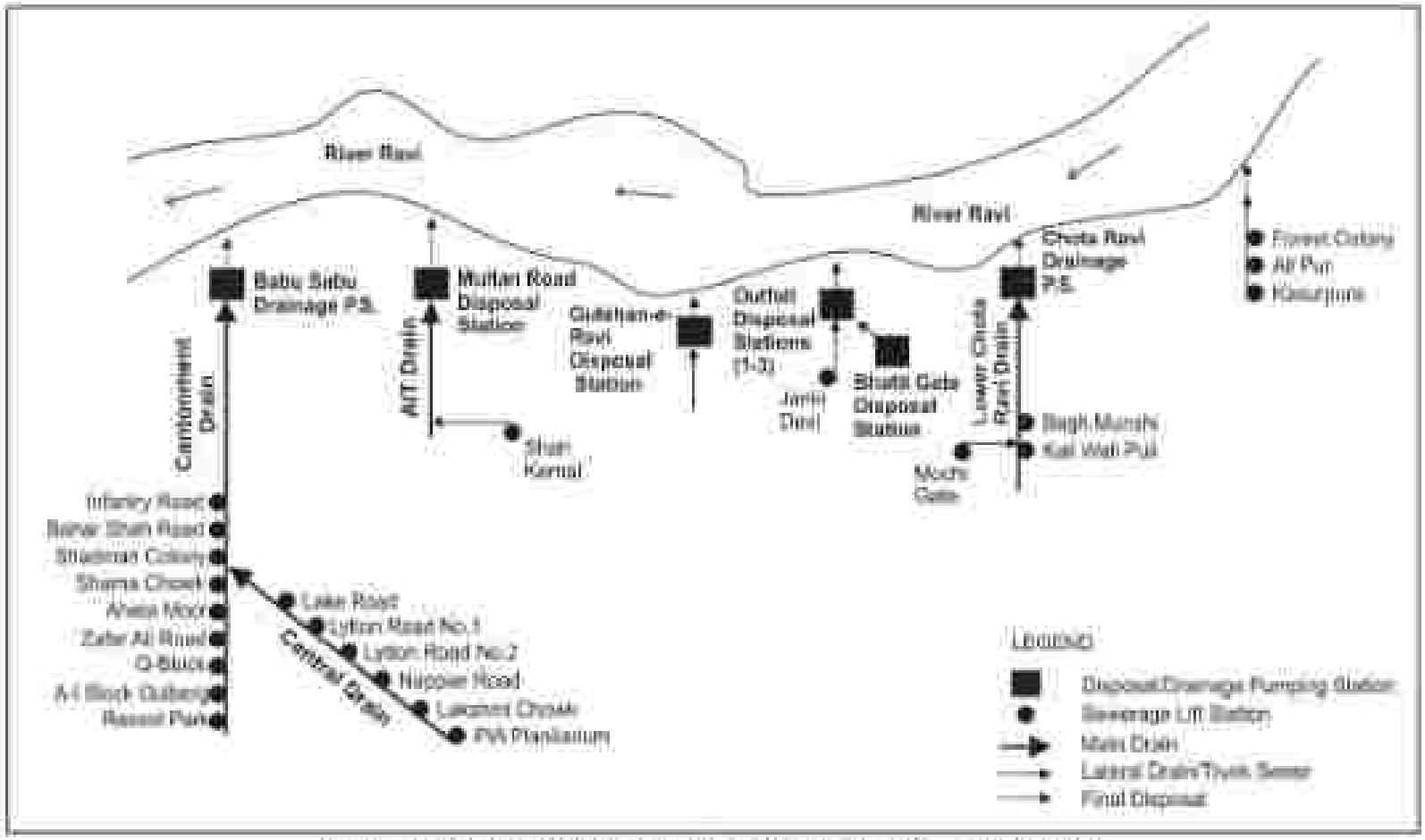


Figure 3-1: Conceptual Diagram of Sewerage System of Babu Sabu

3.3 OBJECTIVES OF PROPOSED PROJECT

Objectives of Design of WWTP Project are as follows:

- To meet the prevailing environmental standards (Punjab Environmental Quality Standards-PEQS)
- To improve condition of river Ravi by reducing the pollution load
- To make treated effluent suitable for reuse for agriculture, after dilution with river water.
- To prevent the spread of diseases resulting from improper disposal of wastewater.
- To prevent and control soil and groundwater pollution.

3.4 PROJECT LOCATION AND ACCESSIBILITY

The proposed project site for the Wastewater Treatment Plant (WWTP) is located in south west of Lahore. The proposed site is 1.5 Km away from Babu Sabu interchange. The site is surrounded by two settlements named as Jhuggian Nagra at north east having co-ordinates 31° 31' 29.75" N & 74° 16' 19.73" E and Shadewal at south west having co-ordinates 31° 30' 29.54" N & 74° 14' 39.38" E. In the west of the proposed site, River Ravi flows. M2 (Lahore-Islamabad) Motorway passes parallel to the proposed site.

Location Map of the Project Area is given in previous section as Figure 1.1. Accessibility Map is given as Figure 3.2.

3.5 CATCHMENT AREA

Babu Sabu (South-West) WWTP is proposed to treat wastewater from some specific catchment areas of WASA, Lahore. The catchment area of Babu Sabu WWTP, Disposal Stations and Cantonment Drain is presented separately in Figure 3.3, Figure 3.4 and Figure 3.5.

3.6 AREA OF INFLUENCE (AOI)

The AoI includes the area in which construction will be carried out as well as the surrounding areas where direct and indirect impacts may be foreseen due to the implementation of the proposed project. Following areas were included in AOI:

1. An area of 500m from the area where treated effluent will be discharged in existing cantonment drain.
2. Section of River Ravi downstream which will ultimately receive treated wastewater from WWTP.
3. An area of 500m from WWTP which includes all the drains that discharge wastewater into WWTP.
4. An area of disposal stations which are being upgraded under this project.
5. Catchment area has also been discussed for AOI definition as per recommendations of AFD.

Map of AoI is given as Figure 3.6.

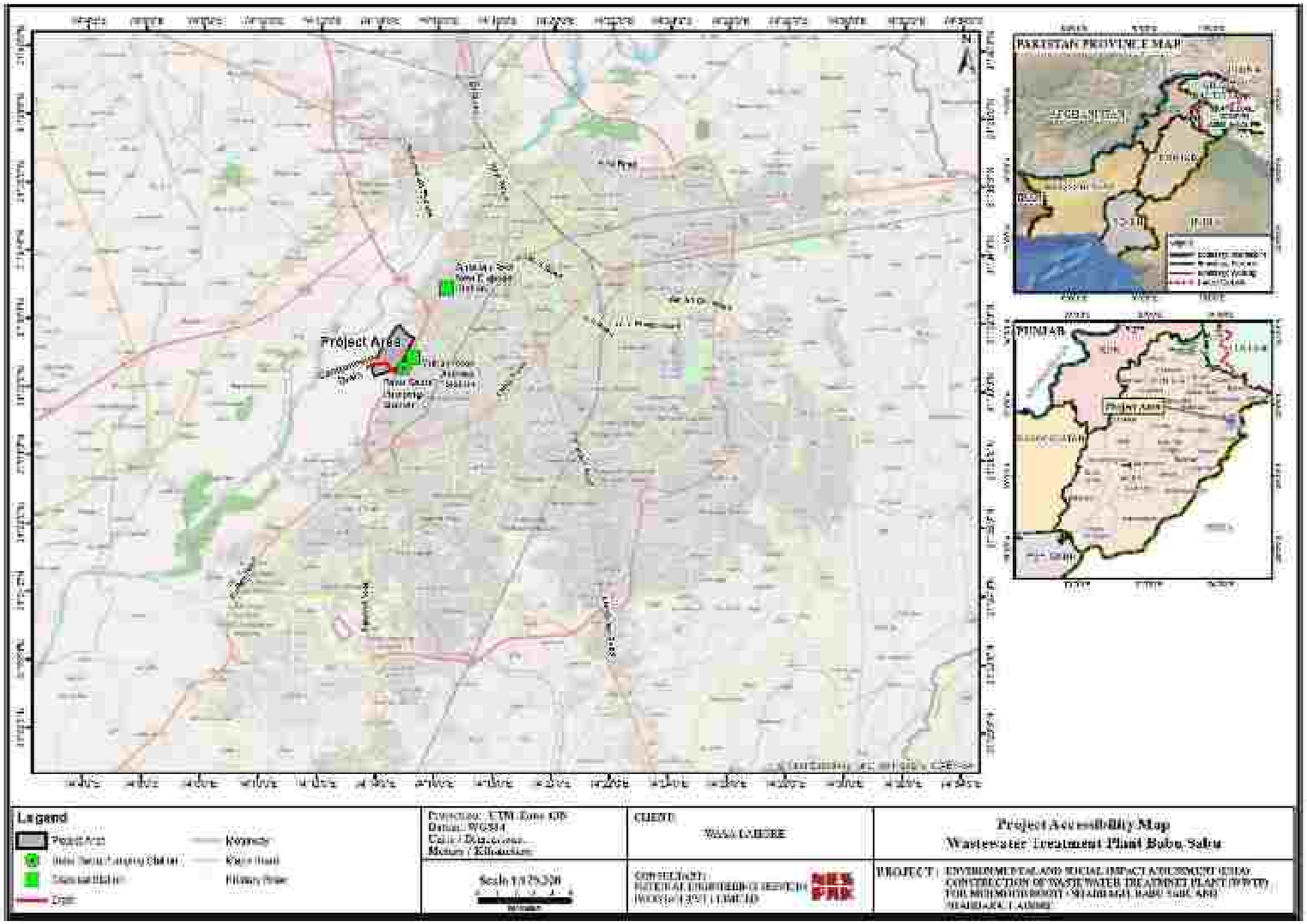


Figure 3-2: Accessibility Map of the Project Area

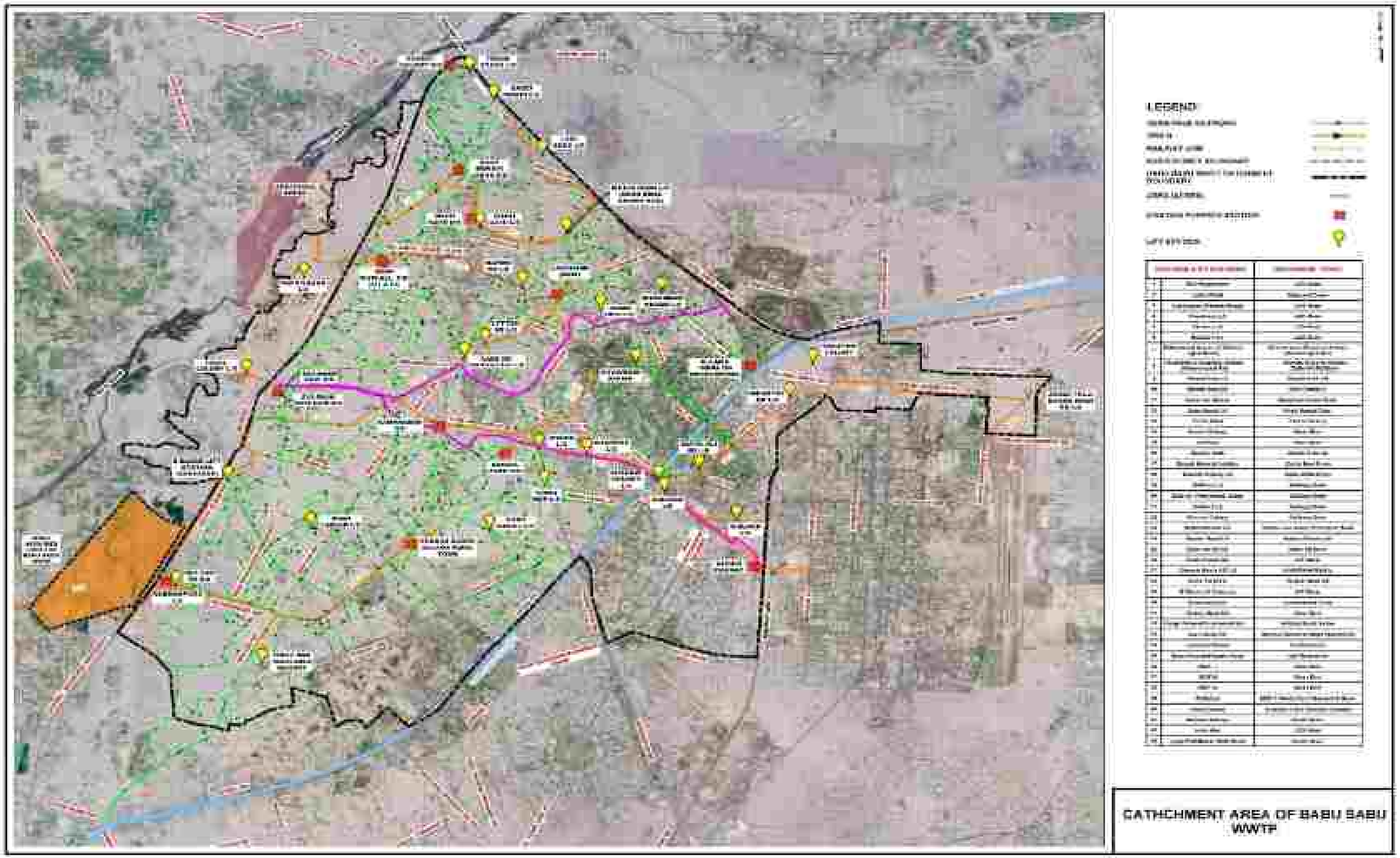


Figure 3-3: Babu Sabu WWTP Catchment Area

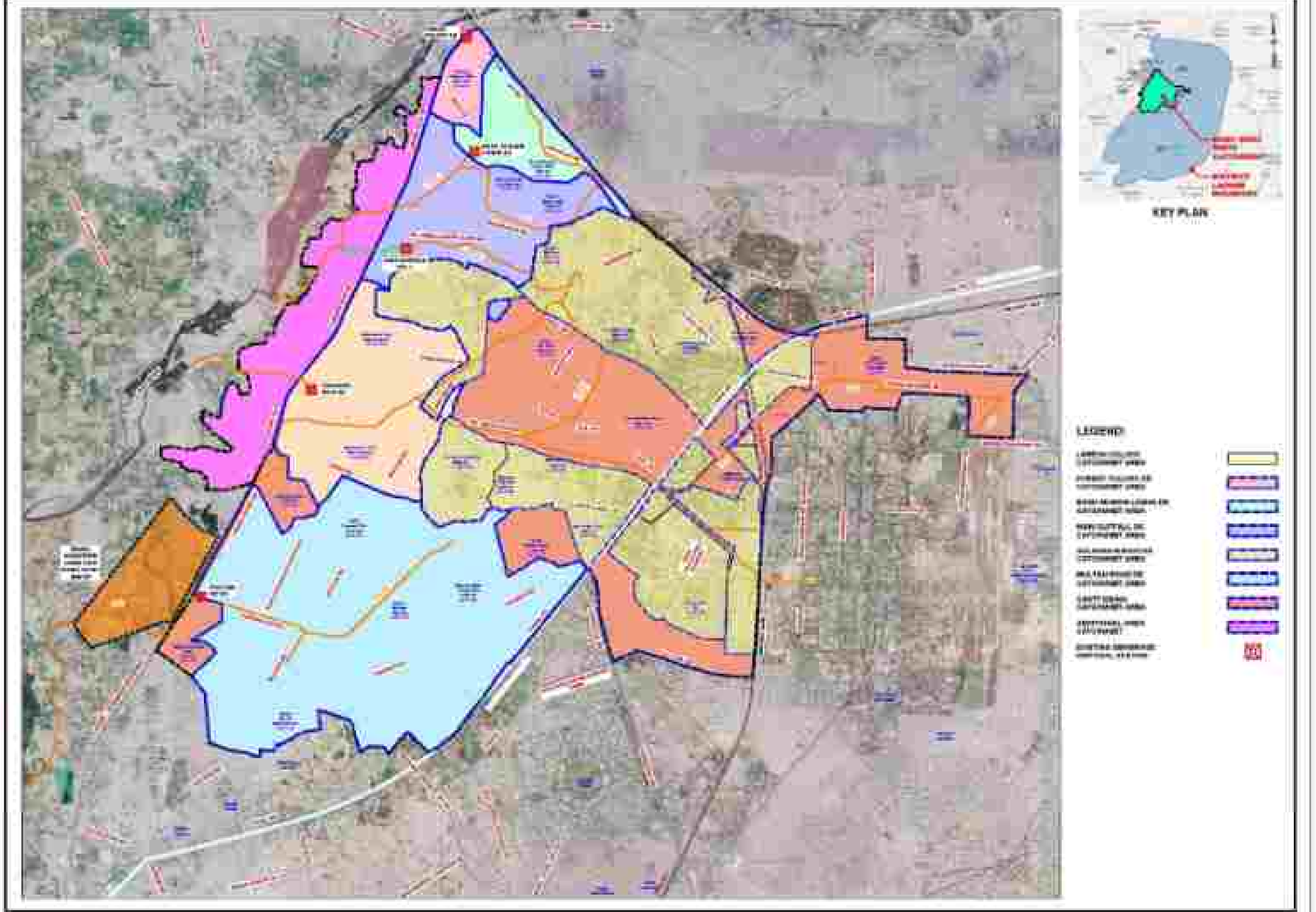


Figure 3-4: Catchment Area of various Disposal Station

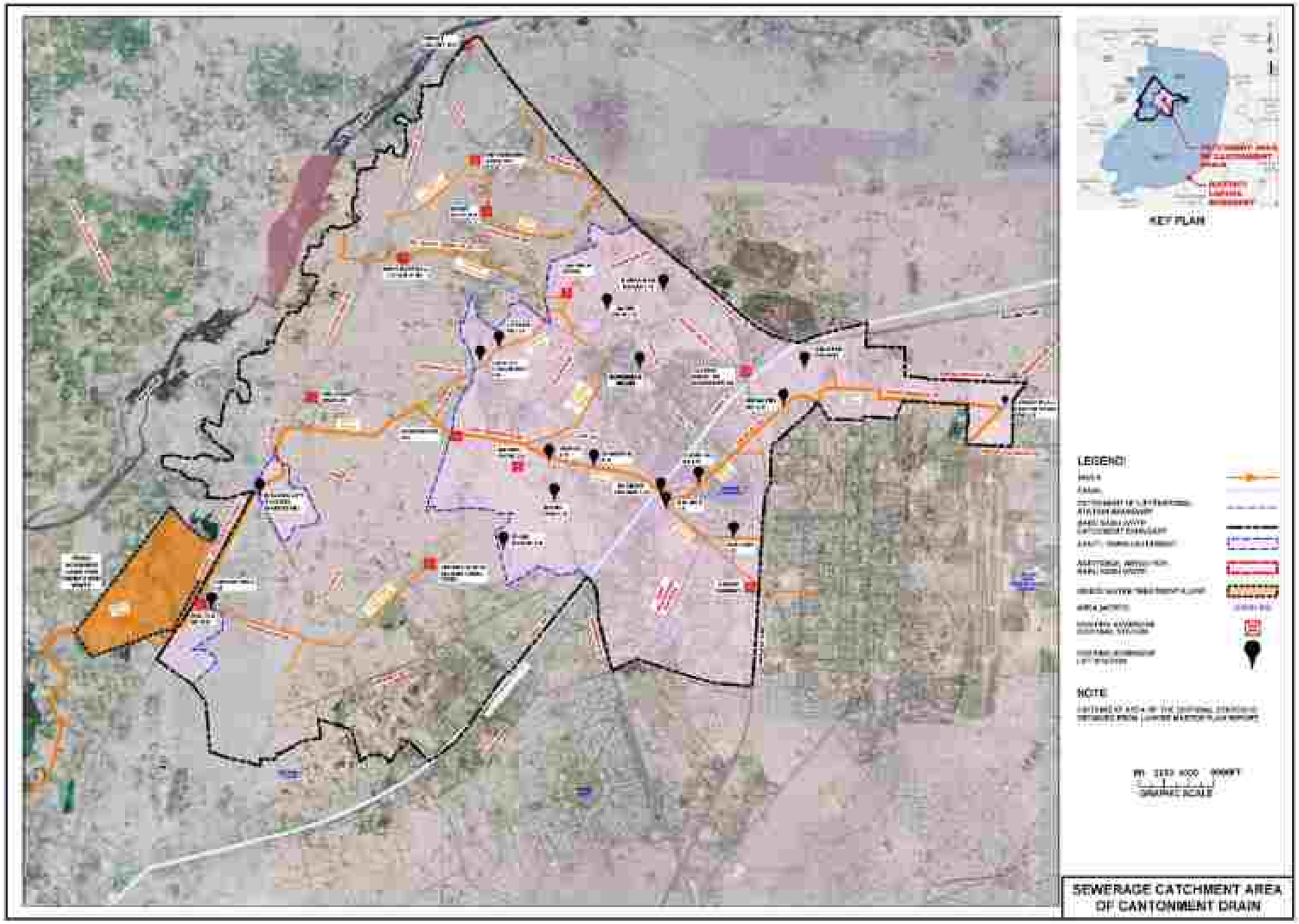


Figure 3-5: Catchment Area of Cantonment Drain

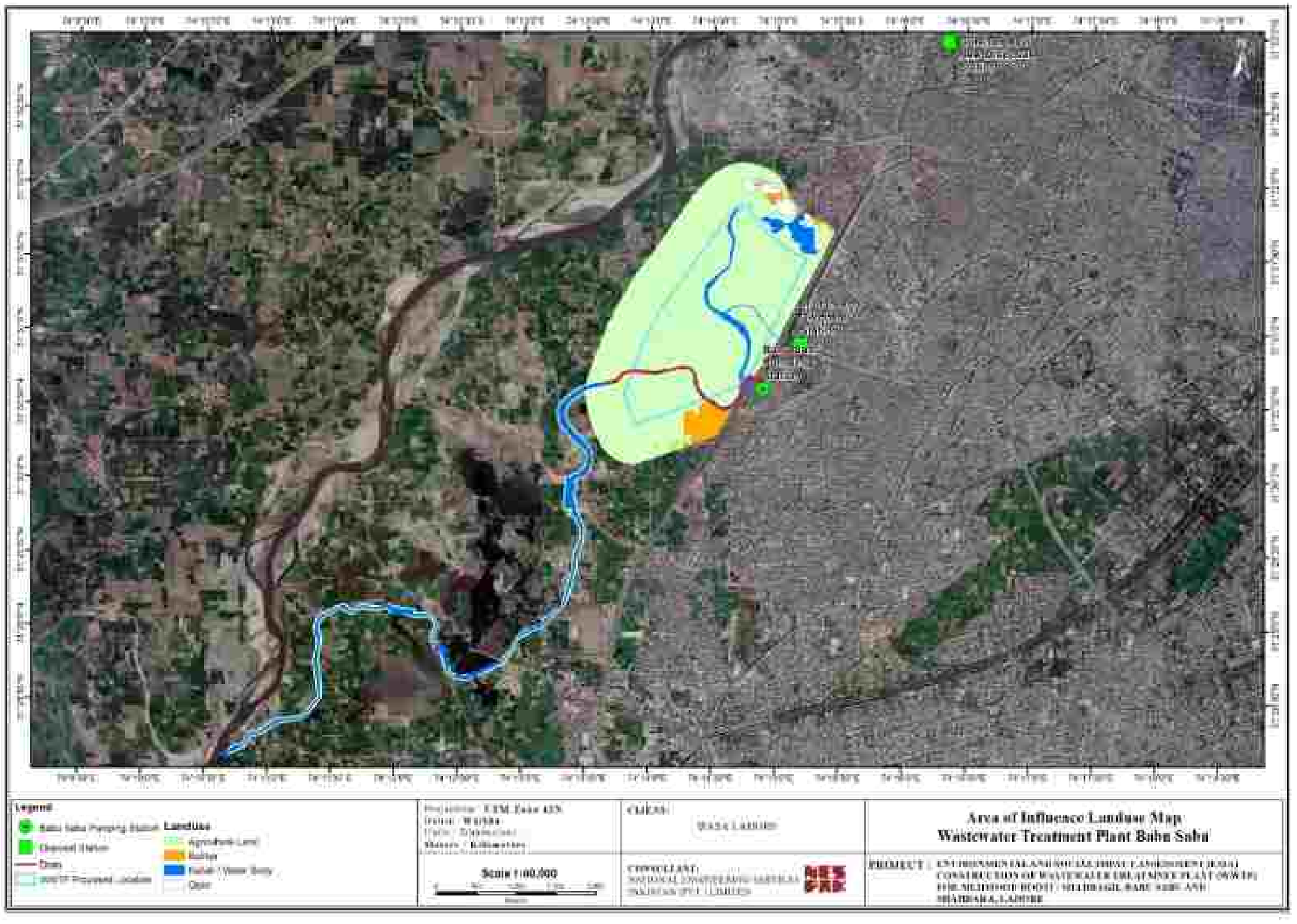


Figure 3-6: AOI of the Project

3.7 PROJECT COMPONENTS

Construction of Wastewater Treatment Plant (WWTP) at Babu Sabu, Lahore includes the following components:

- Wastewater Treatment Plant including allied structures & buildings
- Construction of Collector Channel from cantonment drain to proposed influent station within WWTP Site and upgradation of Disposal Stations

3.7.1 Wastewater Treatment Plant and Allied Components

3.7.1.1 Design Horizon/ Stages

The project is divided in two stages. In Babu Sabu Stage 1 (BSS1), design horizon is year 2035 and for Babu Sabu Stage-2 (BSS2), design horizon is up to year 2045. Technical design has been carried out for design horizon of year 2045, however, this project mainly focused BSS1 (year 2035).

3.7.1.2 Wastewater Inflows

For 2035 the to-be-served-population and inflow were set to 2,000,000 PE and 400,000 m^3/d, respectively. For 2045 and BSS2 the population served was estimated to be 5,000,000 PE and 1,000,000 m^3/d inflow.

The inflow from Lalech Colony (LC) project is not included. LC project which is expected to be in operation by 2035 and associated flow will not be conveyed to WWTP but directly discharge to the river, at least on short/medium term. This will result in reduction of wastewater flow and pollution load to the proposed WWTP.

	2035	2045	Unit
Population served	2,000,000	5,000,000	PE
Estimated daily wastewater flow	400,000	1,000,000	m^3/d
Hourly Peak flow	35,000	82,500	m^3/h

The following influent wastewater characteristics have been used.

Parameter	Design value
pH	7 – 8
Hot Weather Wastewater Temperature (°C)	18
BOD5 (mg/l)	225
COD (mg/l)	450
Total Suspended Solids (mg/l)	300
NH4-N (mg/l)	30

These concentrations were estimated based on the dry weather flow measurement campaign. As nitrogen removal is not foreseen for Babu Sabu WWTP. The following daily wastewater

loads are used for the calculation. Influent wastewater loads to WWTP at BSS1 and BSS2 are given in the following table.

Parameter	Stage 1 (2033)	Stage 2 (2043)
COD (kg/d)	180,000	460,000
BOD5 (kg/d)	90,000	226,000
Total Suspended Solids (kg/d)	120,000	300,000

3.7.1.3 Effluent Standards

The design criteria, defined in the Punjab Environmental Quality Standards for Municipal and Liquid Industrial Effluents (No SO(S)/EPD/7-25/2013) published 2016 apply for this project. The important parameter for the design of the WWTP are as depicted in the following table.

Parameter	Concentration
COD	≤150 mg/l
BOD5	≤80 mg/l
TSS	≤200 mg/l

3.7.1.4 Site Selection for Wastewater Treatment Plant

Available area for the wastewater treatment plant is given as Figure 3.7, however a detailed flood assessment study was carried out as the project area is located in flood plain of River Ravi. After the study, site of the WWTP was selected at the location as given in Figure 3.8.

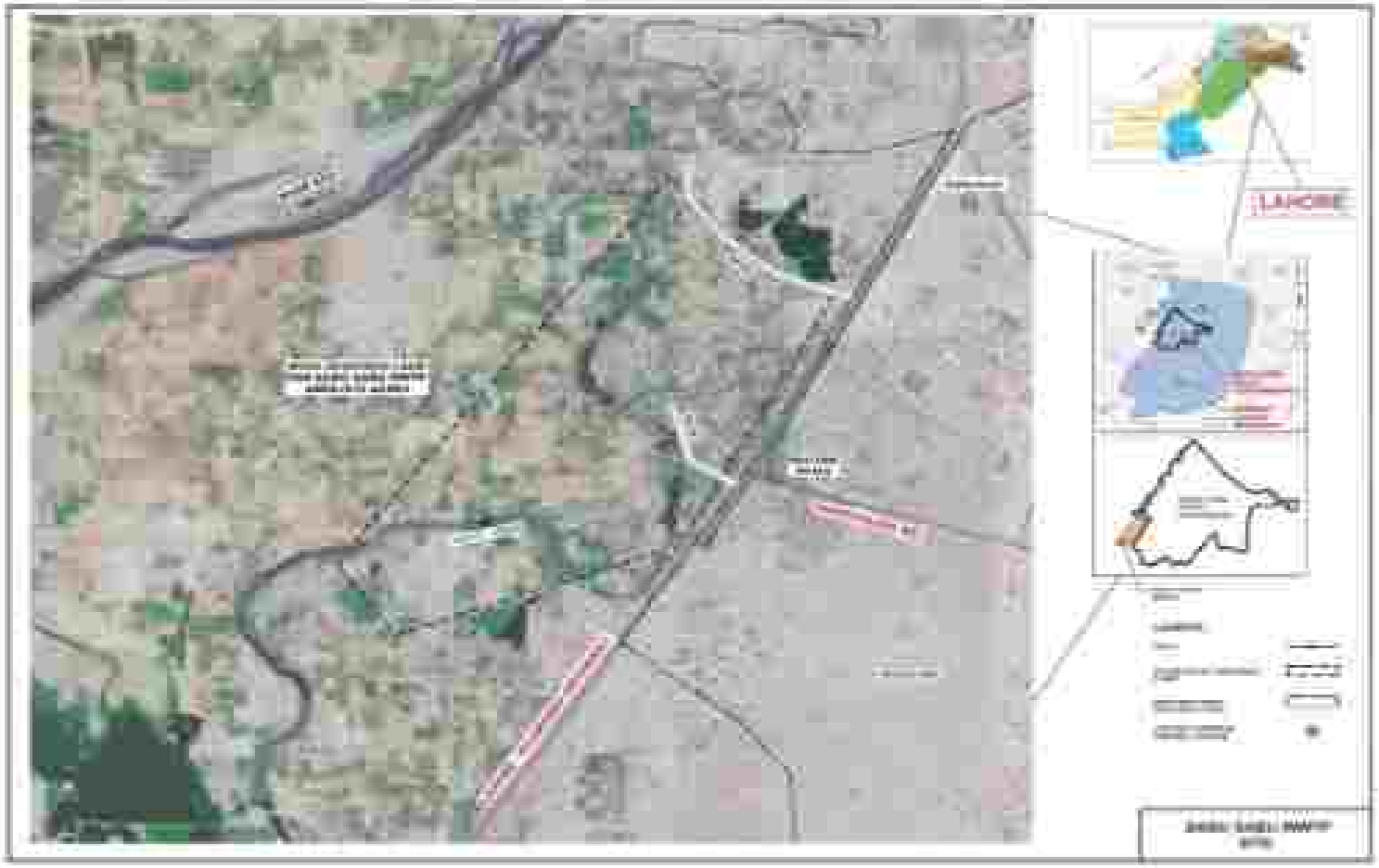


Figure 3:7: WWTP Project Site

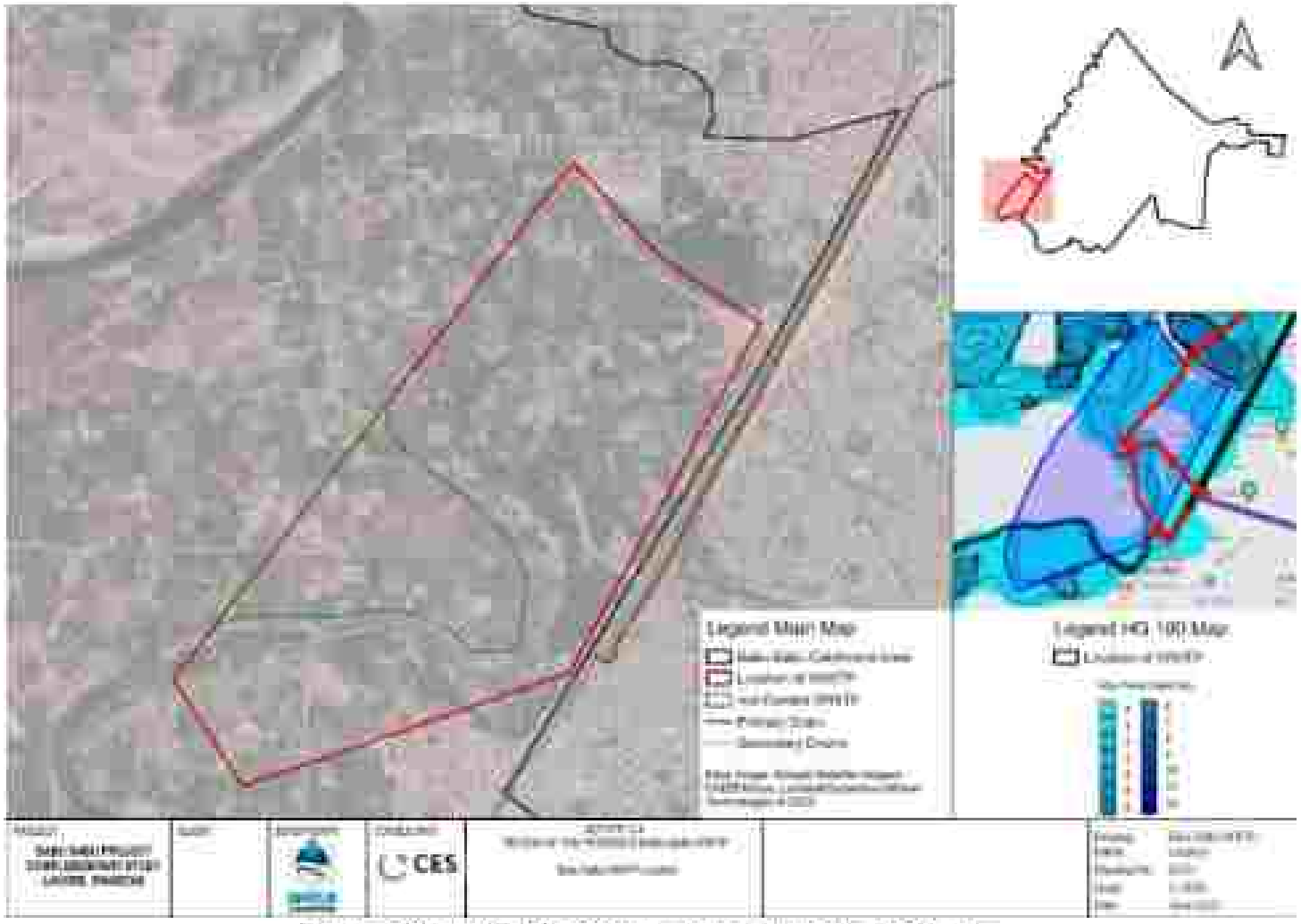


Figure 3-8: WWTP Proposed Location within Available Site

The red line indicates the total available site for the WWTP. The northern half is occupied by power lines and therefore has been left out of the actual decision making. After the flood risk assessment, it turned out clear that large parts of the location are under risk of regular, mid-frequent flooding (HQ25) and rare flooding (HQ100). To avoid construction costs for needed dikes or embankments the WWTP for Phase 1 has been only designed on the non-flood-prone area shown inside the green dashed line in above map. The small right map in above figure shows the flooded areas in blue for a HQ100 event.

3.7.1.5 Analysis of Alternatives:

Various technical alternatives for biological treatment, which is the main treatment process in WWTP. The proposed alternatives are:

- Alternative 1: Conventional Activated Sludge: Extended Aeration Activated Sludge (EAAS)
- Alternative 2: Preliminary Sedimentation / Conventional Activated Sludge, Medium Load (CAS) with sludge digestion

The listed alternatives form the basis for the conceptual design. They are summarized in Figure 3.9. In addition to the biological treatment other treatment steps differ with the alternatives. It is worth to note that an option consisting of anaerobic ponds and trickling filter has also been considered. While this option would present some significant advantages in terms of O&M easiness (limited required skills), it is not presented here as it would not comply with AFD requirements in terms of GHG emissions. Indeed, the anaerobic ponds would produce too much GHG and would not be eligible for AFD financing as per information provided by AFD.

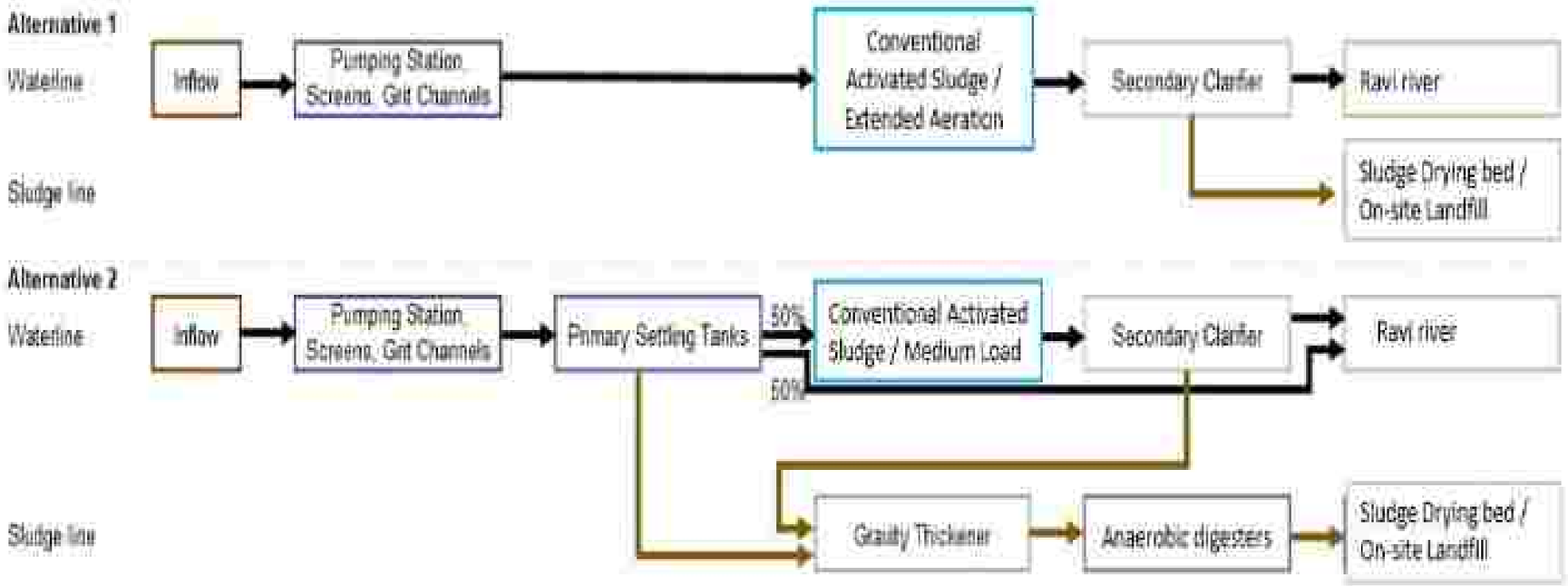


Figure 3-9: Alternative for WWTP

Technologies Applicable for all Alternatives

The following chapter is meant to give an overview over the chosen technologies involved in the different alternatives.

A. Screens

a. Coarse screening

To remove the bigger solid waste from wastewater, coarse screening is needed. This step will also protect the successive pumps from larger objects which could damage them. Due to the size of the WWTP, this screening must be mechanical. For this kind of screening, only bar screens shall be installed.

b. Fine screening

After the pump station, fine screening is needed in order to protect the WWTP equipment. This screening could be done through bar screens or drum screens.

Due to the size of the WWTP, bar screens have advantages of easier to operate, Lower investment cost and Higher capacity. So bar screens has been recommended.
bar screens.

B. Grit and grease removal

In order to remove grit and grease from wastewater, a first operation must be set up which will remove grit through sedimentation and grease by flotation. This stage will generate grit and grease as by- products which will then be treated separately and disposed. Grit removal is especially important to reduce abrasion of equipment at subsequent treatment stages.

C. Sludge drying beds

The drying bed typically consists of a shallow rectangular basin with a permeable base, allowing the liquid in the sludge to drain while retaining the solid sludge. The bed's base material should be selected to provide adequate drainage while preventing sludge particles from passing through. The sludge should be evenly spread on the drying bed to optimize surface exposure and facilitate uniform drying. The recommended thickness typically ranges between 15 to 30 centimetres.

The required frequency of sludge removal from the drying bed depends on various factors such as sludge characteristics, climate conditions, and bed design. On average, desludging is performed every 6 to 12 months, or when the solid sludge layer reaches a predetermined thickness of around 50 to 75% of the initial layer depth.

3.7.1.6 Technologies for Alternative 1

Biological Treatment – Extended Aerated Activated Sludge (EAAS) Process

The conventional activated-sludge (CAS) process with or without primary treatment is still the most widely used biological treatment process for reducing the concentration of organic pollutants in wastewater.

In principle, this process involves enhancing the auto-purification that occurs naturally in water bodies. Influent, made up of organic matter, nitrogen and phosphorus comes into contact with bacteria in the presence of oxygen. Biomass develops due to the nutrients in the influent (carbon, nitrogen, and phosphorus). This development of biomass is called sludge production, and this sludge must be separated from treated water. A culture of microorganisms is concentrated in the tanks and oxygen is injected artificially to accelerate auto-purification. In addition to oxygenation, artificial mixing is required for the microorganisms to remain suspended in the biological tank and thus facilitate the contact of pollutants with existing biomass.

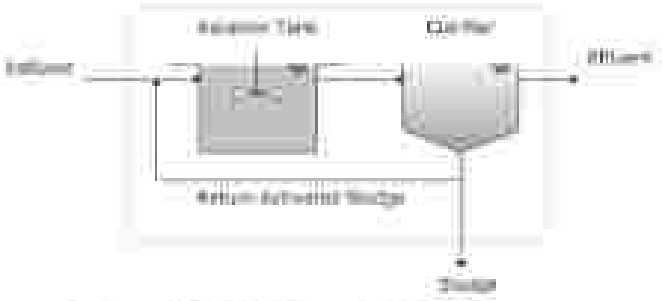


Figure 3-10 : Activated Sludge Process

The process can be summarized as follows:

- Aeration tank (biological tank), where influent is in contact with biomass in the presence of oxygen.
- Air delivery system, which supplies oxygen to bacteria in the aeration tank.
- Mixing, which helps to improve oxygen transfer, avoid sedimentation in the aeration tank and facilitate contact with biomass.
- Secondary sedimentation tank, where sludge is separated from water.
- Return of activated sludge waste from the bottom of the secondary sedimentation tank to the aeration tank, to ensure the necessary quantity of biomass in the biological process.
- Excess biomass removal from the aeration tank to stabilize sludge concentration.

Extended Aerated Activated Sludge (EAAS) is one specific form of CAS in which the sludge in the system is aerobically stabilized, i.e. stay in the aerated tanks until microbiological inactivity is reached which commonly occure after 25 days of sludge retention time (SRT). As a consequence, this process leads to large aeration tanks but do on the other hand not required further sludge stabilization steps within the process chain. For this alternative 6 m deep aeration tanks with pressure aeration are foreseen. Due to the sludge stabilisation which requires a high sludge age the tanks are large. The effluent from the clarifiers is discharged to the wetland.

3.7.1.7 Technologies for Alternative 2

The idea for this alternative is to treat all incoming wastewater with a primary treatment, but to reduce costs by only treating a part of the incoming wastewater biologically. Considering the effluent standards to be followed by the project, only 50% of the primarily treated wastewater needs to be further treated in a biological second stage in order to achieve the discharge standards in the mixed effluent.

Primary Settling Tanks - Conventional PST

This stage consists of a first settling phase that serves mainly to remove a major part of the SS and BOD.

This kind of PST consists of a simple wastewater settling tank. The O&M is easy and investment cost is limited due to the simple technology employed. However, the system requires a substantial area.

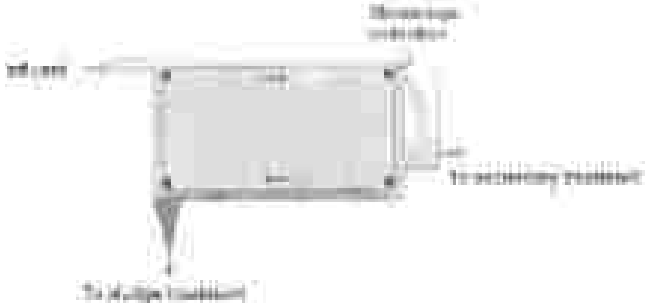


Figure 2-11: Primary settling tank

The PSTs are useful to reduce the load at the biological treatment inlet and they produce primary sludge.

Biological Treatment – Medium load Conventional Activated Sludge (CAS) Process

The medium load CAS as proposed in this option requires a far smaller sludge retention time compared to EAAS CAS since stabilization is not the primary goal, but pollutant removal. In this specific case, nutrient removal is not considered. In addition, the project area has quite a warm climate, therefore, the required area for this alternative compared to alternative 1 is about 6 times smaller. The tanks can be designed as oxidation ditches.

In oxidation ditches the wastewater is transported circularly with the inlet on one side and the outlet on the other side of the tank. There is a concrete wall in the center of each tank. At both ends of this wall turbine surface aerators will be positioned to supply the bacteria in the tanks with oxygen. There is enough area available to construct the tanks with a depth of only 4 m which is still suitable for surface aeration. By that, complex pressurized aeration can be avoided. In addition to the aerators, horizontal stirrers, one on each side, will be installed to uphold sufficient flow in the tank. Below figure shows examples of an oxidation ditch as well as turbine surface aerators.

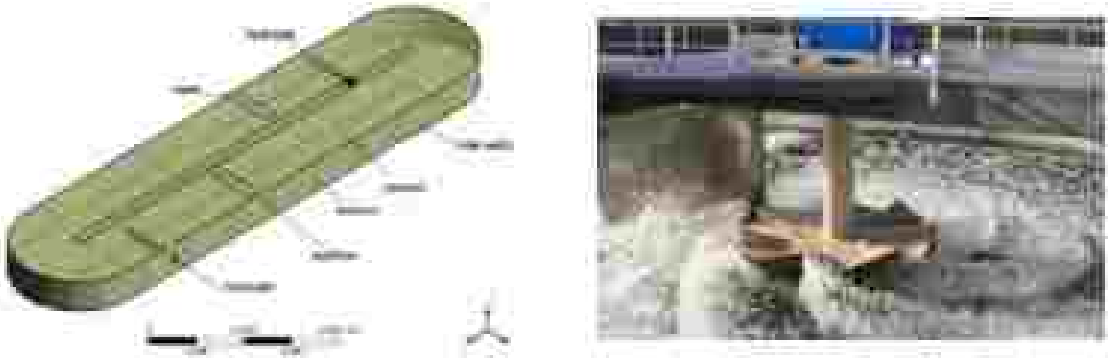


Figure 3-12: 3D-model oxidation ditch (source: Santos (2015))[1] – left and example surface aerator (source: https://www.westech-inc.com/)

As per conceptual design report, when mixing the clarifier effluent (50%) with the primary treatment effluent (50%) the required effluent standards can be achieved. A ratio of 50% was retained to start introducing advanced wastewater treatment in Lahore and to secure the outlet wastewater concentration. It is not based on technical consideration.

Since the SRT in the aerated tanks (ditches) only amounts to around 4 days the sludge needs to be stabilized in subsequent sludge treatment units to avoid health and environmental risks.

Sludge Thickening -Gravity Thickener

Primary and secondary sludge are to be further treated in the gravity thickeners. They are structured similarly to sedimentation tanks. A system comprising a scraper and squeegees helps to concentrate the settled sludge at the bottom of the tank. Supernatant fluid is then returned to the inlet of the plant, and sludge is sent on to further treatment processes. They are usually circular and remove bottom sludge and discharge supernatant over their top edge. The figure below shows the scheme of a gravity thickener. The sludge is separated by zone settling and solids flux theory. Thickener dimensioning is executed via hydraulic loading rates.1 Adding thickening agents increases the accumulated sludge. A sludge storage tank prior to the thickeners could level its inflow. Sedimentation normally occurs within 24 hours.

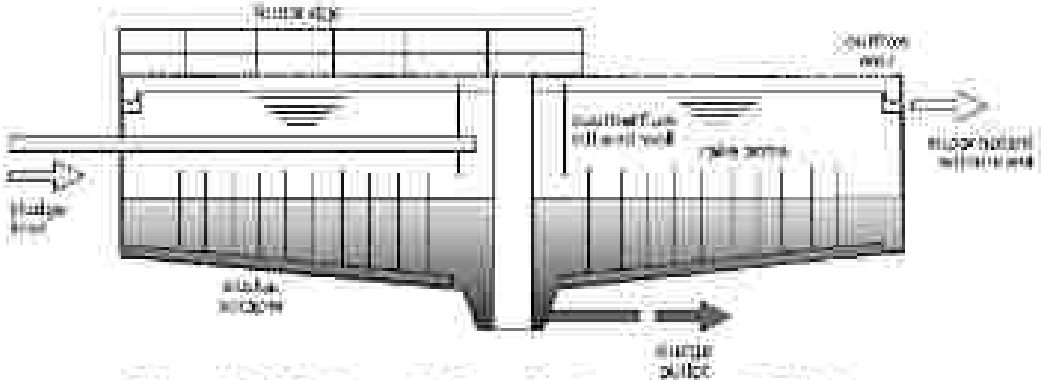


Figure 3-13: Schematic Cross Section of Gravity Thickener

Sludge Stabilization through Anaerobic Digestion – Sludge Digesters

Anaerobic digestion is among the oldest processes used for the stabilization of sludge. The decomposition of organic matter occurs in a heated tank without oxygen. The transformation residue is stable, hence has fewer odors and is limited in terms of pathogens. Methane accounts for about 60 to 65% of the volume of gas produced and provides a renewable source of energy which can be transformed into heat and electricity.

Anaerobic digestion reduces sludge by about 55% in terms of volatile matter and by up to 40% in terms of sludge volume.

Temperature and mixing both play a key role in the proper functioning of anaerobic digestion (rapidity of start-up, stabilization of the fermentation process and production of biogas). Temperature has a strong influence on microorganism activity, as well as the complete decomposition of bacteria. This factor must be kept stable during the operation.
Other factors, such as pH, sludge dosage rates, hydraulic retention time and the production of volatile fatty acid also have strong influences on the anaerobic digestion process.

Optimal temperatures for anaerobic digestion can be classed in two categories:

- Mesophilic digestion: operation is maintained at 35 to 40°C (average 37°C). The sludge remains in the digester tank for 15 to 25 days. This method is rather simple in operation and produces large amounts of biogas.
- Thermophilic digestion: operation is maintained at 50 to 60°C (average 55°C). Effective degradation of organic compounds and a reduced retention time are the advantages of this process. On the other hand, the complexity of the process, heavy heating requirement and poor properties for further dewatering treatments are the main obstacles which often prevent this method from being applied in practice.

Anaerobic digestion is widely used in large plants as it offers the following advantages:

- Sludge production is significantly reduced, while the sludge is stabilized.
- A substantial amount of volatile organic matter and pathogens are eliminated.
- Biogas is generated which can then be used in a combined heat and power plant (CHP) to produce heat and power.

However, the investment and maintenance costs involved in this process are elevated and a high level of care is required during operation. The risk of ammonia, nitrogen and phosphorous pollutants being returned to the inlet of the plant also needs to be considered.

Sludge Dewatering as further option to the drying beds

Dewatering may be carried out directly on raw sludge, or after a pre-thickening stage. Dewatering removes a significant amount of the sludge's moisture content, transforming it into a pasty-textured 'cake'. This product is more stable and closer to its final form for disposal.

3.7.1.8 Sludge Disposal

A. Agricultural use

This is the most widely used method of disposal in Europe, in which the organic matter and nutrients are re-used in the production of crops by their disposal on farmland. The sludge can be used immediately after dewatering (with or without lime) or after composting.

Bio-solids spread on farmland must fulfill two conditions:

- they must not contain any harmful substances,
- they must meet the requirements of farmland.

These conditions are established in regulations which restrict the amount of nutrients, heavy metals and pathogens that can be spread per unit of land and over specific time periods, and are also dependent on the pH of the soil and the choice of crops.

Re-use of bio-solids in agriculture is the most favorable option from an economic and environmental point of view. Although sludge is not as rich as other fertilizers, it may gradually help to improve the quality and the structure of the soil.

B. Landfill

There are two alternatives for disposing of sludge in practice: mono-deposits in which only sludge is disposed, and mixed deposits in which the sludge from the WWTP is disposed together with other municipal solid waste.

Landfill could be a feasible option as it is a simple technology with a relatively low cost. However, due to its questionable environmental impact, landfill should be chosen only when no agricultural use for the sludge is possible.

When applying a landfill solution, the following issues must be analyzed carefully:

- contamination of groundwater and surface water,
- release of the greenhouse gas methane produced through organic waste decomposition and unpleasant odors caused by other gases, etc.

Therefore, landfill sites should be located far from residential areas. An impermeable layer is needed at the bottom of the site to limit the risk of leachate penetrating into underground aquifers. The waste is deposited and then compacted and covered with soil. In some landfills, bio-gas released from landfill is recovered to produce electricity.

Hence, if landfill is properly managed and adequately funded, the choice of this method of disposal may be justified due to its safety and relatively low cost.

c. Incineration

Sludge which is highly contaminated with heavy metals or other undesirable pollutants is not allowed to be used in agriculture or disposed in landfill. In this case, incineration could be chosen as a feasible final method of disposal.

Sludge, either alone or in combination with other waste, is incinerated at an optimal furnace temperature of 800 to 900°C. To reduce the fuel required for combustion, sludge needs to be dewatered to around 25% of solids content at least. The calorific value of sludge is the main determining factor in whether additional fuel is needed during the process. The residual ash from the process is a stable and inorganic substance which can be recycled in construction materials or disposed in landfill.

This process helps to reduce sludge volume by up to 90% and sludge mass by up to 80%. It completely destroys pathogens, eliminates leachate and minimizes odors due to a fully enclosed and high temperature system. Low sensitivity to sludge composition is also among the advantages of incineration.

On the other hand, incineration facilities consume a great amount of fuel, and release the greenhouse gas carbon dioxide into the atmosphere. The fumes produced require a very specific treatment before being released into the atmosphere which makes this technology rather costly.

D. Conclusion

As per discussion with LWASA, the sludge shall be sent to landfill in the short and medium term. Indeed, agricultural reuse cannot be considered as (i) there is no regulation in Pakistan to allow such disposal, (ii) social acceptability will be low. Furthermore, considering the wastewater catchment and the presence of arsenic in the raw water, it is likely that the sludge will be polluted with heavy metals. Incineration being also not an option in Pakistan, the only remaining solution is to landfill the sludge. In the future, a different disposal might be considered depending on actual sludge heavy metals concentrations and potential regulation changes.

LWASA plans to landfill the sludge on the WWTP site. This will then allow for short and medium term sludge disposal. However, on a long term, it is recommended to look for alternative options and especially to consider the possibility of agricultural reuse if the sludge quality allows it.

3.7.1.3 Dimensioning of the different alternatives

Alternative 1 EAAS

This option is a simple reliable treatment technology. But because of the high SRT the EAAS tanks need a lot of space and with the depth of over 4-meter pressure aeration will be required, leading to high energy costs.

As the sludge is directly stabilized inside the biological treatment, no further sludge treatment steps are required. There is less biological hazard, so it is safe to be pumped onto the drying beds. If required in the future nutrient removal can be implemented with this option.

Treatment Technology	Phase 1		Phase 2	
	Units	Total Area (ha)	Units	Total Area (ha)
Inlet structure & Mechanical treatment	2	0.12	4	0.24
Biological Treatment		11.5		23.7
EAAS Tanks	6		15	
Clarifiers	36		45	
Drying Beds		12.1		32.6
Auxiliary buildings, roads & pathways		8.8		16.6
Total		31.6		73.2

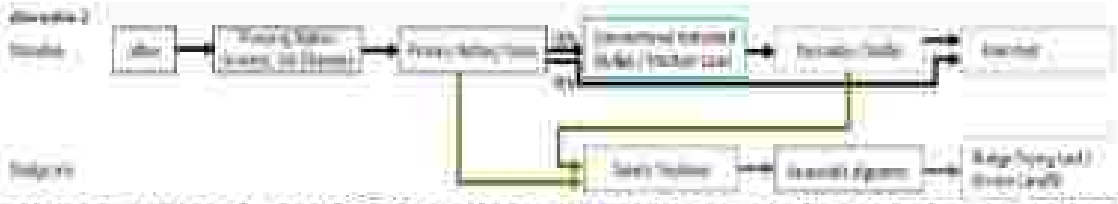
Figure 3-14 shows the provisional layout of WWTP with EAAS process.



Figure 3-14: Alternative 1 -Top plan view Babu Sabu WWTP with EAAS process

Alternative 2 CAS

This option is the most complicated in terms of different treatment stages and internal flow management. As only 50% of the incoming wastewater is supposed to be treated in a biological treatment, two wastewater streams would exist after the primary sedimentation tanks. The large amounts of sludge from the primary settling tanks and the excess sludge from the CAS process are merged in the gravity thickeners and afterwards anaerobically processed in the sludge digesters. The effluent sludge would be stabilised and largely mineralized through the degradation of organic matter. Afterwards it could be safely applied onto the drying beds. Following figure provides alternative 2 option



In this alternative only the SRT for carbon removal is required for designing the biological treatment stage therefore the dimensioned tank area is about 10 times smaller compared with alternative 1. A shallow oxidation ditch design with only 4 meter depth has been chosen to avoid the cost and maintenance intensive pressure aeration.

The sludge digesters have been designed with a temperature from the lower edge of the mesophilic temperature regime to ensure that the digesters don't need elaborate insulation. The produced biogas can be used for electricity production which would reduce the operational costs considerably. Anyhow the management of a properly functioning anaerobic digestion requires skilled personnel and proper management.If required in the future nutrient removal can be implemented with this alternative.

Treatment Technology	Phase 1		Phase 2	
	Units	Total Area (ha)	Units	Total Area (ha)
Inlet structure & Mechanical treatment	2	0.13	4	0.26
Primary Settling Tanks	16	0.32	48	0.97
Biological Treatment CAS Tanks Clarifiers	8 8	1.9	32 32	4.7
Gravity Thickeners	2	0.22	20	0.66
Sludge Digesters	2	0.36	20	0.6
Drying Beds		10.1		28.3
Auxiliary buildings, roads & pathways		3.6		9.3
Total		16.5		41.2

The following Figure 3.11 shows the provisional layout Babu Sabu WWTF with primary treatment, CAS and sludge digesters



Figure 3-15: Alternative 2 Top plan view Babu Sabu WWTP with Primary Treatment, CAS and Sludge Digesters

3.7.1.10 Design Conclusion

Design Alternatives Conclusion is presented in the following table

Sr. No.	WWTP Process & Standard Criteria	EAAS With Drying Beds	CAS With Sludge Digesters And Drying Beds
1	Land Requirement Stage 1	32 ha	17 ha
2	Land Requirement Stage 2	76 ha	41ha
3	Treatment Performance	Sufficient to meet the standards	Sufficient to meet the standards
4	Process Expandability (Effluent Quality)	Enhanced nitrogen removal: denitrification already included	Enhanced nitrogen removal: denitrification possible with additional equipment
5	Process Expandability (Quantity)	Possible with additional tanks & works and dike to prevent flooding	
6	Impact Of Primary Treatment	Due to economic reasons and low wastewater concentrations: no primary treatment envisaged	Solid removal from total wastewater flow Production of unstabilized sludge
9	Process Know-how And Process Experience	Most common process for large-scale plants with large worldwide long-term experience (> 75 years)	Most common process for large-scale plants with large worldwide long-term experience (> 75 years)
10	Process Sensitivity	Sound capability to withstand organic and hydraulic load fluctuations	Sound capability to withstand organic and hydraulic load fluctuations
11	Operation E&M Works Maintenance	Advanced level of skill necessary Advanced degree of automation	Very advanced level of skill necessary Advanced degree of automation
12	Need For O&M Expertise Key Staffs	International experts required: (i) WWTP manager, (ii) 1 WWTP process expert, (iii) 1 E&M expert National experts required (senior experts): (i) WWTP deputy manager, (ii) 2 process experts, (iii) 2 E&M experts	International experts required: (i) WWTP manager, (ii) 1 WWTP process expert, (iii) 2 E&M expert National experts required (senior experts): (i) WWTP deputy manager, (ii) 3 process experts, (iii) 4 E&M experts
13	Nuisance Control (Noise, Odour)	No major nuisances to be expected if efforts are undertaken (covering of noisy equipment, odour control of physical treatment units and sludge line)	No major nuisances to be expected if efforts are undertaken (covering of noisy equipment, odour control of physical treatment units and sludge line)
14	Capex Estimation Stage 1	227M EUR	108 M EUR
15	Opex estimation Stage 1	9.5 M EUR / year	1.73 M EUR / year
16	Capex + 15 Years Of Opex	318 MEUR	131 MEUR

* For this option, OPEX would be increased in 3.33 MEUR/year if energy produced is not reused on site.
** Considering that energy produced by the sludge digestion is not used on site, the total for CAPEX and 15 years OPEX would be of 155 MEUR

It is important to mention that for both options O&M will need to be done by an experienced International private company, at least for a period of 5 years after commissioning and if possible, for a period of 15 years. A five years period can be associated with the Design and Build contract to ensure consistency between design and operation. Such O&M company shall have references in operating such large scale WWTP (recommended to consider experience of operating more than 10 WWTP of a capacity higher than 250,000 m3/day). While some options will require less capacities and skills, it is still recommended for such company to be involved due to the specificities of the project and the WWTP. This period of 5 years O&M shall be the opportunity to properly train LWASA staffs on wastewater management. After 5 years of operation, it is also recommended for LWASA to ensure O&M through involvement of experienced private company to ensure proper operation, especially if LWASA skills have not been highly developed over the period.

As a conclusion, it can be noted that Options 2 is relatively cheaper than option 1. Considering that sludge digestion will allow to electricity production significant savings can be considered on the long term (while it will require high O&M skills). The main risk related to Option 2 is an inadequate management of sludge digestion that would, as a consequence, reduce energy production and produce un-stabilized sludge which might then not be disposed properly.

3.7.1.11 Allied Structures

Several allied structures shall be constructed within WWTP boundary including admin building, staff quarters, guard room, workshop, substation building etc.

3.7.2 Conveyance System

The second component of the WWTP shall be the arrangement for conveying wastewater to the WWTP and diversion arrangement to dispose of the treated wastewater into river Ravi.

The proposed conveyance system shall comprise mainly two components stated as under:

i) Collector Channel; which will be used to convey sewage from Cantonment Drain to aforementioned influent pumping station. Collector Channel shall commence from the cantonment drain after its crossing of Lahore-Islamabad Motorway (M-2) and will traverse wiithin the site of WWTP.

   Interception point is proposed to be the downstream of Babu Sabu Drainage Pumping Station. At present, the drain receives sewage from a large proportion of catchment area of the WWTP. Presently, the cantonment drain is meandering within the land of WWTP. Construction of collector channel will require diversion of its flow to bypass the WWTP site.

Therefore, Diversion structure and diversion channel shall be provided downstream of bridge of service road on the drain adjacent of Lahore-Islamabad Motorway (M-2) which will bypass the flow during construction of Collector Channel and again connect with cantonment drain just outside the WWTP site.

ii) **Upgradation of Existing Disposal Stations:** Gulshan-e- Ravi Disposal Station and Multan Road Disposal Station shall be upgraded under the project.

Layout Plans of the proposed conveyance system, Collector Channel and diversion Structures are presented in **Figure 2.12 and 2.13** respectively.



Figure 3-16: Proposed Conveyance System

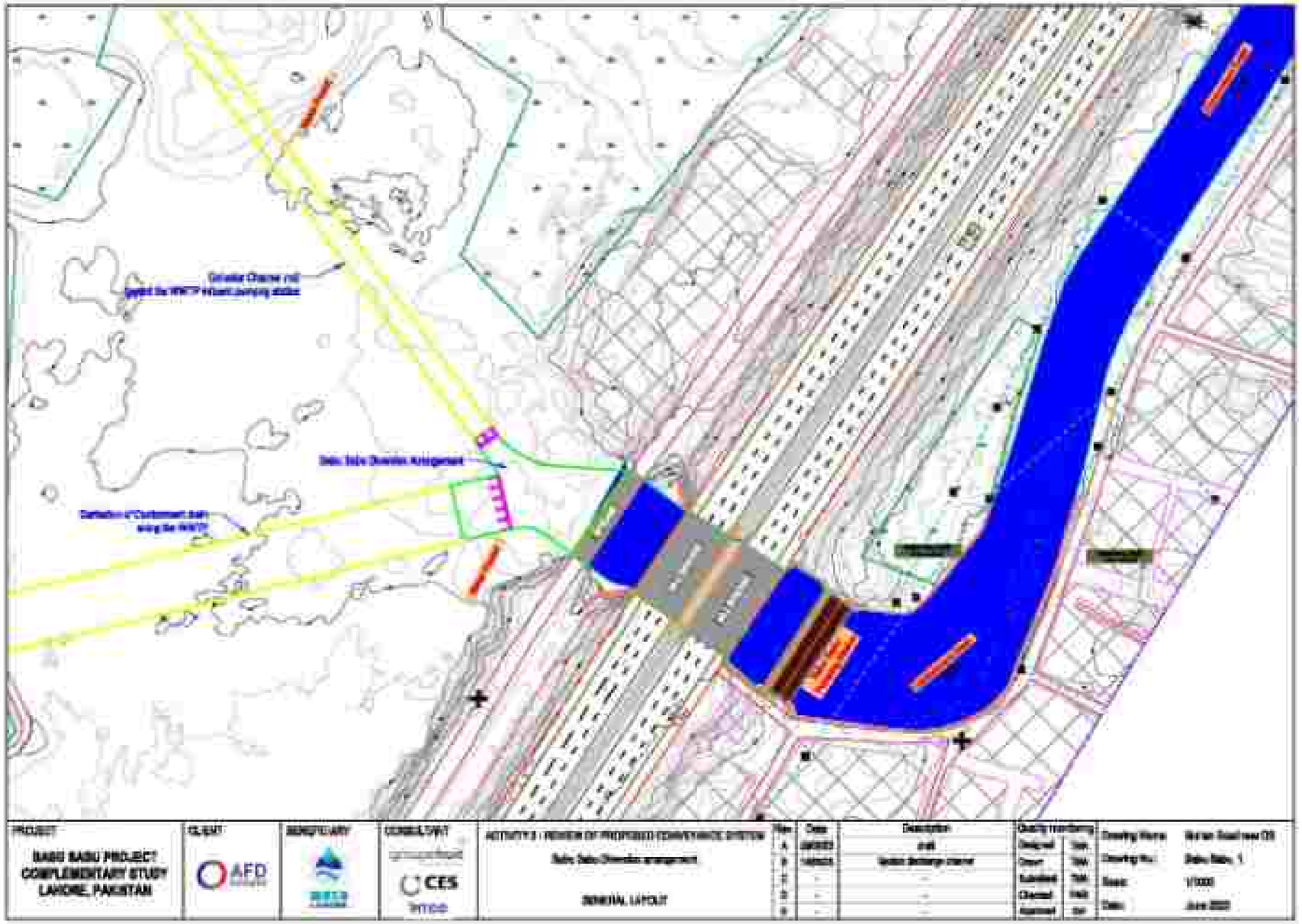


Figure 3-17: Layout Plan of Proposed Collector Channel and Diversion Structure

3.8 LAND USE AT PROJECT SITE

The predominant landuse in the project area is agriculture. The project site of treatment plant consist of agricultural area, katcha tracks, temporary sheds for farmers/workers. Disposal station is surrounded by residential, commercial, religious areas while effluent channel discharge waste water into River Ravi. . Figure 3.18 provides a view of land use at the project site.



Figure 3-18: Land use of the Project Area

3.9 LAND ACQUISITION

Land for Wastewater Treatment Plant (WWTP) has already been acquired by WASA, Lahore in different tenures up to 1998 according to the Land Acquisition Act of 1894 (LAA-1894, but some people have filed cases in courts of law against compensation issues. There are in total seven court cases.

However, the proposed project site has been encroached by the locals. About 730 acres of land is under cultivation and consist of crops including green fodder and vegetables. Some katcha structures and sheds has been erected in WWTP site where farmers/workers reside to look after crops and animals.

3.10 MAN-POWER REQUIREMENT

Total man power required for the proposed project corresponds to an average workforce of 300 persons on site during construction phase, which correspond to a peak workforce of 450 persons. Whereas, workers /employees during operation phase will be 50.

3.11 POWER REQUIREMENT

Electric power supply at 11kV level shall be required for provision of electrical services for Babu Sabu, Lahore. The scheme of development of MV/LV Distribution system design mainly comprises of the following for the power supply arrangement:

- Wastewater Treatment Plants (WWTP)
- Influent Pumping Station
- Admin Building
- Staff Quarters and
- External/Road Lighting System

The power supply at 11kV level and distribution at 415/240V shall be used for the Indoor/Outdoor electrification. In case of failure of main supply, Diesel Generator shall be available to cater the load of the Influent Pumping Station

3.12 WATER REQUIREMENT/DEMAND

The source of water during construction phase shall be WASA. Fire Hydrant system shall be installed for fire safety precautions.

The water consumption is estimated to be12,000[a] litres/day for 300 construction workers during construction phase of the proposed Project.

The water consumption is estimated to be 2,000 gallons/day for 50 workers during operation phase of the proposed Project.

3.13 WASTEWATER GENERATION

The wastewater generation is estimated to be 9,600[b] litres/day during construction phase of the proposed Project and 1,600 litres/day during operation phase of the proposed Project.

3.14 SOLID WASTE ESTIMATION

[a] Tentative Work Force Requirements including Client and Contractor Staff = (300) x (40) = 4,000 litres/day

[b] Design Criteria of Public Health Engineering for Water Supply, Sewerage and Storm Water Drain (Domestic sewage generation = 80% of water consumed/day)

The municipal solid waste generated by 300 construction workers is estimated to be around 184 kg/day (as per 0.612 kg/capita/day waste generation)[16] for the proposed Project. In addition to this, construction waste will also be generated at the site. Solid waste generated during construction and camp sites shall be collected and safely disposed by Lahore Waste Management Company (LWMC) or its registered contractor.

During operational phase, solid waste generation is expected to be 30.6kg/day by 50 WASA workers.

3.15 CONSTRUCTION MATERIALS

The materials used in construction of Wastewater Treatment Plant would include clay, coarse aggregates (crush), fine aggregates (sand), steel, water, asphalt, reinforcement, cement and excavated material from ponds etc. Geotextile membrane is planned for sludge monofills to avoid any percolation in the ground.

Coarse aggregates (crush), fine aggregates (sand), steel, water, asphalt, reinforcement, cement will be used for the construction of the office building, channelization, pumping station and other physical structures. Clay will be used as liner of the ponds the coefficient of permeability of the clay should not be more than 1*10-7. Excavated earthen material will be used for the construction of the flood protection dykes. The material for civil works will be bought from local market.

3.16 CONSTRUCTION EQUIPMENT

The list of the machinery and the equipment required for the proposed project is provided in Table 3.2.

Table 3.2 Machinery and Equipment Requirement for the Proposed Project

Sr. No.	Machinery/ Equipment	Sr. No.	Machinery/ Equipment
1	Dump Truck	10	Self-Propelled Pneumatic Roller
2	Front End Loader	11	Concrete Transit Truck
3	Dozer	12	Concrete Pump
4	Grader	13	Excavator
5	Vibratory Roller	14	Water Pumps
6	Water Tankers	15	Vibrators
7	Agg. Spreader	16	Generators
8	Three Wheel Rollers	17	Paver
9	Tandem Roller		

16. Source: http://epd.punjab.gov.pk/solid_waste

3.17 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:

- The camp site must be chosen following the IFC workers accommodation guidelines;
- There should be no resettlement issue for the location of the camps;
- 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.

3.18 PROJECT ADMINISTRATIVE JURISDICTION

The proposed project lies in the city of Lahore, Punjab Province.

3.19 PROJECT IMPLEMENTATION SCHEDULE

The project is expected to be completed within three (03) years. Detailed work schedule is given in Figure 3.19.

3.20 COST OF THE PROJECT

The estimated cost for implementation of the proposed Project is Rs. 32,180 million.

CONSTRUCTION OF WWTP AT BABU SABU (SOUTH-WEST)

WORK SCHEDULE-CONSTRUCTION PHASE

Sr. No.	Components	Year-1												Year-2												Year-3											
		M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9	M-10	M-11	M-12	M-13	M-14	M-15	M-16	M-17	M-18	M-19	M-20	M-21	M-22	M-23	M-24	M-25	M-26	M-27	M-28	M-29	M-30	M-31	M-32	M-33	M-34	M-35	M-36
C	Issuance of Award Letter																																				
A	**Conveyance System**																																				
1	Construction of Collector Channel-1																																				
2	Construction of Collector Channel-2																																				
B	**Influent Pumping Station**																																				
1	Construction of Wet Wells																																				
2	Construction of Dry Wells																																				
3	Procurement and Installation of Pumps																																				
4	Suction/Delivery Piping																																				
5	Testing and Commissioning																																				
C	**Upgradation of Exiting Disposal stations**																																				
1	Forest Colony Disposal Station																																				
I	Construction of Dry Well																																				
II	Procurement and Installation of Pumps																																				
III	Parcemain																																				

Figure 3-19: Detailed Work Schedule

Sr. No.	Components	Year-1												Year-2												Year-3											
		M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9	M-10	M-11	M-12	M-13	M-14	M-15	M-16	M-17	M-18	M-19	M-20	M-21	M-22	M-23	M-24	M-25	M-26	M-27	M-28	M-29	M-30	M-31	M-32	M-33	M-34	M-35	M-36
2	Bagh Munchi Ladha Disposal Station																																				
I	Proposed Dry Well																																				
II	Procurement and Installation of Pumps																																				
3	Multan Road Disposal Station																																				
I	Construction of Wet Well																																				
II	Construction of Dry Well																																				
III	Procurement and Installation of Pumps																																				
IV	Forcemain																																				
D	**Wastewater Treatment Plant**																																				
1	Inlet Drain/Channel																																				
2	Flow Distribution Chamber (FDC)																																				
3	Grit Chamber (GC)																																				
4	Primary Sedimentation Tank (PST)																																				
5	Aeration Tank (AT)																																				
6	Secondary Sedimentation Tank (SST)																																				
7	Sludge Thickener (STH)																																				

Sr. No.	Components	Year-1												Year-2												Year-3											
		M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9	M-10	M-11	M-12	M-13	M-14	M-15	M-16	M-17	M-18	M-19	M-20	M-21	M-22	M-23	M-24	M-25	M-26	M-27	M-28	M-29	M-30	M-31	M-32	M-33	M-34	M-35	M-36
8	Sludge Drying Beds (SDBs)																																				
9	Treated Effluent Channel (Inside)																																				
10	Treated Effluent Channel (Outside)																																				
11	Diversion Channel																																				
12	Installation of Mechanical Equipment																																				
13	Internal Yard Piping																																				
14	Sludge Pump Rooms																																				
15	Blower Rooms																																				
16	Admin Building																																				
17	Staff Quarter and Guard Room																																				
18	Access Road																																				
19	Internal Road Network																																				
20	Buffer Zone/Plantation Works																																				
21	Flood Protection Works																																				
22	Testing and Commissioning																																				

4 ENVIRONMENTAL AND SOCIAL BASELINE PROFILE

This chapter provides the description of the baseline conditions along the proposed project within the AoI as defined in section 3. Considering the potential impacts of the Proposed Project, existing baseline environmental conditions of the proposed project's AoI 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 project activities.

The existing environmental conditions around the proposed project have been considered with respect to physical, biological and socio-economic aspects. Site visits were conducted to survey the field area and to collect environmental data on physical, biological and socio-economic parameters in AoI. Map of AoI is given as Figure 3.6. Further, consultations were held with the general public and stakeholders of the project area in order to seek the public opinion on the implementation of the proposed project.

4.1 PHYSICAL ENVIRONMENT

4.1.1 Topography

The topography of the project area is flat. The General height of the area is approximately 220 meters above the Mean Sea Level (MSL). The district Lahore is divided into two parts. The low lying alluvial soil is along the Ravi River, and the uplands in the east. Upland is a plain slope from north-east to south-west. The lowlands are generally inundated during the monsoon season by Ravi River, flowing in the west of district along its boundary with district Sheikhupura.

4.1.2 Regional Geology

The Project Area does not have any valuable minerals. Although, scientific in depth investigations haven't been carried out, yet the surveys conducted have failed to discover any minerals worth the name till to- date.

The only minerals worth to value are kellar and kankar in the district Lahore. Kallar is the grey powdery substance collected and taken out from the old village sites and other deserted abodes in the district. It is used for the manufacture of crude saltpeter and also as manure for the top dressing of young cotton and tobacco plants (no longer in the line of extensive cultivation). With the passage of time the demand for Kallar diminished and its use as a trading commodity is on the decline. Kankar is used for metaling roads and its smaller particulars are burnt for lime. It is a kind of limestone gravel and is found, after being dug out at a depth varying from one to eight feet, in many parts of the district particularly the uplands. Regional Geological map of the project area is shown in Figure 4.1

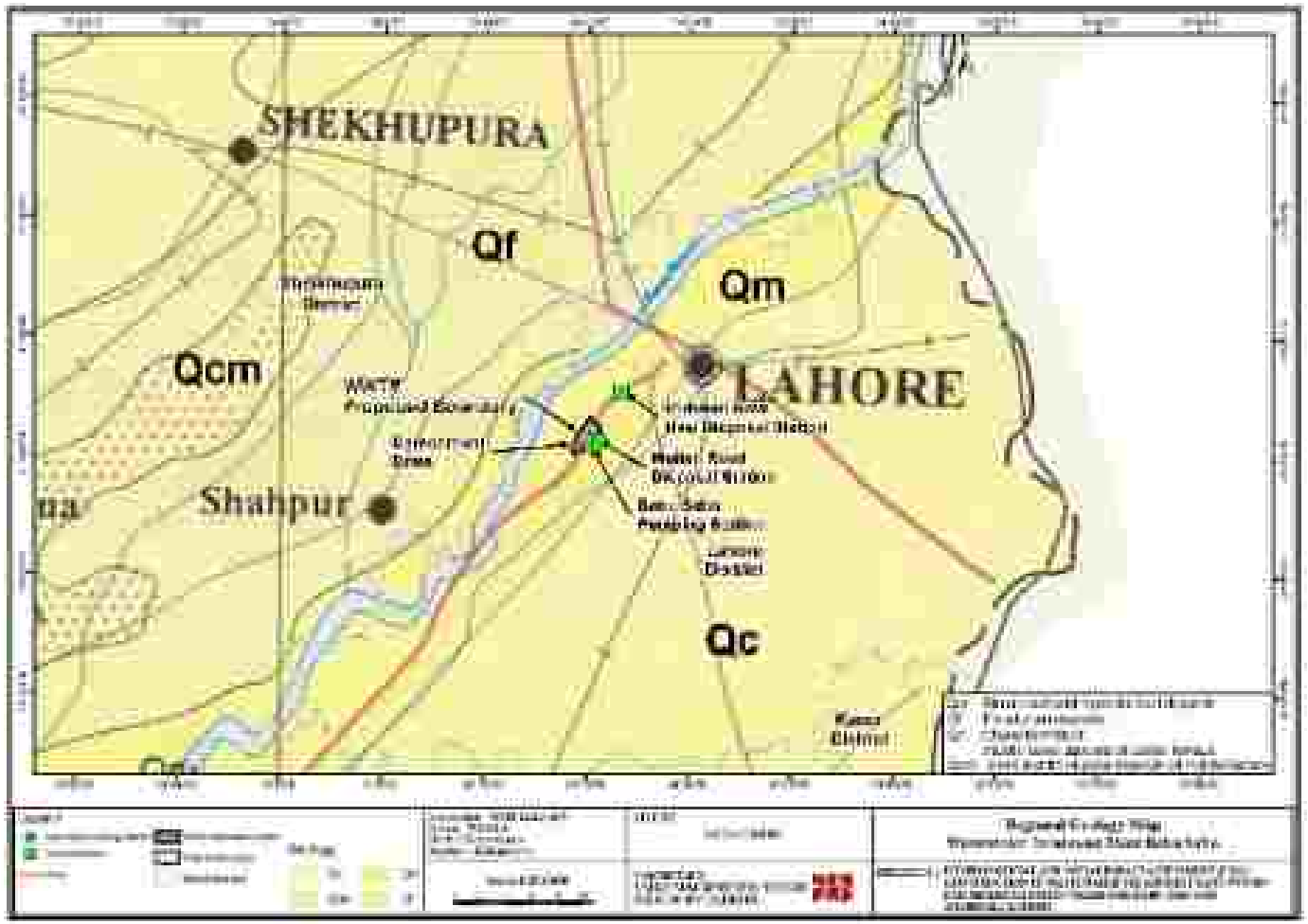


Figure 4-1: Regional Geology Map

4.1.3 Soil

The soil in the Project Area is cohesion less and is of alluvial type deposited by Ravi River. Various soil layers below the ground level includes: silt, silty clay, silty sand, poorly graded sand with silt, lean clay etc. Soil Map of the Punjab Province is given in Figure 4.2. On which project area is marked.

The soil is different in character and generally inclined to be dry. However, it is rich in potential plant nutrients.

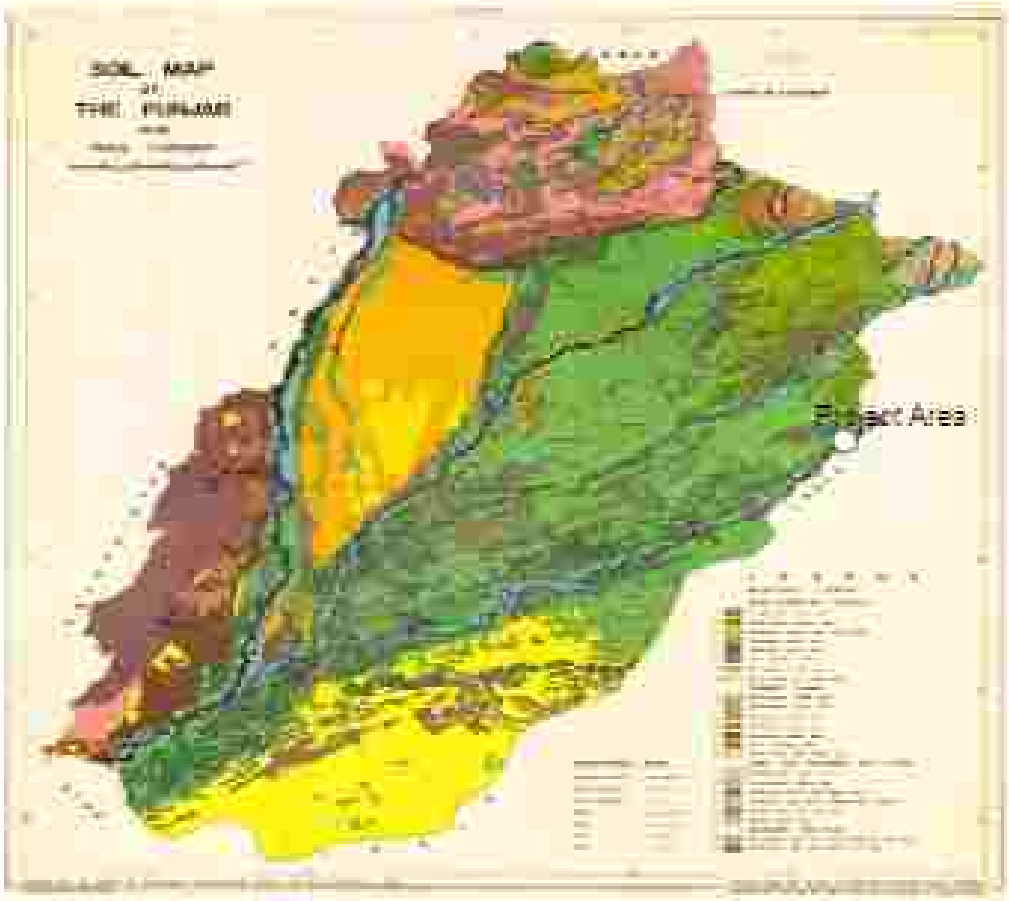


Figure 4-2: Soil Map of the Study area

At the location of wastewater treatment plant, light brown to brown Lean Clay/Lean Clay with sand (CL), in soft state, is generally present up to a depth of around 1.5 m below NSL. The above layer is underlain by Silty Sand (SM)/Poorly graded Sand with silt (SP-SM) in loose to medium dense state.

At the location of Collector Channel, fill material generally consisting of Silty Sand/Clayey Silt mixed with pieces of asphalt, bricks, stone, polythene bags and concretions is present from top of ground to about 2.0 m depth below NSL. The above layer is underlain by Silty Sand (SM) /Poorly graded Sand with silt (SP-SM) in loose to medium dense state.

4.1.4 Seismology

Study area is located in the tectonic zone of down warp and platform slope in the seismic zone of noticeable earthquake from 3.1 to 4.9 on Richter scale (Atlas for Pakistan).

The known main active fault near Lahore is the Main Boundary Thrust (MBT) which passes at a distance of about 180 km towards northeast along the Himalayan front. Damaging earthquakes have been recorded along this fault during the past century. The most recent is the October 08, 2005 Kashmir earthquake, which caused heavy devastation in Kashmir and adjoining areas of NWFP. However, it did not cause any major damage to Lahore. Destructive earthquake of 1827 was felt in Lahore region. This earthquake damaged the minarets of the famous Badshashi Mosque. Kangra earthquake of 1905 was also felt in Lahore. Some damage like Townhall building in Lahore is associated with this earthquake.

According to building code of Pakistan prepared by NESPAK recently, it is located in Seismic Zone 2A of Pakistan (Lower limit of moderate damage). Zone 2A represents peak ground acceleration (PGA) from 0.08 to 0.16g. Figure 4.3 shows the seismic zoning map of Punjab with the Project Area falling under Seismic Zone-2A.

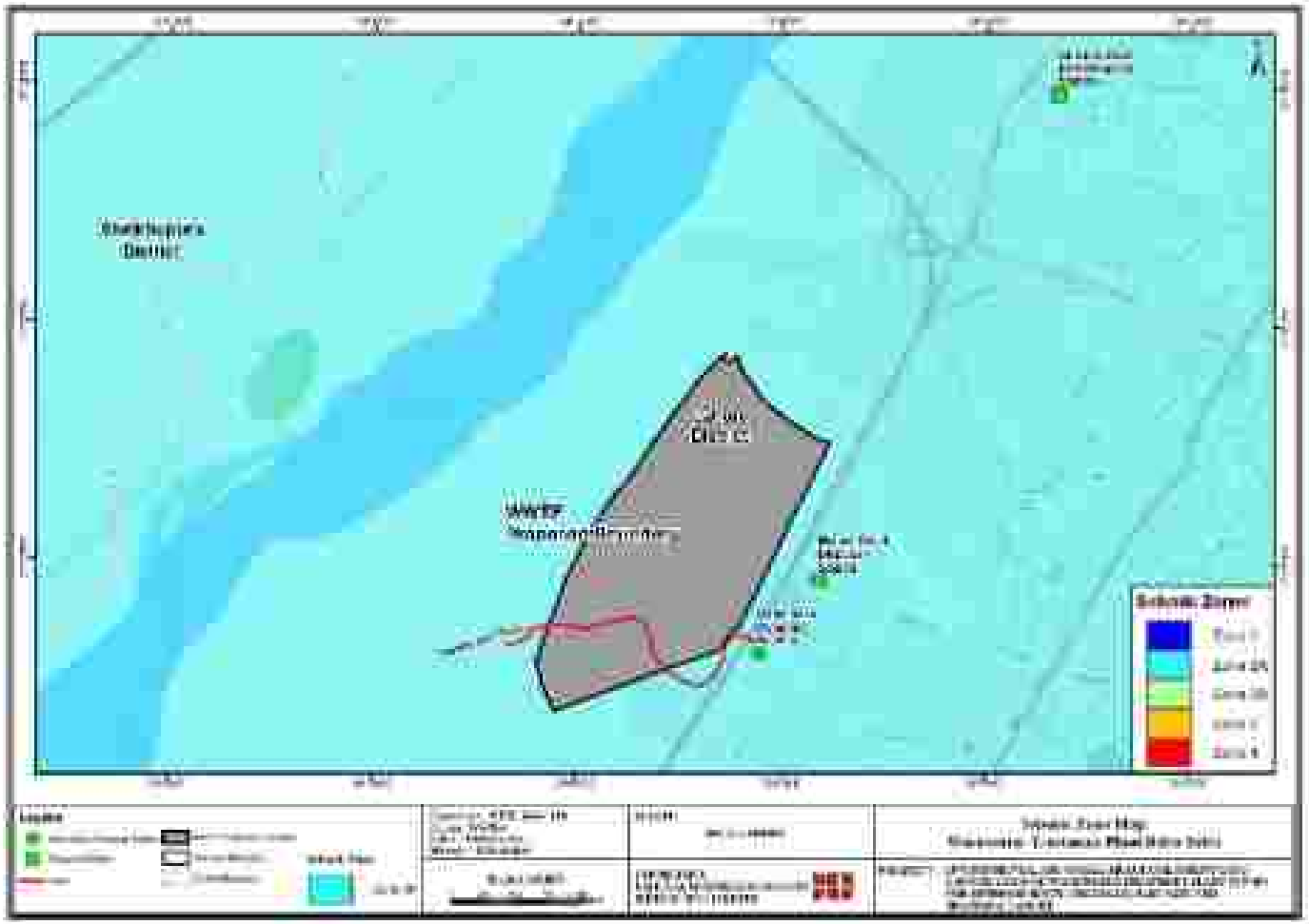

Seismic Zone

Figure 4-3: Seismic Zoning Map of Project Area

4.1.5 Climate and Meteorology

Seasonal climatic conditions must be considered for the design and execution of Project. The climate including air temperature, precipitation, humidity and evaporation is an influencing factor affecting the construction of plant and other engineering structures. However, to determine the overall effect of the climatic stresses, daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation must be considered. The Project Area has extreme climate, it has hot summer and cold winters. The summer starts from April and lasts till September. May, June, and July are the hottest months. The mean maximum and minimum temperature ranges from 40.4 °C and 27.3 °C respectively for these months. The winter seasons lasts from November to March. December, January and February are the coldest months. The mean maximum and mean minimum temperature ranges from 19.8°C to 5.9°C in January. Temperatures vary from 5.9 °C to 40.4 °C. 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. The average rainfall is about 629 millimeters per year. The wastewater flows changes considerably in monsoon season i.e. from 200 to 166,000 cusecs.

Table 4.1 to 4.9 shows wind direction, wind speed, temperature, monthly rainfall and humidity at various timings during 2012-2016

Table 4.1: Wind Direction at 0800 AM (2012-2016)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2012	N22W	N74W	N32W	N16E	N19W	S58W	S54E	S42E	N67W	NZTE	N	N
2013	N26W	S74E	N52W	N	N53W	N88E	S75E	S23E	635E	N22W	N38W	W
2014	N73W	N73W	N43W	N41W	N33W	S58W	S34E	S08E	S9TE	N62W	N45W	N13E
2015	N23W	N37E	N29W	N20W	N39E	N28E	N72E	S61E	N4FW	S74E	N	N
2016	N22W	N22W	N06E	N45W	N47E	S75E	S51E	N88E	S45W	C	N27W	N

Table 4.2: Wind Direction at 0500 AM (2012-2016)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2012	N37W	N43W	N53W	N61W	N67W	S81W	S34E	3T1E	N63W	N62W	N45W	N60W
2013	N50W	N45W	N79W	N69W	N73W	S28W	N06E	N16E	N2EE	N60W	N55W	N71W
2014	N6EW	N33W	N63W	N62W	S54W	S59W	E	W	N35E	N42W	N53W	N52W
2015	N31W	N36W	N35W	N54W	N31E	N62W	S91E	S30W	S83W	N43W	N39W	N75W
2016	N34W	S7EW	N12W	N61W	N72E	S81E	S4TW	N35E	N82W	N60W	N34W	W

Table 4.3: Wind Speed (Knot) at 0800 AM (2012-2016)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2012	2.2	1.3	1.6	1.6	2.2	2.1	2.3	1.8	0.4	0.4	0.1	0.6
2013	0.6	1.1	1.2	1.1	2.7	3.7	2.6	1.9	1.3	0.6	0.2	0.4
2014	0.3	0.7	2.1	2.7	2.9	3.4	2.8	2.1	1.5	1.7	0.2	0.3
2015	0.5	1.9	2.2	3.3	2.3	1.9	2.2	1.9	0.5	0.7	0.1	0.2
2016	0.4	0.6	1.3	2.4	2.6	2.8	1.6	1.0	1.1	0.0	0.4	0.2

Table 4.4: Wind Speed (Knot) at 0500 AM (2012-2016)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2012	2.5	3.4	4.8	3.3	3.3	4.1	2.1	1.3	2.0	1.0	0.5	1.2
2013	1.9	3.7	3.7	3.7	4.5	3.7	2.6	2.4	2.9	2.1	1.7	1.0
2014	2.2	4.0	4.6	4.2	4.3	4.3	3.7	3.7	3.5	3.1	1.9	0.9
2015	1.6	4.1	3.7	4.1	3.7	4.3	2.1	1.9	2.5	1.7	1.3	1.1
2016	1.1	2.0	3.6	5.2	3.7	3.1	1.4	1.2	2.2	2.3	0.8	0.5

Table 4.5:Monthly Total Rainfalls (mm) (2012-2016)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2012	15.6	6.8	10.0	49.9	0.2	12.2	37.7	197.1	199.4	25.6	0.2	21.0
2013	12.2	71.2	19.8	7.3	1.2	138.0	242.2	382.3	30.7	18.4	4.8	7.0
2014	4.0	22.8	32.3	84.8	22.5	50.1	49.4	58.7	450.3	3.8	29.2	0.0
2015	16.9	63.3	141.8	5.2	31.7	45.5	328.0	92.7	125.8	3.8	0.4	-1.0
2016	28.7	2.8	27.4	2.9	31.2	116.2	161.7	315.1	127.7	0.8	0.2	0.0

Table 4.6: Monthly Mean Minimum Temperature °C (2012-2016)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2012	7.4	8.3	14.4	20.1	26.4	26.7	27.2	26.1	24.6	19.4	12.8	7.5
2013	5.6	9.9	14.9	19.8	25.1	26.6	26.2	24.6	24.2	20.5	11.3	7.3
2014	6.2	8.1	12.9	17.9	22.8	27.3	26.4	25.9	25.2	21.9	13.0	7.9
2015	7.7	11.5	14.4	20.8	25.2	26.3	25.4	26.6	25.1	20.2	13.9	8.4
2016	8.1	9.3	16.9	21.2	25.7	27.8	25.9	25.6	25.6	20.9	13.0	9.3

Table 4.7: Monthly Mean Maximum Temperature °C (2012-2016)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2012	19.0	20.3	27.4	33.3	38.3	41.6	38.8	34.4	33.8	31.3	28.6	19.7
2013	15.9	20.5	28.1	34.0	40.3	38.7	35.3	32.0	35.1	32.1	28.6	20.9
2014	18.2	20.2	25.1	32.1	37.2	41.2	36.5	36.2	32.9	31.3	25.5	19.6
2015	18.5	22.5	26.1	32.7	39.1	38.1	34.2	34.6	34.5	32.0	26.9	21.6
2016	17.6	23.5	28.0	35.3	40.2	39.6	36.5	34.1	35.1	33.5	27.7	23.1

Table 4.8: Humidity (Percentage) at 0500 AM (2012-2016)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2012	82	68	60	59	58	43	76	82	79	72	76	83
2013	86	82	73	61	58	54	83	86	78	80	79	85
2014	87	86	78	68	46	47	70	72	83	76	77	84
2015	86	81	78	61	42	54	76	86	70	74	76	77
2016	87	79	73	45	42	56	77	79	72	72	76	84

Table 4.9: Humidity (Percentage) at 0500 AM (2012-2016)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2012	51	41	37	25	20	28	52	67	61	45	49	60
2013	56	59	45	30	20	43	69	72	62	56	47	62
2014	57	57	31	33	30	31	54	64	63	51	46	63
2015	63	50	52	36	24	36	54	66	61	46	46	46
2016	64	43	43	24	24	39	58	67	66	42	47	57

Source: Meteorology Department Lahore

Based on climatic elements, five seasons are recognized in the project area:

i) Pre-monsoon Season

Pre-monsoon refers to the period from April to June prior to the setting in of the monsoon. This is the hottest and the driest season, with persistent dry and hot winds. Day time temperature rises to 40.4° C. The flows in the river begin to rise simultaneously due to snow-melt water in the high mountains. The water table falls to the maximum depth.

ii) Monsoon Season

Monsoon is the main rainy period, which starts at the beginning of July, reaches its climax in August and gradually, subsides in September. High intensity Rainfall causes soil erosion which is a function of erosivity and erodibility. The cool monsoon winds followed by heavy showers lower the temperature to great extent. The part of rain percolates into the soil and is conserved in the subsoil and part adds to the groundwater. The conserved moisture in the soils is generally sufficient to rejuvenate the vegetation. All plants grow rapidly and mature towards the end of the season. With the start of monsoon season, the rivers flow at their peak level. The groundwater level is improved toward the end of the season in September and October.

iii) Post-monsoon Season

Post monsoon season refers to autumn (October-November). The temperature starts falling but the extreme aridity prevents plants to flower early and set seed toward mid-seasons. Groundwater level rises as a result of infiltration from rainfall.

iv) Winter Season

Winter refers to the period from December to January. The lowest temperatures (< 2°C) and cold winds characterize this season. The plants become dormant and most of them dry out. Most of the trees shed their leaves and few remain green or partly green. Sometimes this season becomes severe due to cold Siberian winds. Groundwater level declines in this season due to low flows in the rivers and no or little rains which usually fall in light showers causing little soil erosion.

v) Spring Season

Spring refers to the period from February to March. Temperatures become pleasant. The mean maximum temperature is 27°C with the highest precipitation of 41.2 mm and relative humidity of 57.8 percent. Some light showers of rain may also fall without generating run off. The vegetation sprouts again because of conserved moisture from winter and spring rains, if any. The water table starts falling.

4.1.5 Climate Trends

Pakistan is one of the most susceptible countries due to climate change. A detailed climate study performed by Groupheiut Consultant under this project (climate Study attached) reveals that the project area is facing various climate changes including modified trends of precipitation, warmer temperature, increased droughts, floods and other extreme weather events.

4.1.7 Hydrology and Ground Water

Hydrogeology

The Study Area forms the upper part of Punjab plain, which is a part of the Indo-Gangetic depression. This depression is of a synclinal nature. Synclinal depression is a fore deep downward of the Himalayan foreland of variable depth, converted into flat plains by simple process of alluvial deposition. The aquifer underlying the Study Area comprise unconfined alluvium with a thickness of about 1050 feet (rock has been encountered at depth 1050 ft in the deepest test bore hole drilled near Thokhar Niaz Beg in Punjab) as a part of regional groundwater investigation. Hydrological map showing that the Project Area falls in Bari Doab is shown in Figure 4.4. It is part of the large inter alluvial upper Bari Doab, which is bounded by the Ravi River in northwest and the Sutlej River to the southeast. The Bari Doab along with other Doabs like Rechna, and Chaj form the vast alluvial plain of the upper Indus Plain in Punjab.

The alluvium is derived from the erosion of mountain ranges in north. It has been deposited and reworked by the large meandering rivers and tributaries of the Indus River and comprises a random distribution of fine to coarse sand with lenses of silty clay and clay of varying thickness and extension. Borehole logs for tube-wells shows that the lenses of less permeable material are neither thick nor continuous so, in spite of their heterogeneity, the alluvial sediments constitute an aquifer which on regional basis behaves as a single homogeneous unconfined water body.

Regional Flow Pattern and Condition of Groundwater

The regional groundwater flow in the area is from northeast, the Jammu and Kashmir foothills which are at higher elevation, towards the southwest along the general slope of the area.

The water table in the study Area ranges from 15ft (surrounding areas) to 100 ft in the center of city. This condition is during the monsoon season, when the water table is high and the annual fluctuation is reported not more than 10 feet. Before the introduction of controlled irrigation system in Punjab, the water table was deep towards the centre of Doabs and was shallow along the rivers. After the introduction of controlled irrigation system in the region, water table started rising as a result of leakage/seepage from irrigation canals and infiltration from irrigation applications on crop fields. As a result, the area became water logged until about 1950 when a quasi-equilibrium state was reached, controlled in part, by evapo-transpiration and drainage.

Groundwater flow to the area has partly been checked due to creation of a large deep bowl of around 130 ft deep in Lahore City located in north east of the Industrial state by the declining of water table. This has happened due to high groundwater abstraction for meeting the demand of public water supply for large population and for industries. Therefore, water table in the area is showing declining trend.

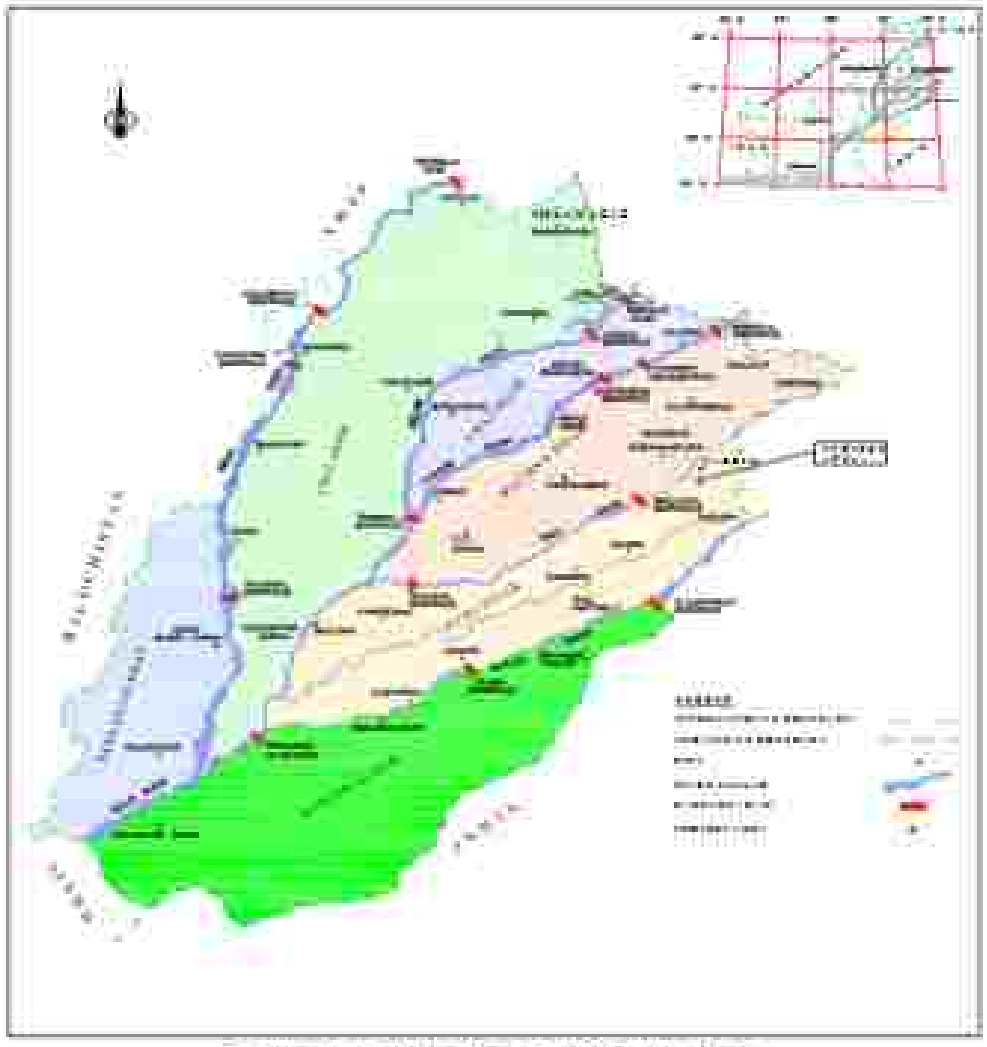


Figure 4-4: Hydrology of the Study Area

Recharge and Discharge of Groundwater

The main recharge source to the groundwater is from regional groundwater flow, from the piedmonts of Kashmir mountain range located in northeast at a distance of around 150 km, and follows the general slope of the area that is northeast to southwest along the Ravi River with an average slope 1.22 ft/ mile.

Recharge to the area is also supplemented by leakage from canal system, seepage from the irrigated fields and infiltration from rainfall. The regional groundwater flow is the dominant component of recharge and assures the sustainability of the quantity and quality of groundwater. The main sources of discharge in the area are the evapo-transpiration and groundwater abstraction by the industrial and irrigation tube-wells.

Evapo-transpiration is considered to be negligible when depth to water table is more than 10 feet. The net effect of all the discharges are that the depth of post monsoon groundwater in the area never more than 10 feet in the surrounding of the Lahore city, which is also an indicator of groundwater sustainability.

The aquifer underlain the Study Area is more than 1000 ft thick saturated column of sand and extends up to the piedmont of Kashmir hills located in north east at a distance of more than 100 km. The regional groundwater flow starts from the piedmonts of Kashmir's mountains and passing through the Rechna Doab enters into the Bari Doab and forms one large water body (aquifer). The River Ravi divides the area into Bari Doab in south and Rechna Doab in north.

A number of industrial and irrigation tube-wells up to 4 cusec capacities are already operating in and around the Project Area. Lahore City has 400 WASA public water supply tube-wells with a capacity of 4 cusec each at about 800 ft depth. In addition to this, large numbers of industrial tube-wells in and around Lahore are being operated.

4.1.3 Surface Water Resources

The main sources of surface water that can be used as alternative to groundwater in Lahore are Ravi River, Lahore Branch Canal, Khalra Distributary and the BRBD canal.

Ravi River

The Ravi River is a trans-boundary river crossing north western India and eastern Pakistan. It is one of six rivers of the Indus system in Punjab region. The Ravi River having a total length of about 720 kilometer flows across the city of Lahore. However, besides monsoon season the river is mostly dry due to the fact that water is diverted in India for irrigation and domestic purposes. In the past, River Ravi was the main source for recharge of groundwater aquifer, but due to increasing water demand and diversion of its water in India, it can no longer meet the required aquifer recharge of Lahore city. The quality of water of Ravi River has a direct impact on quality of water present in the adjacent aquifer.

The project area is located in close proximity to River Ravi. Effluent from proposed WWTP will be discharged in River Ravi. Currently all this effluent is being discharged without any treatment.

BRBD Canal

BRBD canal flows in the east of Lahore, from North to South. It crosses Grand Trunk Road, at a distance of about 6 kilometer from Lahore Ring Road. The Canal takes off from Upper Chenab Canal (UCC) at Bambanwala, itself off takes from Marala Barrage with full discharge. The BRBD is about 175 kilometer long. It is an earthen channel except a short lined central segment. Although design capacity at head is 7,250 cusecs, the maximum discharge is around 4,500 cusecs. Among others, one of the reasons of limiting discharge to 4,500 cusecs is the limited design capacity of Syphon for crossing of River Ravi. This means that water from BRBD canal is a better and dependable source as compared to Ravi River that can be used to supply water to residents of Lahore after treatment in future. The Canal is brick lined from RD 280 to RD 373 and crosses the River Ravi and GT road at RDs 281 and 325+1 respectively.

Lahore Branch Canal

The other surface water source is the Lahore Branch Canal (LBC), which takes off from BRBD canal at about RD 230. It is an open channel with lining at both sides. Due to its limited discharge of about 400 cusecs, this canal cannot be considered as surface water source for Lahore, even to draw 100 cusec discharge.

Khaira Distributary

This water source lies in the south of Lahore and it also takes off from BRBD canal, and flows from east to west. Its flow is even less than the Lahore Branch Canal, and hence cannot be utilized for the supply of water to 100 cusecs water treatment plant.

Drainage

All of the Lahore districts drain ultimately to River Ravi which is the major natural surface water resource located in the northern part of the district. River Ravi receives huge amount of wastewater from the city of Lahore and other industrial discharges from different sources especially Hudyara Drain, a natural drain which carries pollution loads from both Pakistan and India. Most wastewater discharge reaches to Ravi in the 80km stretch between Baghbanpura and Lahore. These wastewater discharges, along with reduction in available water in River Ravi for dilution, has greatly deteriorated the quality of river water. River Ravi runs merely as a sullage carrier near Lahore during low flow season.

Besides, there are 78 minor drains which finally fall in eight (8) major drains namely Satto Kattla drain, Lakshmi Drain, Suk Nehar Drain, Upper Chota Ravi Drain, Siddique Pura Drain and Shahdara Drain. Nowadays, all these drains collect wastewater from different areas of Lahore and finally fall into River Ravi.

Hydrology/ Surface Water Resources Map is shown in Figure 4.5.

[1] Flood Feasibility Study Report on Lahore Water and Wastewater Management Project-February, 2019



Figure 4-5: Surface Water Hydrology Map

4.1.9 Floods

The project area is located in flood plain of River Ravi. Lahore had been subjected to extreme floods in past due to high discharge in Ravi River during monsoon season. The flood of 1955 is the second highest on record flood for the Ravi River, with peak discharges of 14,932 cumecs at Shahdara. It breached flood embankments of the Bambanwala–Ravi–Sedian–Dipalpur Link Canal, upstream from Ravi Siphon, and at Shahdara Bridge. The Punjab Irrigation Department estimated that flood discharges of 7,334 m³/s passed through the breaches at Ravi Siphon and 8,495 m³/s through the breaches at Shahdara Bridge. The flood of 1988, with magnitude of 18,309 cumecs (675,941 cusecs) at Shahdara, was the worst flood of 20th century to hit Lahore City.

According to Indus Basin Treaty in 1960, right of Ravi River belong India. India uses the water of Ravi for the purpose of irrigation and generation of electricity. Before entering into Pakistan, Madhopur Headwork is present in India, with spillway capacity of 17,750 cumecs, further 24 km upstream is the Ranjit Sagar Dam (Thein Dam), having spillway capacity of 20,878 cumecs (CWC India). The Ranjit Sagar Dam was put into operation in 2011. This massive storage, if released at the rate of maximum spillway capacity, can create a huge flood.

Flows in the river have a great temporal variation, which results from structural interventions from Indian side and rainfall pattern. The flow in Ravi River is measured by gauging station installed on Railway Bridge near Shahdara. Monthly averages flows from October to March are very less. The average flow in these six months is 48.4 cumecs[4]. The maximum average flow occurs in the months of July, which is 545 cumecs. While minimum average flow is in December, which is 40.4 cumecs.

A disaster relief control center has also been established to control the emergency situation. The control center remains updated with the latest information regarding the disaster situation of the district and immediately disseminates it to the relief agencies.

4.1.10 Urban Flooding

Urban Flooding is being observed in Lahore for last few years due to intensive rainfall and inadequate storm water drainage system which is causing massive damage to the Lahore. These heavy rainfalls are being attributed to an induced impact of climate change.

Recent spell of Monsoon Season 2023, in Lahore, caused record breaking rains resulting in severe urban flooding. Most of the roads of the city were submerged in water, traffic system choked. Supply of electricity disrupted in most of the areas. In some severe case deaths were also reported.

[4] *Safe Passage of Extreme Flood: How Mighty Chenab and Ravi Rivers Can Co-Exist Safely in Lahore City in Pakistan*, Ahsan et al., J. Civil Environ. Eng. 2018, 8:4

4.1.11 Environmental Monitoring

The environmental monitoring/ laboratory testing and analysis of parameters like ambient air quality, noise level, wastewater, surface water and groundwater / drinking water help to analyze the prevailing environment conditions in and around the Project Area. It provides a baseline to measure the changes in wastewater quality, groundwater /drinking water quality, air quality and noise level. Environmental Monitoring for ambient air quality, noise level, wastewater, surface water and groundwater / drinking water was carried out in 2019 and 2021 for the proposed project.

The sampling locations of the above mentioned parameters are shown in Figure 4.5. The environmental monitoring, sampling and testing report in 2019 and in 2021 is attached as Annex-II.

In July 2019, environmental monitoring for ambient air and noise level was conducted at WWTP site. Samples of surface water was taken from river Ravi while for drinking water, samples were taken from Shadiwal and from Jhugian Nagra.

In October 2021, environmental monitoring for ambient air and noise level was conducted at Multan Road Disposal Station Sabzazar and Saggian wala Bypass Road while surface water sample was taken from river Ravi. Drinking water samples were also collected from above mentioned three locations.

Table 4.10 provides detail regarding location of sampling points, date of monitoring and justification for selection of monitoring location.

Table 4.10: Location of Environmental Sampling and Monitoring Points

Sr. No.	Sampling Point	Location	Date of Monitoring	Justification for selection of monitoring location
Ambient Air Quality				
1.	AA 1:	At WWTP Site	July 29, 2019	• At Project Site
2.	AA 2:	Multan Road Disposal Station	October 13, 2021	• At Project site • In Residential area along Cant. Drain i.e. Sabzazar Housing Scheme
3.	AA 3:	Saggian Bypass	October 14, 2021	• Near Mosque at Bypass • Near Residential area of Catchment
Noise Level				
1.	NL 1:	At WWTP Site	July 29, 2019	• At Project Site
2.	NL 2:	Multan Road Disposal Station	October 13, 2021	• At Project site • In Residential area along Cant. Drain i.e. Sabzazar Housing Scheme

Sr. No.	Sampling Point	Location	Date of Monitoring	Justification for selection of monitoring location
3	NL 3	Saggian Bypass	October 14, 2021	• Near Mosque at Bypass • Near Residential area in catchment
Drinking Water Sampling				
1.	DW 1:	Jhugtian Nagra	July 29, 2019	• In residential area adjacent to WWTP site
2.	DW 2:	Shadiwal	July 29, 2019	• In residential area adjacent to WWTP site
3.	DW 3:	Multan Road Disposal Station	October 14, 2021	• At Project site • In Residential area i.e. Sabzazar Housing Scheme
4.	DW 4:	Saggian Bypass	October 14, 2021	• Near Mosque at Bypass • Near Residential
Wastewater/ Surface Water Quality				
1.	WW 1:	Kartar Drain near Sabzazar	October 14, 2021	• At Project site
2.	WW 2:	Drain at Saggian By Pass	October 14, 2021	• In Residential area in catchment
3.	WW 3:	Near discharge point of effluent from WWTP	October 14, 2021	• At Project site
4.	SW 1:	River Ravi	July 29, 2019:	• Nearest river to project area
5.	SW 2:	River Ravi	October 15, 2021	Nearest river to project area

4.1.12 Air Quality

Atmospheric pollution, particularly in urban areas like Lahore, has a strong impact on daily life. Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2), Carbon dioxide (CO_2), Carbon monoxide (CO), Ozone (O_3) and particulate matter (PM_{10}) are considered pollution indicators.

The ambient air quality was monitored at the proposed project area in 2019 and 2021. In July 2019, the sampling was done on WWTP Plant Site and in October 21, 2021 at Multan Road Disposal Station Sabzazar and Saggian wala Bypass Road.

Table 4.11 summarizes the air quality monitoring results. Detailed monitoring results are attached as Annex-II.

Table 4.11: Ambient Air Quality Analysis

Sr. No	Parameters	Monitoring Duration	PEQS 2016	WB/ IFC	Units	Monitoring Locations		
						AA 1: WWTP Site	AA 2 Sabzazar	AA 3: Saggian wala Bypass
1.	Carbon Monoxide (CO)	08 Hours	5	-	mg/m³	0.9	2.62	5.12
2.	Sulphur Dioxide (SO_2)	24 Hours	120	20	µg/m³	24.9	39.28	81.67
3.	Ozone	01 Hour	130	100	µg/m³	0.3-11.7	33.34	71.86
4.	Nitric oxide (NO)	24 Hours	40		µg/m³	20.6	16.05	28.06
5.	Oxides of Nitrogen (NO_2)	24 Hours	80	-	µg/m³	34.9	31.12	65.24
6.	Particulate Matter (PM_{10})	24 Hours	150	50	µg/m³	134	123.44	173.80
7.	Particular Matter ($PM_{2.5}$)	24 Hours	35	25	µg/m³	37.6	23.53	45.67
8.	Suspended Particulates (SPM)	24 Hours	500	-	µg/m³	168	283	415
9.	Lead	24 Hours	1.0	-	µg/m³	0.053	0.31	0.97

The test results have been compared with the stringent value from PEQS 2016 and WB/IFC limits. The results show that all the parameters were within the permissible limits at all locations except Sulphur Dioxide (SO_2), particular matter (PM_{10}) and particular matter ($PM_{2.5}$), which is higher than the limits of WB/IFC standards. Carbon Monoxide CO was found to be higher than the PEQS 2016 limits at Saggian Wala bypass road. Main causes of high values of Sulphur Dioxide, Particulate matter & Carbon Monoxide are industrial activities in nearby areas and inefficient burning of fuel due to vehicles which require maintenance as well as usage of substandard fuel. Location of monitoring point is shown in Figure 4.5.

4.1.12 Water Quality

Water Quality monitoring was conducted to determine the baseline characteristics of ground water and surface water in the project area.

Surface Water

Surface water sample was taken from River Ravi at the downstream of project site on July 29, 2019 and on October 21, 2021. Pakistan has not yet established surface water quality standards; therefore, the water quality results of aforementioned parameters are compared below with the WHO guidelines for surface water standards in class V (for Agriculture purpose) and PEQS for drinking water standards.

Table 4.12 shows the results for surface water quality in the project area. Detailed monitoring results are attached as Annex-III. Location of monitoring point is shown in Figure 4.6.

Table 4.12: Surface water Quality Test Results

Sr. No.	Parameters	Unit	PEQS 2016	WHO Class V	Monitoring Location	
					SW 1	SW 2
1	pH	-	6-9	<6.5	7.4	7.62
2	Total Dissolved Solids(TDS)	Mg/L	3500	-	208	212
3	Chloride	Mg/L	1000	-	36	07
4	Cyanide	Mg/L	1.0	-	0.035	ND
5	Fluoride	Mg/L	10	-	0.2	0.25
6	Pesticides	Mg/L	0.15	-	ND	ND
7	Cadmium	Mg/L	0.1	>0.0035	BDL	ND
8	Chromium	Mg/L	1	>0.016	0.0006	ND
9	Copper	Mg/L	1	>0.016	0.143	0.3
10	Lead	Mg/L	0.5	>0.082	0.0002	ND
11	Mercury	Mg/L	0.01	>0.0024	BDL	ND
12	Selenium	Mg/L	0.5	-	BDL	ND
13	Nickel	Mg/L	1	>1.4	0.045	ND
14	Zinc	Mg/L	5	>0.12	0.184	0.96
15	Arsenic	Mg/L	1	>0.36	BDL	ND
16	Barium	Mg/L	1.5	-	0.335	ND
17	Manganese	Mg/L	1.5	-	0.158	0.14
18	Boron	Mg/L	5	-	0.030	ND
19	Color	NGVS	-	-	7 TCU	<5
20	Total Coliform Bacteria	NGVS	-	-	Positive	Positive
21	Fecal Coliform Bacteria	NGVS	-	-	Positive	Positive
22	Taste		Not Objectionable	-		Acceptable
23	Odor		Not Objectionable	-		Acceptable
24	Nitrite, NO_2	Mg/L	≤3	-		0.05
25	Nitrates, NO_3	Mg/L	≤50	-		0.50
26	Phenolic Compounds	Mg/L	N.S	-		ND
27	Total Hardness as $CaCO_3$	Mg/L	≤500	-		144
28	Residual Chlorine	Mg/L	N.S	-		ND
29	Turbidity	NTU	≤5	-		<5

Sr. No.	Parameters	Unit	PEQS 2016	WHO Class V	Monitoring Location	
					SW 1	SW 2
30	Aluminium (Al)	Mg/L	≤ 0.2	3.0		0.95
31	Antimony (Sb)	Mg/L	≤ 0.005		-	ND

NA= Not Applicable BDL= Below Detection Limits ND= Not Detected
PEQS= Punjab Environmental Quality Standards NGVS= No Guideline Value Set

The test results have been compared with the stringent value from PEQS 2016 and WHO Class V. The results show that the value of pH is higher than the WHO class V. The results also show positive total Coliform, Fecal Coliform & E.Coli. The addition of chemicals and pollutants in river ravi are responsible for high pH values and zinc. The positive bacterial values are due to discharge of wastewater effluents into River Ravi.

Drinking Water

Samples of drinking water were taken from Shadiwal and from Jhugian Nagra in July 22, 2019 while in October, 2021 from Disposal Station near Sabzazar and Saggian Bypass. Table 4.13 shows the results of groundwater analysis in the project area. Detailed monitoring results are attached as Annex-II. Location of monitoring point is shown in Figure 5.6.

The test results given below in Table 4.13 have been compared with the stringent value from PEQS 2016 and WHO standards. The test results show that all the parameters were within the permissible limits except arsenic value at all three locations (compared with WHO standards) and total coliforms at Shadiwal and Jhugian Nagra. At Shadiwal and Jhudia Nagra, ground water samples were collected from hand pumps which may be at shallow depth and some sewage portion may be mixed at these depth. Remaining samples were taken from tap water which comes from municipal water supply pipelines.

Table 4.13: Groundwater Analysis of the Project Area

Sr. No.	Parameters	Unit	PEQS	WHO Standards	Monitoring Locations			
					DW 1: Jhugian Nagra	DW 2: Shastiwal	DW 3: Multan Road Disposal Station	DW 4: Saggain Bypass
1	pH	-	6.5-8.5	6.5-8.5	7.6	7.6	7.28	7.29
2	Total Dissolved Solids (TDS)	Mg/L	≤1000	≤1000.00	843	316	0.24	0.36
3	Antimony	Mg/L	≤0.005	0.02	ND	ND	ND	ND
4	Taste	-	Unobjectionable	Unobjectionable	Acceptable	Acceptable	Acceptable	Acceptable
5	Odour	-	Unobjectionable	Unobjectionable	Acceptable	Acceptable	Acceptable	Acceptable
6	Color	TCU	≤15	≤15	7 TCU	14 TCU	< 5	< 5
7	Chloride	Mg/L	<250	250	72	19	09	31
8	Boron	Mg/L	≤0.3	0.3	0.146	0.149	ND	ND
9	Cadmium	Mg/L	0.01	0.003	BDL	BDL	0.007	0.009
10	Arsenic	Mg/L	≤0.05	0.01	BDL	BDL	0.011	0.15
11	Mercury	Mg/L	≤0.001	0.001	BDL	BDL	ND	ND
12	Lead	Mg/L	≤0.05	0.01	BDL	BDL	ND	ND
13	Copper	Mg/L	2	2	0.017	0.021	2.51	2.51
14	Total Hardness	Mg/L	<500	-	257	204	143	149
15	Coliform bacteria (total)	Mg/L	-	-	Positive	Positive	Absent	Absent
16	E. Coli	Mg/L	0	0	Negative	Negative	Absent	Absent

Sr. No.	Parameters	Unit	PEQS	WHO Standards	Monitoring Locations			
					DW 1: Jhugian Nagra	DW 2: Shadiwal	DW 3: Multan Road Disposal Station	DW 4: Saggain Bypass
17	Coliform bacteria (Fecal)	Mg/L	0	0	Negative	Negative	Absent	Absent
18	Aluminum	Mg/L	≤0.2	0.2	BDL	BDL	ND	ND
19	Turbidity	Mg/L	<5	<5	4	1	< 5	<5
20	Nickel	Mg/L	≤0.02	0.02	BDL	BDL	ND	ND
21	Selenium	Mg/L	0.01	0.01	BDL	BDL	ND	ND
22	Chromium	Mg/L	≤0.05	0.05	BDL	BDL	ND	ND
23	Cyanide	Mg/L	≤0.05	0.07	ND	ND	ND	ND
24	Fluoride	Mg/L	≤1.5	1.50	0.1	0.2	0.24	0.36
25	Manganese	Mg/L	≤0.5	0.5	0.151	0.03	0.13	0.14
26	Nitrate	Mg/L	≤50	50	1.3	0.2	0.6	0.8
27	Nitrite	Mg/L	≤3	3	ND	BDL	0.012	0.038
28	Zinc	Mg/L	5	5	0.005	BDL	ND	ND
29	Residual Chlorine	Mg/L	0.2-0.5	-	ND	ND	ND	ND
30	Phenolic compounds	Mg/L	—	-	ND	ND	ND	ND
31	Pesticides	Mg/L	—	-	ND	ND	ND	ND
32	Barium	Mg/L	0.7	0.7	0.324	0.224	ND	ND

NA= Not Applicable
ND= Not Detected
BDL= Below Detection Limits
PEQS= Punjab Environmental Quality Standards

4.1.14 Wastewater

The wastewater quality was measured at three (03) different locations i.e. Sabzazar, Saggian Bypass and Niazi Chowk on October 21, 2021. The water samples were analyzed for the parameters specified in PEQS, 2016. The detailed wastewater results are given in Table 4.14. Detailed monitoring results are attached as Annex-II.

Table 4.14: Wastewater Analysis of the Project Area

Sr. No.	Parameters	Unit	PEQS	IFC Effluent Guidelines	Sampling Locations		
					WW 1: Sabzazar	WW 2: Saggian Bypass	WW 3: Cantt Drain
1.	Temperature @ lab	°C	-		26	26	26
2.	pH Value @ 25 °C	pH Unit	6-9	6-9	8.12	7.69	7.68
3.	Total Dissolved Solids (TDS)	mg/L	3500		564	537	907
4.	Sulphate	mg/L	600		66	32	38
5.	Fluoride	mg/L	10		ND	ND	ND
6.	Total Chromium	mg/L	1.0		ND	ND	ND
7.	Cyanide	mg/L	1.0		ND	ND	ND
8.	Chlorine	mg/L	1000		56	33	138
9.	Sulfide	mg/L	1.0		0.055	0.054	0.052
10.	Oil & Grease	mg/L	10	10	ND	ND	ND
11.	Chemical Oxygen Demand (COD)	mg/L	150	125	179	230	185
12.	Biochemical Oxygen Demand (BOD5)	mg/L	80	30	91	118	85
13.	Ammonia (NH3)	mg/L	40		ND	ND	ND
14.	Phenolic Compounds	mg/L	0.1		ND	ND	ND
15.	Total suspended Solids (TSS)	mg/L	200	50	156	199	325
16.	Arsenic (As)	mg/L	1.0		0.011	0.01	0.012
17.	Selium (Se)	mg/L	1.5		ND	ND	ND
18.	Boron (B)	mg/L	6.0		ND	ND	ND
19.	Cadmium (Cd)	mg/L	0.1		0.012	0.009	0.011
20.	Chromium (Cr)	mg/L	1.0		ND	0.027	0.019
21.	Copper (Cu)	mg/L	1.0		0.58	0.53	0.58
22.	Iron (Fe)	mg/L	8.0		0.19	0.45	0.62
23.	Lead (Pb)	mg/L	1.0		ND	ND	ND
24.	Manganese (Mn)	mg/L	0.01		0.13	0.11	0.2
25.	Mercury (Hg)	mg/L	1.0		ND	ND	ND
26.	Nickel (Ni)	mg/L	1.0		ND	ND	ND

Sr. No.	Parameters	Unit	PEQS	IFC Effluent Guidelines	Sampling Locations		
					WW 1: Sabzazar	WW 2: Saggian Bypass	WW 3: Cantt Drain
27	Silver (Ag)	mg/L	0.5		ND	ND	ND
28	Selenium (Se)	mg/L	0.5		ND	ND	ND
29	Zinc (Zn)	mg/L	5.0		ND	ND	ND
30	Anionic Detergents	mg/L	2.0		ND	ND	ND
31	Total Toxic Metals	-	1.0		0.854	0.706	0.668
32	Chromium-VI	mg/L	0.15		ND	0.013	0.011
33	Pesticides	mg/L	ND		ND	ND	ND

ND= Not Detected PEQS= Punjab Environmental Quality Standards

All samples had high organic contamination with chemical oxygen demand and biological oxygen demand values higher than PEQS and IFC standards in all three samples. TSS value was higher at all the locations as compared to IFC standards. However as compared to PEQS, it was higher at one point i.e. Cant. Drain. This may be due to addition of sewage waste, industrial wastewater as well as other multiple sources of toxic water pollutants being dumped into water canals which end up in River Ravi.

4.1.15 Noise

Noise level was monitored at the proposed project area in 2019 and 2021. In July 2019, the noise level was measured on WWTP Plant Site and in October 21, 2021 at Sabzazar and Saggian Bypass. Table 4.15 summarizes noise level monitoring results. Detailed monitoring results are attached as Annex-II. Location of monitoring point is shown in Figure 4.6.

Table 4.15 Noise Level Monitoring Results

Sr #	Location	PEQS dB (A) (Residential)	WHO/IFC dB (A) (Residential)	Monitoring Location		
				WWTP site	Sabzazar	Saggian bypass
1	Day	55	55	56	59.8	74.1
	Night	45	45	56	53.6	72.8

The test results have been compared with the stringent value from PEQS 2016 and WHO/IFC standards for residential areas. The test results show that noise level is slightly higher at night at WWTP site. Variations were observed Sabzazar and Saggian Bypass that were due to constant traffic flow and increased on peak hours for points at Saggian Wala Bypass Road. As the location at Sabzazar had limited intervention of traffic, noise level showed less variations.

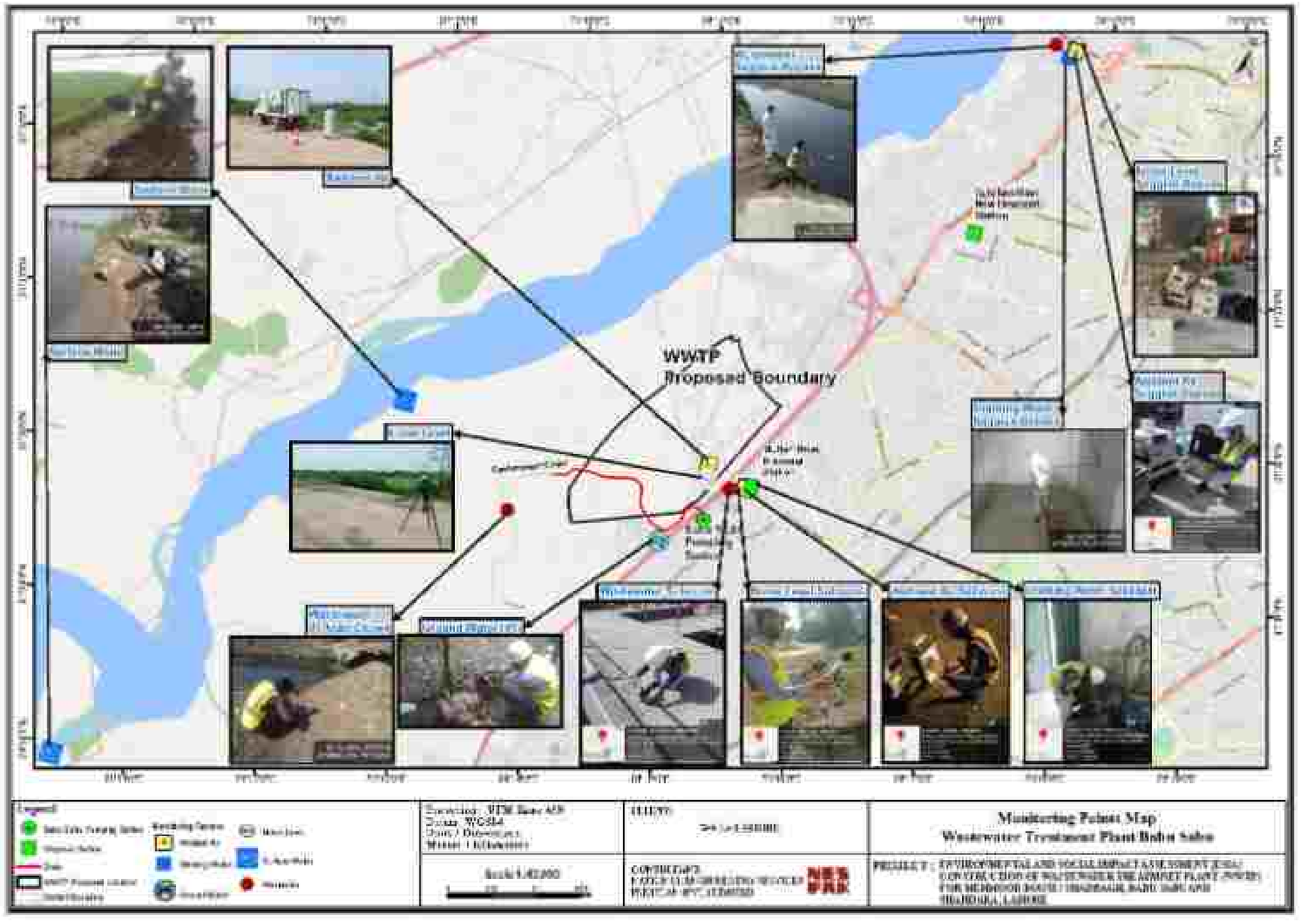
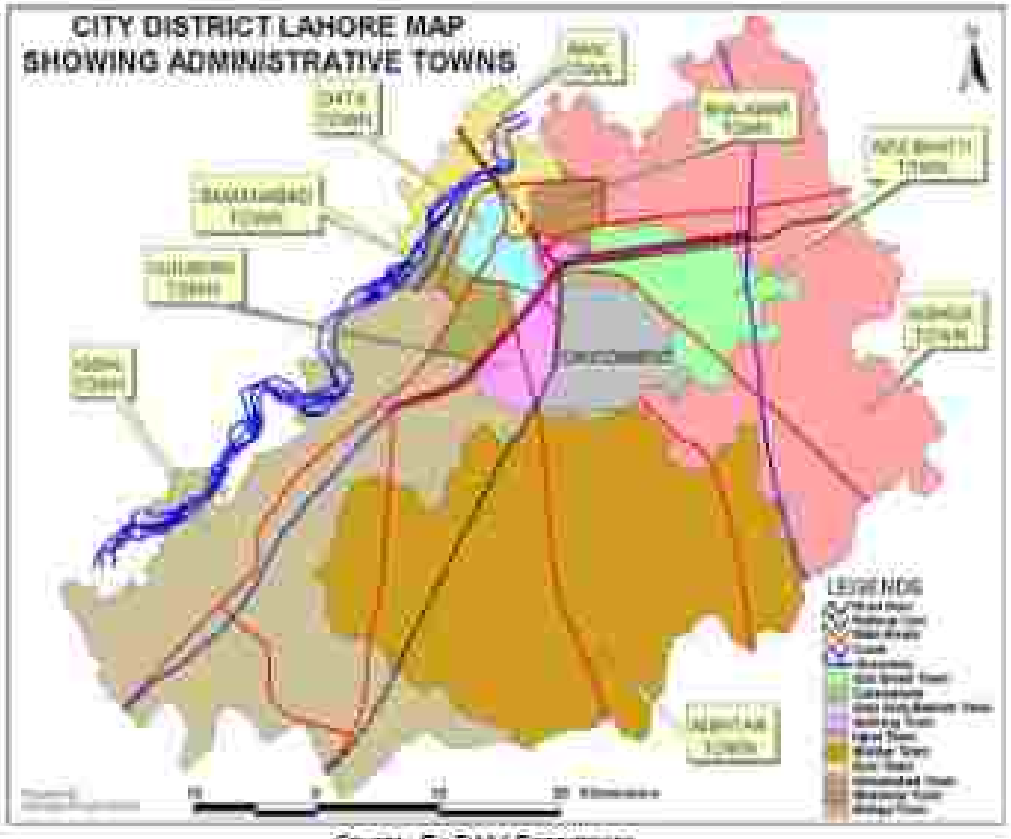


Figure 4-6: Location Map of Monitoring Points

4.1.16 Solid Waste

Lahore, having a population of approximately 13 million (Census result 2023), is experiencing urban sprawl and industrialization leading to a generation of enormous amount of solid waste from many sources like household waste, commercial activities, industries, hospitals, animal waste, all of which are contributing in creating environmental and health hazards for citizens.

For the collection of the solid waste, city has been divided in nine (09) towns which include Ravi Town, Shalimar Town, Wahga Town, Aziz Bhatti Town, Data Ganj Baksh Town, Samanabad Town, Gulberg Town, Allama Iqbal Town and Nishter Town as shown in Figure-3.8. Approximately 8160 tons per day of solid waste is generated in Lahore @ 0.612kg/c/day. About 8200 tons[14] of solid waste is collected daily and disposed of at landfill site. Total infectious waste generated from Lahore is 17537kg/day which is about 25% of the hospital waste generated in Lahore. Administrative zone map for the collection of Solid waste shown in Figure 4.7.



Source: E-SWM Department

Figure 4-7: Administrative zone map for the collection of Solid waste

[14] (2018, January 25). Retrieved January 28, 2018, from http://www.lwmc.com.pk/

4.1.17 Land use

The predominant landuse in the project area is agriculture. The project site of treatment plant consists of agricultural area, katcha tracks, temporary sheds for farmers/workers. Disposal station is surrounded by residential, commercial, religious areas while effluent channel discharge waste water into River Ravi.

On WWTP site, about 730 acres of land is under cultivation and consist of crops including green fodder and vegetables. Some katcha structures and sheds has been erected at WWTP site where farmers/workers reside to look after crops and animals. There are 39 electric poles on the WWTP site.

Figure 4.8 provide map of land use of the project site. Map of Landuse in Asl has also been given in Figure 4.9



Figure 4-8: Land use Map of the project area

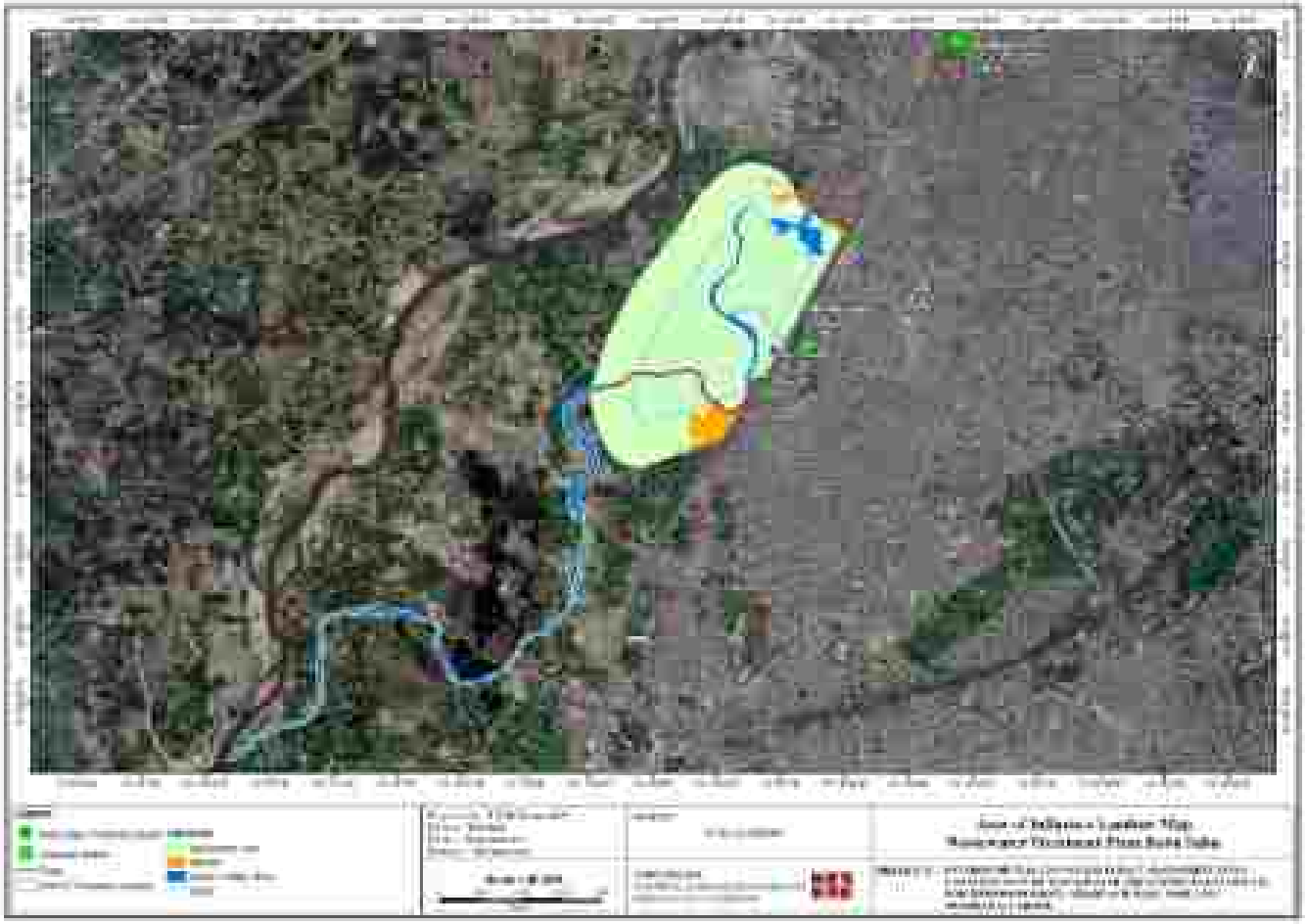


Figure 4-5.: Land use in AoI of the Proposed Project

4.1.18 Environmental Sensitive Receptors

Sensitive receptors and their respective sensitivity are listed in Table 4.16. A comprehensive map showing sensitive receptors of the project area such as schools, Mosques, Graveyard/Shrines, etc. is given in Figure 4.10. Pictorial representation of some major sensitive receptors in the project area is given in Figure 4.11.

Table 4.16: Environmental Sensitive Receptors and their Sensitivity

S.N	Name/Type of Physical Sensitive Receptor	Remarks
A	**Educational/ Health Institutions**	
1	Govt. Primary School for boys	Sensitivity due to access, dust, noise and vibrations especially in teaching hours during construction phase.
2	All Public School	
3	Govt. Primary School for Girls	
4	Allied Grammar School	
	MIH Hospital	
B	**Mosques/ Shrines/Graveyard**	
1	Mosque Ya Rasool Allah	Mosques/ Graveyard is sensitive due to access to fulfill the religious rituals in case of death.
2	Private Mosque	
3	Zain Zahl Mosque	
4	Shrine Baba Bohia Shah	
5	Shamsham Ghatt	
6	Masjid Al Zehra	
	Masjid Truck Adda	
7	Masjid Hasan	
8	Darbar Zahoor Ali Shah	
9	Jamia Masjid	
	Jamia Masjid Siraj ul Mutreera -	
10	Graveyard	
	Graveyard Sherakot	
C	**Residential Areas**	
1.	Shadiwal, Jhuglan Nagra, Talat Park, Ameen Park & Sattazar Town	Sensitivity due to noise and vibrations. Exposure to dust and access problems during construction phase.
D	**Commercial Areas**	
1.	Shops in project area	Sensitivity due to noise and vibrations. Exposure to dust and access problems during construction phase.

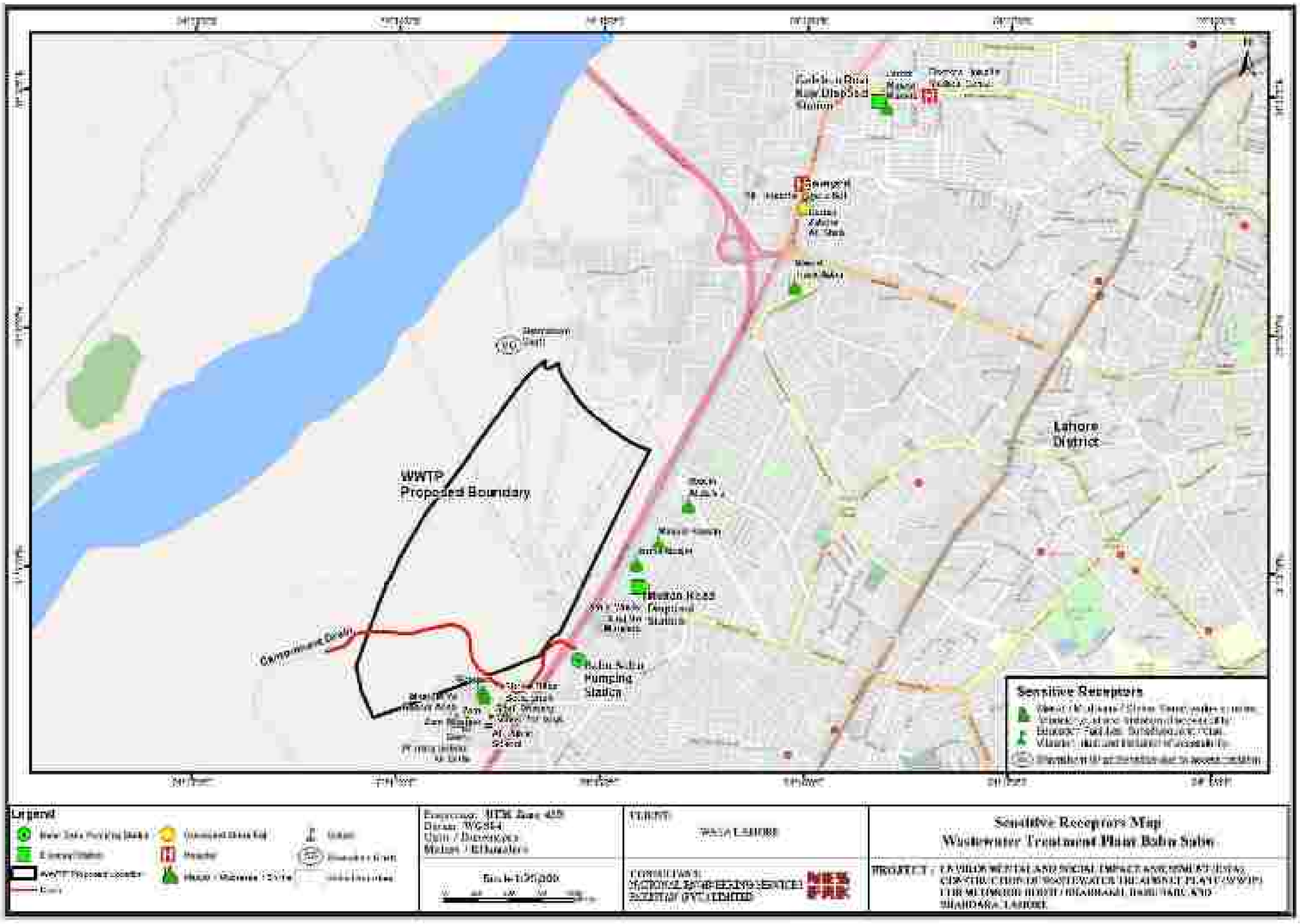


Figure 4-10: Sensitive Receptors of Project Area

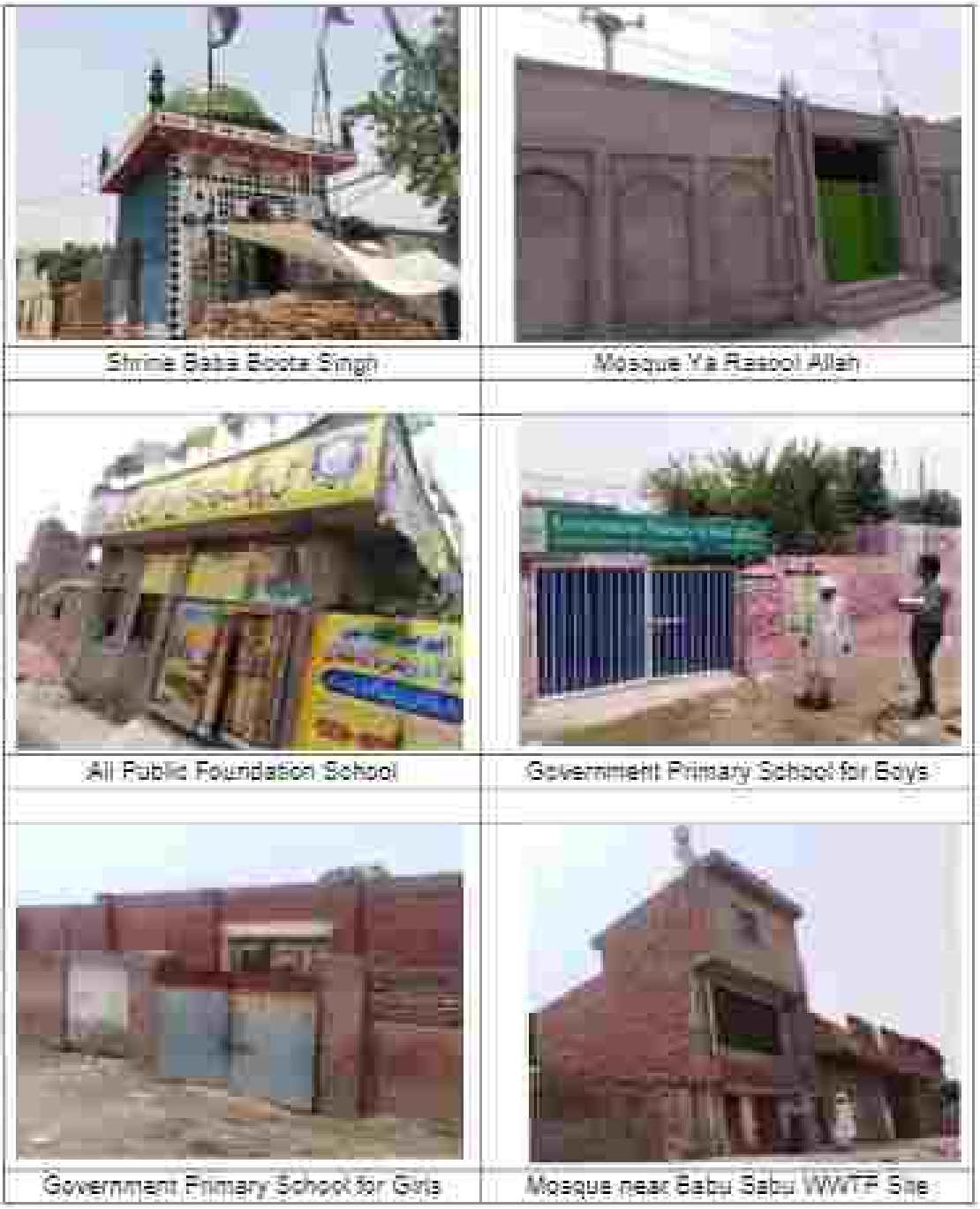


Figure 4-11: Major Sensitive Receptors in the Project Area

4.2 ECOLOGICAL CLIMATE

Babu Sabu lies between 31°32.4'N and 74°15'E. The climate of the region is semi-arid and sub-tropical. Summer is at the peak and winter is extreme here in the area. Heavy rainfall occur in late June in monsoon season. The hottest month is June and winter season starts from November onwards.

Methodology

In order to study the Project Area, all available literature and data regarding the tract, its habitat, flora and fauna was thoroughly reviewed to have a better understanding of the Project Area. Based on desk studies, baseline ecological conditions of the area and information gathered through stake holder consultations, primary field and secondary data. The proposed site was thoroughly examined.

After going through all available material a check list was developed, on the basis of which the base line data was collected.

4.2.1 Biodiversity of the Area

This particular area has been accessible to humans for a long time resulting in low diversity and wildlife abundance, some of the broad leaved trees exist in the area and these species still survive the on-slaught of urbanization. Same may be found in remote barren areas or in graveyards only. There is probably little natural vegetation left in tract. Natural vegetation of the Lahore region is falling under tropical thorn forest type, but no such designated forest is reported in the project area and has long ago been replaced completely by agricultural crops. Floristic study of any given area helps to evaluate the plant wealth and its potential values (Iqbal, z et al 2016). Vegetation of the area shows that the area is suitable for plantation of native species along the agriculture fields. Variation in diversity is among the tools that are caused due to climate, heterogeneity, biotic interaction and habitat. In the past the area was covered with huge amount of ground vegetation and dominated trees but now the conditions are at the adverse side because the original or natural habitat has been modified and converted into barren land for construction and for agricultural (fodder) purposes. This particular area has been accessible to humans for a long time resulting in low diversity and wildlife abundance.

The project area is populated by different trees like, Dharek (*Melia azedarach*) along with some other species including Mulberry (*Morus alba*), Shisham (*Dalbergia sissoo*), Ber (*Ziziphus mauritiana*), Bariyan/ Bohr (*Ficus benghalensis*), Sukh chain (*Pongamia Pinnata*), Jamun (*Syzygium cumini*), Mesquite (*Prosopis juliflora*), Poplar (*Populus eumericana*), Parkinsonia (*Parkinsonia aculeata*), paper mulberry (*Broussonetia papyrifera*) aak (*Calotropis procera*) and some weeds.

The original Species of area are no more found due to human activities. A fairly not diverse range of bird species is found living in some of suitable areas of the proposed site, including common species such as the dove, common myna, tree pie, crow, and sparrow. Rarely seen birds of prey include the common pariah kite is rare. As a level of threats/disturbance along the project area are high so the level of biodiversity is also shaky.

However, in assessing the value of a habitat, rarity, ecological functioning, regional diversity, and other important attributes must be in consideration.

4.2.2 Flora

The Study Area is situated in semi-arid region of Pakistan. The region is characterized by dry climate both in summer and winter season. The water precipitation is in the form of occasional seasonal rains, during rainy season (July– September).

Natural Flora of the Project Area as given in Table 4.17 enriched with Shrubs, Trees, Medicinal Plants, Forbs, Herbs, Weeds, and Grasses. Some pictures of the local trees and other vegetation are provided in Figure 4.11 :

Table 4.17: List of Flora Found in Project Area

Sr. No	Common/English Name	Botanical Name
1	Dhrek	*Melia azedarac*
2	Mesquite	*Prosopis juliflora*
3	Ber	*Zizyphus mauritiana*
4	Khatbal	*Cynodon dactylon*
5	Aak	*Calotropis procera*
6	Mulberry	*Morus alba*
7	Shisham	*Dalbergia sissoo*
8	Banyan, Bohr	*Ficus benghalensis*
9	Sukh chain	*Pongamia Pinnata*
10	Jamun	*Syzygium cumini*
11	Pipal	*Ficus rumelliana*
12	Farash pipli	*Farsetia aegyptia*
13	Paper mulberry	*Broussonetia papyrifera*
14	Aak	*Calotropis procera*

4.2.3 Fauna

Fauna of the tract consists of mammals, rodents, reptiles, amphibians and birds. The details are given as under in Table 4.18:

Table 4.18: List of Fauna Found in Study Area

Sr. No	Common Name	Scientific Name
1	Jackal	*Canis aureus*
2	Porcupine	*Hystrix indica*
3	Squirrel	*Funambulus pennanti*
4	Mouse	*Funambulus pennanti*
5	Mongoose	*Herpestes auropunctatus*



Prosopis juniflora



Calotropis procera



Broussonetia papyrifera



Ficus bengbalensis



Ziziphus mauritiana



Trees and electric towers along Agriculture fields

Figure 4-12: A view of Flora in the Project Area

Reptiles

Reptiles reported in the Study Area are enlisted in below table.

Table 4.19: Names of Reptiles in the Study Area

Sr. No.	Common Name	Scientific Name
1.	Indian Krait	Bungarus caeruleus
2.	Spiny tailed Lizard	Uromastyx hardwickii
3.	Fringed toed Lizard	Acanthodactylus cantoris

Amphibians

Amphibians found in the Study Area are given in Table .20

Table 4.20: Names of Amphibians in the Study Area

Sr. No	Common Name	Scientific Name
1.	Common Frog	Rana tigrina
2.	Common Toad	Bufo bufo

Avifauna

Avifauna of the area is not plentiful and birds were not seen frequently in the immediate project site. Birds of the tract consist of small and medium sized in insignificant number due to non-availability of suitable habitat includes Food & shelter. Avifauna in the study area is given below in Table 4.21.

Table 4.21: Names of Avifauna in the Study Area

Sr. No	Common Name	Zoological Name
1.	Koel	*Eudynamys scolopaceus*
2.	Ring Dove	Columba livia
3.	Myna	*Acridotheres tristis*
4.	Tree Pie	Dendrocitta vagabunda
5.	Crow	Corvus corax

Endangered Species

No terrestrial endangered species of flora and fauna listed under IUCN and local Pakistan list of endangered/ threatened/ near threatened categories are found in the project area.

Protected Area

In the project area, no protected areas and forest are reported. The 'Shadhanwali Forest Reserve-3' is closest sensitive area which is around 04 KMs away from the project area.

4.2.4 Agriculture

Large portion of the selected site is barren but the project site supporting only fodder crops are grown in the proposed site. The surrounding areas are also supporting some vegetables but not reported in the project area due to non-suitability of soil conditions. Most agricultural activities in the project area are confined where irrigation is possible. Large areas on are Barani/Rain fed where in good rainy periods dry farming is practiced. In the surrounding areas (away from the project area) main agricultural crops of the district are Wheat, Maize, Shaftal. Still old traditional agricultural practices like Sickle Harvesting, Soil preparation with Pickaxe and separation of grains by Bullocks are in vogue.

4.2.5 Livestock

Livestock grazing is common in the Study Area and is an important source of income for the rural population. Cows, buffalos, Goats and sheep are seen freely grazing in open areas or in fallow agricultural fields. Almost all the households who have their link with agriculture are keeping cattle. The trend of livestock keeping is decreasing due to reduction in grazing areas.

4.2.6 Aquatic Ecology

Pakistan is enriched with freshwater fish fauna comprising about 193 fish species. These natural fish populations are under consistent stress of over exploitation, degradation and destruction of natural breeding habitats due to construction of dams, introduction of exotic species, consecutive droughts, frequent hybridization, indiscriminate use of pesticides and release of untreated sewage and industrial effluents in natural river systems.

River Ravi is 885 km long with a catchment area of 40,287 km2. It originates in Himalayas, traverses its upper 80 km in India and lower 735 km in Pakistan. The major structures on the river are Thein Dam and Madhopur Headworks in India and Balloki and Sidhnai Barrageon Pakistan. Construction of Thein dam and flow diversion at Madhopur in India has drastically reduced the river flows. During last few decades, rapidly increasing human population and consequent upon various kinds of anthropogenic activities, industrial effluents discharge, civic sewerage etc. the water quality of the River Ravi has badly affected. Water flow through the river has already been declined many folds after Indus water Basin treaty with India. A study conducted during 2014-15 revealed the following fish in River Ravi at various locations.

Table 4.22: The Fish species found in different sampling sites of River Ravi

Sr. No.	Fish species	Sr. No.	Fish species
1.	Abbotteena marar	16	Heteropneustes fossilis
2.	Barilius bendelisis	19	Labeo dyocheilus pakistanicus
3.	Barilius modestus	20	Labeo rohita
4.	Barilius vagra	21	Labeo calbasu
5.	Cirrhinus mrigala	22	Mastacembelus armatus
6.	Cirrhina reba	23	Notopterus notopterus
7.	Cyprinus carpio	24	Mastacembelus pancalus
8.	Clupisoma garua	25	Oreochromis aureus
9.	Cengsus eurelius	26	Oreochromis mossambiques
10.	Chanda nama	27	Oreochromis niloticus
11.	Colisa fasciata	28	Puntius punjabensis
12.	Colisa lalia	29	Puntius sophore
13.	Chela mavuis	30	Puntius sarana
14.	Chela orinatus	31	Parambassis baculis
15.	Chela gachua	32	Parambassis ranga
16.	Eutropiichthys vacha	33	Salmophasia punjabensis
17.	Gobiopsis atta	34	Securicula gora

Study conducted by K Parvez in 2014-15 Journal of Entomology and Zoology Studies-2015, Issue-1

Various studies conducted to study aquatic life in River Ravi reveals that most of the commonly occurring fish species of River Ravi in the past are missing. Plankton which is primary food in the food chain, its population is drastically reducing due to heavy metals in the drainage effluents. Some species of plankton which are tolerant to heavy metals are causing accumulation of toxic metals in fish and other aquatic animals. This contaminated fish may be injurious to the human and other fish consumers.

Being already polluted and having minimum flow in River Ravi, river ecology does not have any significant value.

4.3 SOCIO-ECONOMIC BASELINE

This section deals with the social conditions of the Project Area. During the desk/ office study, available reports/ documents were comprehensively studied. During the field survey interviews with the local residence, shopkeepers, students, businessman, Advocates, property dealer and laborer were held and observations were also recorded after giving due consideration during survey. Individual interviews and meetings with the females of project area were also held to explore their needs, problems and priorities related to the project execution. The Social Survey Tool (Socio-economic, gender situation survey and public consultation proforma) is attached as Annex-III.

4.3.1 Administrative and Political Settings

The project area falls in the administrative jurisdiction of District Lahore. In district Lahore, Commissioner is the highest ranked administrator of the district. For the collection of revenue and administration, the districts subdivided into Tehsils. Local governments also administer the area through Union Councils and Tehsils. The total area of the district Lahore is 1,772 square kilometers. Ten administrative divisions (towns) of District Lahore are 1. Aziz Bhatti town, 2. Data Gunj Bakhsh town, 3. Gulberg town, 4. Iqbal town, 5. Lahore Cantonment, 6. Nishter town, 7. Samanabad town, 8. Shalimar town, 9. Ravi town and 10. Wagah town.

4.3.2 Demographic Characteristics of the Project Area

4.3.2.1 Population

Total population of the Lahore is 13 million as per Digital Census 2023. According to Census of 2017, total population of the district was 11.13 million[14], with an annual growth rate of 4.07 percent since 1998. Gender-wise, 52.35% of the population is male, while 47.64% is female, and transgender people make only 0.01% of the population[15]. Table 4.23 gives population, its intercensal increase and average annual growth rate since 1951 of Lahore district.

[14] Pakistan Bureau of Statistics
[15] District Wise Population by Sex and Rural/Urban: Census 2017-Pakistan Bureau of Statistics

Table 4.23: Population and Intercensal Increase and Growth Rates

Description	1951	1961	1972	1981	1998	2017
Population (in 000's)	1,135	1,635	2,698	3,645	6,319	11,126,285
Intercensal Increase (percent)	43.3	59.2	37.0	73.3	-	-
Average Annual Growth Rate (percent)	3.7	4.1	3.8	3.5	3.3	4.01

Source: DCR of Lahore District, 1998 and Census Result, 2017 of Lahore District

4.3.2.2 Mother Tongue

The mother tongue refers to the language used for communication between parents and their children in any household. Punjabi is the predominant language being spoken by majority (68.2 percent) of the population of the district, followed by Urdu, Pushto and Siraiki being spoken by 10.2, 1.8, and 0.4 percent respectively. Sindhi is spoken by 0.1 percent. However, Urdu and English are used as official languages and as mediums of instruction and media administration.

4.3.3 Economic Conditions

Economically Active Population of the Lahore District

The economically active population is defined here as the persons working most of the time during the year preceding the census date i.e. 5th March 1998, looking for work, lay off and un-paid family helpers assisting their family. The economically active population as enumerated in the last census was 21.8 percent of the total population or 29.6 percent of the 10 years and over i.e. the population exposed to the risk of entering the economically active life at any time. The formal percentage is known as Crude Activity Rate (CAR), while the latter is known as Refined Activity Rate (RAR). Of the total male population 39.9 were economically active, while 60.1 percent were inactive. 25.4 percent children under 10 years, 18.0 percent students, 1.9 percent domestic workers, while 14.8 percent were landlords, property owners, retired persons, disabled etc.

Unemployment

Unemployment rate is measured as ratio of looking for work and laid off in total economically active population comprising employed, looking for work, laid off and unpaid family workers, generally representing in percentage. The unemployment rate was 20.7 percent, which was mainly due to unemployment amongst males representing 21.4 percent, while female unemployment rate was just 2.2 percent. This is because of their small proportion in total economically active population.

Employed Population by Occupations

In 1998 of the total employed persons, 44.7 percent had elementary occupations, followed by service workers, and shop and market sale workers, 17.5 percent and professional 9.2 percent. In rural areas people having elementary occupations, were again in majority followed

by skilled agricultural and fishery works and service workers and shop and market sale workers represented 52.5, 23.7, and 8.4 percent respectively. The highest percentage in urban area is of elementary occupations too, followed by service workers and shop and market sales workers and crafts and related trade workers and having 43.2, 19.3 and 9.1 percent respectively.

4.3.4 Industry, Trade and Trade Centers

After Karachi, Lahore is the biggest industrial area in Pakistan. There has been a steady expansion of industries in and around Lahore since independence. There are many large industrial units in the district. These units manufacture cotton, woollen and silk cloths, carpets and rugs, textile products, leather and rubber foot wears, wearing apparel, pharmaceutical goods, soap, iron and steel products, heating, plumbing and lighting equipment, hardware, miscellaneous fabricated products, agriculture machinery, engines and turbines, textile machinery, printing machinery, metal working machinery, pumps and compressors, household machinery, water generators, motor generators, transformers, electric fans, communication equipments, cycles and rickshaws. There are also a good number of printing and publishing units and body building workshops. Besides, there are units of canning and preservation of food, edible oils, beverages, metal and wood furniture, rubber products, chemicals, glass products, repair of railway equipment, toys and stationary etc.

4.3.5 Educational Facilities

Lahore is an old first class seat of learning in Pakistan. The world famous and the oldest university of Pakistan i.e. University of the Punjab is located in this city. The pioneering University of Engineering and Technology is also in Lahore. There has been a significant development in the educational sector of this district. University of the Punjab has been extended and its new campuses are constructed along the Lahore branch of Upper Bari Doab canal. This provides an ideal environment for teachers and taught in the green lush area surrounded by New Muslim Town, Wahdat Colony, PCSIR Colony, Faisal Town and Garden Town. There are also a number of Government and private schools, colleges and technical institutions. Lahore is therefore rightly been called by Pitras Bukhari an eminent scholar, the city of colleges and schools. Most of the colleges have boarding houses for their students who hail from interior Punjab and other parts of the country. Moreover the study of Business Management, Commerce and Computer Technology is becoming very popular for the decade.

4.3.6 Health Facilities

Ample medical and health facilities are available in the Lahore Metropolitan Corporation area and its suburbs. Shaukat Khanam Hospital is the latest addition in the medical care facilities in Lahore for the most dangerous disease in the country i.e. Cancer. There are also other hospitals of voluntary organizations which provide health cover to the general public. King Zaid Bin Sultan Hospital is also a very advanced addition in the medical care for Lahore. Among the prominent hospitals are General Hospital, Lady Willingdon Hospital, Mayo Hospital, Fatima Jinnah Hospital, The Children Hospital, Services Hospital, and Ganga Ram Hospital

etc. Besides, a number of private medical practitioners, Hakims and homeopathic doctors are also practicing in the city.

4.3.7 Archaeological / Historical Places of Interest

The most common places of interest in Lahore city are Royal Fort Lahore, Minar-e-Pakistan, Badshahi Mosque, Lahore Museum, Shrine of Data Ganj Baksh, Shrine of Madhu Lal Hussain. While the recreational/entertainment places of Lahore are Shalimar Garden, Jallo Park, Lahore Zoo etc.

4.4 SOCIOECONOMIC BASELINE SURVEY

The information regarding socioeconomic baseline survey is based on the primary data collected from the settlements existing in surroundings of the proposed project area and its catchment area. The purpose of baseline survey is either to identify the situation analysis of socioeconomic conditions or to collect information about settlements. Figure 4.13 shows the baseline map of the settlements located in surroundings of the proposed project.

Settlements along the Project Site

The proposed project covers the Shadiwal, Akram Park, Mughal Park, Shera Kot, Niazbaig, Khalid Town, Abubakar Road, Maragzar, Tallat Park and Babu Sabu. Brief of each settlement is given below.

A. Shadiwal

Shadiwal village is located at the start of project area. The average household size in this village is measured as 6.5 person. This village has not a good network of roads except some streets with brick soling. Infrastructure facilities like electricity, gas and mobile phones are available in this village but other facilities like piped water supply, sewerage, drainage, hospitals and other health care facilities are not available. There are no government educational institutions present in the village. No graveyard is present there which is the desire need of the locals of Shadiwal. While no historical/archeological place has been found in the village. Majority of respondents involve in agricultural activities as the crop farming is used as their occupation. Some of the respondents are dependent on wage employment (labor) for their source of income.

B. Amar Park

Amir Park is located near the project area. Infrastructure facilities like electricity, roads are available in this area but other facilities like drinking water supply, sewerage, drainage, natural gas, hospitals and health care facilities are not available. No historical/archeological places have been found in Amar Park. Some of the roads are asphalted. It lacks in educational facility for both boys and girls. People depend on nearest town/urban center for their basic supplies.

such as health care & post office facilities and commercial banks etc. Majority of the respondents are dependent on wage employment (labor) for their source of income.

C. Mughal Park

Mughal Park is located in the surroundings of project area. Infrastructure facilities like electricity, roads are available in this area but other facilities like drinking water supply, sewerage, drainage, natural gas, hospitals and health care facilities are not available.

D. Tallat Park

Tallat Park is located around the project area. Infrastructure facilities like electricity and roads are available in this area but other facilities like drinking water supply, sewerage, drainage, natural gas, hospitals and health care facilities are not available. There are mosque and graveyard present in the area. No historical/archeological places have been found in Tallat Park. Majority of the respondents are dependent on wage employment (labor) for their source of income.

E. Niazbaig

Niazbaig is located around the project area. The average household size in this area is measured as 6.3 person. Majority of respondents involve in agricultural and other business activities which are their occupations. Some of the respondents have dependency on wage employment for their source of income. Some of the roads are asphalted. Infrastructure facilities like electricity and drinking water supply facilities are available in this area but no sewerage system is present here. There are some private educational institutions present there but no govt institute is present for the locals of the area. There is a mosque and graveyard has been found in Niazbaig. While no historical/archeological place has been found in this town.

F. Babu Sabu

Babu Sabu is that point in the project area where wastewater treatment plant is planned to implement. The average household size in this area is measured as 6.6 person. Majority of respondents involve in agricultural and other business activities which are their occupations. Some of the respondents have dependency on wage employment for their source of income. Some of the roads are asphalted. Infrastructure facilities like electricity and drinking water supply facilities are available in this area but no sewerage system is present here. There are some private educational institutions present there but no govt institute is present for the locals of the area. There is a mosque and graveyard has been found at Babu Sabu. While no historical/ archeological place has been found in this town.

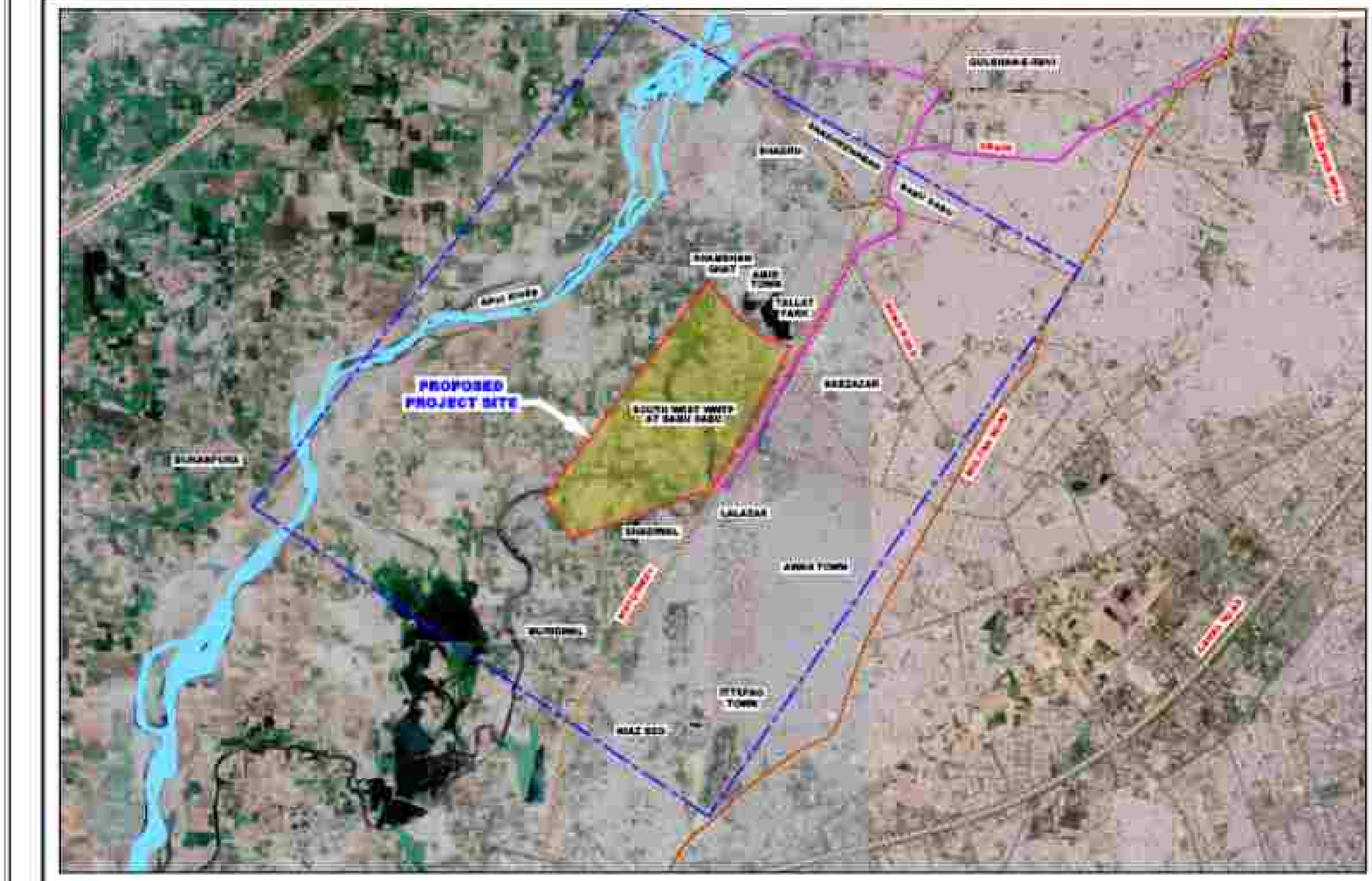


Figure 4-13: Baseline Map of Settlements around the South West WWTP Site

4.5 FIELD SURVEY

4.5.1 Socio-economic Survey

Social Survey of the proposed project were carried out in 2019 and 2021.

In June 2019, field surveys were carried out for the collection of demographic and socio-economic baseline information. This preliminary baseline survey was carried out at at Shadiwal, Akram Park, Mughal Park, Shera Kot, Niaz baig, Khalid Town, Abubakar Road, Maragzar, Tallat Park, Babu Sabu, Sabzazar etc. A sample of one hundred and eighty (180) respondents was selected on the basis of simple random sampling technique. Efforts were made to integrate with maximum population from all walks of life according to their stakes so the respondents are mostly private land owners, shop keepers (renters), customers, local residents, pedestrians, road users etc.

Later on, in 2021, the socio-economic survey was conducted again. A sample of 50 was selected on the basis of random sampling. During the survey major focus was to collect information about their settlement patterns and availability of facilities (educational, medical, religious, recreational and historical/archeological) of all the settlements existing in the surroundings of proposed project.

A sample of 230 respondents (180 respondents in 2019 and 50 respondents in 2021) was selected on the basis of simple random sampling technique, which includes private land owners, shop keepers (renters), customers, local residents, drivers, females etc. During the survey, both males and females were included in the sample. Efforts were made to include different types of stakeholders according to their stakes in the sample and contact the maximum population during the survey.

This field survey included the collection of demographic and socio-economic baseline information i.e. educational levels, economic resources and dependencies, quality of life, infrastructure (water supply resources and its use & satisfaction, sewerage), transportation, availability of facilities, housing settlement patterns, general health status, perceived impacts of the project, their protective measures, basic needs, the means to safeguard their interests during project implementation.

In addition to this baseline survey, a separate survey for preparation of resettlement action (RAP) was conducted which was focused on identifying the socio-economic baseline of the people effected by the installation of WWTP at Babu Sabu treatment plant site. Details of this baseline survey is given in RAP.

4.5.2 Socio-economic Survey Findings

Detailed findings of the survey (including surveys carried out in 2019 and 2021) comprising of different parameters are discussed in the following sections.

4.5.2.1 Demographic Characteristics of the Respondents

Demography is defined as statistical analysis of data about the characteristics of a population, such as the age, sex / gender, religion, ethnic structures, mother tongue, marital status of the people within the population. According to survey, demographic characteristics of sampled population are described hereunder:

a. Sex Ratio of the Respondents

During the baseline survey, 230 respondents were interviewed, comprising 83% males and 17% females. Table 4.24 shows sex ratio of the respondents.

Table 4.24: Sex Ratio of the Respondents

Sex Ratio of the Respondents			
Sr. No.	Sex Ratio	Number	Percentage
1	Male	190	83
2	Female	40	17
Total		230	100

b. Age Composition of the Respondents

The demographic characteristics of the sample survey (Table 4.25) shows that 20% of the respondents were up to 25 years of age, 33% of the respondents were aged between 25 – 35 years while 17% were 35 – 45 years old and 30% respondents were more than 45 years of age. These figures show that sampled respondents were mature enough to give their opinion about the proposed project and have envisioned of its impacts.

Table 4.25: Age Composition of the Respondents

Age Composition of the Respondents			
Sr. No.	Age Limit	Number	Percentage
1	15-25	45	20
2	25-35	77	33
3	35-45	39	17
4	Above 45	69	30
Total		230	100

c. Marital Status

In sampled respondents, the percentage share of the married respondents was higher than that of the unmarried. Majority of the respondents i.e. 88% were found married, 12% were observed unmarried during socioeconomic baseline survey as shown in Table 4.26.

Table 4.26: Marital Status of the Respondents

Marital Status			
Sr. No.	Marital Status	Number	Percentage
1	Married	263	82
2	Unmarried	27	12
Total		235	100

d. Mother Tongue

Punjabi language was the predominate language being spoken by majority of the respondents i.e. 76%. Besides Punjabi, 09% speak Urdu and 10% use both Punjabi and Urdu language for communication. While 04% respondents speak Pushto/Urdu language. Table 4.27 shows the language being spoken by the respondents.

Table 4.27: Mother Tongue of the Respondents

Mother Tongue			
Sr. No.	Mother Tongue	Number	Percentage
1	Punjabi	173	76
2	Punjabi, Urdu	24	10
3	Urdu	21	9
4	Urdu, Pushto	10	4
Total		230	100

e. Caste / Ethnic Group

According to baseline survey, it was found that the largest number of the respondents i.e. 20% were Jutt by caste, 16% were Rajpoot/Rana, 13% were Bhatti, 8% Khan, 5% Sheikh 4% Khokhar, 3% were Khokher and Arain each and 23% belong to other castes. The castes of the sampled respondents are given in Table 4.28.

Table 4.28: Caste / Ethnic Group of the Respondents

Caste/Ethnic group of the Respondents			
Sr. No.	Caste	Number	Percentage
1	Arian	31	13
2	Bhatti	28	13
3	Jutt	47	20
4	Khokhar	10	4
5	Khan	13	6
6	Sheikh	11	5
7	Rajpoot/Rana	37	16
8	Any Other	52	22
Total		230	100

4.5.2.2 Quality of Life

a. Educational Status of the Respondents

From survey results (Table 4.29) it was found that out of 230 respondent's majority of the respondents i.e. 59% were illiterate and only 41% were literate. Primary school respondents were 14%, 06% went to middle schools, 10% were up to matric level and 04% were of intermediate & 7% of above inter level education.

Table 4.29: Educational Status of the Respondents

Educational status of Respondents			
Sr. No.	Education level	Number	Percentage
1	Illiterate	136	59
2	Primary	33	14
3	Middle	14	6
4	Matric	22	10
5	Intermediate	10	4
6	Above inter	15	7
Total		230	100

b. Professional Status of the Respondents

According to socioeconomic survey findings, it was witnessed that out of 230 respondents, majority i.e. 33% are engaged in agricultural and farming profession, 13% are working as daily wage labor, 02% are shopkeepers, 11% are property dealer, 07% are unemployed and 06% are drivers. While 22% are involve in their own private businesses and 11% respondents belong to some other professions.

During survey, efforts were made to integrate with people from all walks of life. The detailed statistics based on sample survey, regarding professional status of the respondents are shown in Table 4.30.

Table 4.30: Professional Status of the Respondents

Professional status of Respondents			
Sr. No.	profession Type	Number	Percentage
1	Agriculture/ Farming	68	33
2	Driver	12	6
3	Unemployed	15	7
4	Labor	38	18
5	Shopkeeper	22	2
6	Private Business	22	22
7	Any Other	90	11
Total		230	100

c. Employment Status

Socioeconomic survey findings depicted that out of 230 respondents, majority i.e. 68% respondent's family members are self-employed who are running their own businesses and shops; 17% belong to general labor, 11% were private employees, 03% were unemployed. While 9% were females who are busy in their household activities. Employment status of the respondents is shown in Table 4.31.

Table 4.31: Employment Status of Respondents

Employment status			
Sr. No.	Employment status	Number	Percentage
1	Self Employed	157	68
2	Private Employee	26	11
3	Household	21	9
4	Unemployed	8	3
5	General Labor	38	17
Total		230	100

4.3.2.3 Economic Dependency

a. Source of Income

Socioeconomic survey findings depicted that out of 230 respondents, majority i.e. 30% respondents source of income belong to agriculture and farming, 27% are working as daily wage laborers, 02% livelihood depends on livestock (cattle), 07% trade/business and 07% were driver. While 02% are performing different services for their livelihood and 03% sell milk and ghee for the income generation purpose and 21% belongs to some other sources of income which they did not mention. Source of income of the respondents are shown in Table 4.32.

Table 4.32: Source of Income of Respondents

Major Source of Income			
Sr. No.	Source	Number	Percentage
1	Agriculture/ Farming	69	30
2	Cattle (meat)	4	2
3	Trade/Business	15	7
4	Driver	17	7
5	Labor	63	27
6	Milk/Ghee selling	6	3
7	Service	6	3
8	Any Other	49	21
Total		230	100

b. Average Monthly Income

The income status of the respondents was evaluated by dividing the respondents into different income categories. During field survey it was observed that out of 230 respondents, 01% respondents are earning less than 10,000, 24% respondents fall within the income range of 10,000 to 15,000, 25% respondents fall within the income range of 15,000 to 20,000, 01% respondents fall within the income range of 20,000 to 25,000 and majority 49% earn above 25,000. Table 4.33 shows income status of the respondents.

Table 4.33: Average Monthly Income of the Respondents

Average Monthly Income			
Sr. No	Distribution	Number	Percentage
1	Less than 10,000	2	1
2	10,000 to 15,000	55	24
3	15,000 to 20,000	57	25
4	20,000 to 25,000	3	1
5	Above 25,000	113	49
Total		229	100

c. Average Monthly Expenditures

Table 4.34 shows average monthly expenditure of the respondents. Out of 230 respondents, only 01% respondents reported their expenditure less than 10,000, 14% respondents fall within the expenditure range of 10,000 to 15,000 while majority i.e 34% respondents fall within the expenditure range of 15,000 to 20,000, 19% respondents reported their expenditure within the range of 20,000 to 25,000 and only 32% spend above 25,000.

Table 4.34: Average Monthly Expenditures of the Respondents

Average Monthly Expenditures			
Sr. No	Distribution	Number	Percentage
1	Less than 10,000	3	1
2	10,000 to 15,000	32	14
3	15,000 to 20,000	78	34
4	20,000 to 25,000	43	19
5	Above 25,000	74	32
Total		230	100

4.3.2.4 Family Pattern and Family Size

a. Family System

Survey results shown that majority of the respondents i.e. 73% are living in the joint family system in which parents and children live with other combinations of family members. Remaining 27% are living in the nuclear family system which has been shown in the Table 4.35.

Table 4.35: Family System of the Respondents

Family System of Respondents			
Sr. No.	Type	Number	Percentage
1	Joint	169	73
2	Nuclear	61	27
Total		230	100

b. Family Size

Survey results shows that 70% families have 0-5 family members, 29% families have 6-10 family members remaining 01% of the respondents have 11-15 family members which has been shown in the Table 4.36

Table 4.36: Family Size of the Respondents

Family Size of Respondents			
Sr. No.	Family Members	Number	Percentage
1	0-5	161	70
2	6-10	66	29
3	11-15	3	1
Total		230	100

4.5.2.5 Housing & Settlement Pattern

c. Ownership Status of the House

Ownership status of the house depict that how much respondents belong to self owned, rented structures (houses). During field survey it was observed that out of 230 respondents, majority i.e. 82% of the respondents have self owned structures and remaining 17% of the respondents were found to live in the rented houses and 0% are in partnership. Following Table 4.37 shows the ownership of the houses of the respondents.

Table 4.37: Ownership Status of the House

Ownership Status of House			
Sr. No.	Response	Number	Percentage
1	Self-Owned	189	82
2	Rented	40	17
3	Partnership	1	0
Total		230	100

d. Nature of Construction of Houses

Out of 230 respondents, majority i.e. 71% live in the pacca houses made up of bricks and concrete, 27% live in the semi-pacca houses whereas 02% live in the kaccha houses. Table 4.38 shows the nature of the construction of the houses.

Table 4.38: Nature of Construction of Houses

Nature of construction of House			
Sr. No.	Type	Number	Percentage
1	Pacca	163	71
2	Semi-Pacca	62	27
3	Kaccha	5	2
Total		230	100

4.3.2.5 Basic Amenities

a. Availability of Basic Facilities

The availability of facilities and development of this community is noticed by visiting the proposed project area. Table 4.39 shows that majority of the respondents i.e. 37% have electricity only, 32% have electricity and water supply both, 17% have electricity & water supply and gas, 08% have electricity, gas & telephone, 04% have electricity & sewerage system and 02% have electricity, water supply, gas & telephone facilities.

Table 4.39: Availability of Facilities

Availability of Basic Facilities			
Sr. No	Facilities	Number	Percentage
1	Electricity	85	37
2	Electricity & Water supply	74	32
3	Electricity & Sewerage	10	4
4	Electricity & Water supply and Gas	38	17
5	Electricity, Gas & Telephone	18	8
6	Electricity, Water supply, Gas & Telephone	5	2
Total		230	100

b. Source of Energy for Cooking

The source of energy for cooking is mostly wood and cow dung cakes in the proposed project area. Table 4.40 shows that majority of the respondents i.e. 34% use LPG cylinders, 30% use gas, 20% use wood while only 17% use wood and cow dung cakes for the cooking purpose.

Table 4.40: Source of Energy for Cooking

Source of Energy for Cooking			
Sr. No.	Type	Number	Percentage
1	Gas	69	30
2	LPG Cylinder	78	34
3	Wood, Cow dung cakes	38	17
4	Wood	46	20
Total		230	100

4.5.2.7 Source of Water and its Satisfaction Level

c. Source of Water for Domestic Use

Sampled respondents are depending upon a number of sources of water for domestic use which has been shown in Table 4.41. Motor/Pump is the main source of water for domestic use in the proposed project area so majority of the respondents i.e. 40% were depending on this source of water. 14% respondents use public water supply while 07% respondents use hand pumps, 04% use boreholes and motor/pump & filtration plants, and 30% were using filtration plant as a source of water.

Table 4.41: Source of Water for Domestic Use

Source of Domestic Water Use in Project Area			
Sr. No.	Source of water	Number	Percentage
1	Public water supply	33	14
2	Hand Pumps	16	7
3	Motor/Pump	95	40
4	Any Other (Filtration Plants)	70	30
5	Borehole	9	4
6	Motor Pump & Filtration Plant	10	4
Total		230	100

d. Satisfaction Level with Water Quality

The quality of water is directly linked to the quality of health. Table 4.42 depicts the perception of people about water quality in the proposed project area. It was noticed during the baseline survey that the quality of water is not satisfactory. Majority of respondents i.e. 92% are not satisfied with it due to its poor quality while 08% respondents are satisfied with quality of water.

Table 4.42: Satisfaction Level with Water Quality

Satisfaction Level with Water Quality			
Sr. No.	Response	Number	Percentage
1	Yes	41	8
2	No	189	92
Total		230	100

e. Reasons of Dissatisfaction

The reasons of dissatisfaction are shown in the Table 4.43 depicts that majority of respondents i.e. 53% are not satisfied with it due to hard and brackish water and smell or bad taste while according to 15% respondents, water is rusted & polluted. 07% said that this water becomes

contaminated due to mixing of sewerage water and not suitable for donking while remaining 16% are satisfied with it.

Table 4.43: Reasons of Dissatisfaction with Water Quality

Reasons of Dissatisfaction			
Sr. No.	Response	Number	Percentage
1	Smell or bad taste	121	53
2	Rusted & Polluted water	34	15
3	Not fit for drinking due to mixing of sewerage water	17	7
4	Contaminated water	17	7
5	Satisfied with water quality	41	18
Total		230	100

f. Smell of bad taste of water

Table 4.44 depicts the perception of people about water quality in the proposed project area. It was noticed during the baseline survey that the quality of water is not satisfactory. Majority of respondents i.e. 74% are not satisfied with it due to its poor quality and according to them that due to smell or bad taste water is not drinkable. While 13% respondents have not issue with its bad smell or taste and other 13% did not give any response regarding its smell or taste.

Table 4.44: Smell of bad taste of water

Smell or Bad taste of Water			
Sr. No.	Response	Number	Percentage
1	Yes	170	74
2	No	31	13
3	No Response	29	13
Total		230	100

g. Source of Water for Agriculture Purpose

Sampled respondents are depending upon a number of sources of water for agriculture use which has been shown in Table 4.45. Tube well is the main source of water for agriculture use in the proposed project area i.e. 63% use tube well water, 02% respondents use other sources of water while 36% has no agricultural land so they do not need any water source for the agricultural purpose.

Table 4.45: Source of Water for Agriculture Purpose

Source of Water for Agricultural Purpose			
Sr. No.	Type	Number	Percentage
1	Tube well	145	63
2	Any Other	5	2
3	No usage of agricultural land	80	36

Source of Water for Agricultural Purpose			
Sr. No.	Type	Number	Percentage
Total		230	100

h. Use of sewerage water for Agriculture purpose

Table 4.46 shows the usage of water (sewerage) for agricultural purpose. 64% of the respondents said that they did not use sewer water for the agricultural purpose while 36% respondents agreed that sewerage water has been used for the irrigation purpose.

Table 4.46: Use of sewerage water for Agriculture purpose

Use of Sewerage water for agriculture purpose			
Sr. No.	Response	Number	Percentage
1	Yes	82	36
2	No	148	64
Total		230	100

4.5.2.8 Current Sewerage System Problems and its dissatisfaction level

a. Satisfaction level with current sewerage drain in this area

Table 4.47 depicts the satisfaction level with current sewerage drain in this area. It was noticed during the baseline survey that the quality of water is not satisfactory. Majority of respondents i.e. 90% are not satisfied with it due to various issues regarding sewer system of their areas while 10% respondents are satisfied with current sewer drains.

Table 4.47: Satisfaction level with current sewerage drain

Satisfaction with the current sewerage drain of this area:			
Sr. No.	Response	Number	Percentage
1	Yes	22	10
2	No	208	90
Total		230	100

b. Reasons of dissatisfaction with current sewerage drain of area

Sampled respondents are facing a number of problems associated with current sewerage drain of the area and has been shown in Table 4.48. It was noticed during the baseline survey that the sewerage system is not satisfactory. Majority of respondents i.e. 56% told that it is a poor drainage system. 17% said that water becomes stagnant in their areas due to poor sewerage system, 11% are unsatisfied because of blockage of roads due to open sewer drains, and 06% respondents said that there is no proper sewerage system present in their areas while 10% did not show any response regarding the current sewerage system.

Table 4.48: Reasons of dissatisfaction with current sewerage drain

Reasons of dissatisfaction with the current sewerage drain of this area			
Sr. No.	Response	Number	Percentage
1	Blockage of roads due to open sewer drains	26	11
2	Poor drainage system	128	56
3	No sewerage system in the area	14	6
4	Water stagnation due to poor sewerage system	40	17
5	No response	22	10
Total		230	100

c. Water Ponding in the area

Table 4.49 shows the water ponding in the area. Majority of the respondents i.e. 87% of the respondents said that there is water ponding in their residential and commercial areas due to poor sewerage and drainage system, while 13% respondents said that no water ponding occur due to sewer water in the area.

Table 4.49: Water Ponding in the area

Water pounding in the area due to open drain			
Sr. No.	Response	Number	Percentage
1	Yes	199	87
2	No	31	13
Total		230	100

d. Odor problem in the area

Table 4.50 shows the frequency and percentage of odor problem occurred due to presence of sewer water in the area. Majority of the respondents i.e. 90% of the respondents said that there is always odor problem in and around the area due to poor sewerage system while 10% respondents negate this situation of the area.

Table 4.50: Odor problem in the area

Odor problem due to sewerage water in the area			
Sr. No.	Response	Number	Percentage
1	Yes	208	90
2	No	22	10
Total		230	100

4.5.2.9 Types of crops grown in agriculture land

Table 4.51 shows the frequency and percentages of crops grow in the agricultural land. 24% of the respondents said that they mostly grow the fodder in the agricultural land, 22% of the respondents grow vegetables and fodder. 12% said that they grow wheat, maize, fodder & vegetables while just 4% of the respondents said that they grow vegetables in their agricultural land which they use to cook and sell in the markets for earning purpose. On the other hand, 37% of the respondents declared that they do not possess any agricultural land so no crops have been grown in their land.

Table 4.51: Types of crops grown in agriculture land

Crops mostly grow in agriculture land			
Sr. No.	Types of Crops	Number	Percentage
1	Fodder	55	24
2	Fodder & vegetables	51	22
3	Vegetables	10	4
4	Wheat, maize, fodder & vegetables	28	12
5	No Crops	86	37
Total		230	100

4.5.2.10 Common Diseases in the Project Area

Access restrictions to safe drinking water and insufficient fulfillment of nutritional requirements have a significant influence on the health status of the local population. This is further exacerbated by the shortage of medical facilities within the project area.

Table 4.52 shows that Hepatitis and Jaundice are the most common diseases which have been seen in the proposed project area, affecting at least one household member in 35% of households. Diarrhea & Abdominal Pain was reported by 21%, only Diarrhea was reported by 11% of households. High Blood Pressure and Jaundice was reported by 6% and Cholera and Diabetes was reported by 3%. Although Hepatitis, Cholera, Diarrhea, Skin infection & High blood pressure are reported by 16%.

Table 4.52: Common Diseases in the Project Area

Common Diseases suffered by Respondents			
Sr. No.	Type of Illness	Number	Percentage
1	Cholera	6	3
2	Diabetes	8	3
3	Diarrhea	26	11
4	Diarrhea & Abdominal Pain	48	21
5	Hepatitis & Jaundice	81	35
6	Hepatitis, Cholera, Diarrhea, Skin Infection & High blood pressure	36	16

Common Diseeeas suffered by Reepondents			
Sr. No.	Type of Illness	Number	Percentage
7	High blood pressure	12	5
8	Jaundice	12	5
Total		230	100

a. Reasons of Diseases

Table 4.53 shows the reasons of common diseases which have been seen in the proposed project area, affecting most of the households. According to 45% these diseases spread due to poor hygienic conditions and according to 26% these are water borne diseases and according to 9% these are hereditary and 17% says these are due to both water born & poor hygienic conditions. Remaining 3% give some other reasons.

Table 4.53: Reasons of Diseases

Reason of Diseases			
Sr. No.	Type of Illness	Number	Percentage
1	Water borne	60	26
2	Poor hygienic conditions	110	48
3	Hereditary	14	6
4	Any other	6	3
5	Water born & Poor hygienic conditions	40	17
Total		230	100

b. Mode of Transport

Table 4.54 shows that there are 59% respondents who use private transport i.e. Motorcycles to move from one place to another while 13 use rickshaws, 11% use cars, 6% use motorcycles and rickshaws both, 3% are those who use public transport, 2% have tractors. While 7% have not any transport to use.

Table 4.54: Mode of Transport

Principle Mode of Transport			
Sr. No.	Transport Type	Number	Percentage
1	Car	25	11
2	Local Transport	7	3
3	Motorcycle	135	59
4	Motorcycle Rickshaw	12	5
5	Rickshaw	29	13
6	Tractor	5	2
7	No transport	17	7

Principle Mode of Transport			
Sr. No.	Transport Type	Number	Percentage
Total		230	100

4.5.2.11 Awareness & Implementation of Proposed Project

a. Awareness about the Project

The analysis of the socio-economic baseline survey shows the awareness level about the proposed project in Table 4.55. Majority of respondents i.e. 57% had awareness about the proposed project while remaining 43% of the respondents had no awareness about the proposed project.

Table 4.35 : Awareness about the Proposed Project

Awareness about the proposed project			
Sr. No.	Response	Number	Percentage
1	Yes	130	57
2	No	100	43
Total		230	100

b. Implementation of the Proposed Project

Out of 180 respondents, majority of respondents i.e. 92% were in favor of the construction of proposed project by considering it beneficial for the public while 08% were against the proposed project due to some concerns/apprehensions. Table 4.56 shows the implementation of the proposed project.

Table 4.36 : Implementation of the Proposed Project

Implementation of the proposed project			
Sr. No.	Response	Number	Percentage
1	Yes	212	92
2	No	18	8
Total		230	100

c. Reasons of Acceptance of the Proposed Project

Out of 230 respondents (who are in favor of this project), majority of respondents i.e. 34% believed that project is good for the treatment of wastewater of the area, 14% believed that its good for environment, 10% believed that it will provide better standards of living for residents, again 10% believed that project will provide safe water to the locals of the area, 12% believed that infrastructural development of the project area will increase due to this project, 06% described that throughout this project income generating activities will increase for local residents, 03% said the no water pounding will takes place in this area, 02% believed that

there will be easy access to everywhere if no water pounding will takes place that if while 07% respondents were not in favor of this project. Table 4.57 shows the reasons of acceptance of the proposed project.

Table 4.57: Reasons of Acceptance of the Project

Reasons of acceptshce			
Sr. no.	Reason	Number	Percentage
1	Development of the area	25	12
2	Good for the treatment of waste water of area	76	34
3	Good to provide safe water to the area	35	16
4	Job Opportunities	14	6
5	Good for Environment	33	14
6	Better standard of living	24	10
7	Easy access to reach everywhere	3	2
8	No water pounding in the area	8	3
9	Not in favor of project	17	7
Total		235	100

4.5.2.12 Perceived Impacts of the Project during and after Construction

Table 4.58 & Table 4.59 provide us the various impacts perceived by the respondents during construction and during operational phase of the wastewater treatment plant at Babu Sabu.

a. Perceived Impacts of the Project During Construction Phase

When respondents were asked about impacts which they perceive during construction phase. 34% believed that dust and noise problems will occur which may create problems for the local residents. 30% of the respondents supposed that mobility problem will occur. 17% assumed that due to construction of wastewater treatment plant, the access roads will be blocked which may cause movement problems for the road users while 10% respondents have some privacy issues during construction phase of WWTP. 06% will face vehicle parking issues. 03% will face both transport and mobility issues. The perceived impacts have been shown in the following Table 4.58.

Table 4.58: Possible Impacts (During Construction)

Possible Impacts of the Project (During Construction)			
Sr. No.	Impacts	Number	Percentage
1	Dust & Noise Problems	79	34
2	Blockage of roads	38	17

3	Mobility problems	66	30
4	Privacy issues	23	10
5	Transport + Mobility issues	6	3
6	Vehicle parking issues	13	6
Total		220	100

b. Possible Impacts of the Project During Operation Phase

When respondents were asked about impacts which they perceive during operation phase, majority of respondents i.e. 38% believed that due to the implementation of this project, development of the project area will have enhanced with proper treatment of wastewater and provision of safe water for the locals of the area, 18% believed that income generating activities and provision of jobs for locals will increase due to this project. 18% supposed this WWTP beneficial for local residents as residents are expected to get more facilities in their areas by the construction of this treatment plant. 14% believed that it is overall good for environment while 06% respondents remained quiet and give no response in this regard and 03% said this project will raise their standard of living. The perceived impacts have been shown in the following Table 4.59.

Table 4.59: Possible Impacts (During Operation)

Possible impacts of the Project (During Operation)			
Sr. No	Impacts	Number	Percentage
1	Proper waste water treatment and provision of safe water	87	38
2.	Provision of Job Opportunities to locals of the area	41	18
3	Beneficial for Local Residents	41	18
4	Good for environment	33	14
5	Better standard of living	7	3
6	No response	21	9
Total		230	100

4.5.2.13 Suggested Measures and Needs

a. Protective Measures

From the data given in Table 4.60, 22% of the respondents said that land should not be acquired,18% & 15% suggested that dust and noise pollution should controlled and job opportunities should be given to local residents, 10% respondents highlighted that the construction activities should be completed well on time, 09% respondents said that health facilities should also be provided to the local residents, again 06% told that an alternate

routealtivetsich plan should be given to local residents, 07% respondents said that proper compensation should be given in case of the physical and economic displacement by the project, while 13% respondents remained quiet and give no response regarding the treatment plant.

Table 4.50: Protective Measures

Protective Measures			
Sr. No.	Protective Measures	Number	Percentage
1	Dust and noise should be controlled	35	15
2	No Acquisition of land	51	22
3	Work should be completed in time	22	10
4	Provision of Job Opportunities to locals of the area	34	15
5	Provision of health facility	20	9
6	Proper Compensation should be given for the loss of lands and structures	16	7
7	Alternate route/diversion plan should be given	21	9
8	No response	30	13
Total		230	100

b. Pressing Needs of the Project Area

Survey Results are shown in Table 5.52, which further depict that out of 230 respondents, 20% of them told that provision of schools, hospitals and graveyard is the dire need of people. 21% respondents showed that roads should be built in the project area in order to avoid the congestion and a smooth flow of traffic and provide water supply systems as well to resolve the water problems. 18% of respondents showed their interest regarding the provision of gas, water supply and sewerage systems while 16% said that sewerage system is also an important need of locals of area and 02% respondents wants swimming pool for domestic use while 04% did not give any response.

Table 4.51: Pressing Needs

Pressing Needs of the area			
Sr. No.	Pressing Needs	Number	Percentage
1	Hospital & Graveyard	45	20
2	Road & water supply	48	21
3	Schools and Hospitals	45	20
4	Water, Sewerage and Gas	42	18
5	Sewerage system	36	16
6	Swimming pool for domestic use	6	2
7	No response	9	4
Total		230	100

4.5 GENDER SITUATION SURVEY

Participation of women in development sector is equally important as in different other sectors. One of the overarching pillars of meaningful consultation is the inclusion of vulnerable groups including women in the consultation process. Women have been consulted and equitably involved in project design and implementation phase. To this end, individual interviews and meetings with the females were held to explore their needs, problems and priorities related to the project execution. For the selection of female respondents for gender situation survey, simple random sampling technique was adopted and 96 female respondents were randomly selected. Pictorial view of gender survey are given in Figure 4.14.





Figure 4-14: Pictoral View of Gender Consultation

4.6.1 Gender Situation Survey Analysis

Findings of the gender situation survey analysis have provided in the following sub-sections:

a. Age Composition of Female Respondents

The findings of the survey (Table 4.62) show that 32% of the respondents were up to 25 years of age, 28% of the respondents were between 26 – 35 years of age group ,36% were 36 – 45 years old and remaining 04% respondents were more than 45 years of age. As the highest percentage (36%) of 36-45 years old respondents depict that the female respondents are mature enough to give their opinion about the proposed project.

Table 4.62: Age Composition of Female Respondents

Age Composition of Female Respondents			
Sr.No.	Age Limit	Number	Percentage
1	16-25	32	32
2	26-35	27	28
3	36-45	35	36
4	Above 45	3	4
Total		95	100

b. Educational Status of the Female Respondents

The findings of survey indicate that the majority of the respondents i.e. 44% were studied up to primary level of education, 08% went to middle school, 26% were achieved their education up to matric level, 12% were of intermediate and only 8% above intermediate level of education.

Table 4.63: Education of Female Respondents

Education of Female Respondents			
Sr. No.	Education level	Number	Percentage
1	Up to Primary	43	44
2	Middle	8	8
3	Matric	27	28
4	Intermediate	11	12
5	Above Inter	7	8
Total		96	100

c. Marital Status

The percentage of the married respondents was higher than the unmarried. Majority of the respondents i.e. 72% were found married remaining 28% were unmarried shown in Table 4.64.

Table 4.64: Marital Status

Marital Status			
Sr.No.	Marital Status	Number	Percentage
1	Married	69	72
2	Unmarried	27	28
Total		96	100

d. Family Size (Total Number of Children)

Survey results show that 59% families have 0-5 children, 18% families have 6-10 children remaining 23% of female respondents do not have any child because of their single marital status. Total Number of Children of the respondets have been shown in the Table 4.65.

Table 4.65: Total Number of Children

Total Number of Children			
Sr. No.	Distribution	Number	Percentage
1	0-5	53	55
2	6-10	16	17
3	No Children	27	28
Total		96	100

e. Number of Dependent Children

The findings of the survey show that 64% families have 0-5 dependent children, 08% families have 6-10 dependent children and remaining 28% of the respondents do not have any child because of their single marital status. Total Number of Dependent Children have been shown in the Table 4.66

Table 4.66: Number of Dependent Children

Number of Dependent Children			
Sr. No.	Distribution	Number	Percentage
1	0-5	61	64
2	10-Jun	7	8
3	No Children	27	28
Total		95	100

f. Age Composition of Dependent Children

The age distribution of the dependent children of the respondents has been given in the Table below

Table 4.67: Age of Dependent Children

Age of Dependent Children			
Sr. No.	Distribution	Number	Percentage
1	1,2 years old	4	04
2	3,4 years old	8	08
3	5,6 years old	4	04
4	7,8,9 years old	4	04
5	Above 9 years old	11	11
6	3,4 & 5,6 and 7,8,9 years old	37	39
7	No Children	27	28
Total		95	100

g. Mode of Child Care

Table 4.68 shows that there are 96% respondents who take care of their children themselves, 18% respondents left their children in mother's home when they are on duties and 28% of respondents do not have any child because of their single marital status.

Table 4.68: Mode of Child Care

Mode of Child Care			
Sr. No.	Mode	Number	Percentage
1	Selfcare	32	33
2	Others (Mothers home)	16	17
3	No Children	27	28
Total		95	100

h. Hours spend for Childcare

Survey results show that all 72% respondents spend more than 20 hours for caring of their children. The 28% of respondents do not have any child because of their single marital status. The detail has been provided in the Table 4.69

Table 4.69: Hours in average week spend to care children

Hours in average week spend to care children			
Sr. No.	Hours	Number	Percentage
1	Over 20s	68	72
2	No Children	27	28
Total		95	100

i. Occupation of Female Respondents

It was witnessed that out of 95 respondents, majority i.e. 60% were house wives and 20% were factory and agricultural workers. Reaining 20% respondent's students. The detail of occupations of respondents has been given in the Table 4.70

Table 4.70: Occupation of Respondents

Occupation of Respondents			
Sr. No	Profession	Number	Percentage
1	House Wife	57	60
2	Working Women	19	20
3	Student	19	20
Total		95	100

j. Nature of Work

Findings of the survey depict that 18 respondents work related to agricultural activities to earn income. Only 04% were associated with field work surveying in factories and 80% do not work outside the homes. Nature of work of female respondents are shown in Table 4.71

Table 4.71: Nature of Work if Working Woman

Nature of Work if Working Woman			
Sr. No	Nature of Work	Number	Percentage
1	Field Work	4	04
2	Other Work	15	16
3	No Work	76	80
Total		95	100

k. Working Hours of Working Women

Survey results show that 08% of the respondents work 3 hours per day while 12% work 5-8 hours per day and 80% do not work outside their homes. Working hours has been shown in the Table 4.72.

Table 4.72: Working Hours per Day

Working Hours per Day			
Sr. No.	Working Hours per Day	Number	Percentage
1	3	8	08
2	5-8	11	12
3	No Work	76	80
Total		95	100

l. Salary Status of Working Women

The earning status of the respondents was evaluated by grouping the respondents in different income categories. During field survey it was observed that 04% of respondents were earning less than 10,000rs 12% of the respondents fall between the income range of 10,000 to 15,000, 04% respondents fall in income range of 15,001 to 20,000 while 80% do not work outside their homes. Table 4.73 shows income status of female respondents.

Table 4.73: Salary Receiving

Salary Receiving			
Sr. No	Distribution	Number	Percentage
1	Less than 10,000	4	04
2	10,000 to 15,000	11	12
3	15,001 to 20,000	4	04
4	Nil	76	80
Total		95	100

m. Satisfaction Level with Current Salary

Table 4.74 depicts the satisfaction level of women about the current salary which they or their spouse are receiving. It was noticed in gender situation survey that majority of

respondents i.e. 92% are satisfied with it while 08% respondents are not satisfied.

Table 4.74: Are you satisfied with your current salary?

Are you satisfied with your current salary?			
Sr. No	Response	Number	Percentage
1	Yes	87	92
2	No	8	08
Total		95	100

n. Power to spend the money

Table 4.75 shows that there are 80% female respondents are those who have full power to spend their money the way they like and 08% cannot use this power. While 12% are those who do not earn money and do their household chores only.

Table 4.75: power to spend your money

Do you have full power to spend your money			
Sr. No.	Response	Number	Percentage
1	Yes	76	80
2	No	8	08
3	No Earnings	11	12
Total		95	100

o. Support of Spouses for the career of their females

Majority of respondents i.e. 44% do not have support of their spouses in their career building and other 28% have this support. While remaining 28% of female respondents do not have a spouse. Table 4.76 shows support of spouse for the career of their females.

Table 4.76: spouse actively support you in your career

Does your spouse actively support you in your career?			
Sr. NO	Response	Number	Percentage
1	Yes	26	27
2	No	42	44
3	Having no spouse	27	28
Total		95	100

p. Work in the Agriculture Fields

The findings of the survey show that majority of respondents i.e. 80% do not work in agriculture fields while 04% of the respondents do work and remaining 16% did not give any response. Table 4.77 shows the work in the agriculture fields.

Table 4.77: work in the agriculture fields

Do you also work in the agriculture fields			
Sr. No.	Response	Number	Percentage
1	Yes	4	04
2	No	76	80
3	No response	15	16
Total		95	100

q. Saving

The findings indicate that the majority of respondents i.e. 82% cannot save money generated from their household income every month due to increased household expenditures level. While 32% of the respondents do save and remaining 16% did not give any response. Table 4.78 shows the work in the agriculture fields:

Table 4.78: save some money from your household income every month

Do you save some money from your household income every month			
Sr. No	Response	Number	Percentage
1	Yes	30	32
2	No	49	52
3	No Response	15	16
Total		95	100

r. Safety of women

The findings of the survey shows that majority of respondents i.e. 68% said that the project area is safe for women to travel alone while remaining 32% respondents unsafe for themselves to move alone. Table 4.79 shows the responses of respondents.

Table 4.79: Safety of Women in the Project Area

Safety of Women in the Project Area			
Sr. No.	Response	Number	Percentage
1	Yes	65	68
2	No	30	32
Total		95	100

s. Protective Measures for Safety of Women

The results of the study indicates that 32% of the respondents required proper protective measures for their safety during travelling in surrounding areas, while 68% respondents were satisfied with existing situation. Detail of protective measures has been provided in the Table 4.80

Table 4.80: Protective Measures for Safety Women

Protective Measures for Safety Women			
Sr. No.	Response	Number	Percentage
1	Proper Security	30	32
2	Satisfied with safe traveling	65	68
Total		95	100

t. Skills and Tracings

Table 4.81 shows that 24% of female respondents shown their interest to get vocational trainings to earn their livelihood, 20% wanted to learn stitching / embroidery, 12% female respondents were interested in parlor work, and 44% don't want to learn any skill.

Table 4.81: Skills and Trainings

Skills and Trainings			
Sr. No.	Response	Number	Percentage
1	Vocational Training	23	24
2	Stitching / Embroidery making	19	20
3	Parlor Work	11	12
4	Don't want to learn any skill	42	44
Total		95	100

u. Response about Getting Education

Majority of respondents i.e. 92% were in favor of female's education because they think that the educated women can have greater awareness of their rights, they can transfer compassionate and good moral values to their children. Educated women can also have better understanding of maintaining a healthy family while 08% don't agree with these statements and they are of the view that women should only do their households activities, take care of their family members and children. Table 4.82 shows the responses of women about getting education.

Table 4.82: Response About Getting Education

Response About Getting Education			
Sr. No	Response	Number	Percentage
1	Yes	87	92
2	No	8	08
Total		95	100

v. Health Facilities:

During gender situation survey, different women were consulted from different localities. The

results show that majority of respondents i.e. 80% have various health facilities in their localities like small clinics, dispensaries and some hospitals, while 20% do not have access to any health facility in their locality. Table 4.83 shows the responses of women about health facility.

Table 4.83: Health Facilities

Health Facilities			
Sr. No.	Response	Number	Percentage
1	Yes	76	80
2	No	19	20
Total		95	100

w. Source of Water for Domestic Use

Residents of the Projects area depending upon mainly two water sources for their domestic use which has been shown in Table 4.84. The majority i.e. 64% of the respondents gets water from the boreholes and 36% get water from public water supplies.

Table 4.84: Source of Water for Domestic Use

Source of Water for Domestic Use			
Sr. No.	Source	Number	Percentage
1	Public water supply	34	36
2	Hand pumps	61	64
Total		95	100

x. Pressing Needs of Women

Survey Results shown in Table 4.85, which depict that 32% of the respondents mentioned health facilities as pressing need of the area, 24% respondents demanded for vocational training institutes, 20% of respondents mentioned building schools. Moreover 06% of the respondents considered the importance of development of boutiques in the area and 12% females wants jobs to earn their livelihoods.

Table 4.85: Pressing Needs of Women

Pressing Needs of Women			
Sr. No.	Pressing Needs	Number	Percentage
1	Vocational Training Institutes	23	24
2	Health Facilities	30	32
3	Buildings of Schools	19	20
4	Boutiques	6	06
5	Jobs for Women	12	16
Total		95	100

y. Awareness about the Project

The analysis of the gender situation survey shows the awareness level about the proposed project in Table 4.86 Majority of female respondents i.e. 92% were not aware about the proposed project and remaining 08% of female respondents had information about the proposed project.

Table 4.86: Knowledge about the proposed project

Knowledge about the proposed project			
Sr. No.	Response	Number	Percentage
1	Yes	8	08
2	No	87	92
Total		95	100

z. Implementation of the Proposed Project

Majority of respondents i.e. 80% were in favor of implementation of the proposed project by considering it beneficial in many aspects and remaining 20% were not in favor of the project due to some concerns/apprehensions.

Table 4.87: Implementation of the project

Implementation of the project			
Sr. No.	Response	Number	Percentage
1	Yes	76	80
2	No	19	20
Total		95	100

aa. Reasons of Acceptance

Out of 95 respondents (who are in favor of this project) 16% believed that this project is beneficial for local residents, 20% believed that it is good for environment, 12% believed that project will provide safe water to the locals of the area 18% described that by implementation of the project no water pounding will take place in their areas while 16% respondents not respondents and 20% were not in favor of this project. Table # 88 shows the reasons of acceptance of the proposed project.

Table 4.88: Reasons of Acceptance

Reasons of Acceptance			
Sr. No.	Reason	Number	Percentage
1	Beneficial for Local Residents	15	16
2	Good for Environment	19	20
3	Good to provide safe water to the area	11	12

Reasons of Acceptance			
Sr. No.	Reason	Number	Percentage
4	No water pounding in this area	19	19
5	Not in favor of project	19	20
6	No reasons	13	13
Total		98	100

bb. Reasons of Rejection

Mobility issue was the main reasons mentioned by 20% of the respondents for the rejection of the proposed Project. Detail has been given in Table 4.89

Table 4.89: Reasons of Rejection

Reasons of Rejection			
Sr. No.	Response	Number	Percentage
1	Issue of Mobility	19	20
2	In favor of Project	76	80
Total		95	100

cc. Perceived Impacts of the Project During Construction Phase

When respondents were asked about impacts which they perceive during construction phase, 24% mentioned dust and noise will occur which may create problems for them, 44% female respondents supposed that they will face mobility issues, while 32% female respondents mentioned issues of privacy during construction phase of this project. The perceived impacts have been shown in the following Table 4.90.

Table 4.90: Possible Impacts of the Project (During Construction)

Possible Impacts of the Project (During Construction)			
Sr. No.	Impacts	Number	Percentage
1	Dust & Noise issues	23	24
2	Mobility problems	42	44
3	Privacy issues	30	32
Total		95	100

dd. Possible Impacts of the Project During Operation Phase

The majority of respondents i.e. 20% believed that no water pounding will take place in their areas after implementation of the Project, 19% believed that they will have easy access to everywhere without having any sewerage/drainage issue in their localities. Moreover, 12% of the respondents supposed the proposed treatment plant will be beneficial for local residents as residents are expected to get more facilities in their areas after implementation of the

project, 20% believed that it is good for environment and no response received by the 32% respondents. The perceived impacts have been shown in the following Table 4.91

Table 4.91: Possible Impacts of the Project (During Operation Phase)

Possible Impacts of the Project (During Operation Phase)			
Sr. No	Impacts	Number	Percentage
1	Benefits for Local Residents	11	12
2	Good for environment	19	20
3	No water pounding in this area	19	20
4	Easy access to everywhere	15	16
5	No response	30	32
Total		96	100

4.7 SOCIO-ECONOMIC PROFILE OF PERSONS AFFECTED BY THE PROJECT

In addition to this baseline survey, a separate survey for preparation of Resettlement Action Plan (RAP) was conducted which was focused on identifying the people most vulnerable to the installation of WWTP at Babu Sabu treatment plant site.

Details of socio-economic status of vulnerable people is given in RAP.

5 STAKEHOLDER ENGAGEMENT PLAN AND PUBLIC CONSULTATION

5.1 INTRODUCTION

Stakeholders & Gender, involvement is an important feature of the environmental-social assessment and can lead to a better and more acceptable decision-making regarding the Project design and implementation. Public involvement, undertaken in a positive manner and supported by a real desire to use the information gained to improve the Project design and social acceptability, will lead to better outcomes. Public involvement is necessary for smooth implementation of the Project and to get support from the local community for the success of the Project.

5.2 OBJECTIVES

The objectives of stakeholder consultation were to contribute to the openness, transparency and dialogue. Special efforts were made to ensure that the communication with the public should be efficient and well balanced. The concerned stakeholder groups were identified to participate in the assessment process. Specific tasks and purposes of consultations with stakeholders were:

- Ensure public and community participation in the project social and environmental policy objectives and decision making;
- Informing the public about the proposed project;
- Identify and involve all stakeholders, especially local residents, in the consultative and participation process;
- Share information with stakeholders on the design and construction of the proposed project and anticipated impacts on the physical, biological and socio-economic environment of the project area;
- Assembling better understanding of local needs
- Understand stakeholders' concerns regarding various aspects of the project, including the existing available facilities and problems, construction of the project and the likely impacts (positive & negative) of construction and operation related activities;
- Understand the perceptions, assessment of social impacts and concerns of the communities in the vicinity of the proposed project;
- Provide an opportunity to the public in the consultation session for valuable suggestions related to project design;
- Reduce the chances of conflict through an early identification of controversial issues, and consult them to find acceptable solutions;
- Receive feedback from primary stakeholders on mitigation and enhancement measures for environmental and social impacts; and
- Creating a sense of ownership of the project among the stakeholders.

5.3 REGULATORY REQUIREMENT

The adequacy of the public consultation and information disclosure is one of the basic criteria used to determine the project compliance with the national / international safeguard policies. Both national and international requirements are briefly described below:

5.3.1 National Requirements:

The national environmental laws require that one round of consultations to be conducted during the environmental study or scoping level of the Project. However, the WB and ADB guidelines requires several rounds of consultations during the entire project completion stage.

The Review of the Initial Environmental Examination and Environmental Impact Assessment Regulations 2022 (IEE and EIA Regulations) provide the necessary details on the preparation, submission, and review of IEE and EIA in Pakistan. Under Regulation 9 of the Regulations, a set of guidelines have been issued for general applicability and sectoral guidelines produced indicating specific assessment requirements. This includes the Guidelines for Public Consultation, 1997 (the 'Guidelines') summarized below:

- Objectives of Public Involvement: To inform stakeholders about the proposed Project, to provide an opportunity for those otherwise unrepresented to present their views and values, providing better transparency and accountability in decision making, creating a sense of ownership with the stakeholders.
- Stakeholders: people who may be directly or indirectly affected by a proposal will clearly be the focus of public involvement. Those who are directly affected may be Project beneficiaries, those likely to be adversely affected, or other stakeholders. The identification of those indirectly affected is more difficult, and to some extent it will be a subjective judgment. For this reason it is good practice to have a very wide definition of who should be involved and to include any person or group who thinks that they have an interest. Sometimes it may be necessary to consult with a representative from a particular interest group. In such cases the choice of representative should be left to the group itself. Consultation should include not only those likely to be affected, positively or negatively, by the outcome of a proposal, but should also include those who can affect the outcome of a proposal.
- The range of stakeholders typically includes local people, other affected communities, proponents, government agencies and local councils, Non-Governmental Organizations (NGOs) and other influential people.
- Mechanism: provide sufficient relevant information in a form that is easily understood by non-experts (without being simplistic or insulting); allow sufficient time for stakeholders to read, discuss, consider the information and its implications and to present their views; responses should be provided to issues and problems raised or comments made by stakeholders; selection of venues and timings of events should encourage maximum attendance.
- Timing and Frequency: planning for the public consultation program needs to begin at a very early stage; ideally it should commence at the screening stage of the proposal and continue throughout the EIA process.
- Consultation Tools: some specific consultation tools that can be used for conducting consultations include focus group meetings, needs assessment, semi-structured interviews, village meetings and workshops.

- Important Considerations: The development of a public involvement program would typically involve consideration of the following issues: objectives of the proposal and the study; identification of stakeholders; identification of appropriate techniques to consult with the stakeholders; identification of approaches to ensure feedback to involved stakeholders; and mechanisms to ensure stakeholders' consideration are taken into account.

3.3.2 International Guidelines

a. Agence Française De Développement (ADF) and World Bank Policies

AFD mainstreams corporate social responsibility into its governance system and activities. In this context, AFD takes measures to assess and manage environmental and social risks for all AFD-funded operations. AFD has developed operating procedures to identify, prevent or mitigate environmental and social risks and impacts, as well as any human rights violation that could result from AFD-funded activities.

The approach taken by AFD Group is based on the World Bank Safeguard Policies and International Finance Corporation (IFC) Performance Standards and involves (i) assessing the environmental and social risks and impacts of each project submitted to the decision-making bodies and the remedial measures already planned to be implemented by the beneficiaries of the financing; (ii) proposing additional measures to be implemented by the beneficiaries, which aim to limit these risks or offset the effects; (iii) monitoring the implementation of these measures during the implementation phase of the operation; (iv) managing unforeseen events; and (v) improving project quality and the environmental and social performance of the beneficiaries of its financing.

b. World Bank Group Guidelines

The International Finance Corporation (IFC) is the private-sector wing of the World Bank Group (WBG). The IFC Performance Standards (IFC PS) and "IFC Stakeholder Engagement: Good Practice Handbook for Companies doing Business in Emerging Markets" layout the objectives and approach for modern stakeholder engagement. This handbook has also been taken into consideration in drafting this SEF. Stakeholder involvement is good practice for modern development initiatives that lead to environmental and social impacts.

- Stakeholder's identification: Stakeholders include individuals and/or groups that can be affected by or are interested in the development initiative. Consultations should be held with the stakeholders engaging all types of stakeholders, which can include potentially affected communities, local government and regulatory authorities, regulatory institutions, NGOs, academia and other civil society bodies.
- Selection of consultation techniques: Sufficient information should be shared with the stakeholders in a timely and effective manner, with consideration for stakeholder interests, linguistic and educational backgrounds, and socio-cultural setting;
- Arrangements for consultations: Venue and timing for consultation meetings should be chosen in a manner that encourages maximum participation on behalf of stakeholders;

- Stages of consultation: Consultations should be conducted during the early cycle of project development (scoping stage), so that the results and outcomes of the consultations can contribute to the design process. Following this, stakeholders should be provided feedback before finalization of the project's environmental design (feedback stage) on how their concerns, raised at the scoping stage, were addressed through suitable mitigation or design changes; and
- Stakeholder feedback and use of results: The views of stakeholders should be documented and then analyzed for use in more effective decision-making.

c. Good Practice Principles

The consultations have been undertaken in good faith, while remaining impartial. The good practice principles which have been observed during the consultations are as follows.

- Cultural sensitivity – this requires respect, understanding and appreciation for the customs, institutions, values, and norms of the communities affected by a project.
- Interactive approach – stakeholder engagement should not be limited to the one-way dissemination of information by the project proponent but should include stakeholder input into decision making processes for the proposed Project.
- Open, transparent and informative – Project stakeholders should have access to relevant information, in a simple and understandable format.
- Inclusive and equitable – ensure all stakeholder groups are represented, including less represented groups such as women, children, elderly and the poor.
- Appropriateness and flexibility – stakeholder engagement techniques (surveys, interviews, workshops etc.) must be appropriate to the specific phase of the EIA study (scoping consultations, feedback consultations) and the stakeholder groups identified.
- Capacity building – capacity building should be a part of interaction with stakeholders, wherever appropriate and practicable.

5.4 CONSULTATION AND PARTICIPATION PROCESS

For ascertaining the perceptions of different stakeholders about the proposed project (during construction & operation), consultation meetings were held with them. These meetings were carried out in the vicinity areas of proposed project. The meetings with stakeholders were carried out in June and July, 2019 & and updated in Septembers 2021.

5.4.1 Methods of Public Consultation

Public consultation was carried out in order to establish stakeholder's opinion regarding project implementation. The following methods were used for public consultation with project stakeholders.

- Scoping Sessions
- Formal Meetings
- Informal Meetings
- Individual Interview
- Focus Group Discussions (FGDs)

5.4.2 Identification of Stakeholders

Stakeholders are persons or groups who are directly or indirectly affected by a project as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Two types of the stakeholders were identified, the primary stakeholders who would be directly affected by the project and the secondary stakeholders, who would be indirectly affected by the project (or who could indirectly affect the project).

Table 5.1: Categories of Project Stakeholders

Primary stakeholders	All project affected persons, households, communities. Project beneficiaries - for instance: residents of the project area including the resettlers community and gender
Secondary Stakeholders:	WASA and other related government departments/agencies responsible for the design, management and implementation of the project, contractors, construction workers, financing institutions, mass media/civil society members, consultants and project advisors

Stakeholders for the Project include locally affected communities and their formal and informal representatives, national or local government authorities, civil society organisations and groups with special interests, the academic community, or businesses. Field work and public consultation phase was used to identify the stakeholders. On the basis of the findings of the field team, the primary stakeholders were:

- People that might be indirectly affected by the project;
- People who shall benefit from project activities in the form of employment or business opportunities;
- Knowledgeable residents of the area keen to contribute to the consultation process;
- Pressure groups demanding construction of WWTP on urgent basis; and
- Landowners whose properties will be acquired.

All those stakeholders had different types of stakes according to their professions.These stakeholders were contacted by the consultants and took into consideration their views and reservations/concerns about the project.

5.5 APPROACH OF CONSULTATIONS

To carry out stakeholder & Gender consultations, the consultants adopted a strategic and flexible approach, where influential/key persons were earlier briefed and taken into confidence for holding community level meetings and followed by candid meetings with residents and small group meetings with men and women separately.

A series of comprehensive consultations were carried out with the project stakeholders at various locations during the preparation of environmental and social impact assessment. The consultation and scoping sessions were designed specifically to provide project information to the public. These sessions were informal so as to encourage friendly social environment in which participants were comfortable in raising questions, expressing their opinion and

concerns about the project besides seeking clarification regarding their concerns. The focus group discussions were instrumental in the process, whereas one-to- one meetings were also held with the institutions.

The Consultants organized the consultative meetings in the Project Area. The participants were made aware of the purpose of the meeting, the project concept and the scope of related works, and probable impact of construction and subsequent operational activities of the project with reference to PAPs. The Social and Environment Specialists apprised the audience with the technical and social aspects of the project in detail.

3.5.1 Consultation with primary stakeholders

Consultations were carried out within the immediate area of influence of the project. Table 3.2 provides a brief of the public consultations with primary stakeholders including consultation with females.

Table 5.2: Summary of Consultation Meetings with the Primary Stakeholders including Females

Sr. No	Village /Mouza	Venue	Date	No. of Participations
1	Shadiwal	Dera Shoukat Ali	18-06-19	19
2	Shadiwal	Dera Malik imtiaz	19-06-19	19
3	Babu Babu	Dera Ashraf Dolla	20-06-19	22
4	Shadiwal	Dera Lakha	21-06-19	14
5	Shadiwal Amir park	Property Dealers	21-06-19	10
6	Amir Park	Main Chowk	25-06-19	9
7	Talal Park	Residential Area	15-07-21	11
8	Forest Colony	Residential Area	15-07-21	15
Female Consultation Meeting				
9	Shadiwal	Dera Councillor	19-06-19	25
10	Amir Park	Baba Naseer	25-06-19	8
11	Talal Park	Residential Area	15-07-21	7

3.5.2 Consultation with Secondary Stakeholders/ Relevant Departments

Different relevant Government departments (Irrigation, LESCO, Police, Environment, Agriculture, Livestock, WASA, Health etc.) were consulted in order to collect the information regarding the possible impacts of the project, and to discuss the issues/constraints and get their views to mitigate the potential environmental and social impacts associated with the

implementation of the project. Table 5.3 provides a summary of the public consultations meetings with secondary stakeholders.

Table 5.3: Summary of Consultation Meeting with the Secondary Stakeholders

Sr. No	Department	Designation	Date
1	Irrigation	SE Drainage	10-07-19
2	LESCO	Dy Manager Assistant Engineer	10-07-19
3	EPA	Dy. Director	11-07-19
4	WASA	Director P& D	11-07-19
5	Revenue WASA	Revenue staff	11-07-19
5	Live Stock	Deputy Secretary	11-07-19
6	Agriculture	Director	30-07-19 &03-09-2021
7	Health	Doctor	30-07-19
8	Police	SHP	30-07-19
9	Wildlife Department	DD	03-09-2021
10	Forest Department	DFO	03-09-2021

5.5.3 Primary Stakeholders' Concerns

The Wastewater Treatment Plant at Babu Sabu, will have several impacts of varying significance. Despite the concerns, the affected communities have a friendly attitude towards the Project although there was some participants who were against the Project. . Public consultation survey Performa is attached with as social survey tool as Annex-III.

The meetings were attended by a large number of people. The Consultant team encouraged the participants to express themselves and engaged them in detailed discussion on project impacts, community consultation, compensation and awareness about the project. There was active participation of the community people in the meetings and participants expressed their willingness to support the Project. Table 5.4 shows concerns raised by the participants of the consultations held in the project area and responses to address the concerns.

Table 5.4: Concerns and Responses of the Consultation Meetings

Sr. No	Key Topic	Concerns raised	Responses
1	Inconvenience to Local people	During the construction phase of the project, this will result in causing inconvenience to the nearby residents by affecting their daily life activities. They feared that their routine life will be severely affected as a result of resettlement and dislocation.	The contractor will ensure that construction work does not hinder local people's access to the local route and their ability to cross it safely.
2	Control over dust and noise	Minimize the effects of noise, dust, vibration, traffic and lightening associated with construction activities on the communities living along the	Sprinkling of water will be ensured to avoid dust problem and contractor will be bound for sprinkling of water. Noise barriers shall be provided in sensitive

Sr. No	Key Topic	Concerns raised	Responses
		project route that can cause disturbances and stress.	area in form of boundary wall.
3	Agriculturally Fertile Lands	Most fertile lands have historically given birth to prosperous settlements which are well connected and have much better infrastructure. Acquiring these agriculturally productive lands and converting them into non-agricultural uses have produced much resistance. So, try to minimize the wastage of crops & trees.	Most of the land is already acquired. Treated water will improve the environmental, health condition of the overall population of Lahore and downstream area of river Ravi. The quality of food will improve. Due to installation of water treatment plant the quality of the ground water and surface water will improve.
4	Compensation issues	Concerns of to be affected people were about compensation of loss of assets due to the project interventions, compensation rates, and timely disbursement of compensation. Compensation should be through crossed cheques, early & fairly compensation is required. Employment opportunities should be provided during construction phase of the project.	Compensation rates will be decided as per the law of land and in consultation with local people. Contractor will be directed to hire maximum labour force from the local communities.
5	Principles and procedures of rate assessment	The affected community expressed their desire to disclose the rates of assets to be acquired. Rates will be shared and disclosed with local people and finalized with the consideration of affected people according to the market rate.	The compensation rates will be based on negotiations with the local communities to reflect the replacement value of the assets acquired.
6	Lack of trust in local government	Some people indicated that they could not rely on the local government for proper compensation of land acquisition and resettlement.	Local people will be included in various project committees to increase their confidence in the process.
7	New civic Amenities	There were demands to provide basic civic amenities like dispensary, high school especially for female, Water filtration plant and Sui gas.	These suggestion noted.
8	Income/ Employment	Local people raised concerns related to participation of local people in income generation activities such as their involvement in employment opportunities and they suggested the poor people should be given special attention for employment during construction	The contractor will provide jobs to the locals on priority basis. Effort will be made to engage poor & vulnerable during the construction stage of the project.

Sr. No	Key Topic	Concerns raised	Responses
		stage.	
9	Fears and Concerns of Women	The presence of outside labour may restrict the movement of local women working in nearby fields. They shared that there is no platform or forum at the village level through which women can voice their problems. Early information before start of work. Employment should be given to local people.	Measures will be proposed by the contractor to minimize impact on women's mobility, and to ensure women's privacy.
10	Value of the property	Due to the construction of plant, the value of the properties will significantly decrease in the surrounding areas of WWTP.	Measures will be proposed to minimize this impact.

5.5.4 Consultation with Project Affected Persons (PAPs)

Specific Consultation were conducted with PAPS and the local. The purpose of this exercise was to identify the PAPs, aware them about the project and AFD policy for the resettlement, conduct census and socio-economic survey. Consultation were conducted with PAPS and the local. The purpose of this exercise was to identify the PAPs, aware them about the project and AFD policy for the resettlement, conduct census and socio-economic survey. Table 5.5 indicated the summary consultations and minutes of meeting.

Table 5.5: Summary of Consultation with Affected Person

Sr. No.	Village / Mauza	Venue	No. of Participations	Date of consultation	Minutes of meeting
1.	Babu Sabu	Agriculture Field	7	10-9-2023	The participant were briefed about the project, impact assessment, survey and eligibility of the compensation. The cultivators mentioned that they will vacate the land whenever required for the project.
2	Babu Sabu	Dera Rasheed	24	15-9-2023	The cultivators extended their operation for implementation of the project and they were willing to vacate the land for the implementation of the Project.

On the basis of the consultations so far, the consultants reckon that the social and environmental impacts of this project are not insurmountable, and WASA will make sure that

compensation and assistance amounts are paid properly including skilled and unskilled employment to the project affected people (PAPs) as far as is reasonably practicable.

All of the above concerns and expectations have been adequately incorporated in the project design in the form of the mitigation measures included in the Environmental Management Plan and the communities were also informed during the consultation meetings.

The consulted women demanded that with the project implementation, health and educational facilities should also be provided in the project area. They consider the project beneficial for the surrounding population in terms of improvement in health and hygiene conditions.

5.5.5 Consultation with Secondary Stakeholders

Table 5.5: shows the concerns of secondary stakeholders.

Sr. No.	Department	Concern	Response
1	Irrigation	NOC approval is requried from irrigation Department for the construction of Waste Water Treatment Plant (WWTP) at Babu Baku because the area has been declared as flood zone. Water from the drain is being utilized for irrigation as it is harmful to the crops, if the water is treated it can be used to grow crops.	Concerns have been noted and will be communicated to the relevant department.
2	EPA	Control measures should be adopted for surrounding communities to avoid odour problem. To reduce odour thick plantation is requrie at the project site. 2 km Area at all side should be declare buffer zone and no residential and commercial building construct. New sewerage connection should not be given to industries. It was suggested by AD Environment that one EIA for whole project should be carried out separately for each component of the project including WWTP, conveyance system, force mains and up-gradation of disposal station was discussed.	Comments will be documented and conveyed to the concerned department.
3	Police	Proper security will be provide to local people during construction and operational phase.	Police Department will be coordinated for the security matter.
4	Health	According to the doctor, bacteria is at its most prevalent in windy and humid conditions. These airborne hazards not only create unpleasant odours but they also pose the risk of respiratory and gastrointestinal infections for people living in close proximity to the facility. The effects of inhaling these chemicals and organisms can vary depending on a variety of	Comments have been documented and concerns will be conveyed to the relevant department.

Sr. No.	Department	Concern	Response
		factors, but can include respiratory infections, eye irritation, depression, central nervous system damage, and possible poisoning. Polluted drinking water is the main cause of stomach diseases in the area and this project will be highly beneficial to the area dwellers.	
3	Agriculture	In villages, land is not just an asset or a factor of production. It is in most cases, a source of livelihood. Server concerns raised by the participants on acquiring the agriculturally productive lands and converting them into non-agricultural uses. According to Agriculture officer agriculture land will decrease and during construction phase crop yield will also decrease due to dust particles and pollution. Crops details of the area were shared along with other details by the official. The tentative compensation rates for agricultural crops were share and discussed among the experts. The official added that detailed assessment for the agricultural crops is required to compensate the local communities as per acceptable market rate.	Concerns have been documented and concerns will be conveyed to the relevant department. The official was briefed by the NESPAK Ecologist about the mitigation measures.
5	Livestock	The livestock and agricultural are income generating activities of people in the project area will be disturbed because most of the population of project area is either directly or indirectly involved in livestock and agricultural activities.	Concerns have been noted and will be communicated to the relevant department
7	WAPDA	According to Deputy Manager 40% electric supply is being provided from this grid station which is near to site of WWTP. We are already suffering from the drain passing in front of grid station because it damage ours electronic items. NOC will be require from LESCO for WWTP.	Comments will be documented and concerns will be conveyed to the relevant department
8	Forest Department	The DFO was briefed by NESPAK Ecologist regarding the Project and the specifications. In result the officer responded the following: • The flora and forest of the region was discussed among the Forest officer and NESPAK team and agreed to avoid tree cuttings up to maximum level to keep the ecological balance of the region. • The official emphasizes on minimum damages to tree and green cover as these species are playing important role in soil formation, flood protection and clean environment over all.	Comments will be documented and concerns will be conveyed to the relevant department

Sr. No.	Department	Concern	Response
9	Wildlife Department	After detailed briefed about proposed activities of the road project Deputy Director of wildlife department responds and show his concerns about • Minimuming damages to the habitats were recommended • Loss of trees will have discouraged to keep the eco balance and to protect habitat of wildlife of the region as mentioned in baseline • The official shared that No project area is falling under any protected area of wildlife department • Required details of the faunal species of the region were also provided.	Comments will be documented and concerns will be conveyed to the relevant department

3.6 GENDER CONSULTATIONS

Keeping in view the important role of the females in the household as well as in the society, gender consultations were also conducted. Gender situation survey analysis was carried out at various locations including Shadiwal, Amir Park, Forest Colony, Lalazar, Gulshan-e-Ravi, Badhur, Sanda Kalan, Kholthal Town to record views of the females and issues related to the project implementation.

3.6.1 Awareness, Concerns about the Project and Response to their Queries

Women actively participated in the meetings and showed their support for the project. Most of the women were un-aware about the project. Upon describing the proposed projects details they considered the project valuable for the local community. Participants of the consultations highlighted few issues related to women due to project execution. Their concerns were of minor nature related to residential disturbance and mobility of women in the area.

Participants were briefed that adverse impacts have been minimized designing WWTP away from the main settlements and affected families will be compensated properly.

3.6.2 Problems Faced and Pressing Needs of the Women

Female participants highlighted various issues faced in the area which are:

- Lack of facilities of safe drinking water,
- Females were of the view that our water supply lines are spread over the street, due to traffic load in our streets these shouldn't be disturbed.
- Lack of health facilities in the nearby health centres, and
- Insufficient educational facilities in nearby schools

The foremost preferred needs of the female participant were clean drinking water, improved health facilities and better public transport and employment opportunities.

3.6.3 Gender Enrolment in Project Activities

The gender disaggregated data was collected to identify the gender impacts and measures have been laid down in the EIA and EMP to mitigate the adverse gender impacts and enhance positive impacts.

The social and gender staff of PMU will be responsible for EMP implementation and social and gender inclusive project activities, and progress reporting. The PMC social and gender staff will assist in internal monitoring of EMP implementation and reporting. The capacity building program including trainings of LWASA, PMC, and contractors' staff in gender mainstreaming are planned. Gender disaggregated database will be developed and progress of RP and GAP implementation will be reported.

Moreover, the contractor should make sure that no discrimination is made on the basis of gender while hiring of workers. The contractor should set the employment relationship on the code of equal opportunity and fair treatment and develop Code of Conduct for workers to address this issue.

- The Contractor should make sure that no discrimination is made on the basis of gender while hiring of workers;
- The employment decisions should not be made on the basis of personal characteristics unrelated to inherent job requirements, including race, gender, nationality, religion or belief, disability, age, sexual orientation, or ethnic and social aspects; and
- Establish and strictly enforce a No Sexual Harassment Policy in accordance with provincial law.

There is a potential that gender inequality might arise during construction through discrimination made against women by unequal work distribution and unequal pay among others which should be addressed.

3.7 FUTURE CONSULTATIONS

The stakeholder consultation and engagement is an ongoing process and will continue throughout the project's construction as well as operation and maintenance phases. The ongoing consultation process could be scheduled on need basis with the stakeholders including but not limited to the concerned government departments, local administration, the community representatives and affected Persons from the proposed project area.

The overarching goal of consultations and community engagement is to support and facilitate the project's design and implementation, to reduce conflicts and project opposition, and to increase project's acceptability.

The community members will be compensated by project proponent and they will be encouraged to participate in project activities during construction and operation phases. The consultations will be made in future to facilitate the community at the local level.

Further consultations to be undertaken as part of the Project EIA process include the Project public hearing. The Punjab EPA will require that public hearings to assess public opinion on the environmental impacts of the Project. The Punjab EPA will advertise the public hearings in a newspaper. The legal requirement is advertisement in at least one English or Urdu national newspaper, but in practice, advertisements are usually placed in two national newspapers and also in local newspapers. The public hearings will be held at least 30 days after the public notice. Concerns raised during the public hearing will be addressed in the EIA report before approval.

The consultations will be carried out during the construction and operation phases of project. Consultations will be undertaken in all the communities twice or more time in a year, depending on the number of concerns raised under each consultation. Ongoing stakeholders' engagement activities include:

- Ongoing reporting on progress on the implementation of environmental and social management measures identified during the EIA process and recording of comments on the effectiveness of these measures;
- Updating communities and other stakeholders about project developments and recording comments on these; and
- Ongoing action of the grievance mechanism

Efforts will be made to maximize the consultations during the project implementation. The consultations will be carried out with the objectives to develop and maintain communication linkages between the project promoters and stakeholders, provide key project information to the stakeholders, and to solicit their views on the project and its potential or perceived impacts, and ensure that views and concerns of the stakeholders are incorporated during the implementation with the objectives of reducing or offsetting negative impacts and enhancing benefits of the proposed project. The framework for the future consultations is elaborated in Table 5.7, but not limited to the following:

Table 5.7: Future Consultations Framework

Sr. No.	Stakeholders	Project Phase	Frequency of Consultation	Responsible entity (refer to EMP as well)
1	Institutions/Departments	• Pre-implementation • During the Project implementation • At Closure period	• One round of consultation before start of implementation of project • Bi-annually during operation phase • Once before the closure of the project	• DC • LWASA • PMU • DC • PMU • PMU • LWASA

Sr. No.	Stakeholders	Project Phase	Frequency of Consultation	Responsible entity (refer to EMP as well)
2	Local Communities/ Key Persons	• Pre-implementation • During the Project implementation • At Closure period	• Consultation at different stages before implementation, periodic meetings during construction phase and at the time of Project completion	• DC • LWASA • PMU • CC • PMU • PMU • LWASA
3	NGOs/CBOs (if any)	• Pre-implementation • During Project implementation • At Closure period	• Periodic meetings will be conducted as per requirement of the Project	• PMU
3	Project Affected People: People residing in project area Local Communities and Beneficiaries	• Pre-implementation (right after compensation payment) • During Project implementation (during construction and at the beginning of Operational Phase as a minima)	• Periodic meetings (at minima: 1 per semester as before construction and during the first year of construction; once per year during the 2 remaing years of construction and once at the beginning of the operational phase) with PAPs regarding their satisfaction about the compensation and restoration of livelihood and grievance lodged and addressed. • Periodic meetings with communities throughout the project lifecycle and their involvement in operation of the WWTP	• PMU • LWASA • CC • PMU • LWASA

After suggesting the possible solutions of the stakeholders' concerns, the solutions (final ESIA report) will be disclosed once again before the stake holders and general public. ESIA report will be accessible to interested parties on request and the version of final report will be available in the project office and its summary will be available in national language.

5.8 FUTURE INFORMATION DISCLOSURE PLAN

After suggesting the possible solutions of the stakeholders' concerns, the solutions (final ESIA report) will be disclosed once again before the stake holders and general public. ESIA report will be accessible to interested parties on request and the version of final report will be available in the project office and its summary will be available in national language.

Figure 5.1 shows Pictorial View of Public Consultation Meetings with primary and secondary stakeholders.





Consultation with PAPs in the Project Area





Consultation meeting at village Shadikai





Consultation meeting at village Nilai Baru



Consultation meeting at village Amir park



Consultation meeting at village Tallet park



Consultation meeting at village Batu Batu



Consultation meeting at Batu Khakhian



Consultation meeting with Agricultural Officer



Consultation meeting at Village Bafu Sabu





Border consultation meeting



Meeting with Deputy manager LESCO



Meeting with SE Drainage



Meeting with Director P& D,VIASA

Meeting with Forest Department

Meeting with EPA

Meeting with Forest Department

Figure 5-1: Pictoral View of Consultation Meeting

6 GRIEVANCE REDRESS MECHANISM

6.1 GRIEVANCE REDRESS MECHANISM (GRM)

The Grievance Redress Mechanism discussed in this section has been developed for the WWTP and the same would be followed for the proposed project. The typical grievances associated with the environmental and social aspects of the proposed project are likely to include but not limited the following:

- Dust, noise and air pollution from construction activities;
- Intensive schedule of construction activities;
- Inappropriate timing of construction vehicle and machinery flow;
- Traffic movement;
- Water pollution;
- Air pollution;
- Noise pollution;
- Waste disposal;
- Tree cutting;
- Open dumping of construction material;
- Spillages from construction machinery;
- Moment problem;
- Compensation issues.

6.2 REGULATORY FRAMEWORK FOR GRIEVANCE REDRESS MECHANISM

The Land Acquisition Act, 1894 contains provisions pertaining to objections and hearings of affected persons of land and associated assets. The act is limited to address grievances pertaining to compensation and there is no provision in the legal framework for a continuous grievance redress mechanism on the concerns and grievance of the affected persons and other stakeholders other than land acquisition, compensation and related matters.

Under the Punjab Environment Protection Act, 1997 (Amended 2012), the Environment Protection Department (EPD), Punjab created Environment Protection Agency (EPA) which is responsible for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution; and promotion of sustainable development in the province. EPA sustains qualitative and quantitative standards for the discharge of effluents, wastes, air emissions or noise either for general applicability or for a particular area or from a particular source in the form of Punjab Environmental Quality Standards (PEQS), 2016 and other standards established under the laws, rules and regulations.

6.2.1 World Bank Requirements

The WB requires establishment of a suitable project level grievance redress mechanism in accordance with WB's Environment and Social Policy and applicable standards for the project affected persons and to address the concerns and grievances of the stakeholders. This mechanism can receive and facilitate resolution of the concerns or grievance of people who

believe they have been adversely affected by the Project's environmental or social impacts or the people who believe that their interest are at risk due to the project including construction and operations activities. There is also provision for protection of complainants from retaliation and the right to remain anonymous, if requested, to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's social, resettlement and environment performance.

Measures have been identified to mitigate environment, social and resettlement impacts to be caused due to implementation of the Project works. However, in spite of best efforts, there is a high chance that the individuals and households affected by the project or other stakeholders are dissatisfied with measures adopted to address adverse environment and social impacts of the Project. To address such situation, an effective Grievance Redress Mechanism (GRM) will be established to ensure timely and successful implementation of the project. It will also provide a public forum to the aggrieved to raise their concerns and address them adequately. It will receive, evaluate and facilitate the resolution of affected People's concerns, complaints and grievances about the environmental and social performance at the level of the Project.

6.3 THE AIMS AND OBJECTIVES OF GRM

The GRM will aim to investigate charges of irregularities and complaints and grievances received from the affected people and other stakeholders and provide a time-bound early, transparent and fair resolution to voice and resolve environmental and social concerns and grievances linked to the project. The objectives of the grievance redress mechanism are:

- To provide affected persons (APs) and other stakeholders with a clear process for providing comment and raising grievances;
- To allow APs and other stakeholders the opportunity to raise concerns, complaints and grievances anonymously through using the several intake locations and modes;
- To structure and manage the handling of concerns and grievances, and allow monitoring of effectiveness of the mechanism; and
- To ensure that concerns and grievances are handled in a fair and transparent manner, in line with provincial laws and regulation, WB environment and social policy framework and standards, and international best practices.

6.4 NATURE OF COMPLAINTS TO BE REDRESSED

It is anticipated that during the project implementation and operational phase, the nature of such complaints will relate to compensation and resettlement and rehabilitation assistance, income and livelihood restoration matters, damages, mobility and access issues of general public or disruptions of services and utilities during civil works will be related to the project functionaries. Examples of grievances that may arise are listed below:

- Name of project affected persons (PAPs) may be missing from the eligible PAP's list;
- Losses (such as damage to assets or loss of income) may not identified correctly during detailed design stage;
- Improper distribution of compensation and/or resettlement assistance;

- Delays in the payment of compensation and resettlement assistance;
- Any disruption by the civil works contractors;
- Non-observance of project principles, by different parties, as laid down in the RP;
- Environmental issues; and
- Any other issue arising during the project implementation.

The ES staff of Environmental Committee also known as Project Management Unit (PMU) with the assistance of ES staff of PMC and Contractors shall make the public aware of the GRM, particularly the PAPs, through public awareness campaigns, information dissemination material and face-to-face meetings with both literate and illiterate PAPs. The GRM shall be publicized through the notice boards at their VICs, site offices of contractors and sub-contractors, construction camps, and at accessible and visible locations of urban areas, trunk sewer site and along the corridor of pumping and disposal stations. The information about GRM shall be disseminated to the PAPs and other concerned stakeholders through face-to-face meetings with illiterate male and female PAPs, information dissemination material and workshops. The illiterate men and women will be facilitated in documenting their verbal complaints by the ES staff of PMU, PMC or the Contractor staff and subsequent follow ups until their resolution. The names of the ES staff of PMU, PMC and Contractors, their addresses, contact numbers and the 24/7 Universal Access Number (UAN) or complaint registration number of LWASA will serve as hotlines for registering verbal and written concerns, complaints and grievances. The project information brochure will include provision of GRM, but a dedicated brochure on GRM will be prepared in Urdu language and shall be widely disseminated throughout the trunk sewer site and along the corridor of pumping and disposal stations by the ESS of PMU, PMC and Contractors. Grievances may be reported verbally, can be placed in the complaint boxes or filed in writing in the form of a letter, via web based GRM at LWASA website, the WWTP website or by phone through designated staff of the PMU, PMC, Contractors or UAN of LWASA.

6.5 THREE TIER GRIEVANCE REDRESS MECHANISM

A three-tier GRM has been designed to provide a time-bound, early, transparent and fair resolution for PAPs and other stakeholder grievances (Figure 6.1). The ES staff of PMU will undertake public awareness campaigns on the GRM with the assistance of ES staff of PMC and Contractors. All complaints received verbally or in writing will be properly documented and recorded in the Complaint Management Register(s). In addition, an easy-to-access web-based GRM will be implemented.

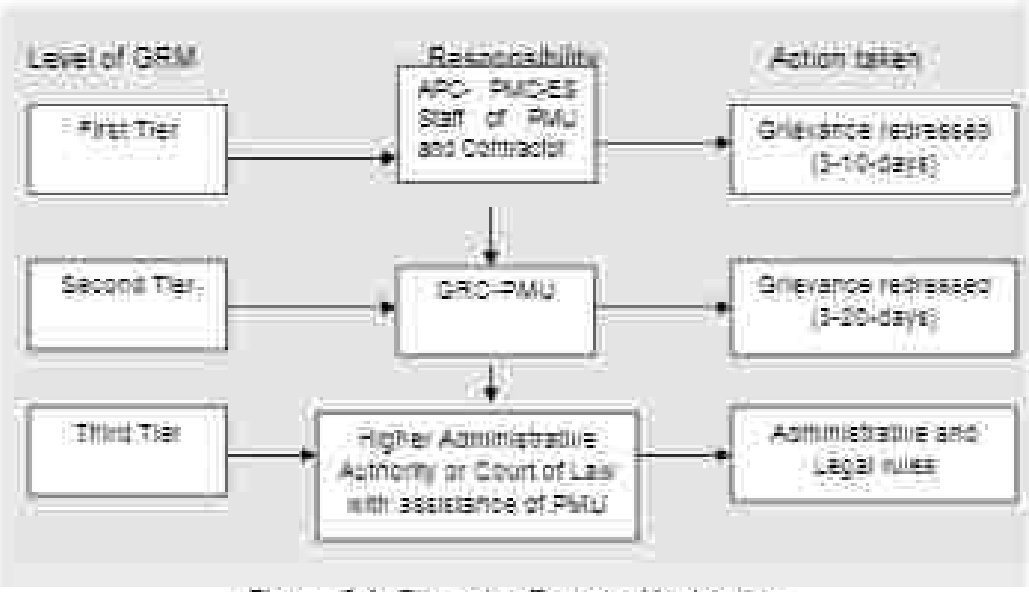


Figure 6-1: Grievance Redress Mechanism

6.5.1 First Tier of GRM

The first level of grievance redress system includes the Site/village level displaced person's committee (APC) selected and nominated by the displaced persons from each affected settlement located along the project road alignment. The APC will be presided by its president who will be selected by the committee members nominated by the displaced persons. These APCs will be a formal node for coordination and communication with the project execution authorities and are required to act as local node for recording and redress of grievances as per their local customs and practices. The technical staff will maintain a close liaison with the APCs to guide and assist them in recording and resolution of grievances. In this regards, the resettlement/environmental specialist and social mobilizers will closely coordinate and work together with the APC members and the local community to ensure grievances are recorded, investigated and discussed during APC's meetings and guide them to explore and recommend remedial measures at their level. They will also liaise with the counterpart engineering staff, and contractors to ensure implementation of the APC's recommendations and/or raising the complaint to second level of GRM/GRC for review and redress if the grievances are not resolved at APC level.

6.5.2 Second Tier of GRM

The PMU will be the second tier of GRM which will offer the fastest and most accessible mechanism for resolution of grievances. The ES staff of PMU shall be designated as the key personnel for grievance redress. Resolution of complaints will be completed within two to ten working days, depending on the nature of grievance. First, concerns and grievance resolution will be attempted at local level by the ES or any other staff of PMU, PMC and Contractors or through the involvement of the representatives of APs Committee and informal mediators. At this stage, ES staff of PMU and PMC may ask LWASA for additional support and guidance in

grievance redress matters. Investigation of grievances will involve site visits and consultations with relevant parties (e.g. affected people, DC office staff, contractors, traffic police, general public and utilities companies). Grievances will be documented and personal details (name, address, date of complaint and nature of complaint) will be included unless anonymity is requested. A tracking number shall be assigned for each grievance, including the following elements:

- Initial grievance sheet (including the description of the grievance), with an acknowledgement of receipt handed back to the complainant, when the complaint is registered either verbally or in writing;
- Grievance monitoring sheet and mentioning actions taken (investigation and corrective measures); and
- Closure sheet, one copy of which will be handed over to the complainant after s/he/he agrees to the resolution and signed-off.

The ES staff in PMU will refer the unresolved issues or grievances (with written documentation) to the second tier of GRM, the Grievance Redress Committee (GRC). The GRCs shall be established by LWASA at the designing stage of the project prior to the approval of ESIA and Livelihood Restoration Plan (LRP) reports so that the APs and other stakeholders have recourse to refer their concerns and grievances. The GRC will consist of the following persons: (i) MD-LWASA as head of GRC, (ii) Deputy Managing Director, (iii) Project Director-PMU, (iv) representative of DC office, (iv) representative of PMC, (v) representative of Contractors (on call), (vi) representative of relevant government offices (on call), (vi) two to three representative of the Affected Persons. The ES staff of PMU shall organize training on GRC for the LWASA, PMU, Contractors, sub-contractors and service providers with the assistance of ES staff of PMC to orient about the GRM, grievance registration and handling procedures as laid down in the ESIA and LRP.

A hearing can be called with the GRC, if necessary, where the PAF(s) can present details of his/her/their concerns and grievance. The process will facilitate resolution through mediation. The GRC will meet as necessary when there are grievances to be addressed. The GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within twenty working days, depending on the nature of grievance. The ES staff of PMC and Contractors will have observer status on the committee, if required. If unsatisfied with the decision, the existence of the GRC shall not impede the complainant's access to the government's administrative or judicial remedies.

The functions of the GRC are as follows: (i) resolve problems and provide support to affected persons arising from various social, resettlement and environmental issues such as land acquisition (temporary or permanent, as applicable), asset acquisition, eligibility for entitlements, compensation and resettlement assistance as well as environment issues including dust, noise, utilities (electric power, gas, telephone optical fiber, water supply, waste disposal, traffic interference, access and public safety), (ii) reconfirm grievances of PAPs, categorize and prioritize them and aim to provide solutions maximum within two to 20 working days; and (iii) report to the aggrieved parties about developments regarding their grievances and decision(s) of the GRC. The ES staff of PMU will be responsible for processing and presenting all relevant documents, field enquiries and evidences to the GRC, maintaining a database of complaints, recording decisions, issuing minutes of meetings and monitoring to see that formal orders are

issued and to ensure that required actions against decisions are being carried out. The PMC and Contractors ES staff will assist PMU in these tasks as and when required.

6.5.3 Third Tier of GRM

In the event that a grievance cannot be resolved directly by the PMUs (first tier) or GRC (second tier), the affected people can seek alternative redress through the district administration, the Secretary Housing of Urban Unit and Public Health Engineering Department (HUD&PHED) or higher level administrative authorities and the court of law or as appropriate. The PMU or GRC will be kept informed by the district or local administration, or any other authorities. The grievance redress mechanism and procedures are depicted in Figure 6.1. The monitoring reports of the LRP and EMP implementation shall include the following aspects pertaining to progress on grievances: (i) number of cases registered, level of jurisdiction (first, second, and third tiers), number of hearings held, decisions made, status of pending cases; and (ii) lists of cases in process and already decided upon, may be prepared with details such as name with copy of National Identity Card (NIC), complaint number, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e., open, pending and closed).

6.6 PURPOSE OF THE GRIEVANCE REDRESS COMMITTEE

The purpose of this grievance redress committee (GRC) is to provide means to seek investigation and effective resolution of grievances related to any of the issues on social, resettlement and environment performance of the project. And the purpose of LAR Coordination Committee (LCC) is to provide means to seek effective redress of issues related to land acquisition and compensation.

Table 6.1:: Composition Project Level GRC

	Members	Designations
1.	Managing Director LWASA	Chair of the Committee
2.	DMD Engineering LWASA	Deputy Chair, will preside over meetings when Chair is unable to attend
3.	Director LWASA relevant section	Member
4.	Land Acquisition Collector of LWASA and LDA	Member
5.	Assistant Land Acquisition Collector of LWASA	Member
6.	Project Director-WWTP	Member (also act as secretary of the committee)
7.	Environment and Social Staff-PMU	Member
8.	Environment and Social Staff-Supervision Consultant	Observer
9.	Environment and Social Staff-Supervision Contractor	Observer
10.	Team Leader-PMC	Member (on call)
11.	Chief Resident Engineer- Contractor	Member (on call)

6.7 ROLE OF LAND ACQUISITION AND RESETTLEMENT COORDINATION COMMITTEE

LAR Coordination Committee (LCC) will play the role of Grievance Redress Committee to redress the grievances related to land acquisition and compensation issues. The ES staff of PIU, with the assistance of ES staff of PMC and EPC Contractor will fully inform the APs of their rights and of the procedures under the LAA for addressing complaints both verbally or in writing during the process of land acquisition and compensation. Care will always be taken to prevent grievances rather than going through a redress process. This can only be obtained through careful implementation of the EMP and LRP, by ensuring full participation and consultation of the PAPs, and by establishing extensive communication and coordination between the affected people, the PMU, the LAC and local government.

Table 6.2: Composition LAR Coordination Committee

	Members	Designations
1.	Deputy Commissioner (District Land Acquisition Collector)	Chair of the Committee
2.	Additional Deputy Commissioner Revenue (Land acquisition)	Deputy Chair, will preside over meetings when Chair is unable to attend
3.	Managing Director LWASA	Member
4.	Land Acquisition Collector of LWASA and LDA	Member (also act as secretary of the committee)
5.	Tehsil Dar Acquisition (Shalimar Tehsil)	Member
6.	Assistant Land Acquisition Collector of LWASA	Member
7.	Environment and Social Staff-PMU	Member
8.	Chief Resident Engineer-Design and Supervision Consultants	Member (on-call)
9.	Staff of concerned departments	Member (on-call)

The LCC will serve a due diligence function on land acquisition. It will meet once in a month and will review the progress of the land acquisition and compensation process of the project, seek reports from the LAC, the Project Director and APCs, take cognizance of delays and anomalies in the process, suggest remedial measures and, if necessary, bring them to the notice of the DC Lahore and Punjab Board of Revenue.

6.7.1 Functions of GRC and LAR Coordination Committee

The GRC and GRM will perform following functions:

- Ensure effective implementation of the Grievance Redress Mechanism on the issues that fall under their jurisdiction;
- Ensure an easy access to GRM having provision to file grievances verbally or by phone, in writing or via web based provision including the option of submitting grievances anonymously;

- GRC and LCC will look into all retained grievances and effectively address and resolve them within 15 days from the receipt of the grievances, in a timely and impartial manner;
- The GRC and LCC will deal promptly with any issues relating to land acquisition, resettlement, compensation or resettlement assistance that is brought before it;
- The GRC and LCC will take decisions on the basis of consensus or majority of votes;
- When required, the GRC and LCC would seek the assistance of other persons and institutions;
- Speaking orders and decisions of the committee on the grievances shall be recorded and replied to aggrieved parties and persons with a copy kept as record;
- In case, aggrieved is not satisfied by the decision of the GRC and LCC, s/he/he can prefer an appeal within ten days of the receipt of decision, the GRC could refer the case to the appropriate forum after examining the appeal; and
- In the event that a grievance cannot be resolved by GRC, the affected person can seek alternative redress through the higher administrative authority or court of law or as appropriate.

5.3 PROVISIONS OF GRIEVANCE REDRESS MECHANISM UNDER LEGAL FRAMEWORK OF GOVERNMENT OF PUNJAB

Environment Protection Agency Complaint Section

A Complaint Cell is already functional in EPA-Punjab for addressing public complaints regarding environmental pollution. This section of EPA is responsible for:

- Maintaining the record of public complaints received by the Office of the Director General, EPA Punjab and subsequent actions taken to find solutions to these issues; and
- Processing all grievances regarding environment received at online petition cell of the Chief Secretary, Punjab.

Punjab Information Technology Board has designed an effective Complaint Management System (CMS) for the assistance of Environment Protection Department (EPD) for recording and processing of complaints and take further necessary actions to deliver the services and take steps to eradicate the problems of pollution recorded. All the complaints lodged by the citizens through applications are recorded in the CMS. Different labs are operating under EPD for the testing of different materials affecting the environment and their results are also recorded in this system.

Complaints lodged are categorized according to the industry and pollution type, district name along with the violation type, and the violation is defined under different laws. Furthermore, status of the complaint, to whom the complaint will be sent, is also selected within the system. This information system provides summary of reports to the users of EPA in graphical representation under different categories i.e. district wise, year wise and violation type. After the lab testing of materials taken from different areas or districts which are thought to be affecting the environment, further necessary actions are taken. Either the case is discarded, depending on the results, or the case is further processed. Documents related to the complaints are recorded in the system and complaint is further transferred to different levels of hearing of case at district level or at courts. The complaints recorded can be searched, edited, saved and there is a unique feature of advance search added to the system. The salient features of the system are:

- Recording of complaints;
- Different types of reports on basis of districts, violations, industry and pollution type;
- Recording of Lab tests results;
- Record of all complaints logged at one glance;
- Record of current complaints; and
- Summary of reports under different categories.

6.3 GRIEVANCE REDRESS MECHANISM UNDER LAND ACQUISITION ACT

A grievance mechanism is also available under the Land Acquisition Act (LAA), 1894 to allow the APs appealing regarding the land acquisition and compensation. The LAA contains provisions pertaining to objections and hearings of affected people of land and associated assets. The objections are heard by the Land Acquisition Collector at different stages. The persons interested are also entitled to file reference before the Civil Court. Against the decision of the Civil Court, affected people can seek their remedy before the High Court and then the Supreme Court. Further, right to writ petition under Article 199 of the Constitution exists which empowers the interested person to challenge the acquisition itself on several grounds.

As finances will move differently for land and other affected assets associated with land and the resettlement and rehabilitation assistance (in the first case funds will move from LWASA through the LAC Office to the PAPs, while in the second case funds will go directly from LWASA to the PAPs through the Project Director of the LWWM Project), Complaint & Grievances will be addressed through two different processes: (i) project level GRM; (ii) as per provision in the LAA, described in Table 6.3. If the Land Acquisition Collector fails to satisfy the PAP(s), he/she/they can further submit their case to the higher administrative authority or the appropriate court of law.

Table 6.3: Right to Objections and Hearing under Land Acquisition Act

Land Acquisition and Compensation Issues: Hearing of objections
Section 5-A
(1) Any person interested in any land which has been notified under Section 6 as being needed for a public purpose or for a Company, within 30 days after the issue of the notification, object to the acquisition of the land or of any land in the locality, as the case may be.
(2) Every objection under sub-section (1) shall be made to the Collector in writing, and the Collector shall give the objector an opportunity of being heard either in person or by pleader and shall, after hearing all such objections and after making such further inquiry, if any, as he thinks necessary, submit the case for the decision to the Commissioner together with the record of the proceedings held by him/her and a report containing his/her recommendations on the objections. The decision of the Commissioner on the objections shall be final.
(3) Where land is needed for a Company, the Collector shall, after making such enquiries as he deems necessary, also make his recommendations to the Commissioner with regard to the area that in his opinion is reasonable for the purpose; and
(4) For the purpose of this section, a person shall be deemed to be interested in land that would be entitled to claim an interest in compensation, if the land were acquired under this act.

Section 9. Notice to Persons Interested:

(1) The Collector shall then cause public notice to be given at convenient places on or near the land to be taken, stating that the Government intends to take possession of the land, and that claims to compensation for all interests in such land may be made to him/her.

(2) Such notice shall state the particulars of the land so needed, and shall require all persons interested in the land to appear personally or by agent before the Collector at a time and place therein mentioned (such time not being earlier than 15 days after the date of publication of the notice), and to state the nature of their respective interests in the land and the amount and particulars of their claims to compensation for such interests and their objections (if any) to the measurements made under section 8. The Collector may in any case require such statement to be made in writing and signed by the party or his/her agent.

(3) The Collector shall also serve notice to the same effect on the occupier (if any) of such land and on all such persons known or believed to be interested therein, or to be entitled to act for persons so interested, as reside or have agents authorized to receive service on their behalf, within the revenue district in which the land is situated.

(4) In case any person so interested resides elsewhere, and has no such agent, the notice shall be sent to him/her by post in a letter addressed to him/her at their last known residence, address or place of business and registered under Part III of the Post Office Act, 1866.

(5) The Collector shall also serve notice of the enquiry to be held under section 11 (such notice not being less than fifteen days prior to the date fixed under sub-section (2) for determination of claims and objections) on the Department of Government, local authority or Company, as the case may be, for which land is being acquired, and require it to depute a duly authorized representative to attend the enquiry on its behalf for the purpose of making objections (if any) to the measurement of the land, claims to any interest in the land or the amount of any compensation. Such authorized representative shall be a party to the proceedings.

Section 11. Enquiry and Award by Collector:

On the day so fixed, or on any other day to which the enquiry has been adjourned, the Collector shall proceed to enquire into the objections (if any) which any person interested (and a Department of Government, a local authority, or a Company, as the case may be), has stated pursuant to a notice given under section 9 to the measurements made under section 8; and into the value of the land (at the date of the publication of the notification under section 4, sub-section (1)), and into the respective interests of the persons claiming the compensation and shall make an award under his hand of the true area of the land,

The compensation which in his opinion should be allowed for the land, and the apportionment of the said compensation among all the persons known or believed to be interested in the land, of whom, or of whose claims, he/she has information, whether or not they have respectively appeared before him/her.

Post Award:

In cases where LAC announces the award and AHHAP has received the compensation amount for loss of assets, LAC cannot make any decisions or revise its previous decisions. Such cases will be decided as per Section-18 of the LAA by the Court under Section-28 of the LAA, if AHHAP has filed the appeal within due date and time, as given below for the awareness of the PAPs

Reference to Court and Procedure Thereon:

Section 18. Reference to Court:

(1) Any person interested who has not accepted the award may, subject written application to the Collector, require that the matter be referred by the Collector for the determination of the Court, whether his/her objection be to the measurement of the land, the amount of the compensation, the persons to whom it is payable, or the apportionment of the compensation among the persons interested, amount or costs aligned.

(2) The application shall state grounds on which objection to the award is taken: Provided that every such application shall be made, -

(a) if the person making it was present or represented before the Collector at the time when he/she made his/her award, within six weeks from the date of the Collector's award;

(b) in other cases, within six weeks of the receipt of the notice from the Collector under Section 12, sub-section (2) or within six months from the date of the Collector's award, whichever period shall first expire.

(3) Notwithstanding anything to the contrary contained in Section 21, the Provincial Government may, if it has not accepted the award, refer the matter to the Court within a period of six months from the date of announcement of the award; provided that the Court shall not entertain the reference unless in its opinion there is a prima facie case for inquiry into and determination of the objection against the award.]

Section 18. Collector's statement to the Court.

(1) In making the reference, the Collector shall state for the information of the Court, in writing under his/her hand:

(a) the situation and extent of the land, with particulars of any trees, building or standing crops thereon;

(b) the names of the persons whom he/she has reason to think interested in such land;

(c) the amount awarded for damages and paid or tendered under sections 5 and 17, or either of them and the amount of compensation awarded under section 11; and

(d) if the objection was to the amount of the compensation, the ground on which the amount of compensation was determined.

(2) To the said statement shall be attached a schedule giving the particulars of the notices served upon, and of the statements in writing made or delivered by the parties interested respectively.

Section 20. Service of Notice:

The Court shall thereupon cause a notice specifying the day on which the Court will proceed to determine the objection, and directing their appearance before the Court on that day, to be served on the following persons, namely: -

(a) the applicant;

(b) all persons interested in the objection, except such (if any) of them as have consented without protest to receive payment of the compensation awarded; and

(c) if the objection is in regard to the area of the land or to the amount of the compensation, the Collector [and the Department of Government, local authority or Company, as the case may be, for which land is being acquired].

Section 21. Restriction on Scope of Proceedings:

The scope of the inquiry in every such proceeding shall be restricted to a consideration of the interests of the persons affected by the objection.

Section 22. Proceedings in Open Court:

Every such proceeding shall take place in open Court, and all persons entitled to practice in any Civil Court in the province shall be entitled to appear, plead and act (as the case may be) in such proceeding.

23-A. Cross Objection– The Provincial Government, or a local authority or a Company for which land is being acquired, may lodge a cross objection to the objection made by any person interested and the Court may reduce the amount awarded by the Collector if it considers it just and proper.

7 ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS & MITIGATION MEASURES

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 subproject. A brief qualitative description of each aspect and the affected environment is presented in this section.

7.1 IMPACT IDENTIFICATION AND EVALUATION

Potential impacts of the proposed project have been identified on the basis of literature review, site surveys and expert opinion on prevailing site conditions and sensitive receptors. A comprehensive map showing sensitive receptors is given as **Figure 4.11**. Identified impacts have been evaluated through characterization and environmental impact matrix.

7.1.1 Project Impact Evaluation Matrix

The Impact Evaluation Matrix has been developed by placing project activities along one axis (i.e. Y-axis), and on the other axis (i.e. X-axis) the different environmental parameters likely to be affected by the proposed subproject actions grouped into categories i.e. physical, ecological and socio-economic environment. Significance of impact was assessed for Impact Matrix as follows:

Notion of Significance for Impact Evaluation Matrix

Impact significance depends on both the nature of the impact and on the sensitivity of the receptor. The more sensitive the receptor the greater will be the significance of impact from that proposed activity. For this EIA, activities and nature of impact are combined with the sensitivity of the receptor to evaluate the significance of the impact. The significance of impact is characterized as *very low, low, moderate, high* and *very high*.

Following the assessment of magnitude, the quality and sensitivity of the receiving environment or potential receptor has been determined and the significance of each potential impact established using the impact significance criteria matrix as shown below. Most of the potential impacts can be mitigated by implementation of various types of mitigation measures, however, some residual environmental impacts may remain after mitigation. Notion of significance is provided in **Table 7.1**.

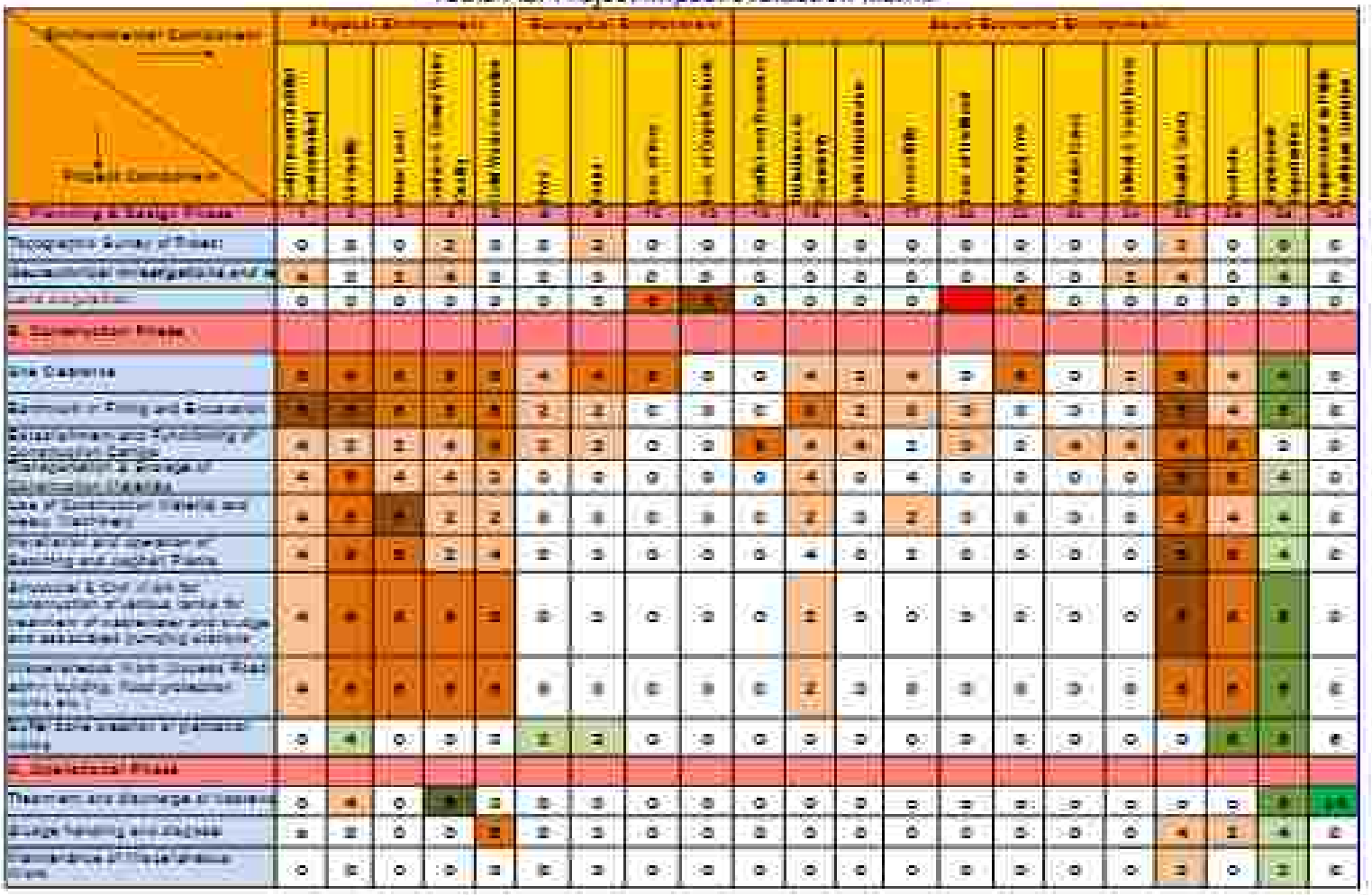
Table 7.1: Notion of Significance

Magnitude of Impact	Sensitivity of Receptors			
	High (4)	Medium (3)	Low (2)	Negligible (1)
Major (4)	16	12	8	4
Moderate (3)	12	9	6	3
Minor (2)	8	6	4	2
Negligible (1)	4	3	2	1

Positive Impact Score	Impact Significance	Adverse Impact Score
0	Negligible	0
2 to 4	Low	2 to 4
4 to 8	Medium	4 to 8
8 to 12	High	8 to 12
>12	Very High	>12

A Project Impact Evaluation Matrix is given as Table 7.2

Table 7.2: Project Impact evaluation Matrix



7.2 ANTICIPATED IMPACTS DURING PLANNING/DESIGN PHASE

Following is the description of impacts envisaged and the recommended mitigation measures during Pre-construction/Design Phases.

7.2.1 Environmentally Responsive Design Considerations

Designing of the project components without considering the prospective and futuristic needs can result in structures with low social acceptability and functionality.

The proposed project consists of design of WWTP along with allied components. WWTP design is the major component of the project. It is important to carefully calculate design flows to avoid oversizing or resizing the structure of the treatment plant. The received influent is expected to have high BOD about 225mg/l and COD about 450mg/l which will be treated in treatment plant to discharge the effluent of desired quality having BOD less than 80mg/l and COD less than 150mg/l to meet the requirement of PEQS, 2016 as given in Section 3. Improper designed of the treatment facility may lead to failure and financial loss. The different components of the project must be properly planned; else it may lead to both technical and social problems along with environmental issues of back flow creating foul smell and unhygienic conditions.

Adequate planning for treated effluent and sludge disposal is required to ensure an environmentally benign treatment process. This impact is permanent and moderate negative in nature.

Mitigations:

- Wastewater flows shall be carefully calculated to avoid oversizing of the treatment plant;
- Treated effluent shall be disposed off in cant drain passing from the project area. It is planned to upgrade this cantonment drain into Treated Effluent Channel from WWTP discharge point upto River ravi.
- All structural, layout and engineering designing shall be in strict accordance with the applicable by-laws and engineering parameters;
- Adequate planning for treated effluent disposal and sludge disposal shall be done to ensure an environmentally benign treatment process;
- The conveyance channel from cant drain to babu sabu influent pumping station shall be designed while keeping in view the projected wastewater flow, flooding risks and other design parameters;
- Proper storm water drainage system shall be designed for the proposed WWTP according to the national/international engineering guidelines.

7.2.2 Flooding Patterns

Since the proposed site for WWTP is located in the flood plain of River Ravi downstream of the existing flood protection bund. Floods, if hit proposed WWTP, may damage equipment, civil work and put the WWTP out of operation. Therefore, it is essential to provide flood

protection arrangement to protect the treatment plant. However, any obstruction in the floodplain increases the potential for flooding of adjacent and downstream area and interferes with natural hydrological processes. The construction in the flood plain may alter the volume of water it may hold, thus altering the extent of the area under flood. This will be a major negative and permanent impact.

Mitigation measures:

- WWTP and its allied components shall preferably installed in the un-flooded zone during 100-year flood event, which has been identified in Flood Assessment Study of Wastewater Treatment Plant carried out by Groupe Huit Consultant.
- All pumping stations and electrical equipment should be located higher than the maximum flood level as proposed in Climate Risk Assessment Study by Groupe Huit Consultant.
- Flood protection dykes shall be provided around WWTP boundary and conveyance channel;
- The boundary for the treatment plant will act as a barrier, pushing water away from WWTP site;
- Stone pitching will be provided to protect dyke slopes against wave action; and
- A spur exists on the upstream of the proposed project area, whereas the Motorway (M-2) runs along its eastern side. These existing structures also secure the proposed project area against detrimental effects of flood discharges.

7.2.3 Climate Change Impacts:

A detailed Climate Risk Assessment study of this project (attached as Annex-IV), has been performed by Groupe Huit Consultant. The outcomes of this study has been reproduced in this para. The study has been performed with two perspectives i.e. the impact of climate change on the project and impact of project on climate change. After assessing various components of climate change, the study revealed that area is highly susceptible to climate risks specially floods, droughts, and extreme heat. Other impacts such as cyclones, landslide, earthquake and forest fire will not have a significant impact on project area.

The project will result in contributing to greenhouse gases in following ways;

- Most of the components of WWTP will have to be imported as Pakistan does not have locally manufactured component. Importing equipment will increase carbon foot prints; and
- The selected technology for WWTP needs continuous supply of electricity. However, frequent load shedding in the project area will necessitate the need for use of diesel generators which will result in GHG emissions.

This is a major impact that needs to be addressed.

Mitigation measures:

- Design of WWTP and allied structure to protect flooding risks as given under heading 7.2.2 - Flooding pattern;
- Droughts are expected due to water shortage or damage of crops due to floods. As

groundwater in Lahore is already contaminated with Arsenic and surface water source. Water use will be minimized and the project itself aims to improve water quality. Although it will be not have a significant impact, however the project will not aggravate risk of drought
- Design/ use of the components which can withstand extreme heat events.

7.2.4 Soil

The soil may be exposed to erosion during removal of vegetation, excavation, leveling/compaction and concrete surfacing of various components of the project. The soil erosion may increase in monsoon. Soil may get contaminated by seepage of the wastewater during operation. The impact is minor negative and temporary in nature.

Mitigation measures

Mitigation measures during planning/ design phase include the following:

- The design shall consider minimum removal of vegetation. The vegetation will be removed only from the locations where WWTP and its allied components is to be installed. Other green area on the project site will not be removed unless need arises.
- Geotechnical investigations of the project area shall be carried out before design, and
- Selection of lining material for sludge storage ponds shall be based on the soil permeability.

7.2.5 Surface water Quality

The main surface water body identified in the project area is River Ravi. The quantity of water in River Ravi near Lahore has been greatly reduced due to the construction of Thein Dam in India. River Ravi receives huge amount of untreated wastewater from the City of Lahore and other industrial discharges from different sources especially: Cantonment Drain, AIT Drain, and Hudyara Drain, a natural drain which carries pollution loads from both Pakistan and India. These wastewater discharges, along with reduction in available water naturally in River Ravi for dilution, has greatly deteriorated the quality of river water. The proposed project will reduce the direct discharge of untreated waste water, consequently improving the river water quality. The impact is major positive and permanent in nature. However, following contingencies may be expected during construction and operation phases of the project:

- Surface runoff in case of over flow/flooding;
- Direct discharge of untreated wastewater during maintenance of ponds; and
- Improper design of the outlet may result in decreased efficiency of WWTP leading to contamination of receiving water body.

Mitigation measures

- The WWTP capacity shall be designed to cater accidental increase in inflow of wastewater.

- Existing arrangements for the disposal effluent shall be continued with proper gated arrangement on the drain and inlet of WWTP to cater for extra discharge to be received from upstream side during operation of the WWTP or its closure for maintenance or any other emergency.
- Proper gated arrangements in the design shall be provided at exit side of the treated effluent water before its discharge in the river to avoid entry of flood water in case of any flood; and
- The design shall also consider option of trapping channel outlets e.g. using a submerged exit pipe baffle to prevent syphoning and transfer of surface crusts to subsequent ponds.

7.2.6 Groundwater Quality

The ground water in the project area is encountered at a depth of 250 ft. The ground water may get contaminated during construction by the improper handling of construction material (fuel, lubricant, bitumen, asphalt etc.) or sanitary water from construction camps. During operation probability of seepage through the surface of ponds may also contaminate groundwater. This impact is permanent and moderate negative in nature.

Mitigation measures

- Selection of liner during the planning stage shall be considered to control seepage efficiently.

7.2.7 Seismic Hazard

The project area is located in Seismic Zone 2A, where 2A (lower limit of moderate damage) represents peak horizontal ground acceleration from 0.03 to 0.15g. In this Zone, designing of various types of structures shall be done on the basis of Peak Ground Accaleration (PGA). A low to moderate intensity earthquake impacting the project site can adversely impact the development. This will be a permanent and medium adverse impact.

Mitigation measures

- The proposed structure shall be designed and constructed to withstand low to moderate earthquakes. For seismic hazard analysis, updated structural and seismic evaluations shall be consulted; and
  To mitigate the seismic hazard, Seismic Building Code of Pakistan 2007 (SBC-07), shall be adopted. This code specifies minimum requirements for seismic safety of buildings and has to be applied and used by engineers in conjunction with the necessary understanding of the concepts of structural geotechnical and earthquake engineering.

7.2.8 Land Acquisition and Resettlement

The Wastewater Treatment Plant (WWTP) will be constructed on a new site for which 836.40 acres of land already has been acquired by WASA, Lahore in different tenures up to 1998 according to the Land Acquisition Act of 1894 (LAA-1894, but during the impact assessment

survey, some people mentioned that they have filed cases in courts of law against compensation issues. Indeed, these people expressed being in disagreement with the compensation provided by when the land was acquired by L-WASA. There are in total seven court cases.

However, the proposed project site has been encroached by the locals. Large area of project is under cultivation. Some katcha structures and sheds has been erected in WWTP site where farmers/workers reside to look after crops and animals. These will be affected due to proposed project. Clearing of the project area will results in loss of livelihood and economic displacement of the affected people. This is major negative impact.

Mitigation measures:

- For the compensation of the affected person against loss of crops and other assets Resettlement Action Plan is being prepared as per social safeguards policy of the AFD.
- The compensation value shall be calculated based on the market value of the crops and average yields in the project area;
- Proper compensation will be provided to all the affectees losing their livelihoods.
- Compensation shall be evaluated and provided as per market rates; and
- Proper consultations and coordination's with DPs during resettlement process.

7.2.9 Disturbance to Public Utilities

Due to the proposed project, transmission lines/ electric pylon may be affected/ relocated and create disruption of public services and economics. This impact is however temporary and moderate negative in nature.

Mitigation measures:

- WWTP components shall be sited away from the electric lines at WWTP site.
- Relocation of the transmission lines, if required, shall be planned and approved before project commencement, to avoid inconvenience to the consumer.
- The provision in the design and budget for the relocation of the existing utility infrastructures wherever required shall be finalized in consultation with the concerned department.
- Close coordination with the concerned departments to curtail inconvenience to the residents of the Project Area; and
- Timely notification of activity and minimizing time to relocate the utilities.

7.2.10 Physical Cultural Resources

Physical and cultural resources identified in the vicinity of the project area were Jamia Masjid Ashrafia in Talat Park and a mosque and shrine of Baba Boota in Shadewal. These resources will not be affected by the project activities as these are away from the project.

7.2.11 Emergency Management

Emergency management in case of natural and man-made disaster is a major concern. Increased incidents of disasters especially act of terror, fire, power failure, earthquakes etc demand proper planning. The impact will be permanent and high adverse in nature.

Mitigation measures

- An emergency response plan is proposed to be formulated by the contractor which shall emphasize line of action for rescue, medical emergencies, natural disasters and firefighting operations. Emergency Response Plan has been attached as Annex-V

7.2.12 Ecological Impacts

Trees of varying species and sizes and vegetation exist in the project area. The flora of the project area includes fruit trees, crops and vegetables. The vegetables observed were cabbage, cauliflower, sugarbeet, turnip, coriander leaves, spinach, reddish and oberjine etc. The crops in the field observed were wheat and mustard. The project involves tree cutting (around 1920 Nos.) and removal of crops which will disturb the natural habitat of predominant fauna and food source in the area. The impact is permanent and major negative in nature.

Mitigation measures

- Compensatory planting for ten trees against each fallen tree of similar floral function shall be planned;
- Provision of compensation in the project budget for the loss of fruit trees shall be made to the affected people;
- A detailed tree plantation plan shall be devised at planning stage.;
- One affected tree shall be compensated by planting10 trees at available spaces;
- Plantation plan shall prefer the prevalent indigenous species of plants, and
- A plan for transplantation of trees especially fruit trees shall be devised.

7.2.13 Gender Issues and Involvement

The project does not have any impact during the design stage. However, during the lifecycle of the project, females may face issues and AFD standards aims to ensure i) gender inclusiveness at all stages is and that ii) project impacts will not exacerbate any inequalities. So gender issues needs to be addressed during planning/designing phase.

Mitigation measures

- Gender issues will be identified during the design phase through inclusive surveys and consultations (including men, women and representative of vulnerable groups);
- A detailed Gender Action Plan will be devised to ensure gender inclusiveness throughout the lifecycle of the project.

7.2 ANTICIPATED IMPACTS DURING CONSTRUCTION PHASE

7.2.1 Topography

Topography will have low adverse impact during construction stage due to removal of vegetation, trees and crops, channelization of drains and excavation/ earth work for the construction of ponds. This impact is minor negative and permanent in nature.

Mitigation measures:

- Dykes can be constructed using excavated materials. It will also help in protection from flooding as the project area lies in flood plain.

7.2.2 Soil

Impact on topsoil and soil stability is mainly expected during the preparatory and construction works, which will be caused by the arrangement of the construction camp, construction site, replacement of the equipment, earthworks, arrangement of temporary and permanent infrastructures, etc.

The soil would be exposed to erosion due to removal of vegetation, establishing construction camps / workshops and excavation etc. The most significant aspects in the construction phase of the proposed treatment plant concerning the soil impact are excavation works, road construction and ponds construction works. These will expose soils in the affected project area leaving them vulnerable to erosion by surface run-off and wind. The overall threat could exist for the durations of construction works in the monsoon season.

On the other hand, the construction of the wastewater treatment plant will involve building large embankment structures on land, which will result in a loss of the option for alternative land use and thus represents an irreversible commitment of land resources.

Besides, there is high possibility for soil pollution with substances due to leakages of fuels and oils from the heavy vehicles and machinery used for construction and due to applied chemicals during this phase.

Mitigation measures:

- In order to prevent the damage and contamination of soil at the project site, surface layer of the soil shall be removed and stored temporarily in pre-selected locations. The soil shall be stockpiled separately. Stockpiles shall be protected from wind and atmospheric precipitation and shall be at least 50 meters away from surface water body.
- Stored excavated material shall be covered and preferably reused, e.g. in construction of dykes etc.
- Sprinkling of water may help in reducing the erosion soil.
- Use of heavy machinery shall be restricted as far as possible to work sites only to avoid the destruction of soil structure.

- Vehicles and equipment shall be checked regularly. In case of damage and fuel / oil leakage, it shall be repaired immediately. Damaged Vehicles shall not be allowed on the construction sites;
- In case of spillage of pollutants, spilled material shall be localized and contaminated site shall be immediately cleaned. Staff shall be provided with appropriate means (adsorbents, shovels, etc.) and with personal protective equipment as well;
- All spoils shall be disposed of at site designated by LWMC and the site shall be restored back to its original conditions;
- Non-bituminous wastes from construction activities will be dumped in approved sites in line with the guidelines for dump sites, and shall be covered;
- Washing yards shall be paved to avoid seepage of runoff from the yard;
- After completion of construction works, all kind of waste (including hazardous waste) will be collected and removed from the area. Hazardous waste shall be removed for further management by the licensed contractor; and
- Perennial grasses and shrubs trees shall be planted to control the runoff on the site.

7.3.3 Water Quality and Usage

The potential sources of water pollution associated with the construction of proposed project have been identified and include:

1) Construction Site Runoff

Runoff from the construction works area may contain increased loads of sediments, suspended solids and other contaminants. Potential sources of pollution from the site include:

- Runoff and erosion from exposed soil surfaces, earth work areas and stockpiles e.g grouting and cement material with the rain;
- Wash water from dust suppression sprays;
- Fuel and lubricants from maintenance of construction vehicles and mechanical equipment;
- Spillage of liquids stored on-site such as oil, diesel, and solvents etc. are likely to result in water pollution; and
- Uncontrolled discharge of debris and rubbish such as packaging, construction material and refuse.

2) Wastewater Produced by On-site Work Force

Waste water would be generated from the workforce during the construction phase. However, waste water can be adequately treated by interim sewage facilities, such as portable toilets, which can be installed within the construction site.

Construction waste, if left unattended will result in forming leachate that will percolate through the soil strata and will reach underground water table and hence, will end up contaminating groundwater. There is a probability that various materials like fuel, lubricant oil and other oily products, which are used during the construction phase may contaminate groundwater and channels carrying water.

Mitigation measures:

- Protection of groundwater reserves from any source of contamination such as the construction and oily waste that will degrade its potable quality;
- Water required for construction may be obtained in a sustainable way that the water availability and supply to nearby communities remain unaffected;
- Stockpiles of cement and other construction materials shall be kept covered when not being used;
- Avoid fuel and other chemicals being stored at numerous locations around the site;
- Maintenance of vehicles and plant shall be carried out only on impermeable areas where any oil spillages can be contained;
- Oils, fuel and chemicals shall be stored at bunded fuel stores and mobile bunded stores;
- Careful planning of the works to minimize soil excavation works during rainy seasons;
- All kinds of waste shall be stored in covered containers and disposed of safely as soon as possible;
- Proper monitoring to check the compliance of PEQS will be carried out;
- Sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit;
- Temporary sanitary facilities, such as portable chemical toilets, shall be employed on-site. A licensed contractor would be responsible for appropriate disposal and maintenance of these facilities;
- Sand/silt removal facilities such as sand traps, silt traps and sediment basins will be provided to remove the sand/silt particles from run-off. These facilities will be properly and regularly maintained. These facilities will be carefully planned to ensure that they would be installed at appropriate locations to capture all surface water generated on site; and
- Contractors will be required to observe drainage conditions during dewatering operations and storm events to assure positive drainage. If flooding occurs along roadways or in neighborhoods, or community complaints arise, the contractor will undertake a combination of the above mitigation measures to minimize drainage and water quality impacts.

7.3.4 Air Quality

Air quality will be affected by various construction activities. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. In certain climatic condition such as hot summer in the city of Lahore, airborne dust can become a major nuisance if control techniques are not properly employed. The critical sources of air pollution during the construction phase will be:

- Unpaved road surface;
- Transportation of materials;
- Construction equipments;
- Vehicular exhaust; and
- Burning of fuel for cooking by workers.

The air emissions may cause health impacts such as dryness and roughness of the throat, eyes, nose, etc. to the workers and staff of the contractor. These emissions may also affect the bio-physical environment. The impact is minor negative and temporary in nature.

Mitigation measures:

Mitigation measures for emissions include the following:

- All vehicles, machinery, equipment and generators used during construction activities shall be kept in good working condition, properly tuned and maintained in order to minimize the exhaust emissions;
- Open burning of solid waste from the contractor's camps shall be strictly banned;
- Use of fuel with substantially lower sulphur content;
- Proper maintenance and repair of power generators and construction machinery is needed to minimize the hazardous emissions;
- Personal protective equipment like masks, goggles and gloves etc., shall be provided to workers; and
- PEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery shall be enforced during construction works.

Dust problems caused during the 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:

- Regular water sprinkling on the site and access roads shall be carried out to suppress excessive dust emission(s).
- For dust control, additives has been developed that agglomerates particles, making them heavier and lowering dispersion in the air, generating less dust. This leads to better air quality on site, less material wasting and a cleaner job site.
- Construction workers shall be provided with masks for protection against the inhalation of dust;
- The vehicles carrying construction materials and the construction material storage areas shall be covered with tarpaulin;
- Vehicle speed in the project area shall be prescribed not more than 20 km/ hr and controlled accordingly;
- Tyres of all the vehicles leaving the site shall be washed. No earth, mud and dust shall be deposited on the public road; and
- Any material dropped on the paved roads will need to be cleaned up immediately to prevent dust nuisance.

Measures to Reduce GHG Emissions

- All stakeholders (LWASA, consultants, contractors, concessionaires) need to become aware that their actions at all stages of a project can contribute to reducing the CO2 burden.
- Elimination of unnecessary idling can save fuel, prolong engine life, and reduce emissions. It can also help reduce the noise levels associated with construction. Unnecessary idling occurs when trucks wait for extended periods of time to load or unload materials or supplies, or when equipment is left on when it is not being used.

- Managing equipment operations and training workers to reduce unnecessary idling is a relatively easy way to lower operating costs and help reduce the environmental impact of construction;
- A preventive maintenance program by the contractor seeks to maintain engines at their original level of performance and eliminate the high cost of catastrophic engine failure. Preventive maintenance is the systematic inspection, detection, and correction of potential construction equipment failures. It significantly reduces fuel consumption and emissions; and
- Use of low sulfur and good quality fuel in the construction vehicles or operating equipment that will reduce maintenance costs and harmful emissions.

7.3.5 Noise and vibration

The noise may be produced due to the operation of construction machinery and equipment related to activities like site clearance and construction of various structures. Health risks associated with exposure to continuous noise levels includes increase in blood pressure, hypertension, temporary threshold shift etc. Sources of noise during construction are heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills and other equipments.

Mitigation measures:

All mitigation measures mentioned below shall be taken in order to minimize the impacts of noise in the project area. These measures include, but are not limited to the following:

- Selection of up-to-date and well maintained construction equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices;
- Confining excessively noisy work to normal working hours in the day, as far as possible;
- Providing the construction workers with suitable hearing protection like ear cap, or earmuffs and training them in their use;
- Vehicles and equipment used shall be fitted, as applicable, with silencers and properly maintained;
- Use of low noise machinery, or machinery with noise shielding and absorption.
- Timing of the construction works to be conducted during the recommended operational hours, to reduce vibration levels to residential properties; and
- The equipment operators to be made aware by the contractor of potential vibration issues problems and of techniques to minimize vibration effects during construction works.

In general following are the 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 shall 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 shall 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 shall be greater than its height. The noise source shall not be visible and barrier shall 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. Administrative controls include activity planning, for example, scheduling pavement breaking operations so as to reduce the number of work site workers exposed. In addition, noisy equipment shall not be run for periods longer than necessary and shall be switched off when not in use.

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 shall be fixed as soon as possible. Ideally, the worksite shall have a system in place for checking and servicing the various machines and power tools.

Noise Perimeter Zones

Noise perimeter zones (NPZ) are another administrative control to limit exposure to noisy processes or equipment to as few workers as possible. NPZ are areas where noise levels of 90 dB (A) or more are roped off and marked to keep out all workers who don't have to be there. NPZ can be set up using a sound level meter to find the safe distance from the source (90 dB (A)) and the NPZ can be set up at that distance. Noise does not radiate from the source at the same level in all directions. Noise from machinery can be higher in one direction than another because the noise can also be either absorbed or reflected from surfaces it contacts, such as the ground or a wall. Therefore, measurements will be taken at several points in an area where people might be working. Once noise levels that are 90 dB (A) or more are determined, rope off this area as the Noise Perimeter Zone. Exclude all workers who do not

need to be in that zone. All workers who need to work within the zone must wear hearing protection.

7.3.5 Solid Waste (Municipal, Construction & Hazardous)

Due to construction activities, municipal and construction waste will be generated from construction activities and contractors camps. Improper dumping of waste may generate odour and attract mosquitoes and other disease vectors. Empty containers containing the toxic, flammable and corrosive materials may pose hazard to the workers. Construction waste will include excavated soil, sand, gravel, wood, metal pieces and electrical wires. Whereas hazardous waste can be comprise paints and construction chemicals. Handling and storage of oil, asphalt-bitumen may be a source of environmental pollution as a hazardous waste. This will result in unhygienic conditions, health risk to work force at the camp site.

Improper disposal of construction waste can lead to nuisance and hazards towards environment and local population. The unspent materials and debris produced from consumed up materials, if left as such and allowed to mix with soil underneath, can degrade the quality of receiving soils and render them unfit for plantation. Leakages of oils, lubricants, chemicals, and other similar substances from their storage sites can spoil the receiving soils and may undermine ability of the spoiled soils to support growth of vegetation and plants.

This may result in health risk to work force and public, if disposal process is mishandled and disposal site is improperly selected. This impact is temporary, site specific and minor negative in nature.

Mitigation measures:

- The waste generated from the camp site will be disposed off at approved sites;
- Burning of waste shall be prohibited;
- Skips and bins will be strategically placed within the campsite and construction site;
- The skips and bins at the construction campsite shall be adequately designed and covered to prevent access by vermin and minimize odour;
- No refueling, storage, servicing or maintenance of equipment should take place within 100 feet of a drain or other sensitive environmental resources;
- General and hazardous waste shall be labeled and segregated;
- Ensure proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.
- Solid Waste shall be safely disposed of at a designated waste disposal site by an approved contractor;
- Proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.;
- Training employees involved in the transportation of hazardous material regarding emergency procedures;
- The contractor shall ensure implementation of waste management plan;
- Training of working force in the storage and handling of materials and chemicals that can potentially cause soil contamination;
- Training of staff regarding handling of different types of waste, waste minimization, reuse and recycling practices shall be ensured.

- 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; and
- The contractor will develop specific environmental management plans for asphalt plants and concrete batching plants. These plans will incorporate the general measures as applicable to the proposed Project, but will also have focused mitigations for solid waste from these plants.

A plan for construction waste management is attached as **Annex-VI** which may be taken as a reference for the formulation of site specific plan.

7.3.7 Visual Impacts and Aesthetics

Possible visual impacts during construction phase activities are likely to arise from fugitive dust generated from site preparation, on-site storage of construction material and storage of construction debris, physical presence and operation of labour camp, etc. This impact is temporary and minor negative in nature.

Mitigation measures

- The area demarcated for proposed WWTP shall be fenced and all the construction activities shall be restricted within the demarcated site.
- Condition of the site approach road shall be improved and same shall be kept free of dust and mud through implementation of dust suppression measures.
- All temporary structures, surplus materials and wastes shall be completely removed on completion of works and the area re-landscaped.

7.3.8 Ecological Impacts (Flora and Fauna)

Trees serve as lungs to the ecosystem. They absorb CO_2 and produce oxygen and thus purify air. It also serves for noise abatement, cooling effect on earth through transpiration, supply of oxygen through photosynthesis. The project requires tree cutting and removal of vegetation. The cutting of these trees will cause major negative and permanent impact on the surroundings as well as fauna of the project area. Following impacts are expected on the ecology of the project area.

- Approximately a total number of 1920 trees will be removed due to project implementation;
- During the construction of wastewater treatment plant, due to clearing and grubbing activities and installation of construction materials, natural vegetation, which includes herbs, shrubs and trees, will be damaged, resulting in potentially adverse environmental impact.
- Construction of access roads, installation of machinery will require clearing of land which will be the cause of loss of ground vegetation permanently.
- During the construction phase, noise and vibrations will arise due to activities such as excavation, cutting, filling and compaction work, as well as operation of construction related vehicles. This could cause disturbance to either humans as well as the wild animals or local birds that inhabit the area.

- Furthermore, these activities will also result in emission of dust and other pollutants that will decrease the quality of air in the project area that will have an impact on humans and wildlife that inhabits the area. However, this impact is a short term effect and will not have a significant impact on the terrestrial fauna.
- Lot of noise and noxious gases produced from machinery and other activities will scare away the birds, wildlife, rodents and reptiles.
- Due to noise pollution, there will be irregular disturbance in signals of birds which they used for communication, mating and hunting.
- As a result of this disturbance, there can be decreased bird density with an increase in noise level.
- Some of the reptiles may get killed due to movement of vehicles and machinery. This will be negative impact for the fauna.

Mitigation measures:

- Cutting of trees shall be avoided, as far as possible so, that negative effects on the process of natural regeneration of species are minimized.
- Carryout reforestation of the disturbed areas after construction activities.
- For replacement of one tree, ten trees shall be planted in accordance with the tree plantation plan. So approximately, a total number of 21500 trees shall be planted. Thus, the number of plants to be raised is 10 times of plants to be removed.
- An awareness campaign targeted on the neighborhood farmers shall be run to popularize the planting of trees species especially recommended in tree plantation plan/reforestation plan.
- It is strongly recommended that minimum tree cutting shall be involved and to avoid damage/ loss of the biodiversity in the area. Contractor shall supply gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel shall not be allowed.
- Limit speed of vehicles and movement of heavy machinery only to designated access routes and operational areas.
- As far as possible, use the existing roads and paths. For new access roads, routes shall be selected, which have minimum vegetation.
- As much as possible, limit clearance of vegetation either ground vegetation or tall trees for the construction of access roads and camps. If possible, select those areas for camping sites where there is less number of plants affected. Moreover, avoid cutting those trees having habitat of birds.
- Compensation made to the land owners for the damage of trees or for the agriculture crops shall be made as soon as possible due to which the financial loss of the land owners will be minimized.
- The camps shall be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly waste of the camps shall be properly disposed of to prevent the chances of easing by wild animals, which may prove hazardous to them.
- Avoidance of critical birds concentration areas to reduce direct and indirect impacts on the birds.
- Noise due to equipment shall be avoided as much as possible by using low noise equipment. Special measures shall be adopted to minimize noise generating activities during the critical period of breeding/nestling.
- Due to cutting of trees, birds will be compelled to fly away and find some safe shelter far away from the disturbed area but plantation of trees will attract them back which will again help in improvement of the project area with rich biodiversity.

- Workers shall be restricted to go to sensitive areas every now and then because birds abundance can decrease due to human presence; and
- Dust emission shall be avoided up to the possible extent.

7.3.9 Disposal of Mucking Material

Inevitable earthwork operations during construction may open up scars on the land around the project area. This impact is temporary and minor negative in nature.

Mitigation measures:

Mitigation measure will include proper landscaping, which shall be given due consideration along with re-establishment of the local/indigenous vegetation. The excavated materials that are unsuitable for use will need to be stored, transported and disposed of appropriately at designated sites.

7.3.10 Discovery of Heritage Sites/ Structures during Excavation

During excavation, there is a chance of finding artifacts. In case of finding any artifact, the contractor shall immediately report through Supervision Consultant to Directorate General (DG) of Archeological Department, Government of Pakistan to take further suitable action to preserve those antiques or sensitive remains. Chance Find Procedure (as given in Annex VII) shall be adopted in case of any accidental discover of cultural heritage.

7.3.11 Transportation of Raw Material and Equipment

The transportation and use of heavy equipment and trucks is required during construction. Trucks will transport raw materials and heavy equipment. This has the potential to directly impact traffic flow along the road (name the access roads).

Mitigation measures:

- Adequate and appropriate road signs shall be erected to warn road users of the construction activities. For example, reduced speed near the entrance roads. This shall be done in conjunction with the traffic police department.
- Raw materials such as marl and sand shall be adequately covered within the trucks to prevent any escaping into the air and along the roadway.
- Heavy equipment shall be preferably transported early morning with proper pilotage.
- The use of flagmen shall be employed to regulate when trucks have access to the main roads.

7.3.12 Traffic Management

The proposed Project will be approaches through various major roads. These roads serve as main approach roads to the proposed Project Area and due to the proposed construction activities and movement of heavy Project vehicles for construction material supply, traffic problems may arise for the commuters and transporters travelling to the project area. The

problems will include traffic jams and inconvenience to the public passing through the Project Area. It will also increase traffic load on the existing road network or access roads ultimately deteriorating the existing condition of the roads. The movement of vehicles along the haulage routes will cause soil erosion, debris flow, dust emissions, vibrational impacts, etc. Considering these consequences, this impact can be categorized as moderate, site-specific, medium term and temporary.

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 along the major roads;
- The speed of the vehicles will be controlled (at 30 to 40 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 shall be informed to the riders through standard signs and displays.

Traffic Management Plan (TMP) has been proposed and attached as Annex-VIII. However, the contractor may take guidance from this TMP and will prepare site specific TMP which will be implemented to avoid traffic accidents, jams/public inconvenience in the Project Area.

7.3.13 Construction Camps/Camp Sites

Improper construction camp location and mismanagement of construction camp activities can lead to various social and environmental impacts which include loss of vegetation due to setting up construction camps, indiscriminate generation of solid waste, discharge of sanitary effluent, water pollution and health & safety issues. Furthermore, cultural differences, behavior of construction workers, potential disregard for local cultural norms can lead to increased tension between local communities and workers residing in the construction camps. Dissatisfaction for the proponent and local community of rehabilitation measures, if the sites are left unclear after completion of construction phase, may occur. This impact is temporary and low adverse in nature.

Mitigation measures:

- The construction camps will follow IFC guidelines ("Workers' Accommodation: Processes and Standards (ifc.org)). Such guidelines set up standards to insure proper workers management, health and safety rules within the camp and limit potential pollution and social impacts in the neighboring communities.
- Training will be provided to all staff on camp management rules and overall discipline and cultural awareness;
- 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. The final location will be determined by the construction contractors and agreed with the LWASA;
- Formulation and implementation of Waste Management Plan to ensure safe handling, storage, collection and disposal of construction wastes and the training of employees who handle waste;
- Camps shall be designed to be self-contained to reduce demand on infrastructure and services of nearby communities;
- The camp site shall be properly fenced and only authorized persons and workers will be allowed to enter;
- Selection of site for construction camp to minimize the removal of existing macro-plants at camp sites;
- Preparation of photographical and botanical inventory of vegetation before clearing the site; and
- Compensatory plantation to be scheduled when construction work near ends.

7.3.14 Social/ Cultural Conflicts

Chances of disputes related to cultural differences between the Contractor's workforce and the local inhabitants due to the mix of local and migratory job seekers may arise. Use of local resources and products by the construction workers can generate stress on the local biophysical resources. This impact is temporary and minor negative in nature.

Mitigation measures:

- Local labor shall be preferably employed for the construction works;
- Careful planning and training of work force to minimize disturbance to the local people;
- Public notification through media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and
- Adequate training of especially for the transitive workforce of the proposed WWTP (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.
- Detailed labour management plan has been attached as Annex-IX.

7.3.15 Gender Based Violence (GBV)

In the society, female plays important role in managing household as well as in income earning activities, but they face various challenges to get access to educational institutions and employment opportunities due to cultural bindings, economic vulnerability and lack of facilities.

According to Pakistan Demographic and Health Survey (PDHS), 2017-18, 28 percent of women of Pakistan age 15 to 49 have experienced physical violence, six percent have experienced sexual violence, and seven percent experienced violence during pregnancy. Three in ten women who have ever experienced physical or sexual violence sought help to stop the violence, yet 59 percent never sought help nor told anyone.

According to the population census of the Lahore district 2017, the sex ratio of females is 47.6 percent. In to order to combat gender issues, Government of Punjab introduces and implemented Punjab Protection of Women against Violence Act, 2016 to counter gender-based discrimination, violence against women, and economic and social empowerment of women. The positive steps have also been taken to encourage and promote women's participation in the political process and the workforce.

During survey, gender situation surveys and consultations with females were conducted at individual and at group levels to get their apprehension regarding the project activities and suggestions to mitigate the relevant impacts. It was observed that except in a few cases (restriction on movements), there was no gender based violence prevailed among the consulted women. However, during construction phase gender based violence might arise due to discrimination made against women by unequal work distribution and unequal pay structure among others. Sexual harassment against women might occur as a consequence of mixing of men and women at the construction site, and moving on the roads, bus stops and markets. Educational institutions near the project alignment are also sensitive regarding gender issues. This impact is negative in nature during construction stage.

Mitigation measures:

With the effective measures and monitoring, the risk of gender violence could be minimized by adopting the following mitigation measures:

- Awareness shall be created among the females at individual and community levels about the constructions sites.
- During the timing of educational institutions workers shall not be allowed to crowd in the surroundings.
- Alternative routes for pedestrian shall be provided to avoid mixing of women with workers.
- Gender protection act shall strictly be enforced during the construction activities in the project area, and monitor the implementation through field staff and district level structure.
- Raise awareness among the communities of the potential risks of GBV, and establish response services in the communities that can respond to instances of GBV (particularly those related to issues of labour influx).
- The Contractor shall make sure that no discrimination is made on the basis of gender while hiring of workers.
- Provisions of gender disaggregate bathing, changing, and sanitation facilities; and
- Contractor shall take proper measures to address and resolve issues relating to harassment, intimidation, and exploitation, especially in relation to women.

- Labour Management Plan incorporating provisions for gender is attached as Annex-IX.

7.3.16 Health and Safety

a) Occupational Health and Safety

Health risks and work safety problems may result at the workplace/camps if the working conditions provide unsafe and/or unfavorable working environment due to storage, handling and transport of construction materials. The health and safety issues are also associated with the malfunctioning in operation of construction machinery and equipment which may cause minor to severe injuries to workers. This impact is permanent and high adverse in nature.

Mitigation measures:

- 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;
- Providing basic medical training to specified work staff and basic medical service and supplies to workers;
- Obligatory insurance against accidents for labourers/workers;
- Layout plan for camp site, indicating safety measures taken by the contractor, e.g. fire fighting 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 ensure no health risks for labourers;
- Protection devices (ear muffs) shall be provided to the workers doing job in the vicinity of high noise generating machines.
- Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction;
- 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;
- Elaboration of a contingency planning in case of major accidents;
- Ensure that the site is restricted for the entry of irrelevant people particularly children.
- Adequate lighting devices, barriers, yellow tape and safety signage shall be posted.
- Material Safety Data Sheets (MSDS) shall be store onsite; and
- Environment, Health and Safety guidelines are attached as Annex-X.

Monitoring of OHS Activities

The contractor will issue OHS monitoring program and management plan. During the construction phase of proposed WWTP, occupational health and safety monitoring programs of the contractor (s) shall verify the effectiveness of prevention and control strategies. The selected indicators shall be representative of the most significant occupational health and safety hazards at the construction site and camps, and the implementation of preventive and control strategies. The occupational health and safety monitoring program shall 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 shall document compliance using an appropriate combination of portable and stationary sampling and monitoring instruments. Monitoring and analyses shall be conducted according to internationally recognized methods and standards. Monitoring methodology, locations, frequencies, and parameters shall be established individually for proposed 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 shall be adequately monitored and documented (curriculum, duration, and participants). Emergency exercises, including fire drills, shall be documented adequately. Service providers and contractors shall be contractually required to submit to the employer adequate training documentation before start of their assignment.

b) Community Health and Safety

The construction activities and vehicular movement at construction sites and access service roads may also result in road side accidents particularly inflicting local communities who are not familiar with presence of heavy equipment and machinery.

This is a temporary and minor negative impact. Quality of ground water and surface water resources available in the nearby local communities may get contaminated due to the construction activities, oil spillage and leakage, roadside accidents etc. The labourers work with different transmittable diseases may cause spread out of those diseases in the local residents.

Mitigation measures:

- The contractor will develop a community health and safety management plan
- There shall be proper control on construction activities and Oil spillage of vehicles.
- The labourers with different transmittable diseases shall be restricted within the construction site;
- Efforts will be made to create awareness about road safety among the drivers operating construction vehicles;
- Instruct foreman 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 & social links;
- Provision of proper safety signage, particularly at sensitive/accident-prone spots;
- If identified, consider guard rails at accident-prone stretches and sensitive locations;
- The communicable disease of most concern during co nstruction phase, like sexually-transmitted disease (STDs) such as HIV/AIDS and COVID-19, shall be prevented by successful initiative typically involving health awareness; education

initiatives; training health workers in disease treatment; immunization program and providing health service.

- Guidelines to combat with COVID-19 are attached as Annex-XI.
- Reducing the impacts of vector borne diseases on long-term health effect of workers shall be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which includes: Prevention of larval and adult propagation of vectors through sanitary improvements and elimination of breeding habitat close to human settlements and by eliminating any unusable impounding of water;
- During construction work pedestrian and vehicular passages shall be provided for crossing near settlement;
- Fencing around the camps shall be strong enough so that it cannot be broken easily by local people for making passages; and
- Use of water shall not disturb public water availability and source of water shall be selected carefully.

7.3.17 Emergency Response

Natural disasters 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 emergencies.

Mitigation measures

Mitigation measures include the following:

- An Emergency Response Plan for earthquakes and manmade disasters shall be developed by the contractor and proponent and shall be implemented in close consultation with the Fire Fighting Department, bomb disposal squad and paramedics.
- Training of the staff/employees regarding the emergency procedures/plans shall be regularly conducted.
- Emergency numbers shall be clearly posted; and
- Minor incidents and near misses shall be reported and preventive measures shall be formulated accordingly.

7.3.18 Employment Opportunities

Employment opportunities for skilled and unskilled labour will be generated during all the activities related to construction. This is a moderate positive impact.

7.3.19 Influx of Labor

For the implementation of Project activities, skilled and unskilled labor is required by the contractor. Mostly, skilled and unskilled workers have been associated with the contractor since long which they utilize, where they are required for the projects, and while other workers are hired from the different areas that belong to different cultural backgrounds. Social problems and conflicts that are associated with Labor influx are as follows:

- Risk of social conflict: Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences or based on competition for local resources. Ethnic and regional conflicts may be aggravated if workers from one group are moving into the territory of the other;
- Increased risk of illegitimate behavior and crime: The influx of workers and service providers into communities may increase the rate of crimes and a perception of insecurity by the local community. Such illegitimate behavior and crimes can include theft, physical assaults, substance abuse, sexual assault and human trafficking;
- Impacts on community dynamics: Depending on the number of incoming workers and their engagement with the host community, the composition of the local community, and with it the community dynamics, may change significantly. Pre-existing social conflict may intensify as a result of such changes;
- Increased burden on and competition for public service provision: The presence of construction workers and service providers (and in some cases family members of either or both) can generate additional demand for the provision of public services such as water, electricity, medical services, transport, education and social services. This is particularly the case when the influx of workers is not accommodated by additional and separate supply systems;
- Increased risk of communicable diseases and burden on local health services: The influx of people may bring communicable diseases to the Project Area, including sexually transmitted diseases (STDs), or the incoming workers may be exposed to diseases to which they have low resistance. Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the Project's medical facility and instead go anonymously to local medical providers, this can result in an additional burden on local health resources;
- Local inflation of prices, accommodations and rents: A significant increase in demand for goods and services due to labor influx may lead to local price hikes and crowding out of community consumers. Depending on Project worker income and form of accommodation provided, there may be increased demand for accommodations, which again may lead to price hikes and crowding out of local residents; and
- Increase in traffic and related accidents: Delivery of supplies for construction workers and the transportation of workers can lead to an increase in traffic, rise in accidents, as well as additional burden on the transportation infrastructure.

This impact is negative and temporary in nature.

Mitigation Measures:

- Labor camp(s) shall be established away from residential population;
- Local labour specifically PAPs will be hired for skilled and semiskilled labour to reduce labour influx and to compensate PAPs. For skilled worker, preference shall be given to the local population subject to constraints (availability of workforce, quality requirements, conformity with labor laws and regulations, flexibility in case of urgent needs, etc.);
- Females will also be employed to promote opportunities for gender involvement in income generating activities, they will be given preference for jobs spanning a spectrum from unskilled positions to highly skilled roles. Emphasis will be placed on ensuring that responsibilities and income associated with these positions are equitable and not disproportionately concentrated in lower income and responsibility

tiers. Almost 10 to 20% of the jobs will be given to females during construction which will be reflected in job notices.

- Awareness shall be created among the work force to ensure respect for local customs;
- Construction work shall be completed within the stipulated time to move workers to next location;
- Labor force shall be shuffled with the time;
- An effective GRM shall be established for the Project to resolve all issues related to the community. Thus progress regarding resolving the issues shall be monitored closely;
- Create awareness among workers on proper sanitation and hygiene practices to endorse proper health and maintain good housekeeping practices at all Project sites.
- Provide adequate personal hygiene facilities in good condition with adequate supply of clean water;
- Make arrangements to treat the affected workers on time to control the movement of vector borne diseases;
- Sensitize workers and surrounding communities on awareness and prevention of COVID-19, HIV/AIDS and sexually transmitted infections (STI) through training, awareness campaigns and workshops during community meetings.
- Provide proper and free COVID-19, HIV/AIDS and STI health screening and counselling for site workers and community members;
- Develop and enforce a strict code of conduct for workers to regulate behavior in the local communities;
- Taking all sensible precautions to avert illicit, vicious conduct by or amongst the Contractor's personnel, and to preserve unity and harmony, and protection of people and property on and near the sites.
- Prohibiting drugs, alcohol, weapons, and ammunition on the worksite among personnel;
- Site security preparations must be contained within the Bills of Quantities (BoQs) to avoid any delays which might be caused due to insecurity.
- Appropriate fencing, security check points, gates and security guards shall be provided at the construction sites to ensure the security of all plant, equipment, machinery and materials, as well as to secure the safety of site staff; and
- The Contractor must guarantee that good relations are maintained with local communities and their leaders to help reduce the risk of vandalism and theft.
- The labor management plan prepared by contractor will include specifics requirement to ensure preference of local workers and APs.

7.4 ANTICIPATED IMPACTS DURING OPERATION PHASE

The anticipated potential environmental impacts related to the proposed project have been studied for the operational stage of the project and are discussed as under:

7.4.1 Handling and Disposal of Sludge and Solid Waste

Sludge handling is important part of biological wastewater treatment processes. The proposed WWTP shall generate huge quantities of sludge which require due consideration for its management. This impact is high adverse and permanent in nature.

The solid waste will be produced from the administration building, staff quarters and workshop during operation phase. If these wastes are not properly handled, they may cause nuisance to the workers and staff. This impact is moderately negative and temporary in nature.

Mitigation measures:

Solid Waste:

- Storage bins shall be provided at the appropriate places with clear demarcation of type of wastes;
- Special storage facility shall be arranged for temporary disposal of hazardous waste during the operational phase, which shall be in compliance with environmental requirements. The facility must include exhaust ventilation system and Shelves and racks for waste disposal;
- In case of waste/sludge disposal, an approved contractor shall dispose of the sludge at the landfill site in consultation with LWMC.

Sludge:

- A short-term solution for sludge management during the first 7 to 8 years of operation is on-site storage at WWTP site which has adequate place for sludge storage, meaning sufficient area resilient to flooding. Agricultural reuse cannot be considered as (i) there is no regulation in Pakistan to allow such disposal, (ii) social acceptability will be low. Furthermore, considering the wastewater catchment and the presence of arsenic in the raw water, it is likely that the sludge will be polluted with heavy metals.
- As a medium- and long-term solution after the 7 to 8 first years of operation, following options are suggested to be adopted;
    - Design of a proper landfill site at WWTP specifically for disposal of sludge depending on actual sludge heavy metals concentrations and potential regulation changes.
    - A feasibility study can be conducted at later stages after considering the quality of sludge for use of sludge for agricultural use. A workable solution for use of sludge as fertilizer can be identified. Such feasibility study should include a cost-benefit analysis of different options identified.
- It shall be ensured that sludge will not be incinerated as incinerating sludge will contribute to GHG emissions therefore not recommended.

7.4.2 Wastewater Quality

The WWTP will have overall positive impact on the surface water by discharging treated wastewater into the River Ravi. However, accidental discharges of untreated wastewater due to the overflow, syphoning or disruption in operation during maintenance of the treatment plant may cause contamination of river water quality. Impact on water quality may occur during the maintenance works as well. The impact will depend on the type and volume of works.

There is probability of the seepage of wastewater from the treatment tanks and channels that may contain high concentrations of organic matter and heavy metals. Improper functioning or

choking of inlet or outlet of the treated wastewater may also cause the ground water contamination. The impact is moderate negative and permanent in nature.

Mitigation measures

- Use the suitable lining material to control the seepage and ground water contamination;
- In case of maintenance/sludge removal, alternative ponds shall remain functional;
- Water shall be retained constantly in ponds to prevent drying out of compacted clay liners. In dry liner Shrinkage cracks may occur, which may cause excessive leakage when ponds later refill;
- Inlet and outlet pipework access/maintenance pits shall be inspected regularly for blockages. These pits shall be covered at other times;
- Monthly treated effluent quality monitoring shall be done from an EPA certified laboratory for compliance with PEQS; and
- In case maximum permissible discharge of pollutants are exceeded, appropriate measures will be taken to remedy the situation promptly (appropriate repairs and maintenance works will be implemented). At the same time, a person in charge of environmental protection shall immediately notify the Punjab EPA about the existing situation. Information shall contain the causes and preventive measures that will be implemented in order to eliminate the problem.

7.4.3 Air Quality

The operation of pumping station, disposal station and treatment plant consume energy and thus produce GHGs. Although in Pakistan electricity is mostly produced from cleaner sources however during load shedding diesel generator will be needed which produce GHG emissions. Further WWTP equipment components may need to be imported during O&M thus will increase carbon footprints. Limited flow in WWTP may cause odour and nuisance. In addition incomplete burning of fuel in machinery can also lead to deterioration of air quality. This impact is moderate negative and permanent in nature.

Mitigation measures

- Ensure complete burning of fuel in machinery;
- Ensure proper O&M of WWTP plant
- Regular monitoring of air quality shall be conducted from an EPA certified laboratory to comply with PEQS 2016.

7.4.4 Soil Quality

Impact on the integrity and stability of soil or the loss and damage of the topsoil is not expected during the operational phase. However, the liner of the sludge storage ponds, while de-sludging may get dried and cracks may lead to the seepage of wastewater and thus contaminate the soil. Improper disposal of sludge is another concern. Emergency situations (spillage of wastewater in case of damage of pipelines or other infrastructures) may also cause soil pollution.

The impact is minor negative and temporary in nature.

Mitigation measures:

- While de-sludging, the ponds shall be sprinkled with water;
- Scum and sludge shall be removed regularly and disposed of safely in consultation with Lahore Waste Management Company (LWMC);
- In case of fuel/oil spill, cleaning of the territory and withdrawal of the contaminated soil and ground for further remediation, and
- Training of the personnel on environmental and safety issues regarding sludge disposal and soil contamination.

7.4.3 HSE Considerations

The operation of WWTP involves minimum man power. The HSE considerations in this regard shall be addressed. Diseases, fire, trips, slips and falls may occur at operation stage. This impact is moderate negative in nature.

Mitigation measures:

- Emergency Response Plan shall be formulated for the WWTP and strictly implemented by the management;
- Emergency numbers shall be clearly posted and communicated to the operation and maintenance (O&M) staff;
- Installation of safety sign boards at the plant site;
- Adequate PPEs shall be provided to the O&M staff and concerned safety staff must do regular inspections for its implementation;
- Strict implementation and practice of work safety permits during maintenance activities;
- Fire extinguishing equipment shall be installed at the treatment plant and the concerned staff shall be well trained to use the equipment during an emergency situation;
- Regular inspection and maintenance of the fire safety and extinguishing equipment by the designated staff;
- Regular fire drills at the plant in order to train the staff and get well aware of the steps to be taken during an emergency situation;
- Regular trainings of O&M staff by a recognized trainer; and
- Regular medical checkups of the O&M staff.

7.4.5 Ecology

No negative impacts are envisaged on the flora of the tract during the operational phase. Moreover, massive plantation shall be raised around the proposed WWTP, which will not only compensate for the loss of trees from the Project Area, but will also improve the landscape of the area. The trees cut during the construction phase shall be compensated with the ratio of 1:10. The implementation of plantation plan recommended in compensation for cutting of trees shall start working during operational stage, to ensure the ecological balance and to avoid any impact on local Environment.

The vegetative buffer zone shall be provided. It may provide the following benefits;

- Creates a visual barrier and enhances the appearance of the WWTP;
- Captures and reduces odor concentrations by;
- Dilution and dispersion of the odor concentrations by the mixing and redirection effects of the wind breaks, directing odors up into the lower atmosphere;
- Reduction in wind speeds which means fewer odorous gases and particles will by picked up and conveyed by the wind;
- Collection and storage of chemical odor constituents on the leaves and surface areas of the plants and trees; and
- Physical interception and absorption of odorous dust particles on the leaves, needles, and branches of the trees.

The impact is positive and permanent in nature.

However following measures shall be adopted during the operation phase:

- Decorative trees and plants shall be planted throughout the treatment plant area and its perimeter.
- Proper check and balance for above activities is highly recommended. Plantations so raised must be maintained according to the silvicultural practices which include proper irrigation, cleaning, pruning, thinning at prescribed intensity, silt clearance and trench-opening, etc.;
- Maintenance and security of the plantation shall be done for at-least five years (in consultation with the forest department). Measures such as fencing, watch guards and fire protection shall be considered; and
- All activities must be done under the technical supervision of Forest Department.

7.4.7 Improved Water Quality

The construction of the proposed WWTP will result in improving the water quality of River Ravi to a great extent and will decrease the pollution load.

Treated wastewater will comply with the PEQS standards. However, such standards are not compatible with any reuse of treated wastewater for irrigation. Treated wastewater will be discharged directly into the river Ravi.

7.4.8 Improvement in Public Health, Hygiene and Sanitation

Current ponding of untreated wastewater without any buffer zone will change into a planned WWTP having buffer zone which will decrease health issues in the adjacent areas. Further practice of irrigating agriculture with untreated wastewater will be prohibited which will positively impact that. There will be no direct negative impacts on public health during operation. It is foreseen that public health risk will be reduced by covering the drainage channels so that untreated wastewater is not discharged to adjacent to agricultural land.

7.5 ANTICIPATED IMPACTS DURING DECOMMISSIONING PHASE

The project can be decommissioned when its life and design period ends. Other reason of decommissioning can be considered if the conveyance channel becomes ineffective due to natural hazards and unexpected changes in climate due to global warming. The proposed project has been designed for an operational period of 25 years. Decommissioning of the project involves improvement, replacement and rehabilitation of conveyance channel, pumps, disposal stations, treatment plant structure and allied utilities. The perceived impacts associated with decommissioning activities may be:

- Land use change;
- Dust emissions;
- Generation of solid and liquid waste;
- Noise and vibration issues;
- Disturbance to ecological resources;
- Occupational health and safety risks to LWASA staff and workers;
- Sanitation and drainage issues for local population due to timeworn conveyance system; and
- Outbreak of waterborne diseases in the proposed area due to dilapidated wastewater collection channel.

Mitigation measures:

- The LWASA in coordination with a Health, Safety and Environment (HES) expert shall develop occupational health and safety procedures and plans for decommissioning phase of the project;
- Solid waste generated during dismantling shall be safely disposed of in defined waste disposal sites;
- The wastes which are reusable or recyclable (e.g : iron bars, stainless steel, and aluminum) shall be sold to waste contractor, and those which cannot be sold out (excess soil and brick pieces) shall be used as a filling material for leveling the depressions;
- Provide protection bunds around drainage and surface water sources (if any), to avoid wastewater ingress;
- Provide appropriate PPE to all workers carrying out dismantling activities;
- Pollution prevention plans to combat issues related to water quality, noise, soil and ambient air;
- Formulation and implementation of Resource Conservation and Restoration Plans;
- Formulation and implementation of Emergency Response Plan; and
- Decommissioning operation shall be completed in the given time period without any delay, to avoid traffic jams, and inconvenience and disturbance to sensitive receptors (residents, religious places, educational and health institutions).

7.6 CUMULATIVE IMPACTS

Cumulative impacts are the environmental and social impacts that result from the incremental impacts of one action and activity when added to past, present, and reasonably foreseeable future actions and activities.

Two projects namely Defence Hosing Authority (DHA) Phase-XIII and River Ravi Front Urban Development Project in the vicinity of proposed treatment plant are currently in the planning stage. If the aforementioned proposed projects are commenced side by side, certain cumulative environmental and social impacts in the form of air and noise pollution and inconvenience to daily commuters may arise and lead to nuisance, if not managed properly. The main cumulative impacts of the two projects can be:

- Dust pollution due to excavation activities;
- Air pollution due to vehicular emissions in case of traffic jams during the construction phase;
- Increase in noise pollution due to construction activities and traffic jams;
- Traffic jams leading to time delays for daily commuters;
- Health issues to nearby local population and workers in the form of respiratory problems, cough, influenza, skin and eye allergies, due to dust emissions and smog;
- Conflict between skilled and unskilled workers of both projects due to construction activities;
- Hindrance in the implemenation of the proposed project activities due to ongoing construction work; and
- Probability of tree cutting and construction camps, if required space is not vacant due to ongoing project activities.

These impacts are temporary and minor to moderate in nature if not managed properly.

Mitigation measures:

- The Planning Commission and the major stakeholders of the said project shall consult each other for their conflicts, and relative construction activities to minimize the cumulative impacts. This may include sharing the scope of work, work activity schedule, and design details that may help in predicting the extent and duration of possible cumulative impacts;
- Lahore Traffic Police Department shall be taken into confidence before the start of the project, so that a comprehensive traffic management plan may be prepared and could be effectively implemented during the construction phase;
- LWASA shall ensure the timely completion of the project along with effective implementation of the proposed Environmental Management Plan (EMP);
- Training and awareness shall be provided to the workers of both projects to avoid individual and work conflicts;
- During the construction phase, Contractors of all aforementioned projects shall conduct meeting once or twice a week to discuss their construction work schedules, and inform each other before hand, if any specific construction work is obstruction to others work, to resolve that dispute; and
- Health and Safety Experts shall be hired by the Proponents and Contractors to adjudicate occupational health and safety risks.

7.7 INDUCED IMPACTS

The proposed project will have certain induced impacts on natural resources as well, and other aspects associated with the environment. In case of the proposed project, the induced impact will be on River Ravi whose quality will be improved due to treated sewage as the water from

River Ravi is used for agricultural purposes and green area by some local inhabitants, hence the pollutants from River Ravi are taken up by the crops and become part of food chain which can ultimately harm the human health (both short-term and long-term health impacts). Moreover, it may also improve the river ecology. However, regular water quality monitoring and good operation and maintenance of the proposed WWTP during the operation phase in accordance with PEQS, 2016 for Municipal Treatment and Disposal of Effluents is necessary. In addition to that, the treatment and disposal of sludge shall be according to engineering practices and as per approved standards.

8 ENVIRONMENTAL MANAGEMENT PLAN

8.1 GENERAL

Environmental Management Program (EMP) is an instrument that details the measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental and social impacts or to reduce them to acceptable levels, and the actions needed to implement these measures. EMP consists of the set of mitigation, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social impacts. The main objectives of EMP are to:

- Provide details of the project impacts along with the proposed mitigation measures and the corresponding implementation activities;
- Define the role and responsibilities of the Project Proponent, Contractor, Supervisory Consultants and other players and effectively communicate environmental and social issues among them;
- Define a monitoring mechanism, reporting frequency and identify monitoring parameters to ensure that all the mitigation measures are completely and effectively implemented; and identify the resources required to implement the EMP and outline the corresponding financing arrangements; and
- Ensure that the project will adopt COVID 19 best international standard procedures (SOPs) during the construction and operational phases.

8.2 CONTRACT DOCUMENTS

The present EMP will be included in the bidding/ contract documents and their implementation will be a contractual binding for the contractors and LWASA.

8.2 INSTITUTIONAL ARRANGEMENT

The institutional arrangement for the implementation of EMP of WWTP at Babu Sabu is presented in Figure 8.1.

The proponent LWASA will be responsible for the compliance of environmental and social safeguard requirements of the WWTP at Babu Sabu. The PC-1 of the project, including environmental compliance requirements, will be prepared by LWASA and submitted to Planning and Development Department, Punjab for approval and subsequent stages of the project. The Environmental Section of P&D Department will review and approve the environmental requirements of the PC-1.

The project activities will be monitored and managed by the PMU, to be established specifically for WWTP at Babu Sabu. The Environmental and Social Cell (ESC) staffed by qualified environmental and social specialist will be established under PMU. The ESC will be the custodian of the EMP. ESC will support to ensure the compliance of EMP. ESC will submit progress report for the implementation of the EMP to Punjab EPA as per environmental approval/NOC conditions for the project.

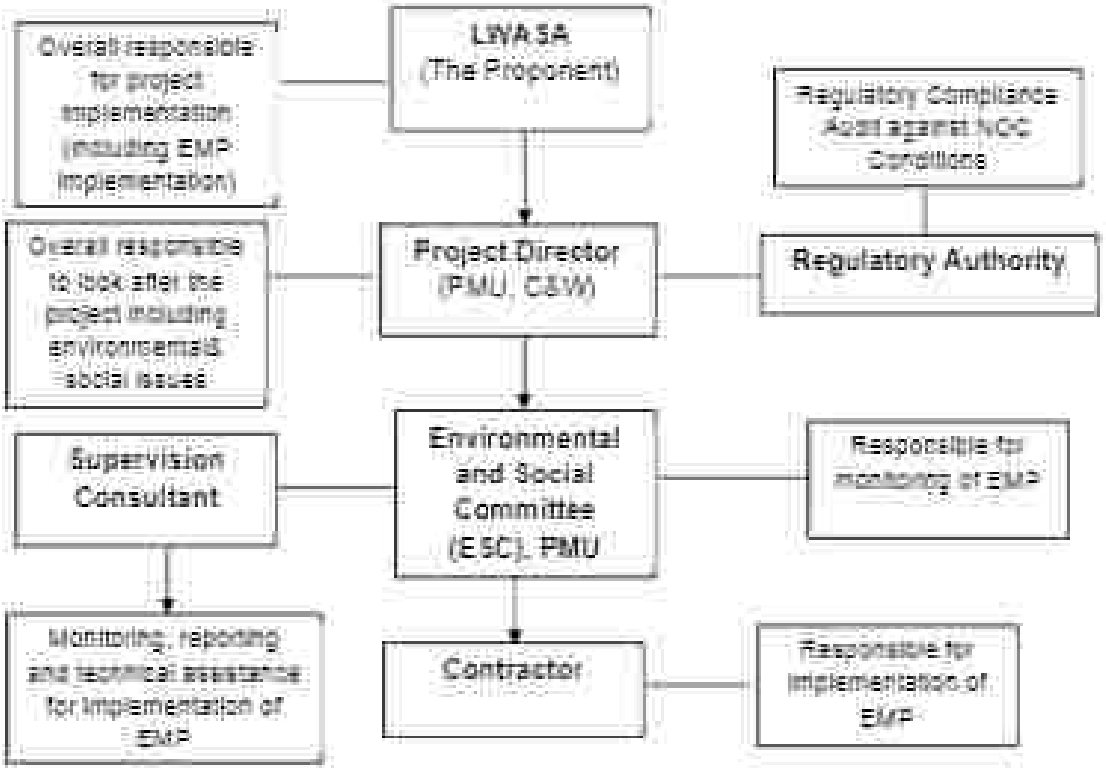


Figure 8-1: Organizational Setup for the Implementation of EMP

a) EPD Punjab

As per Punjab Environmental Protection Act, amended 2012 and 2017, EPD Punjab is responsible for environmental protection and pollution control. The EPD is responsible for the approval of the EIA/IEE of all the developmental projects under their jurisdictions. Based on the EIA and EMP, EPD will monitor (as and when required) the Project activities.

b) Project Management Unit (PMU)/ Project Director (LWASA)

Project Director of LWASA is the in-charge for the financial and technical matters related to WWTP project at Babu Sabu. His responsibilities for monitoring the EMP will consist of:

- Responsible for overall delivery of the project from design to operational phase;
- Provide technical directions for the designs, implementation & O&M of the project;
- Overall financial and administrative management of the project as per rules of the Government and Guidelines of the funding agencies/banks;
- Ensuring that the required environmental training is provided to the concerned PMU staff;
- Review monitoring reports for the progress of environment related activities;
- Make sure that the Contractor is implementing the additional measures suggested by the SC in environmental monitoring reports.

- Assist the Contractor for the timely payments of negotiated prices for temporary land acquisition of construction camps;
- To assist Contractor for obtaining necessary approvals from the concerned departments;
- Maintaining interface with the other lined departments/stakeholders; and
- Reporting to the EPD Punjab on status of EMP implementation.

e) Environmental and Social Cell (ESC) of PMU

ESC will be established in the PMU which shall comprise of following staff:

- Environment & Social Specialist
- Environment / HSE Expert
- Social Safeguard / Gender Expert

Role of Environment & Social Specialist

Roles and responsibilities of Environment & Social Specialist will be as follows:

- Ensure the implementation of all the mitigation measures proposed in the EMP.
- Devise strategy for all the environmental issues that may be encountered during construction.
- Supervise review and implementation of Resettlement Action Plan prepared by the Consultant.
- Establish close liaison with environmental, social and gender experts of consultant and funding agencies etc.
- Resolve all the environmental issues that may be encountered during construction;
- Supervise implementation and monitoring of Gender Action Plan
- Ensure timely submission of safeguards reporting to the funding agency.
- Any other task assigned by the Project Director during design and execution of the project.

Role of HSE Expert

Roles and responsibilities of HSE Expert will be as follows:

- Assist the E&S Specialist in the implementation of all the mitigation measures proposed in the EMP.
- Prepare SOPs for the construction phase;
- Ensure the implementation of all the SOPs;
- Conduct training of all the workers regarding the implementation of SOPs;
- Prepare health and safety report on regular basis;
- Develop SOP documents for general account, power supply, public works, mechanical and electrical, and SCADA safety;
- Investigate and analyze safety incidents and problems, and formulate optimization of protective measures;
- Perform daily safety checks;
- Organize fire drills and other emergency events;
- Supervise the configuration and implementation of labor insurance supplies;

- Evaluate the safety status of each system and position;
- Responsible for organizing the identification of positions, equipment danger sources and risk control management;
- Responsible for organizing health and epidemic prevention, environmental protection and occupational health management; and
- Prepare monthly progress report.
- Establish close liaison with environmental experts of contractor, consultant and funding agencies etc., and
- Any other task assigned by the E&S Specialist during design, execution and O&M of the project.

Role of Social Safeguard / Gender Expert

Roles and responsibilities of Social Safeguard / Gender Expert will be as follows:

- Assist the E&S Specialist in the implementation of all the mitigation measures proposed in the EMP;
- Ensure implementation and monitoring of Gender Action Plan (under the supervision of the E&S specialist)
- Review and implementation of Resettlement Action Plan prepared by the Consultant (under the supervision of the E&S specialist)
- Assist the E&S Specialist in resolving all the social issues that may be encountered during construction;
- Ensure proper implementation of RAP and Grievance Mechanism, GAP and Gender Related aspects of the Grievance Mechanism (GBV, Harassment related grievances and others if any)
- Prepare monthly progress report regarding social sector;
- Establish close liaison with social experts of contractor, consultant and funding agencies etc., and
- Any other task assigned by the PD during design and execution of the project.

d) Supervisory Consultant (SC)

Roles and responsibilities of SC will be:

- To oversee the performance of the Contractor to make sure that the Contractor is complying with EMP;
- Ensuring that the day-to-day construction activities are carried out in an environmentally and socially sound and sustainable manner;
- Strong coordination with the Contractor and PMU of LWASA;
- Preparing training materials and implementing programs;
- Ensure the implementation of the mitigation measures suggested in EMP;
- To supervise and monitor environmental activities being performed at site;
- To organize periodic environmental training programs and workshops for the consultant's and contractor's staff;
- Periodic reporting as mentioned in EMP; and
- Suggest any additional mitigation measures (if required).

e) Construction Contractor

Contractors will be bound to appoint site based Environmental and Social Safeguards Staff with relevant educational background and experience. Contractors' Environmental and Social team will carry out following activities:

- Implementation of the mitigation measures at construction site;
- Contractor will be bound through contract to take actions against all the special and general provisions of the contract document;
- Contractor will develop EHS methodology to make sure the implementation and compliance of EMP during all construction works;
- Provision of proper Personal Protective Equipment (PPE) to the workers and train them for their proper use;
- Compliance with international best SOPs for COVID 19;
- To conduct the environmental and health & safety trainings to the workers/labour; and
- Coordinate with Environmental Specialist of SC.

8.3.1 Institutional Arrangement for Implementation of EMP during O&M Phase

The proposed Project will be administrated by LWASA during the O&M phase. As the project is going to be executed on a Design, Build and Operate approach the operations are most likely to be run by the Contractor at the beginning of the operation phase. The Project Director at PMU of LWASA with his ESC will be responsible for the following;

- Compliance of EMP requirements for O&M phase;
- Coordinating with the operational staff working under the ESC to monitor environmental compliance during project operation;
- Advising on, and monitoring tree plantations along the buffer zone of project area;
- Reporting on the progress of environmental compliance to the EPD Punjab;
- Assessing the long-term environmental impacts of project operation;
- Sustaining a working partnership among the EPD Punjab, Forest and Wildlife departments of Punjab, NGOs and other related public private sector organizations; and
- Reporting to MD LWASA about progress of the work.

8.4 CAPACITY BUILDING/STRENGTHENING

In order to ensure that the EMP provisions are implemented efficiently and effectively, training and capacity building/ strengthening of the implementing parties are required. Therefore, based on the assessment of the institutional capacities of the parties involved in the implementation of the EMP, the following broad areas of capacity building/strengthening have been identified and recommended for effective implementation of the EMP.

Table 8.1 shows the positions proposed for institutional strengthening for an effective implementation of environmental and social mitigation measures.

Table 8.1: Institutional Strengthening

	Position	No.	scheduling (months)	Unit Cost (Rs.)	Cost estimates Rs.
A	Construction Phase				
A1	PMU Safeguards Unit				
	Environment & Social Specialist	1	36	612,500	22,050,000
	HSE Expert	1	36	306,250	11,025,000
	Social Safeguard / Gender Expert	1	36	306,250	11,025,000
A2	Supervision Consultant				
	Environment / HSE Expert	1	36	306,250	11,025,000
	Resettlement Expert	1	36	306,250	11,025,000
	Gender Expert	1	36	306,250	11,025,000
A3	Contractor				
	Environmental / HSE Engineer	1	36	250,000	9,000,000
	HSE Supervisor	2	36	250,000	18,000,000
	Social / Gender Expert	1	36	250,000	9,000,000
					113,175,000
B	O&M Phase (2 years)				
B1	PMU Safeguards Unit				
	Environment & Social Specialist	1	24	612,500	14,700,000
	HSE Expert	1	24	306,250	7,350,000
B2	Supervision Consultant				
	Environment / HSE Expert	1	24	306,250	7,350,000
B3	Contractor				
	HSE Supervisor	2	24	250,000	12,000,000
					41,400,000
	Total (Construction + O&M Phase)				154,575,000

8.5 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) provides the framework for the implementation of the mitigating measures and environmental management and monitoring during design, construction and operation phases of the proposed project. Table 8.2 portray impacts, targets, mitigations and the responsible organizations for the implementation of the mitigation measures during design, construction and operation phases respectively.

In addition to EMP, a separate table for gender impact assessment and mitigation plan has also been developed to meet the AFD objectives for ensuring gender inclusiveness and eliminating gender inequality.

Table 8.2: Environmental Management Plan

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
Design/ Pre-construction Phase					
1.	Environmentally Responsive Design Considerations	To ensure smooth and safe operation of proposed project.	• Wastewater flows shall be carefully calculated to avoid oversizing of the treatment plant. • Treated effluent shall be disposed off in cant drain passing from the project area. It is planned to upgrade this cantonment drain into Treated Effluent Channel from WWTP discharge point upto River ravi. • All structures, layout and engineering designing shall be in strict accordance with the applicable by-laws and engineering parameters. • Adequate planning for treated effluent disposal and sludge disposal shall be done to ensure an environmentally benign treatment process. • The conveyance channel from cant drain to babu sabu effluent pumping station shall be designed while keeping in view the projected wastewater flow, flooding data and other design parameters. • Proper storm water drainage system shall be designed for the proposed WWTP according to the national/international engineering guidelines.	DC	LWASA
2.	Flooding Pattern	To avoid damage due to floods	• WWTP and its allied components shall preferably installed in the un-flooded zone during 100-year flood event, which has been identified in Flood Assessment Study of Wastewater Treatment Plant carried out by Groupe Hull Consultant. • All pumping stations and electrical equipment should be located higher than the maximum flood level as	DC	LWASA

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			proposed in Climate Risk Assessment Study by Groupe Hydr Consultant • • Flood protection dykes shall be provided around WWTP boundary and conveyance channel. • The boundary for the treatment plant will act as a barrier, pushing water away from WWTP site. • Stone pitching will be provided to protect dyke slopes against wave action, and • A spur exists on the upstream of the proposed project area, whereas the Motorway (M-2) runs along its eastern side. These existing structures also secure the proposed project area against detrimental effects of flood discharges.		
3	Climate Change impacts	To reduce the impact on environment and on the project due to climate change	• Design of WWTP and allied structure to protect flooding risks as given above under heading 7.2.2 - Flooding pattern; • • Design/ use of the components and construction activities will be carried out to withstand extreme heat events	DC	LWASA
4	Soil	To avoid Contamination of soil	• The design shall consider minimum removal of vegetation. The vegetation will be removed only from the locations where WWTP and its allied components is to be installed. Other green area on the project site will not be removed unless need arises. • Geotechnical investigations of the project area shall be carried out before design; and	DC	LWASA

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• Selection of lining material for sludge storage ponds shall be based on the soil permeability		
6	Groundwater and Surface Water	To avoid contamination of surface and ground water.	• The WWTP capacity shall be designed to cater accidental increase in inflow of wastewater. • Existing arrangements for the disposal effluent shall be continued with proper gates arrangement on the drain and inlet of WWTP to cater for extra discharge to be received from upstream side during operation of the WWTP or its closure for maintenance or any other emergency. • Proper gated arrangements in the design are required to be provided at exit side of the treated effluent water before its discharge in the river to avoid entry of flood water in case of any flood. • Provision of parallel ponds may be considered in design to be used for controlling over flow, storm water management and maintenance/ sludge removal. • The design may also consider option of capping channel outlets e.g. using a submerged exit pipe baffle to prevent syphoning and transfer of surface waste to subsequent ponds; and • Selection of liner during the planning stage shall be considered to control seepage efficiently.	DC	LWASA

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
6	Seismic Hazard	To keep the structures safe and intact in case of earthquakes	• The proposed structure will be designed and constructed to withstand low to moderate earthquakes. For seismic hazard analysis, updated structural and seismic evaluations will be consulted, and • To mitigate the seismic hazard, Seismic Building Code of Pakistan 2007 (SBC-07) will be adopted. This code specifies minimum requirements for seismic safety of buildings and has to be applied and used by engineers in conjunction with the necessary understanding of the concepts of structural geotechnical and earthquake engineering.	DC	LWASA
7	Land Acquisition and Resettlement	To minimize resettlement, provide fair compensation and restore livelihood	• For the compensation of the affected person against loss of crops and other assets Resettlement Action Plan is being prepared as per social safeguards policy of the AFD • The compensation value shall be calculated based on the market value of the crops and average yields in the project area. • Proper compensation will be provided to all the affectees losing their livelihoods. • Compensation shall be evaluated and provided at full replacement cost. • Proper consultations and coordination's with DPs during resettlement process.	LWASA	

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
9	Public Utilities	To avoid disturbance to the public	• WWTP components shall be sited away from the electric lines at WWTP site; • Relocation of the transmission lines, if required, shall be planned and approved before project commencement, to avoid inconvenience to the consumer; • The provision in the design and budget for the relocation of the existing utility infrastructures wherever required shall be finalized in consultation with the concerned department; • Close coordination with the concerned departments to curtail inconvenience to the residents of the Project Area; and • Timely notification of activity and minimizing time to relocate the utilities.	DC	LWASA
10	Emergency Response	To be prepared for emergency	• An emergency response plan is proposed to be formulated by the contractor which will emphasize line of action for rescue, medical emergencies, natural disasters and firefighting operations;	DC	LWASA
11	Ecological Impacts	To avoid minimize the impacts on flora and fauna	• Compensatory planting for ten trees against each fallen tree of similar floral function shall be planned; • Provision of compensation in the project budget for the loss of fruit trees will be made to the affected people; • A detailed tree plantation plan will be devised at planning stage; • Plantation plan shall prefer the prevalent indigenous species of plants; and	DC	LWASA

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• A plan for transplantation of trees especially fruit trees shall be devised.		
11	Women involvement	To ensure gender inclusion at initial stage to assess risk and avoid gender inequality	• Gender issues will be identified during the design phase through gender surveys and consultations • A detailed Gender Action Plan will be devised to ensure gender inclusiveness throughout the lifecycle of the project.	CC	LWASA
Construction Phase					
1	Topography	To minimize the impact on topography	• Dykes can be constructed using excavated materials. It will also help in protection from flooding as the project area lies in flood plain.	CC	SC and ESC
2	Soil	To minimize soil erosion and contamination.	• In order to prevent the damage and contamination of soil at the project site, surface layer of the soil will be removed and stored temporarily in preselected locations. The soil will be stockpiled separately. Stockpiles will be protected from wind and atmospheric precipitation and will be at least 50 meters away from surface water body. • Stored excavated material shall be covered and preferably reused, e.g in construction of dykes etc. • Sprinkling of water may help in reducing the erosion soil. • Use of heavy machinery will be restricted as far as possible to work sites only to avoid the destruction of soil structure. • Vehicles and equipment will be checked regularly. In case of damage and fuel / oil leakage, it will be	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			repaired immediately. Damaged Vehicles will not be allowed on the construction sites; • In case of spillage of pollutants, spilled material will be localized and contaminated site will be immediately cleaned. Staff will be provided with appropriate means (absorbents, shovels, etc.) and with personal protective equipment as well; • All spoils will be disposed of at site designated by LWMC and the site will be restored back to its original conditions; • Non-bituminous wastes from construction activities will be dumped in approved sites, in line with the guidelines for dump sites; and shall be covered; • Washing yards shall be paved to avoid seepage of runoff from the yard; • After completion of construction works, all kind of waste (including hazardous waste) will be collected and removed from the area. Hazardous waste will be removed for further management by the licensed contractor; and • Perennial grasses and shrubs trees will be planted to control the runoff on the site.		
3.	Surface Water/Groundwater Quality	To avoid contamination of surface and ground water.	• Protection of groundwater reserves from any source of contamination such as the construction and oily waste that will degrade its potable quality; • Water required for construction may be obtained in a sustainable way that the water availability and supply to nearby communities remain unaffected;	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• Stockpiles of cement and other construction materials will be kept covered when not being used. • Avoid fuel and other chemicals being stored at numerous locations around the site. • Maintenance of vehicles and plant will be carried out only on impermeable areas where any oil spillages can be contained. • Oils, fuel and chemicals shall be stored at bunded fuel stores and mobile bunded stores. • Careful planning of the works to minimize soil excavation works during rainy seasons. • All kinds of waste shall be stored in covered containers and disposed of safely as soon as possible. • Proper monitoring to check the compliance of PEQS will be carried out. • Sewage from construction camps will be disposed of after proper pre-treatment and processes such as sewage pit. • Temporary sanitary facilities, such as portable chemical toilets, will be employed on-site. A licensed contractor would be responsible for appropriate disposal and maintenance of these facilities. • Sand/silt removal facilities such as sand traps, silt traps and sediment basins will be provided to remove the sand/silt particles from run-off. These facilities will be properly and regularly maintained. These facilities will be carefully planned to ensure that they would be		

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			installed at appropriate locations to capture all surface water generated on site; and • Contractors will be required to observe drainage conditions during excavating operations and storm events to assure positive drainage. If flooding occurs along roadways or in neighborhoods of community complaints arise, the contractor will undertake a combination of the above mitigation measures to minimize drainage and water quality impacts.		
2	Air Quality	To minimize air pollution	• All vehicles, machinery, equipment and generators used during construction activities will be kept in good working condition, properly tuned and maintained in order to minimize the exhaust emissions; • Open burning of solid waste from the contractor's camps will be strictly banned; • Use of fuel with substantially lower sulphur content; • Proper maintenance and repair of power generators and construction machinery is needed to minimize the hazardous emissions; • Personal protective equipments like masks, goggles and gloves etc. shall be provided to workers; and • PEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery will be enforced during construction works. Dust problems caused during the construction phase of the proposed Project could be effectively mitigated by the	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			implementation of simple procedures by the contractor including but not limited to the following: • Regular water sprinkling on the site and access roads will be carried out to suppress excessive dust emission(s); • For dust control, additives has been developed that agglomerates particles, making them heavier and lowering dispersion in the air, generating less dust. This leads to better air quality on site, less material wasting and a cleaner job site; • Construction workers will be provided with masks for protection against the inhalation of dust; • The vehicles carrying construction materials and the construction material storage areas will be covered with tarpaulin; • Vehicle speed in the project area will be prescribed not more than 20 km/ hr and controlled accordingly; • Tyres of all the vehicles leaving the site will be washed. No earth, mud and dust shall be deposited on the public road; and • Any material dropped on the paved roads will need to be cleaned up immediately to prevent dust nuisance. Measures to Reduce GHG Emissions • All stakeholders (LDWASA, consultants, contractors, concessionaires) will be trained to make them aware that their actions at all stages of a project can contribute to reducing the CO2 burden.		

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• Elimination of unnecessary idling can save fuel, prolong engine life, and reduce emissions. It can also help reduce the noise levels associated with construction. Unnecessary idling occurs when trucks wait for extended periods of time to load or unload materials or supplies, or when equipment is left on when it is not being used. Constructions workers may take breaks and leave equipment running unnecessarily or may use equipment because it is an ingrained habit; • Managing equipment operations and training workers to reduce unnecessary idling is a relatively easy way to lower operating costs and help reduce the environmental impact of construction. • A preventive maintenance program by the contractor seeks to maintain engines at their original level of performance and eliminate the high cost of catastrophic engine failure. Preventive maintenance is the systematic inspection, detection, and correction of potential construction equipment failures. It significantly reduces fuel consumption and emissions; and • Use of low sulfur and good quality fuel in the construction vehicles or operating equipments that will reduce maintenance costs and harmful emissions.		

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
6	Noise	To minimize noise pollution	• Selection of up-to-date and well maintained construction equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices. • Confining excessively noisy work to normal working hours in the day, as far as possible. • Providing the construction workers with suitable hearing protection like ear cap, or earmuffs and training them in their use. • Vehicles and equipment used will be fitted, as applicable, with silencers and properly maintained; and • Use of low noise machinery, or machinery with noise shielding and acoustics. • Timing of the construction works to be conducted during the recommended operational hours, to reduce vibration levels to residential properties; and • The equipment operators to be made aware by the contractor of potential vibration issues problems and of techniques to minimize vibration effects during construction works • Use of barriers to reduce noise • Work Activity Scheduling • Demarcation of Noise Perimeter Zones	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
6	Waste Generation	To avoid/minimize nuisance and environmental pollution in the project area due to solid waste	• The waste generated from the camp site will be disposed off at approved sites. • Burning of waste shall be prohibited. • Skips and bins will be strategically placed within the campsite and construction site. • The skips and bins at the construction campsite will be adequately designed and covered to prevent access by vermin and minimize odour. • No refueling, storage, servicing or maintenance of equipment will take place within 150 feet of a drain or other sensitive environmental resources. • General and hazardous waste shall be labelled and segregated. • Ensure proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.; • Solid Waste shall be safely disposed of at a designated waste disposal site by an approved contractor. • Proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.; • Training employees involved in the transportation of hazardous material regarding emergency procedures. • The contractor shall ensure implementation of waste management plan.	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• Training of working force in the storage and handling of materials and chemicals that can potentially cause soil contamination; • Training of staff regarding handling of different types of waste, waste minimization, reuse and recycling practices will be ensured; • Waste Management Plan will be developed to implement an efficient and responsive solid waste management system during construction phase. Recyclable wastes e.g. steel cans will be sold to waste vendors; and • The contractor will develop specific environmental management plans for asphalt plants and concrete batching plants. These plans will incorporate the general measures as applicable to the proposed Project, but will also have focused mitigations for solid waste from these plants		
7	Visual impacts and Aesthetics	To minimize visual intrusion from large piles of embankment materials	• The area demarcated for proposed WWTP will be fenced and all the construction activities will be restricted within the demarcated site. • Condition of the site approach road will be improved and same will be kept free of dust and mud through implementation of dust suppression measures. • All temporary structures, surplus materials and wastes will be completely removed on completion of works and the area re-landscaped.	CC	SC and ESO
8	Ecology	To minimize the destruction of floral	• Cutting of trees shall be avoided, as far as possible so, that negative effects on the process of natural	CC	SC and ESO

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
		species and save the faunal species in the project area	regeneration of species are minimized and possible alternate route must be considered for proposed treated effluent channel, in which minimum ecological and environmental losses are expected. • Carryout reforestation of the disturbed areas after construction activities; • For replacement of one tree, ten trees will be planted in accordance with the tree plantation plan. So approximately a total number of 15000 trees will be planted. Thus, the number of plants to be raised is 10 times of plants to be removed; • An awareness campaign targeted on the neighborhood farmers will be run to popularize the planting of trees species especially recommended in tree plantation plan/reforestation plan; • It is strongly recommended that minimum tree cutting will be involved and to avoid damage/ loss of the biodiversity in the area. Contractor will supply gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel will not be allowed; • Limit speed of vehicles and movement of heavy machinery only to designated access routes and operational areas; • As far as possible, use the existing roads and paths. For new access roads, routes will be selected, which have minimum vegetation; • As much as possible, limit clearance of vegetation either ground vegetation or tall trees for the		

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			construction of access roads and camps. If possible, select those areas for camping sites where there is less number of plants affected. Moreover, avoid cutting those trees having habitat of birds; • Compensation made to the land owners for the damage of trees or for the agriculture crops will be made as soon as possible due to which the financial loss of the land owners will be minimized; • The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly waste of the camps will be properly disposed of to prevent the chances of eating by wild animals, which may prove hazardous to them; • Avoidance of critical birds concentration areas to reduce direct and indirect impacts on the birds; • Noise due to equipment will be avoided as much as possible by using low noise equipment. Special measures will be adopted to minimize noise generating activities during the critical period of breeding/nesting; • Due to cutting of trees, birds will be compelled to fly away and find some safe shelter far away from the disturbed area but plantation of trees will attract them back which will again help in improvement of the project area with rich biodiversity; • Workers will be restricted to go to sensitive areas every now and then because birds abundance can decrease due to human presence; and		

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• Dust emission will be avoided up to the possible extent.		
9	Disposal of Muckng Material	To avoid nuisance due to excavated material	• Mitigation measure will include proper landscaping, which will be given due consideration along with re-establishment of the local/indigenous vegetation. The excavated materials that are unsuitable for use will need to be stored, transported and disposed of appropriately at designated sites.	CC	SC and ESC
10	Discovery of Heritage Sites during Excavation	To preserve social and cultural heritage sites from damage due to project activities.	• In case of finding any artifact, the contractor shall immediately report through Supervision Consultant to Directorate General (DG) of Archeological Department, Government of Pakistan to take further suitable action to preserve those antiques or sensitive remains. • Chance finds procedure shall be adopted in case of any accidental discover of cultural heritage.	CC	SC and ESC
11	Transportation of Raw Material and Equipment	To avoid the impact due to movement of heavy traffic	• Adequate and appropriate road signs will be erected to warn road users of the construction activities. For example, reduced speed near the entrance roads. This will be done in conjunction with the traffic police department. • Raw materials such as mud and sand will be adequately covered within the trucks to prevent any escaping into the air and along the roadway. • Heavy equipment will be preferably transported early morning with proper pilotage. • The use of flagmen will be employed to regulate when trucks have access to the main roads.	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
12	Traffic Management	To avoid traffic issues during construction	• 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 along the major roads; • The speed of the vehicles will be controlled (at 30 to 40 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 will be informed to the riders through standard signs and displays	CC	SC and ESC
13	Construction Camps/Camp Sites	To avoid various social and environmental impacts due to mismanagement of	• The construction camps will follow IFC guidelines (Workers' Accommodation: Processes and Standards (ifc.org)). Such guidelines set up standards to insure proper workers management, health and safety rules within the camp and limit	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
		construction camp activities.	potential pollution and social impacts in the neighboring communities. • Training will be provided to all staff on camp management rules and overall discipline and cultural awareness. • Formulation and implementation of Waste Management Plan to ensure safe handling, storage, collection and disposal of construction wastes and the training of employees who handle waste. • Camps will be designed to be self-contained to reduce demand on infrastructure and services of nearby communities. • Selection of site for construction camp to minimize the removal of existing macro-plants at camp sites. • Preparation of phytographical and botanical inventory of vegetation before clearing the site; and • Compensatory plantation to be ensured when construction work near-ends.		
14	Social Cultural Conflicts	To minimize chances of disputes relates to cultural differences between the Contractor's workforce and the local inhabitants.	• Local labor shall be preferably employed for the construction works. • Careful planning and training of work force to minimize disturbance to the local people. • Public notification through media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and • Adequate training of especially for the transitive workforce of the proposed WWTP involves both in the construction process and in the commissioning)	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			to regard the customs of the area so that the locals do not feel insecure.		
13	Gender issues	To minimize gender related issues	• Awareness will be created among the females at individual and community levels about the construction sites. • During the timing of educational institutions workers will not be allowed to crowd in the surroundings. • Alternative routes for pedestrian will be provided to avoid mixing of women with workers. • Gender protection act will strictly be enforced during the construction activities in the project area, and monitor the implementation through field staff and district level structure. • Raise awareness among the communities of the potential risks of GBV, and establish response services in the communities that can respond to instances of GBV (particularly those related to issues of labour influx). • The Contractor will make sure that no discrimination is made on the basis of gender while hiring of workers. • Women will be given preference for jobs spanning a spectrum from unskilled positions to highly skilled roles. Emphasis will be placed on ensuring that responsibilities and income associated with these positions are equitable and not disproportionately	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			concentrated in lower income and responsibility here. 10% of the jobs will be given to females during construction which will be reflected in job offices • Provisions of gender segregated bathing, changing, and sanitation facilities; and • Contractor will take proper measures to address and resolve issues relating to harassment, intimidation, and exploitation, especially in relation to women. • Contract of the workers will contain special clause for penalty if engaged in gender-based violence. • Labour Management Plan incorporating provisions for gender is attached as Annex-IX.		
15	Occupational Health and Safety	To ensure proper health and safety of the labors as well as local community.	• 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. • Develop and Occupational Health and Safety (OHS) management plan in line with international best practices; • Providing basic training to workers on local norms to comply with (especially regarding safety and security concerns of females during construction time); • Providing basic medical training to specified work staff and basic medical service and supplies to workers. • Obligatory insurance against accidents for labourers/workers.	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• Layout plan for camp site, indicating safety measures taken by the contractor, e.g. fire fighting 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 ensure no health risks for labourers; • Protection devices (ear muffs) will be provided to the workers doing job in the vicinity of high noise generating machines; • Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction; • 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; • Elaboration of a contingency planning in case of major accidents; • Ensure that the site is restricted for the entry of irrelevant people particularly children; • Adequate lightning devices, barriers, yellow tape and safety signage shall be posted; and • Material Safety Data Sheets (MSDS) will be store onsite.		

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			During the construction phase of proposed WWTP, occupational health and safety monitoring programs of the contractor (s) will verify the effectiveness of prevention and control strategies. The selected indicators will 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 will 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 will document compliance using an appropriate combination of portable and stationary sampling and monitoring instruments. Monitoring and analyses will be conducted according to internationally recognized methods and standards. Monitoring methodology, locations, frequencies, and parameters will be established individually for proposed Project following a review of the hazards; • Continuous and efficient surveillance of workers health during the entire construction phase by the nominated officials of contractors; and • Training: Training activities for employees (construction contractor & supervision consultant		

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			staff) and visitors will be adequately monitored and documented (curriculum, duration, and participants). Emergency exercises, including fire drills, will be documented adequately. Service providers and contractors will be contractually required to submit to the employer adequate training documentation before start of their assignment.		
17	Community Health and Safety	To ensure proper health and safety of the laborers as well as local community.	• There will be proper control on construction activities and Oil spillage of vehicles. • The laborers with different transmittable diseases will be restricted within the construction site. • Efforts will be made to create awareness about road safety among the drivers operating construction vehicles. • 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 & social links. • Provision of proper safety signage, particularly at sensitive/accident-prone spots. • If identified, construct guard rails at accident-prone stretches and sensitive locations. • The communicable diseases of most concern during construction phase, like sexually-transmitted	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			disease (STDs) such as HIV/AIDS and COVID-19, will be prevented by successful initiative typically involving health awareness, education initiatives, training field workers in disease treatment, immunization program and providing health service. • Reducing the impacts of vector borne diseases on long-term health effect of workers will be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which includes: Prevention of larval and adult propagation of vectors through sanitary improvements and elimination of breeding habitat close to human settlements and by eliminating any unnecessary impoundments of water; • During construction work pedestrian and vehicular passages will be provided for crossing near settlement; • Fencing around the camps will be strong enough so that it can not be broken easily by local people for making passages; and • Use of water will not disturb public water availability and source of water will be selected carefully.		
18	Emergency Response	To be prepared for emergency	• An Emergency Response Plan for earthquakes and manmade disasters shall be developed by the proponent and shall be implemented in close consultation with the Fire Fighting Department, camp disposal square and parameters.	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• Training of the staff/employees regarding the emergency procedures/plans shall be regularly conducted; • Emergency numbers shall be clearly posted; and • Minor incidents and near misses shall be reported and preventive measures shall be formulated accordingly.		
19	Influx of Labour	To eliminate issues relating to labor influx	• Labor camp(s) shall be established away from residential population; • Local labour specifically PAPs will be hired for skilled and semiskilled labour to reduce labour influx and to compensate PAPs. For skilled worker, preference shall be given to the local population subject to constraints (availability of workforce, quality requirements, conformity with labor laws and regulations, flexibility in case of urgent needs, etc. • Females will also be employed to promote opportunities for gender involvement in income generating activities, they will be given preference for jobs spanning a spectrum from unskilled positions to highly skilled roles. Emphasis will be placed on ensuring that responsibilities and income associates with these positions are equitable and not disproportionately concentrated in lower income and responsibility tiers. It will be ensured that 10% of the jobs will be given to females during construction which will be reflected in job notices. • Awareness shall be created among the work force to ensure respect for local customs; • Construction work shall be completed within the stipulated time to move workers to next location;	CC	SC and ESC

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• Labor force shall be shuffled with the time. • An effective GRM shall be established for the Project to resolve all issues related to the community. Thus, progress regarding resolving the issues shall be monitored closely. • Create awareness among workers on proper sanitation and hygiene practices to enhance proper health and maintain good housekeeping practices at all Project sites. • Provide adequate personal hygiene facilities in good condition with adequate supply of clean water. • Make arrangements to treat the affected workers on time to control the movement of vector borne diseases. • Sensitize workers and surrounding communities on awareness and prevention of COVID-19, HIV/AIDS and sexually transmitted infections (STI) through training, awareness campaigns and workshops during community meetings. • Provide proper and free COVID-19, HIV/AIDS and STI health screening and counseling for site workers and community members. • Develop and enforce a strict code of conduct for workers to regulate behavior in the local communities. • Taking all sensible precautions to avert illicit, vicious conduct by or amongst the Contractor's personnel		

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			and to preserve unity and harmony, and protection of people and property on and near the sites. • Prohibiting drugs, alcohol, weapons and ammunition on the worksite among personnel. • Site security preparations must be contained within the Bills of Quantities (BoQs) to avoid any delays which might be caused due to insecurity. • Appropriate fencing, security check points, gates and security guards shall be provided at the construction sites to ensure the security of all plant, equipment, machinery and materials, as well as to secure the safety of site staff; and • The Contractor must guarantee that good relations are maintained with local communities and their leaders to help reduce the risk of vandalism and theft. • The labor management plan prepared by contractor will include specific requirement to ensure preference of local workers, APs and women.		
OPERATIONAL PHASE					
1	Solid Waste and Sludge Management	To avoid nuisance due to solid waste and sludge	Solid Waste: • Storage bins will be provided at the appropriate places with clear demarcation of type of wastes. • Special storage facility will be arranged for temporary disposal of hazardous waste during the operational phase, which will be in compliance with environmental requirements. The facility must	PMU LWASA	

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			include exhaust ventilation system and shelves and racks for waste disposal. • In case of waste sludge disposal, an approved contractor shall dispose of the sludge at the landfill site in consultation with LWMC Sludge: • A short-term solution for sludge management (1 to 5 first years of operation) is on-site storage at WWTP site which has adequate place for sludge storage (large enough unflooded area). On-site storage should follow best practices in terms of landfilling (geotextile use and proper design). Agricultural reuse cannot be considered as (i) there is no regulation in Pakistan to allow such disposal, (ii) social acceptability will be low. Furthermore, considering the wastewater catchment and the presence of arsenic in the raw water, it is likely that the sludge will be polluted with heavy metals. • As a medium- and long-term solution, following options are suggested to accept. • Design of a proper landfill site at WWTP specifically for disposal of sludge depending on actual sludge heavy metals concentrations and potential regulation changes. • A feasibility study will be conducted at later stages after considering the quality of sludge for use of sludge for agricultural use. A workable solution for use of sludge as fertilizer will be identified. Such		

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			feasibility study should include a cost-benefit analysis of different options identified. • It shall be ensures that sludge will not be incinerated as incinerating sludge will contribute to GHG emissions therefore not recommended.		
2	Water/Wastewater Quality	To avoid deterioration of water/surface water quality	• Use the suitable lining material to control the seepage and ground water contamination; • In case of maintenance sludge removal, alternative ponds shall remain functional; • Water will be retained constantly in ponds to prevent drying out of compacted clay liners. In dry time Shrinkage cracks may occur, which may cause excessive leakage when ponds later refill; and • Inlet and outlet pipework access/maintenance pits will be inspected regularly for blockages. These pits will be covered at other times. • Monthly treated effluent quality monitoring shall be done from an EPA certified laboratory for compliance with PEQS; and • In case maximum permissible discharge of pollutants are exceeded, appropriate measures will be taken to remedy the situation promptly (appropriate repairs and maintenance works will be implemented). At the same time a person in charge of environmental protection will immediately notify the Punjab EPA about the existing situation, information will contain the causes and preventive	PMU LWASA	

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			measures that will be implemented in order to eliminate the problem		
3	Air Quality	To avoid deterioration of air quality	• Ensure complete burning of fuel in machinery. • Regular Desilting of the WWTP. • Regular monitoring of air quality will be conducted to comply with PEQS 2016	PMU LWASA	
4	Soil	To prevent pilferage of recyclable medical waste	• While de-sludging, the ponds shall be sprinkled with water. • Scum and sludge shall be removed regularly and disposed of safely in consultation with Lahore Waste Management Company (LWMC); • In case of fuel/oil spill, cleaning of the territory and withdrawal of the contaminated soil and ground for further remediation; and • Training of the personnel on environmental and safety issues regarding sludge disposal and soil contamination	PMU LWASA	
5	Health and Safety	To minimize health risk to workers and community	• Health and Safety Management Plan will be developed and strictly implemented during operational phase. • Emergency Response Plan shall be formulated for the WWTP and strictly implemented by the management. • Emergency numbers shall be clearly posted and communicated to the operation and maintenance (O&M) staff.	PMU LWASA	

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• Installation of safety sign boards at the plant site. • Adequate PPEs shall be provided to the O&M staff and concerned safety staff must do regular inspections for its implementation. • Strict implementation and practice of work safety permits during maintenance activities. • Fire extinguishing equipment shall be installed at the treatment plant and the concerned staff shall be well trained to use the equipment during an emergency situation. • Regular inspection and maintenance of the fire safety and extinguishing equipment by the designated staff. • Regular fire drills at the plant in order to train the staff and get well aware of the steps to be taken during an emergency situation. • Regular trainings of O&M staff by a recognized trainer, and • Regular medical checkups of the O&M staff.		
8.	Ecology	To improve the ecology of the project area	• Decorative trees and plants will be planted throughout the periphery of the treatment plant area and its perimeter. • Proper check and balance for above activities is highly recommended. Plantations etc. raised must be maintained according to the silvicultural practices which include proper irrigation, cleaning, pruning, thinning at prescribed intensity, silt clearance and basin-opening, etc.	PMU LWASA	

Sr. No.	Parameters	Target	Mitigation	Responsibility	
				Implementation	Supervision
			• Maintenance and security of the plantation will be done for at-least five years in consultation with the forest department. Measures such as fencing, watch guards and fire protection will be considered; and • All activities must be done under the technical supervision of Forest Department.		

KEY

DC	Design Consultant	CC	Construction Contractor
LWASA	Lahore Water and Sanitation Agency	SC	Supervision Consultant
ESC	Environmental and Social Committee	PMU	Project Management Unit

8.6 GENDER ACTION PLAN

A Gender Action Plan (GAP) is a systematic effort for ensuring that women participate in and benefit from development programs and projects. The GAP for Babu Sabu WWTP project has been developed to meet the World Bank/ AFD objectives to reduce gender inequalities and ensure gender inclusiveness in all phases of the project.

The GAP will safeguard the interest of the community women in the project area, promote their participations in project planning and activities (if applicable) and ensure safer and healthier living conditions for them.

8.6.1 Objectives of Gender Action Plan

The GAP illustrates the specific activities to address gender specific concerns and social impacts associated with the proposed project. The objectives of the GAP are follows:

- To undertake preparatory work to address gender issues in the project.
- To promote women's participation in project.
- To maximize women's access to project benefits.
- To ensure tangible benefits to women.
- To minimize social vulnerability of women arising due to the project activities like securing land, security concerns during construction.

8.6.2 Gender Needs Assessment and Mitigation Measures

To identify needs of women in the project area, detailed surveys were conducted which are given in Section 4 under Gender Situation Survey. In addition Gender Consultations were also conducted in the project area A summary table regards gender needs and proposed mitigation measures is given as below;

Table 8.3: Gender Needs/Issues and their Mitigation Measures

Sr. No	Gender Needs/Issues	Proposed mitigation measures
1	**Provision of safe drinking water supply** Currently, source of drinking water in the project area is handpumps while in the vicinity public water supply is available (refer Table 4.64). Water extracted through bore holes is contaminated due to mixing of sewage in shallow water table. During gender consultation sessions, women in the project area showed concerns regarding drinking water quality which sometimes cause water borne disease in the project area.	The project itself is aimed to improve the quality of water. Construction of wastewater plant will ensure no ponding of wastewater in the project area. Chances of mixing of sewage in water will be minimized. However, following actions are proposed to ensure supply of potable drinking water in the project area: • Conducting water quality testing in the project area on biannual basis Construction of water filtration plant in the project area of influence by LWASA as being practiced by LWASA in other areas of Lahore (not necessarily project boundaries)

Sr. No.	Gender Needs/Issues	Proposed mitigation measures
2	Safe Mobility for Women Women in the project area and nearby vicinity expressed issue of safe mobility (refer Table 4.79 & 4.80)	There are laws in force for female protection but females are not aware of these laws. Training sessions will be arranged for • Awareness regarding laws prevailing in the project area regarding protection of women; • Awareness among females regarding raising of voice for their rights. Contract of the workers will contain special clause for penalty if engaged in gender-based violence. Training session will be arranged for training of workers as well as for community to respect moral values of the project area.
3	Lack of education facilities Schools are available near the project area. However, during gender consultations, females complained regarding lack of proper facilities in these schools.	Steps will be taken by LWASA to play a role in improving education facility in the project area. LWASA may write a letter to Education department for improving the facilities in existing nearby schools with a request to improve education facilities in the area. Local representatives should be involved.
4	Lack of health facilities Gender consultation survey revealed that health facilities in and nearby vicinity are poor and these facilities needs to be updated.	Steps will be taken by LWASA to play a role in improving health facility in the project area. LWASA may write a letter to Health department for improving the facilities in existing health centres with a request to improve health facilities in the area. Local representatives should be involved to ensure follow up of such requests.
5	Inclusion of women in job More than 50% of the women surveyed in and near the project area showed interest for having some sort of jobs like vocational training, stitching and parlor work.	Women will be given preference for jobs spanning a spectrum from unskilled positions to highly skilled roles. Emphasis will be placed on ensuring that responsibilities and income associated with these positions are equitable and not disproportionately concentrated in lower income and responsibility tiers. 10% of the jobs will be given to females during construction which will be reflected in job notices.

8.5.3 Gender Engagement/Action Plan

Gender engagement/ action plan has been prepared by taking into account goals and targets of AFD to ensure gender involvement in the project benefits and to minimize the risks to gender due to project implementation.

Table 8.4: Gender Engagement/ Action Plan

Targets	Proposed Actions	Responsible Agency	Monitoring Indicators
Design/ Pre-construction Stage			
Gender inclusion at initial stage to assess risk and avoid gender inequality	Ensure extensive gender consultation in the project area. Conduct interviews or surveys to assess gender needs and issues in the project area.	CC, LWASA	Filled Gender survey proforma and photographic record of gender consultations
Employment Opportunities	Announce employment opportunities and recruitment notices widely, targeted at women as well as men. Preference should be given to female candidates for jobs spanning a spectrum from unskilled positions to highly skilled roles. Emphasis will be placed on ensuring that responsibilities and income associated with these positions are equitable and not disproportionately concentrated in lower income and responsibility tiers.	PMU LWASA and CC	Notice of employment opportunity published in local newspapers, cable channels, offices outside the construction site, containing the clause regarding preference to females
Establish Gender Fair Compensation Provision Mechanism	Women will be fully informed about the RAP. Compensation related to livelihood restoration will be given to both male and female affected households.	PMU LWASA	Payment of due compensation to be deposited in joint accounts of male and female PAPs
Construction Phase			
Women Workforce	Preference will be given to women from project affected families to work as workers/ labor (wherever feasible) during the construction phase and they receive equal wage for the work. Job opportunities should be spanning a spectrum from unskilled positions to highly skilled roles. Emphasis will be placed on ensuring that responsibilities and income associated with these positions are equitable and not disproportionately	PMU LWASA and CC	Percentage of Females labor force participation reflected in Labour Management Plan per category of positions (unskilled positions to skilled ones)

	concentrated in lower income and responsibility tiers. 10% of the jobs will be given to females during construction which will be reflected in job notices		
Equal Wage	Ensure equal pay for equal work for women and men for all construction and maintenance work	PMU LWASA and CC	All workers both women and men doing same work receive same wage and reflected in payroll
Free Women Mobility	Identify barriers in the women's mobility and take reforms to the those barriers Imposing penalty to employees found to involve in gender harassment Provision in GRM for GBV related issues Harassment cases will be properly addressed and reported through GRM	PMU LWASA and CC	Addition of provisions in contracts regarding penalty in case of involvement in gender harassment. Implementation of GRM and its GBV and harassment mechanisms Unrestricted movement of females and provision of alternative routes for pedestrian shall be provided to avoid mixing of women with workers.
Safety and Security concerns during construction	Labor camps to be established away from the residential areas Training to the workers to respect local norms	Contractor	-Number of Consultation performed in local communities during construction time on women safety and security concerns - Number of grievances received and addressed regarding women harassment
Through the project lifecycle			
Women in Decision Making	Women will be trained and empowered in order to be part of decision-making processes about their households and business affairs	PMU-LWASA to facilitate trainings with help of local representatives	-Number of women having freedom to spend their earnings -Number of Women involved in decision of family matters such as marriage of their children, etc.
Area Safety	Support the relevant departments in enhancing safety and security of women in public spaces, focusing on gender-based violence.	PMU-LWASA in consultation with Gender Development Department	Number of SEA/SH, GBV and harassment cases in the project AOI

	harassment issues and female vulnerability and risk.	Punjab	
Willingness/ Need to learn Skills forearming the Livelihoods	Improve and develop practical skills and opportunities of women population to enhance their participation to earning the livelihoods / businesses through their employment under the project and trainings associated with their jobs.	PMU-LWASA to facilitate trainings with help of local representatives	-Number of women trained under the Project -Number of women saying they have acquired different skills through the project
Occurrence of Diseases	Support health institutions to take reforms for improving health quality and provide safe and healthy environment	Health Department, PMU-LWASA to follow up along with local representatives	Reporting of various diseases in the project AOI
Gender based Violence / Domestic Violence	Provision in GRM for GBV related issues	PMU LWASA and CC	Number of GBV related issues reported and addressed by the project
Reporting of Sexual Harassment issues	Harassment cases will be properly addressed and reported through GRM	PMU LWASA and CC	Number of harassment related issues reported and addressed by the project

8.7 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Safeguard monitoring is an essential tool for assessing whether the adopted environmental and social management measures are meeting their stated objectives. Two complementary methodology approaches are being applied to monitor the proposed actions under the EMP.

- Compliance monitoring; which checks whether the actions proposed by the EMP have been carried out by visual observation, photographic documentation and the use of checklists prepared for the EMP.
- Effects monitoring; which records the consequences of program activities on the biophysical and social environment, as applicable. these effects are repeatedly measured by applying selected indicators.

It is understood the EMP is supplemented with the RAP which should be monitored following the same methodology approaches.

The plan also defines the monitoring mechanism and identifies a set of verifiable monitoring parameters to ensure that all proposed mitigation measures laid down in the EMP are completely and effectively implemented.

Table 8.5 outlines the parameters that will be monitored, expected frequencies of monitoring and responsible agency for monitoring.

Table 8.5: Environmental and Social Monitoring Program

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implementation	Supervision
Before Construction Phase					
Affected people:	In project AOI	Payment of compensation disbursements. Compliance of payment modalities with RAP	Daily	ESC of PMU	SE of SC
Construction Phase (36 Months)					
Wastewater quality	Three points: one at upstream of WWTP site, second at downstream and third at conveyance channel.	Sampling and analysis of wastewater for all the parameters as given in PEQS	Biannually	Contractor	EE of SC ESC of PMU
Groundwater quality	Three points: one at upstream of WWTP site, second at downstream and third at conveyance channel.	Sampling and analysis of groundwater for all the parameters as given in PEQS	Biannually	Contractor	EE of SC ESC of PMU
Air Quality (dust, smoke):	Along the access roads and at project site :	Visual inspection to ensure good standard equipment is in use and dust suppression measures (sprinkling) are in place	Daily	Contractor	EE of SC ESC of PMU
	Along the access road	Visual inspection to ensure dust suppression work plan is being implemented	Daily	Contractor	EE of SC ESC of PMU
Air Quality ($PM_{2.5}$, NO_2, SO_2, CO_2, CO)	Three points at project site.	Air quality monitoring for 24hours for the parameters specified in PEQS.	Biannually	Contractor	EE of SC ESC of PMU
Smoke from construction machinery	Close to construction area	Visual inspection for the color of the smoke	Daily	Contractor	EE of SC ESC of PMU

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implementation	Supervision
Noise and vibration	Three points at project site.	24hour noise monitoring through EPA certified laboratory	Biannually	Contractor	EE of SC ESC of PMU
	Close to noise generating equipment and road	Field observation	Daily	Contractor	EE of SC ESC of PMU
Waste Management	Storage and camp area	Visual inspection that solid waste is disposed of at designated sites	Weekly	Contractor	EE of SC ESC of PMU
Soil	At the project site and at parking of machinery and material storage points	Visual inspection for leaks and spills	Daily	Contractor	EE of SC ESC of PMU
Water quality	At the project site	pH, Organic Matter, Electrical conductivity, Phosphorous, Potassium, Saturation Percentage, Soil Texture	Once	Contractor	EE of SC ESC of PMU
Road Traffic safety	Along the road	Visual inspection to ensure Traffic Management implemented	Weekly	Contractor	EE and SE of SC ESC of PMU
Drinking water and sanitation	At construction camps	Visual inspection	Weekly	Contractor	EE of SC ESC of PMU
Erosion	—	Visual inspection to ensure local roads are not damaged	Weekly	Contractor	EE of SC ESC of PMU
Reinstatement of work sites	—	Visual inspection	After completion of all works	Contractor	EE and SE of SC ESC of PMU
Safety of workers	At active construction sites	Visual inspection to ensure use of PPE by workers	Daily	Contractor	EE and SE of SC ESC of PMU
Provision of PPEs	At active construction sites	Visual inspection	Daily	Contractor	EE and SE of SC ESC of PMU

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implementation	Supervision
Labour Management	At construction camps	Visual inspection regarding Child labour, employment conditions, workers accommodation, housekeeping, HIV/STDs etc.	Daily	Contractor	EE and SE of SC ESC of PMU
Labour Influx	At construction camps	Conflicts related to labour influx	Daily	Contractor	SE of SC ESC of PMU
Grievances Redress	At construction camps and inside community	Type and number of grievances along with grievance status (resolved, ongoing)	Daily	Contractor	SE of SC ESC of PMU
Community/occupational health & safety	At construction camps and nearby communities	Visual Monitoring for community health Type and number of accidents for occupational safety	Daily	Contractor	EE and SE of SC ESC of PMU
Gender Based Violence (GBV)	At construction camps	Number of incidents of women harassment	Daily	Contractor	SE of SC ESC of PMU
Training	At construction camps	Community occupational health and safety and Gender In-equalities	Once during construction period	Contractor	EE and SE of SC ESC of PMU
Affected people	In project AOI	Grievances related to compensation and livelihood restoration	Daily	ESC of PMU	SE of SC
Operation Phase* (2 Year)					
Wastewater quality	Two points, one at upstream of WWTP and second at down stream	Sampling and analysis of wastewater for all the parameters as given in PEQS	Annually	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Ground Water Quality	Two points, one at upstream of WWTP and second at down stream	Sampling and analysis of water quality for all the parameters as per PEQS	Annually	Contractor	EE and SE of SC ESC of PMU EPD Punjab

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implementation	Supervision
Air Quality	At the project Site	Air quality monitoring for 24 hours for the parameters specified in SEQS	Annually	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Noise and vibration	At project site	24 hour noise monitoring through EPA certified laboratory	Annually	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Soil	Close to road	Field observation	Daily	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Solid Waste/ Sludge	At the project Site	Physical and Chemical Analysis of solid waste	Biannually	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Emissions from treatment facility	At the project site	Field observation	Daily	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Smoke emissions from vehicles	Close to operation area	Visual inspection for the color of the smoke	Daily	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Fire Safety System	At the project site	Visual inspection of the fire extinguishers and other associated equipment	Daily	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Tree Plantation	At the location as given in plantation plan	Field observation	Daily	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Road Traffic safety	Along the road	Visual inspection to ensure Traffic Management implemented	Daily	Contractor	EE and SE of SC ESC of PMU EPD Punjab

Parameter	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implementation	Supervision
Safety of workers	At the project site	Visual inspection to ensure use of PPE by workers	Daily	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Labour Management Procedure	At the project site	Child labour, employment conditions, workers accommodation, housekeeping, HIV/STDs etc.	Daily	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Training	At the project site	Community occupation health & safety	Biannually	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Grievances Redress	At the project site	Type and number of grievances along with status of complaints (resolved, ongoing)	Daily	Contractor	EE and SE of SC ESC of PMU EPD Punjab
Gender Based Violence	At the project site	Number of incidents of gender in-equality	Daily	Contractor	EE and SE of SC ESC of PMU EPD Punjab

EE	Environmental/HSE Expert	ESC	Environmental and Social Committee
SE	Social Expert	LWASA	Lahore Water and Sanitation Agency
PMU	Project Management Unit	SC	Supervision Consultant
EPD	Environmental Protection Department		

- * the role and responsibilities are being provided for the operation phase based on the assumption that the project will be operated by the contractor for the first 2 years (as a result of a O&M contract). Should the terms and conditions of the contract change, LWASA will be in charge of implementing this environmental and social monitoring program.

8.7.1 Mitigation Plans

Mitigation plans have been prepared on the basis of the detailed impact assessment. These plans are project-specific, and to the extent possible, site-specific, however contractors will be required to carry out further detailing of the key aspects, to prepare site-specific contractor's management plans as discussed below.

8.7.2 Project and Site-Specific Management Plan

These plans are site-specific and where applicable, contract-specific and will be prepared by the contractor(s) prior to the commencement of construction activities. The Plans to be prepared by the contractors for various aspects of the environmental management will mostly include the detailing of the measures included in Mitigation Plans. A brief description of each of these plans is provided below:

Erosion and Drainage Control Plan will be prepared by the contractor on the basis of the mitigation measures given in EMP. The Plan will be submitted to PMU for review and approval before contractor mobilization.

Pollution Prevention Plan will be prepared and implemented by the Contractor on the basis of WBG EHS Guidelines (2007), as well as the mitigation plans given in EMP. The Plan will be submitted to the PMU for review and approval before contractor mobilization.

Waste Disposal and Effluent Management Plan will be prepared and implemented by the Contractor on the basis of WBG EHS Guidelines (2007), as well as the mitigation plans given in EMP. The Plan will be submmed to the PMU for review and approval before contractor mobilization.

Traffic Management Plan will be prepared by the Contractor on the basis of the mitigation plans given in EMP, after discussion with LWASA and authorities responsible for roads and traffic. The Plan will be submitted to the PMU for their review and approval before contractor mobilization.

Borrow Area Management and Restoration Plan for management and restoration of borrow areas will be prepared by the Contractor on the basis of requirements described in the mitigation plans. This Plan will aim at minimizing the environmental and social impacts during borrowing activities and restoring as much as possible the original natural situation of these sites by various measures (refill, leveling or smoothening). Restoration methodologies will be included in the Plan. The Plan will be approved by the PMU.

Occupational Health and Safety Plan will be prepared and implemented by the Contractor on the basis of the WBG EHS Guidelines (2007) and other relevant standards. The plan also includes: the transportation / movement, storage and usage of explosive materials in compliance with Explosive Act, 1884, Explosive Rules, 2010 and BS5607 (British Standards).

A separate plan to combat COVID-19 containing SOPs is provided as **Annex-XI**. The Plan will be submitted to the PMU for review and approval before contractor mobilization.

Labor Influx Management Plan will be prepared by the Contractor on the basis of the mitigation measures developed in the EMP regarding labor influx. this plan should be linked closely with Health and Safety Plans and Construction Camp Management Plan. The plan should also be developed based on the ESF ESS2 and related guidance (Labor Influx Good Practice note as a minima), and integrate means to address GBV in the context of Labor Influx. The Plan will be submitted to the PMU for review and approval before contractor mobilization.

Drinking Water Supply and Sanitation Plan: Separate water supply and sanitation provisions will be needed for the temporary facilities, labor camps and workshops, in order not to cause shortages and/or contamination. A plan will be prepared by the Contractor on the basis of WBG EHS Guidelines. The Plan will be submitted to the PMU for review and approval before contractor mobilization.

Construction Camp Management Plan will be prepared by the Contractor on the basis of the mitigation plans given in EMP. The Plan will include the camp layout, details of various facilities including supplies, storage, and disposal. The Plan will be submitted to the PMU for review and approval before camp establishment.

Fuel and Hazardous Substances Management Plan will be prepared by the Contractor on the basis of the mitigation plans given in EMP and in accordance with the standard operating procedures, relevant guidelines, and where applicable, material safety data sheets. The Plan will include the procedures for handling oils and chemical spills. The Plan will be submitted to the PMU for review and approval before contractor mobilization.

Emergency Preparedness Plan will be prepared by the Contractor after assessing potential risks and hazards that could be encountered during construction of road. The Plan will be submitted to the PMU for review and approval before contractor mobilization.

Communication Plan will be prepared by the contractor to demonstrate how they will communicate with local community leaders, provide details regarding employment opportunities, and traffic management throughout the construction period. The contractor's communication plan should define a process for receiving, recording and responding to complaints and also monitoring of the success of any responsive action taken to prevent the escalation of any conflicts.

Site Restoration and Rehabilitation Plan The main areas to be considered for site restoration & rehabilitation include the construction area, campsite area, temporary tracks, land used for vehicles, material stores etc. These areas should be restored to their original condition with the maximum possible effort. The restoration work comprises the removal of temporary construction works and removal of any fences installed and levelling of the area (wherever required) etc. The following procedures will be adopted for the restoration of the project sites:

- All temporary construction built for the site development will be removed;
- Site for construction camps will be restored to its original (pre-construction) condition as much as possible;
- All the toxic and hazardous chemicals/materials will be completely removed from the site. Efforts will be made to completely remove the oils and chemical spills which occurred during the construction stage;
- Any debris from the construction site will be removed properly from the site and disposed of in an environmental friendly manner;
- All fencing and gates will be removed and pits will be backfilled; and
- Whole of the site will be covered with the original soil and plantation will be done, wherever required.

To achieve the above objectives the Contractor will prepare a Site Restoration & Rehabilitation Plan well before the completion of the construction activities and submit to PMU through the SC for approval. Finally, after the completion of the restoration process, PMU through the representatives of the ESSU and other community members will inspect the site and give restoration clearance to the Contractor.

Disposal Area Management and Restoration Plan The management and restoration plan of disposal areas will be prepared by the Contractor. The Plan will describe the procedures for spoil management, transportation and disposal at the selected site(s). The Plan will also describe the procedures for systematically disposing the spoil at the disposal site. This Plan would aim at minimizing the environmental and social impacts during disposal activities and restoring as much as possible the original natural situation of these sites by various measures (landscaping, leveling or smoothening). The Plan will include measures to avoid land / soil erosion and landslides. Restoration methodologies will be included in the Plan. The Plan would be approved by the SC and a landscape architect assigned by PMU.

8.8 TRAINING PROGRAM

The environmental and social trainings will help to ensure that the requirements of the EMP are clearly understood and followed by all project personnel (including both men and women). The primary responsibility of providing these trainings to all project personnel will be that of the contractor and EC. The trainings will be provided to different professional groups separately such as managers, skilled personnel, unskilled labors, and camp staff. Capacity building will be aimed at strengthening the EC and operational staff in the field of environmental management and social development; such training will also be beneficial for women employed under the project to improve or diversify their skills. Table 8.6 provides detail of trainings required for implementation of EMP during construction and operational phase.

Table 8.6: Training Details for Implementation of EMP

Training Activity	Participants	Content	Scheduling	Responsibility	Cost Estimates Rs.
Construction phase (3 years)					

Training activity	Participants	Content	Scheduling	Responsibility	Cost Estimates Rs.
AFD Policy and World Bank EHSG	Contractor Staff	Awareness and application of WB EHSG	Twice	Contractor with assistance of SC / LWASA	300,000/=
Resource Conservation and Pollution prevention	Contractor Staff	Awareness of ESS3, importance of practices to be adopted for pollution preventions and resource conservation	Annually	Contractor with assistance of SC / LWASA	150,000/=
Awareness workshop regarding Covid 19 and other vector borne diseases	Contractor Staff	Risk, Prevention and available treatment	Annually	Contractor with assistance of SC / LWASA	150,000/=
Waste Management	Contractor Staff	Awareness associated with waste Storage, collection and safe disposal	Twice	Contractor with assistance of SC / LWASA	300,000/=
Emergency Response	Contractor Staff	Potential natural and other hazard/emergencies and dealing with emergency to minimize damage	Quarterly	Contractor with assistance of SC / LWASA	600,000/=
Pak EPA Regulations and World Bank ESF	Managerial Staff of Contractor	Awareness on World Bank Safeguard Standards, EPA rules, guidelines, regulation and standards for satisfactory compliance	Twice	Contractor with assistance of SC / LWASA	300,000/=
Resettlement Related issues	Contractor and ESC Staff of LWASA	Awareness on ESS-5 Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Twice	SC / LWASA	300,000/=
Labour Management Procedures	Contractor Staff	Awareness on World Bank ESS-2 Labour and working	Twice	Contractor with assistance of SC / ESC	300,000/=

Training activity	Participants	Content	Scheduling	Responsibility	Cost Estimates Rs.
		conditions and HIV/STDs			
Community occupational health and safety	Contractor Staff	Awareness on World Bank ESS-4, Community health and safety and local norms (including security and safety concerns of females)	Twice	Contractor with assistance of SC / ESC	200,000/-
Gender Aspects	Contractor Staff	Awareness on gender inequalities/GBV (other measures of the GAP are already included internally under other components)	Annually	Contractor with assistance of SC / ESC	900,000/-
				Total	2,738,000/-
				Total over 3 years of construction	8,190,000/-
Operational Phase (2 years at minimal)					
WB EHSGs and Pollution prevention	All relevant staff involved in the operational phase of the Project	Awareness and Applicability of WB EHSGs importance of Practices to be adopted for pollution preventions	Once	Contractor with assistance of SC / ESC	200,000/-
Awareness workshop regarding Covid 19 and other vector borne diseases	All relevant staff involved in the operational phase of the Project	Risk, Prevention and available treatment	Once	Contractor with assistance of SC / ESC	200,000/-
Sludge Management at site	All relevant staff involved in the operational phase of the Project	Awareness associated with sludge handling and disposal	Once	Contractor with assistance of SC / ESC	200,000/-
Emergency Response	All staff	Potential natural and other hazard/emergencies and dealing with emergency to minimize damage	Once	Contractor with assistance of SC / ESC	200,000/-

Training Activity	Participants	Content	Scheduling	Responsibility	Cost Estimates Rs.
Pak EPA Regulations and World Bank Safeguard Standards	Managerial Staff	Awareness on World Bank Safeguard Standards, EPA rules, guidelines, regulation and standards for satisfactory compliance	Once	Contractor with assistance of SC / ESC	200,000/-
Labour Management Procedures	Managerial Staff of the contractor and LWASA	Awareness on World Bank ESS-2, Labour and working conditions	Once	Contractor with assistance of SC / ESC	200,000
Community/ occupational health and safety	All relevant staff involved in the operational phase of the Project	Awareness on World Bank ESS-4, Community health and safety	Once	Contractor with assistance of SC / ESC	200,000
Gender Aspects	Managerial Staff of the contractor and LWASA. All relevant staff involved in the operational phase of the Project	Awareness on gender inequalities, GBV and GAP measures	Once	Contractor with assistance of SC / ESC	200,000/-
				Total	1,600,000/year
				Total over 2 years of Operational Phase	3,200,000

8.9 NON-COMPLIANCE OF THE EMP

The implementation of the proposed EMP involves inputs from various functionaries as discussed earlier. The contractor will be primarily responsible for ensuring implementation of the mitigation measures proposed in the EMP, which will be part of the contract documents. The provision of the environmental mitigation cost will be made in the total cost of project, for which contractor will be paid on the basis of monthly compliance reports. The contractor will not be allowed to proceed further until the mitigation measures as proposed in the EMP are taken and approved by Supervision Consultant.

8.10 EMP REPORTING AND REVIEW

The Environmental HSE Expert of Contractor and SC will prepare monthly reports covering various aspects of the EMP implementation including compliance and effects monitoring.

capacity building, and grievance redress during project implementation. List of reports to be prepared during implementation and operation stages are presented in Table 8.7

Table 8.7: Reporting during implementation and operation stages

Report	Contents	Prepared by	Distribution
Monthly Progress Report for EMP Compliance	Any Non-Compliances observed on sites and actions required	SC	Contractor, ESC of PMU
Monthly Progress Report for EMP Compliance	Actions taken on site in response to EE,SC monthly report Project progress and works to be undertaken in the coming three months Details of training delivered Details of accidents reported and actions taken	Contractor	EE of SC ESC of PMU
Quarterly Progress Report for EMP Compliance	Quarterly review on implementation of EMP including compliance and monitoring, capacity building, and grievance redress	SC	Project Director of PMU, Contractor
Biannual Progress Report for EMP Compliance	Biannual reporting for OHS, including work hours, number of lost-time accidents/incidents, serious injuries and fatalities, amount of lost time, root cause investigations, etc. There should also be some incident reporting requirements, such as for major spills, fatalities, local unrest, etc	ESC of PMU with assistance of SC	Project Director of PMU, AFD, Contractor
Annual Report for EMP Compliance	Results of effects monitoring, independent review of environmental and social performance on site. Recommended actions required by all parties	ESC of PMU with assistance of SC	Project Director of PMU, AFD, Contractor

8.11 CHANGE MANAGEMENT PLAN

The present EIA has been carried out on the basis of the Project information available at this stage. It is however possible that the changes are made in some components of the Project during the design and construction phases. In order to address the environmental and social implications of these changes, a simple framework has been devised, which is described in this section. The change management framework recognizes the three broad categories (A, B & C) of the changes in the Project as detailed below:

- Category 'A' Change

The 'Category A' change is one that will lead to a significant departure from the Project described in the EIA and consequently requires a reassessment of the environmental and socioeconomic impacts associated with the change. In such an instance, Client will be

required to conduct a fresh EIA of the changed aspect of the Project design and send the updated report to the relevant agencies for approval.

- Category 'B' Change

The category 'B' change is one that will entail Project activities not significantly different from those described in the EIA, which may result in the Project effects with overall magnitude to be similar to the assessment made in this report. In case of such changes, the EIA will be required to reassess the environmental and socio-economic impacts of the activity, specify additional mitigation measures, if necessary and report the changes to the relevant agencies (Contractors, EPAs).

- Category 'C' Change

A Category-C change is one that is of little consequence to the EIA findings such as change in alignment. This type of change does not result in effects beyond those already assessed in the EIA; rather it may be made onsite to minimize the impact of an activity, such as re-aligning a particular section to avoid cutting a tree or relocating construction campsites to minimize clearing vegetation. The only actions required for such changes are informing all the key personnel and document the change.

8.12 COST ESTIMATE FOR IMPLEMENTATION OF EMP

a) Cost for Environmental Monitoring:

Cost for Environmental monitoring has been worked out and is given in Table 8.8:

Table 8.8: Cost Estimate for Environmental Monitoring during Construction and Operation Phases

Components	Parameters	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs.)
Construction Phase (36 months/ 3 years)						
Air Quality	CO, NO_x, SO_x, PM_{10}	3	Biannually	Contractor	24 hours	990,000/- @ Rs. 55,000/ sample
Ground Water Quality	All PEQS parameters	3	Biannually	Contractor	-	450,000/- @ Rs. 25,000/sample
Surface Water Quality	All PEQS parameters	3	Biannually	Contractor	-	450,000/- @ Rs. 25,000/sample
Noise Level	-	3	Biannually	Contractor	24 hours	90,000/- @ Rs. 5,000/point
					TOTAL	1,980,000/-
Operation Phase (First 2 years)*						
Air Quality	CO, NO_x, SO_x, PM_{10}	1	Annually	Contractor	24 hours	110,000/- @ Rs. 55,000/ sample
Ground Water Quality	All PEQS parameters	2	Annually	Contractor	-	100,000/- @ Rs. 25,000/sample
Surface Water Quality	All PEQS parameters	2	Annually	Contractor	-	100,000/- @ Rs. 25,000/sample
Noise Level	-	1	Annually	Contractor	24 hours	10,000/- @ Rs. 5,000/point
					Sub-Total	320,000/-
				GRAND TOTAL over (3+2 =) 5 years		2,300,000

- * the role and responsibilities are being provided for the operation phase based on the assumption that the project will be operated by the contractor for the first 2 years (as a result of a DBO contract). Should the terms and conditions of the contract change, LWASA will be in charge of implementing this environmental and social monitoring program.

b) Cost of Health & Safety and other miscellaneous items

Cost of Health and Safety is worked out as under Table 8.9.

Table 8.9: Cost of Health & Safety and other miscellaneous items

Sr. No.	Items	Description	Cost (Rs.)
1	Water Sprinkling	Lump sum	1,500,000
2	Medical screening for workers	Rs. 3000 per employee and for 450 employees (construction peak)	1,350,000
3	Material Storage, Handling and use	Two (02) No. of tarpaulins of Rs. 25,000 each	50,000
4	Handling, transportation of Hazardous material and Solid Waste	Rs. 40,000/month for a period of 36 months will be required for transportation of material	1,440,000
5	Provision of Safety Signboards, safety cones, warning tapes etc.	Lump sum	150,000
6	Fire extinguishers in case of fire	Lump sum	120,000
7	Cost of Covid Management	Lump sum	300,000
8	Cost of Personal Protective Equipment (PPE)	For 450 employees (construction peak) for the provision of dust masks, safety shoes, gloves, first aid box, ear plugs	14,922,000
Total Cost			19,832,000

c) Tree Plantation Cost

A detailed tree plantation plan has been prepared as given in Annex-XII. The cost for tree plantation and maintenance has been worked out as Rs. 97,438,000/-.

Cost of implementation of EMP

Cost of implementation of Environmental Management plan is estimated to be Rs. 300 million. However, this cost does not include cost of RAP and fees related to sludge management. Detail is given below in Table 8.10.

Table 8.10: Environmental Management Cost

Sr. No.	Items	Description	Cost
1	Cost of Hiring staff by Contractor for EMP implementation	Refer Table 8.1	Rs. 48,000,000/-
2	Cost of Hiring Staff by LWASA for Supervision of EMP	Refer Table 8.1	Rs. 86,160,000/-

Sr. No.	Items	Description	Cost
3	Cost of Hiring Staff by SC for Supervision of EMP	Refer Table 8.1	Rs: 42,425,000/-
4	Cost of environmental and Social training	Refer Table 8.5	Rs: 11,380,000/-
5	Environmental and Social Monitoring Cost	Refer Table 8.8	Rs: 2,300,000/-
6	Cost of Health and Safety and miscellaneous items	Refer Table 8.9	Rs: 19,332,000/-
7	Cost of Tree Plantation	Refer Annexure-XII	Rs: 97,436,000/-
8	Contingencies	5% of overall cost	Rs: 14,231,750/-
		Total Cost (1 to 7)	Rs:285,035,000/-
		Total Cost (with contingencies)	Rs: 299,266,750/-

9 CONCLUSION AND RECOMMENDATIONS

9.1 GENERAL

This section presents conclusion of the ESIA study of the proposed project. The overall objective of EIA study is to carry out a detailed environmental assessment to assess impacts caused by the different activities and to address measures to mitigate adverse environmental impacts that may arise from the execution of the proposed project.

9.2 CONCLUSION

The implementation of the proposed project will have beneficial impacts on population of the project area. The key beneficial impacts of the proposed project are:

- Construction of proposed WWTP will have overall positive impact on the surface water by discharging treated wastewater into the River Ravi. It will result in improving the water quality of River Ravi to a great extent and will decrease the pollution load;
- Current ponding of untreated wastewater without any buffer zone will change into a planned WWTP having buffer zone which will decrease health issues in the adjacent areas;
- Public health risk will be reduced as untreated wastewater will not be discharged into adjacent agricultural land; and
- The project will produce job opportunity in construction as well as in operational phase.

Apart from the beneficial impacts of the project, the proposed project has potential adverse environmental and social impacts during the construction and operational phases. Most of the adverse impacts during construction are of a temporary nature. These potential impacts can be avoided or mitigated by adopting suitable mitigation or remedial measures as mentioned in this ESIA Report. Following are the conclusions based on the findings of EIA study;

- Major impacts resulting in improper designed treatment facility and other allied components of WWTP will be land acquisition, soil degradation, water pollution, flooding of wastewater during rainy season/floods, structure instability, poor emergency management etc.;
- Major adverse impact at the construction phase will be soil and water contamination, noise and air pollution, generation of solid waste, impact on flora and fauna, disturbance to local people, health & safety of workers and other issues due to influx of labour in the project area;
- During operational phase, accidental discharges of untreated wastewater due to the overflow, syphoning or disruption in operation during maintenance of the treatment plant may cause contamination of receiving surface body (Gamti Drain);
- Improper functioning or choking of inlet or outlet of the treated wastewater may also cause the ground water contamination; and
- Improper management of sludge disposal may give rise to various severe issues to environment and health.

9.3 RECOMMENDATIONS

Following recommendations must be taken care prior to any of the decision about the proposed project:

- Proper implementation of EMP, containing mitigation measures for anticipated potential impacts along with monitoring program, should be ensured during all three phases of the proposed project;
- All personnel, staff, employees and contractor's should undertake appropriate training prior to construction to ensure they are aware of the on-site responsibilities in respect of all environmental and social issues. Moreover, the cost for environmental management, monitoring and training has been estimated which should be included in the PC-I or overall Project Cost; and
- The EMP and all its requirements will be made part of the Contractors Contract, thereby making implementation of the EMP a legal requirement according to the Contract. The Contractor will be bound to prepare his own Site Specific Environmental Management Plan (SSEMP) by adopting all of the conditions of the EMP, the GAP, the RAP and adding site specific elements that are not currently known.
- A feasibility study regarding medium to long term management of sludge will be required. The latter can be conducted at later stages after considering the quality of sludge for use of sludge for agricultural use. A workable solution for use of sludge as fertilizer should be identified. Such feasibility study should include a cost-benefit analysis of different options identified.

ANNEXES

ANNEX I: CONCEPTUAL DESIGN PREPARED BY GROUPE HUIT CONSULTANT

ANNEX II: THE ENVIRONMENTAL MONITORING, SAMPLING AND TESTING REPORT IN 2019 AND IN 2021

ENVIRONMENTAL MONITORING, SAMPLING AND TESTING REPORT IN 2019

ESPAK

Environmental Services Pakistan

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CHEMICAL ANALYSIS TEST REPORT (AMBIENT AIR)

Reference No. of Letter:		Date:	
Name of Industry/Client:			
Address:			
Telephone No.:			
Nature of Sample:		Monitoring Location:	
Date of Sample Collection:		Date/ Duration:	
Sample Collected/Sent By:			
Date of Completion of Analysis:			

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2. Name of Chief Analyst with Seal:
3. Signature of In-charge of the Environmental Laboratory:

Name:

Designation:

Name:

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Page 1 of 1

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NOISE MONITORING REPORT

Reference Number:	Date:
Name of Industry/Work:	
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Telephone No:	
Nature of Sample:	Ambient Noise
Date of Sample Collection:	Date/Time Received:
Sample Collected/Sent by:	
Date of Completion of Analysis:	
Testing/Equipment Used:	

S. No.	Measurement Point	Noise Level in dB(A) Leq	Remarks
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3. Signature of Inchargo of the Environmental Laboratory

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Designation:
Date:

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

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Name of Industry / Client:	[illegible]		

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Tel: +92 51 4852 351

ISO ISO OHSAS

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Laboratory Number:	[illegible] Date: [illegible]
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Date of Completion of Analysis:	[illegible]

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5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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ISO ISO OHSAS

Environmental Services Pakistan

PAK EPA & PUNJAB EPD CERTIFIED

ESPAK

CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Reference Number: [illegible] Date: [illegible]

Name of Industry / Client: [illegible]

S.No.	Parameters	Limit Value (WHO 2022)	Concentration	Method / Equipment Used	Remarks
[illegible]					

Note:
The report shows the representative sample tested in the laboratory.
The responsibility of the interpretation of this report lies with the client.
The above mentioned sample conditions when monitoring/sampling was carried out.
The report is not intended to be used illegally by the client.

	Done By	Checked By	Authorized By	Endorsement By	Endorsement By
1. Sample Analysis	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2. Name of Chief Analyst with Seal	[illegible]				
3. Signature of Incharge of the Environment Laboratory					

Name: [illegible]
Current Designation: [illegible]
Date: [illegible]

End of Report

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ESPAK

CHEMICAL ANALYSIS TEST REPORT (SURFACE WATER)

Reference Number:		Date:	
Name of Industry / Client:			
Address:			
Telephone No.:	—		
Nature of Sample:			
Date Sample Received:		Study / Composite:	
Date of Sample Collection:			
Sample Collected / Sent By:			
Date of Completion of Analysis:			

S. No.	Parameters	Minimum Safe Limit (WHO)	Concentration	Method / Equipment Used	Remarks
1					
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ESPAK

Environmental Services Pakistan

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CHEMICAL ANALYSIS TEST REPORT (SURFACE WATER)

Assessment Number:	[illegible]	Date:	[illegible]
Name of Industry / Client:	[illegible]		

S. No.	Parameters	Analysis Value (mg/L)	Concentration	Method / Equipment Used	Remarks
27	Arsenic (As)	[illegible]	[illegible]	[illegible]	[illegible]
28	Boron (B)	[illegible]	[illegible]	[illegible]	[illegible]
29	Iron (Fe)	[illegible]	[illegible]	[illegible]	[illegible]
30	Manganese (Mn)	[illegible]	[illegible]	[illegible]	[illegible]
31	Color	[illegible]	[illegible]	[illegible]	[illegible]
32	Total Coliform Bacteria	[illegible]	[illegible]	[illegible]	[illegible]
33	Fecal Coliform Bacteria	[illegible]	[illegible]	[illegible]	[illegible]
34	E.Coli	[illegible]	[illegible]	[illegible]	[illegible]
35	Temperature of Sample at the time of Analysis	[illegible]	[illegible]	[illegible]	[illegible]
36	Turbidity	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Note:
The report shall not be reproduced in a whole and in part.
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The values represent sample conditions when monitoring/testing was carried out.
The report data is valid only for the sample supplied by the client.

1. Samples Analyzed By: [illegible]
2. Approved By (Lab Analyst with Seal): [illegible]
3. Signature of the Incharge of the Environmental Laboratory: [illegible]

Name: [illegible]
Designation: [illegible]
Date: [illegible]

End of Report

Page 1 / 1

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ENVIRONMENTAL MONITORING, SAMPLING AND TESTING REPORT IN 2021

Environmental Monitoring, Sampling & Testing for ESIA of Wastewater Treatment Plant at Babu Sabu, Lahore

Submitted to:

National Engineering Services Pakistan

National Engineering Services Pakistan (Pvt.) Limited



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DISCLAIMER

This report is produced in compliance with the Client Request from M/S National Engineering Services Pakistan. The information contained in this report was collected and produced from site visits and monitoring data. The information supplied and contained in this report is, to the best of our knowledge, correct and up to date. TÜ Testing Laboratories (TÜ) – Sustainable Environmental services & Laboratory (SESS&L) JV accept no responsibility for changes made to this document by any third party once report is submitted to the client.

Introduction

1 Introduction:

This section describes the project location and scope of services performed by Tk-SES & L Pv

1.1 Project Background

River Ravi originating in India and ending in Pakistan irrigates almost one million acres of agricultural land in India. Intense pollution contributed by both India and Pakistan is threatening irrigation and ground water and also terrestrial and aquatic life. Even with existing legislations such as the Punjab Water Act of 2019, the Punjab Floodplain Regulation Act of 2019, and the Punjab Environmental Quality Standards of 2016, pollution persists primarily due to a lack of wastewater treatment facilities.

Water and Sanitation Agency (WASA), Lahore has engaged National Engineering Services Pakistan (NESPAK) to carry out the Environmental & Social Impact Assessment (ESIA) for Establishment of Wastewater Treatment Plant at Baho Kalu, Lahore. In order to evaluate baseline environmental conditions of the project area, NESPAK has engaged Punjab Environment Protection Department approved Third Party Environmental Laboratories, Tk Testing Laboratories-Sustainable Environmental Services & Laboratory Pv (Tk-SESL&L) to conduct Monitoring of Ambient Air Quality, Noise as well as sampling & analysis of Wastewater, Surface Water and Ground Water.

1.2 Objectives

The objective of this study is to:

- Conduct environmental baseline study for each point as mentioned in Terms of Reference.
- Comply with the EPA regulatory requirements for conducting environmental baseline monitoring.
- Conduct 24 hours Ambient Air & Ambient Noise analysis at each designated location.
- Carry out grab sampling for obtaining samples of Wastewater & Surface Water.
- Conduct water analysis for each samples as per selected parameters utilized USEPA methodologies.

1.3 Scope of Services

The environmental monitoring/sampling was conducted at advised locations for following environment parameters:

- 24-hours Ambient Air Monitoring
- 24-hours Noise Level Monitoring
- Drinking Water Sampling, Testing & Analysis
- Wastewater Sampling, Testing & Analysis

- Surface Water Sampling, Testing & Analysis

1.4 Monitoring & Sampling Location

Four locations for Baseline Monitoring & Sampling (3 locations for Drinking Water Sampling, Wastewater Sampling, 24-hours Ambient Air & Noise Level Monitoring and 1 location for Surface Water Sampling) were selected as per TOR provided by National Engineering Services Pakistan and details have been mentioned below:

- Disposal Station, near Lahore Sabzzar, Lahore (1st point for Drinking Water Sampling, Wastewater sampling, 24-hours Ambient Air & Noise Level Monitoring)
- Saggian Wah Bypass road, Lahore (2nd point for Drinking Water Sampling, Wastewater Sampling, 24-hours Ambient Air & Noise Level Monitoring)
- Nasir Chowk, Bund Road, Green Colony, Lahore (3rd point for Drinking Water Sampling, 24-hours Ambient Air & Noise Level Monitoring)
- Star Beg, near Mamkeal, Lahore (4th point for Wastewater Sampling)
- Ravi River, near Park View Society (point for Surface Water Sampling)



Figure 1-1 Site locations for Environmental Monitoring & Water Sampling

Methodology

2 Methodology:

Following is the brief description of methodology adopted for monitoring, sampling & analysis:

2.1 Survey Planning:

The Environmental and Social Impact Assessment (ESIA) is being conducted for Wastewater Treatment Plant at Baba Sabu, Lahore. For the purpose, 3 locations for Drinking Water Sampling, Wastewater Sampling, 24-hours Ambient Air & Noise Level Monitoring and 1 location for Surface Water Sampling in Lahore have been identified. The project started with planning of monitoring & sampling activities after meeting with the management of National Engineering Services Pakistan (Pvt.) Limited (NESPAK).

2.2 Identification of Locations:

National Engineering Services Pakistan (Pvt.) Limited (NESPAK) provided TB-02/S&E personnel with monitoring & sampling locations and necessary requirements for job execution.

2.3 Monitoring & Sampling Plan:

On the basis of locations, a monitoring & sampling plan was developed in order to achieve precision and accuracy in the monitoring and sampling of the required environmental parameters. The monitoring & sampling plan was developed in consultation with Client's representatives. Monitoring & sampling was started from 12th October, 2021 to 16th October 2021 as observed in Table 2-1.

Table 2-1 Monitoring/Sampling Schedule for given points

Sr. No.	Monitoring Location	Work	GPS Coordinates	Date
1.	Disposal Station, near I-Block Substation, Lahore	WW1	31°30'32.06"N, 74°15'1.09"E	13-10-21 to 14-10-21
		DW1	31°30'35.29"N, 74°15'0.82"E	
		AA1	31°30'54.24"N, 74°15'8.30"E	
		N1	31°30'54.72"N, 74°15'6.70"E	
2.	Sagrian Wala Bypass road, Lahore	WW2	31°34'20.78"N, 74°16'34.38"E	14-10-21 to 15-10-21
		DW2	31°34'21.08"N, 74°16'41.42"E	
		AA2	31°34'20.83"N, 74°16'41.03"E	
		N2	31°34'21.11"N, 74°16'41.05"E	
3.	Nasir Chowk, Ravi Road, Forest Colony, Lahore	*WW3	31°36'20.12"N, 74°13'22.48"E	15-10-21 to 16-10-21
		DW3	31°36'9.90"N, 74°13'3.13"E	
		AA3	31°36'8.03"N, 74°13'5.46"E	
		N3	31°36'9.05"N, 74°13'5.20"E	
4.	Ravi River, near Park View Society	WW4	31°27'56.35"N, 74°10'25.13"E	15-10-21

*WW3 was collected from Main Reg. near Mandwal, Lahore

2.4 Sampling and Analysis Methods

The sampling and testing methods are given in following sections of the report.

2.4.1 Ambient Air Monitoring

The sampling procedures were based on the methods equivalent of United State Environmental Protection Agency USEPA.

- The air quality monitoring was carried out at reference points with the help of Mobile Air Quality Monitoring Equipment. The Analyzers and techniques of monitoring were equivalent with the requirement of USEPA Standards.
- The ambient air quality was monitored by online analyzers continuously for 24 hours at individual sampling point.
- Dust monitoring which includes Particulate Matter (PM_{10}, $PM_{2.5}$) were monitored using USEPA Equivalent Continuous Monitors.

Methods / standards as per Table 2-2 were utilized for the ambient air quality monitoring and hourly interval data for 24 hours & 8 hours reported. Overall methodology was in accordance with USEPA guidelines as well as Punjab Environmental Quality Standards, Notification No. SO(O)EPD/7-26/2013, dated 05-08-2016.

Table 2.2 Ambient Air Analysis Methodology

Sr. #	Parameters	Method	
		Description	Reference
1.	Sulfur Dioxide (SO_2)	Ultraviolet Fluorescence Method	Based on 40CFR Appendix A-1 to Part 50
2.	Oxides of Nitrogen (Nitrogen Oxide-NO)	Gas phase Chemiluminescence	Based on 40CFR Appendix F to Part 50
3.	Oxides of Nitrogen (Nitrogen Dioxide NO_2)	Gas phase Chemiluminescence	Based on 40CFR Appendix F to Part 50
4.	Respirable Particulate Matter (PM_{10})	Light Scattering	Based on 40CFR Appendix J to Part 50
5.	Respirable Particulate Matter ($PM_{2.5}$)	Light Scattering	Based on 40CFR Appendix L to Part 50

Sr. #	Parameters	Method	
		Description	Reference
6.	Suspended Particulate Matter (SPM)	High Volume Method	Based on 40CFR Appendix B to Part 50
7.	Lead	Gravimetric/ICP/OES	Based on 40CFR Appendix G to Part 50
8.	Carbon Monoxide (CO)	Non-Dispersive Infrared Photometry	Based on 40CFR Appendix C to Part 50
9.	Ozone	Chemiluminescence	Based on 40CFR Appendix D to Part 50

Moreover, metrorological monitoring was performed which incorporated wind speed, wind direction, temperature & Humidity.

2.4.2 Noise Level Monitoring

Noise level monitoring was carried out utilizing Class 1, Sound Level Meters for duration of 20 hours at each point. Methodology followed was IEC 1996-1:2016, which defines the basic quantities to be used for the description of noise in community environments and assessment procedures. It also specifies methods to assess environmental noise and gives guidance on predicting the potential annoyance response of a community to long-term exposure from various types of environmental noises.

2.4.3 Drinking Water Sampling

Drinking water samples for chemical analysis were collected in new HDPE / Teflon Sampling containers for each sample. Separate samples were collected for microbiological aliquot. Temperature & pH were analyzed onsite.

Microbiological Sampling were performed after sterilization of water source as per USEPA guidelines and sample collected in Sterilized glass containers. All samples were transported using Ice boxes with temperature under 4°C to maintain sample integrity. All Sampling was carried out as per USEPA guidelines and Environmental Sample Rules, 2001 Statuary Notification S.O.3527(E)/2001.

2.4.3.1 Drinking Water Analysis

Microbiological analysis was conducted within 24 hours of sample collection and remaining analysis conducted within 3 working days. This was to ensure results are representative of actual drinking water

quality with negligible chances of contamination / interference due to any external factor. Analysis was performed as per Table 2-3 defined in Punjab Environmental Quality Standards for Drinking Water Quality.

Table 2.3 Parameters for analysis of Drinking Water

S.No.	Parameters	Method	
		Description	Reference
1.	Color	Spectrometry	Based on USEPA 110.1
2.	pH	Electrometric	Based on USEPA 150.1
3.	Turbidity	Turbidimetric	Based on USEPA 180.1
4.	Total Hardness	Titrimetry	Based on USEPA 130.2
5.	Total dissolved Solids (TDS)	Gravimetric	Based on USEPA 160.1
6.	Aluminum	ICP-OES	Based on USEPA 200.7
7.	Antimony	ICP-OES	Based on USEPA 200.7
8.	Barium	ICP-OES	Based on USEPA 200.7
9.	Boron	ICP-OES	Based on USEPA 200.7
10.	Cadmium	ICP-OES	Based on USEPA 200.7
11.	Chloride	Titrimetric	Based on USEPA 9253
12.	Chromium	ICP-OES	Based on USEPA 200.7
13.	Copper	ICP-OES	Based on USEPA 200.7
14.	Cyanide	Colorimetry	Based on USEPA 335.4
15.	Fluoride	Ion Chromatographic	Based on USEPA 300
16.	Lead	ICP-OES	Based on USEPA 200.7
17.	Manganese	ICP-OES	Based on USEPA 200.7

Sr. #	Parameter	Method	
		Description	Reference
18.	Mercury	ICP-OES	Based on USEPA 200.7
19.	Nickel	ICP-OES	Based on USEPA 200.7
20.	Nitrate	Colorimetry	Based on USEPA 352.1
21.	Nitrite	Spectrometry	Based on USEPA 354.1
22.	Selenium	ICP-MS	Based on USEPA 200.8
23.	Residual Chlorine	Titration	Based on USEPA 330.1
24.	Odor	Organoleptic	Based on SM-2150
25.	Taste	Organoleptic	Based on SM-2160
26.	Arsenic	ICP-OES	Based on USEPA 200.7
27.	Zinc	ICP-OES	Based on USEPA 200.7
28.	Pesticides	High Resolution Gas Chromatography/High Resolution Mass spectrometry	Based on USEPA 1699
29.	Phenols	Spectrometry	Based on USEPA 420.1
30.	Total Coliform	Membrane Filtration	Based on USEPA 600/R-00/013
31.	Fecal Coliform	Membrane Filtration	Based on Standard Method 9222

2.4.4 Wastewater Sampling

Wastewater sample was collected directly in to the container by the site officer. Measurement of pH & temperature was done on every sample taken. Wastewater samples were transported in ice box/preserved at less than 4°C. All Sampling was carried out as per USEPA guidelines and Environmental Sample Rules, 2001/Statuary Notification/S.R.O.527(E)/2001.

2.4.4.1 Wastewater Analysis

Sample Chain of custody was maintained from sampling location to Laboratory to ensure sample integrity and results submitted within 5 days after submission in Laboratory. Analysis was performed as per the following parameters stated in Table 2-4, defined in Punjab Environmental Quality Standards.

Table 2-4 Parameters for analysis of Wastewater

S.#.	Parameters	Method	
		Description	Reference
1.	Temperature	Thermometer	Based on USEPA 170.1
2.	pH value	Electrometric	Based on USEPA 150.1
3.	Chemical oxygen demand	Titrimetry	Based on USEPA 410.1
4.	Biological oxygen demand	BOD (5 days, 20°C)	Based on USEPA 405.1
5.	Total dissolved solids	Gravimetric	Based on USEPA 160.1
6.	Total suspended solids	Non Filterable Residue By Drying Oven	Based on USEPA 160.2
7.	Chloride	Titrimetric	Based on USEPA 9255
8.	Fluoride	Ion Chromatography	Based on USEPA 300
9.	Oil & Grease	Solvent Extraction & Gravimetry	Based on USEPA 1664
10.	Phenols	Spectrometry	Based on USEPA 420.1
11.	Cyanide	Colorimetry	Based on USEPA 335.4
12.	Anionic Detergents as MBAs	Colorimetry	Based on USEPA 425.1

Sl. No.	Parameters	Method	
		Unacceptable	Reference
13.	Sulfate	Colorimetry	Based on USEPA 375.4
14.	Sulfide	Titrimetry Colorimetry	Based on USEPA 376.1/376.2
15.	Ammonia	Automated Colorimetry/ Titrimetry	Based on USEPA 350.1/350.2
16.	Cadmium	ICP-OES	Based on USEPA 200.7
17.	Chromium as Hexavalent	Colorimetry	Based on Std 3500 - Cr B
18.	Chromium as Trivalent	Colorimetry, ICP-OES Calculated	Based on Std 3500 - Cr B, USEPA 200.7
19.	Copper	ICP-OES	Based on USEPA 200.7
20.	Lead	ICP-OES	Based on USEPA 200.7
21.	Nickel	ICP-OES	Based on USEPA 200.7
22.	Zinc	ICP-OES	Based on USEPA 200.7
23.	Iron	ICP-OES	Based on USEPA 200.7
24.	Manganese	ICP-OES	Based on USEPA 200.7
25.	Selenium	ICP-OES	Based on USEPA 200.7
26.	Silver	ICP-OES	Based on USEPA 200.7
27.	Arsenic	ICP-OES	Based on USEPA 200.7
28.	Barium	ICP-OES	Based on USEPA 200.7
29.	Boron	ICP-OES	Based on USEPA 200.7
30.	Mercury	ICP-OES	Based on USEPA 200.7
31.	Chloride	Colorimetric	Based on Std-4500-Cl-G

Sr. #	Parameters	Method	
		Description	Reference
32	Total Toxic Metals	Calculated	-
33	Pesticides	High Resolution Gas Chromatography/High Resolution Mass spectrometry	Based on USEPA 1699

2.4.5 Surface Water Sampling

Surface water samples for chemical analysis were collected in new HDPE / Teflon Sampling containers for each sample. Separate samples were collected for microbiological aliquot. Temperature & pH were analyzed onsite.

Microbiological Sampling were performed after sterilization of water source as per USEPA guidelines and sample collected in Sterilized glass containers. All samples were transported using Ice boxes with temperature under 4°C to maintain sample integrity. All Sampling was carried out as per USEPA guidelines and Environmental Sample Rules, 2001 Statutory Notification S.R.O.527(1)/2001.

2.4.5.1 Surface Water Analysis

Microbiological analysis was conducted within 24 hours of sample collection and remaining analysis conducted within 3 working days. This was to ensure results are representative of actual ground water quality with negligible chances of contamination / interference due to any external factor. Analysis was performed as per Table 2-5, defined in Punjab Environmental Quality Standards.

Table 2-5 Parameters for analysis of Surface Water

Sr. #	Parameter	Method	
		Description	Reference
1.	Color	Spectrometry	Based on USEPA 110.1
2.	pH	Electrometric	Based on USEPA 150.1
3.	Turbidity	Turbidimetric	Based on USEPA 180.1
4.	Total Hardness	Titrimetry	Based on USEPA 130.2
5.	Total dissolved Salts (TDS)	Gravimetric	Based on USEPA 160.1

Sl. #	Parameters	Method	
		Description	Reference
6.	Aluminum	ICP-OES	Based on USEPA 200.7
7.	Antimony	ICP-OES	Based on USEPA 200.7
8.	Barium	ICP-OES	Based on USEPA 200.7
9.	Boron	ICP-OES	Based on USEPA 200.7
10.	Cadmium	ICP-OES	Based on USEPA 200.7
11.	Chloride	Titrimetric	Based on USEPA 9253
12.	Chromium	ICP-OES	Based on USEPA 200.7
13.	Copper	ICP-OES	Based on USEPA 200.7
14.	Cyanide	Colorimetry	Based on USEPA 335.4
15.	Fluoride	Ion Chromatography	Based on USEPA 300
16.	Lead	ICP-OES	Based on USEPA 200.7
17.	Manganese	ICP-OES	Based on USEPA 200.7
18.	Mercury	ICP-OES	Based on USEPA 200.7
19.	Nickel	ICP-OES	Based on USEPA 200.7
20.	Nitrate	Colorimetry	Based on USEPA 352.1
21.	Nitrite	Spectrometry	Based on USEPA 354.1
22.	Selenium	ICP-MS	Based on USEPA 200.8
23.	Residual Chlorine	Titration	Based on USEPA 330.1
24.	Odor	Organoleptic	Based on SM-2150
25.	Taste	Organoleptic	Based on SM-2160
26.	Arsenic	ICP-OES	Based on USEPA 200.7

Sr. #	Parameters	Method	
		Description	Reference
27.	Zinc	ICP-OES	Based on USEPA 200.7
28.	Pesticides	High Resolution Gas Chromatography/High Resolution Mass spectrometry	Based on USEPA 1699
29.	Phenols	Spectrometry	Based on USEPA 420.1
30.	Total Coliform	Membrane Filtration	Based on USEPA 600/4-85-076
31.	Fecal Coliform	Membrane Filtration	Based on Standard Method 9222

Results & Discussion

This chapter will shed light on the results obtained from Environmental Monitoring as well as Water analysis. Results will be stated and compared with Punjab Environmental Quality Standards and their probable causes will be discussed as per observations during the monitoring / sampling activity.

3 Environmental Monitoring and Analysis Results

Monitoring and analysis results and discussion have been provided as follows:

3.1 Ambient Air Analysis

In this section results of Ambient Air Monitoring (CO, O_3, NH, NO_2, SO_2, $PM_{2.5}$, PM_{10}, SPM & Pb) measured at identified project's sites to get an overview of the ambient air quality are discussed. The ambient air quality results at different locations are as follows:

3.1.1 Location 01- Disposal Station, near L-block Sabzazar, Lahore

The first location was at Disposal Station, near L-block Sabzazar, Lahore having coordinates as 31°30'54.24"N, 74°15'8.30"E. As per Punjab Environmental Quality Standards, all values were monitored on 13/10/2021-14/10/2021 during 24 hours continuous analysis except Carbon Monoxide and Ozone, which were analyzed for 08 and 01 hour respectively. Moreover, the analysis results of Suspended Particulate Matter were obtained after 24 hours gravimetric analysis. The average ambient air results obtained during 24 hours are listed as follows in Table 3-1:

Table 3-1 Ambient Air Monitoring (24 hours) average results at Disposal Station, near L-block Sabzazar, Lahore, (Coordinates: 31°30'54.24"N, 74°15'8.30"E) from 13/10/2021 (10:30AM) to 14/10/2021 (10:30AM)

Ambient Air Quality Monitoring Results					
Sr.	Parameters	Unit	Monitoring Duration	PEQS*	Results
1.	Carbon Monoxide (CO)	mg/m³	08 hours	5	2.62
2.	Nitrogen Oxide (NO)	µg/m³	24 hours	40	18.05
3.	Nitrogen Dioxide (NO_2)	µg/m³	24 hours	80	31.12
4.	Sulfur Dioxide (SO_2)	µg/m³	24 hours	120	39.28
5.	Ozone (O3)	µg/m³	01 hours	130	33.34
6.	Lead (Pb)	µg/m³	24 hours	1.5	0.31
7.	Particulate Matter ($PM_{2.5}$)	µg/m³	24 hours	35	29.53
8.	Particulate Matter (PM_{10})	µg/m³	24 hours	150	121.44
9.	Suspended Particulate Matter (SPM)	µg/m³	24 hours	500	263

*Averages of 24 hours or 8 hours or 1 hour respectively

3.1.1.1 Remarks & Discussion

The ambient air quality analysis location was Disposal Station, near L-block Sabzazar, Lahore. There was a well-maintained area with plantation as well as distance from nearby roads and point sources for stack emissions. Due to minimum point sources and significant distance from road, the ambient air observed was relatively within limits set by Punjab Environment Protection Department. Moreover, the graphical representation in Figure 3-1 also shows no significant changes in 24 hours.

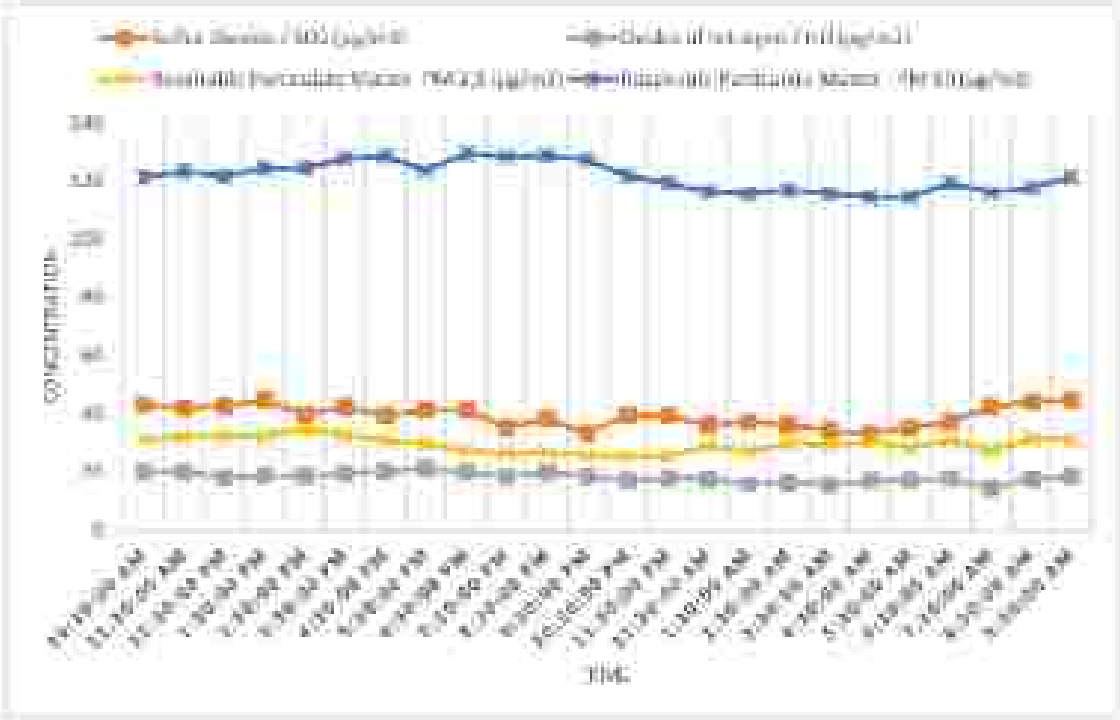


Figure 3-1 Graphical presentation of Ambient Air Results at Disposal Station, near L-block Sabzazar, Lahore

3.1.2 Location 02- Saggian Wala Bypass road, Lahore:

The second location was near Saggian wala bypass road, Lahore having coordinates as 31°34'20.83"N, 74°16'41.01"E. As per Punjab Environmental Quality Standards, all values were collected on 14/10/2021-15/10/2021 during 24 hours continuous analysis except Carbon Monoxide and Ozone, which were calculated for 08 and 01 hour respectively. Moreover, the analysis results of Suspended Particulate Matter were obtained after 24 hours gravimetric analysis. The ambient air results obtained during 24 hours analysis are stated as follows in Table 3-2.

Table 3-2 Ambient Air Monitoring (24 hours) Average results at Saggian wala bypass road, Lahore (Coordinates: 31°34'29.82"N, 74°16'41.82"E) from 14/10/2021 (11:45 AM) to 15/10/2021 (10:45 AM)

Ambient Air Quality Monitoring Result					
Sr.	Parameters	Unit	Monitoring Duration	PEQS*	Results
1.	Carbon Monoxide (CO)	mg/m³	08 hours	5	5.12
2.	Nitrogen Oxide (NO)	µg/m³	24 hours	40	20.08
3.	Nitrogen Dioxide (NO2)	µg/m³	24 hours	80	45.24
4.	Sulfur Dioxide (SO2)	µg/m³	24 hours	120	81.67
5.	Ozone(O3)	µg/m³	08 hours	130	71.56
6.	Lead (Pb)	µg/m³	24 hours	1.5	0.97
7.	Particulate Matter (PM2.5)	µg/m³	24 hours	35	49.67
8.	Particulate Matter (PM10)	µg/m³	24 hours	150	175.8
9.	Suspended Particulate Matter (SPM)	µg/m³	24 hours	500	410

*Averages of NO2 & CO of 08 & 08 hours respectively

3.1.2.1 Remarks & Discussion

The ambient air quality analysis location was near Saggian Wala Bypass road, Lahore which is one of the busiest areas in terms of traffic flow. Most of the traffic is due to large scale 16 wheelers running on diesel fuel and are main source of emission of smoke and gaseous pollutants. This was reflected in the ambient air monitoring results which showed increased levels of Carbon Monoxide along with particulate matter as compared to Punjab Environmental Quality Standards. The trend of the values was increased during rush hours of morning and afternoon. Main causes of Particulate matter & Carbon Monoxide are inefficient burning of fuel due to vehicles which require maintenance as well as usage of substandard fuel. Trend of hourly ambient air results can be observed in Fig 3-5.

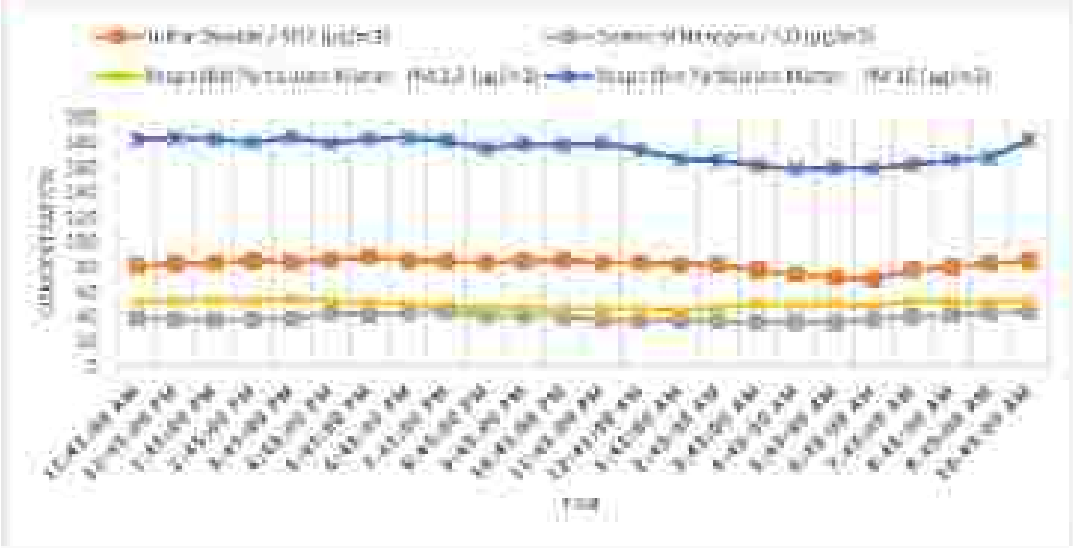


Figure 3-2 Graphical Representation of 24 hours Ambient Air Results Sugjan Wala Bypass Road, Lahore

3.1.3 Location 03: Niazi Chowk, Ravi Road, Forest Colony, Lahore

The third location was at Niazi chowk, Ravi Road, Forest Colony, Lahore having coordinates as 31°36'8.93"N, 74°18'3.46"E. As per Punjab Environmental Quality Standards, all values were monitored on 15/10/2021-16/10/2021 during 24 hours continuous analysis except Carbon Monoxide and Ozone, which were analyzed for 08 and 01 hour respectively. Moreover, the analysis results of Suspended Particulate Matter were obtained after 24 hours gravimetric analysis. The ambient air results obtained during 24 hours are stated as follows in Table 3-3:

Table 3-3 Ambient Air Monitoring (24-hours) average results at Niazi Chowk, Ravi Road, Forest Colony, Lahore (Coordinates 31°36'8.93"N, 74°18'3.46"E) from 15/10/2021 (12:30PM) to 16/10/2021 (11:30AM)

Sr.	Parameters	Unit	Monitoring Duration	PEQS*	Results
1.	Carbon Monoxide (CO)	mg/m³	08 hours	5	4.61
2.	Nitrogen Oxide (NO)	µg/m³	24 hours	40	20.9
3.	Nitrogen Dioxide (NO_2)	µg/m³	24 hours	80	67.84
4.	Sulfur Dioxide (SO_2)	µg/m³	24 hours	120	100.98
5.	Ozone(O3)	µg/m³	01 hours	130	92.63
6.	Lead (Pb)	µg/m³	24 hours	1.5	0.89
7.	Particulate Matter ($PM_{2.5}$)	µg/m³	24 hours	35	41.24

8.	Particulate Matter (PM_{10})	$\mu g/m^3$	24 hours	120	133.58
9.	Suspended Particulate Matter (SPM)	$\mu g/m^3$	24 hours	300	187

*Averages of CO_2 & CO of 01 @ 08 hours respectively

3.1.3.1 Remarks & Discussion

The ambient air quality analysis location was near Nasir Chowk, Pirani Colony, Lahore which was being utilized as a stay area for trucks, buses and other heavy vehicles. Comparatively the traffic flow is less than the one observed at Saggian Wala Bypass but still increased the concentration of dust as compared to Punjab Environmental Quality Standards. Moreover, the values of Carbon monoxide, sulfur dioxide and ozone were high but within PEQS. This indicates high frequency of traffic as well as use of substandard fuel and inefficient engines. Trend of hourly ambient air results can be observed in Fig 3-3 below:

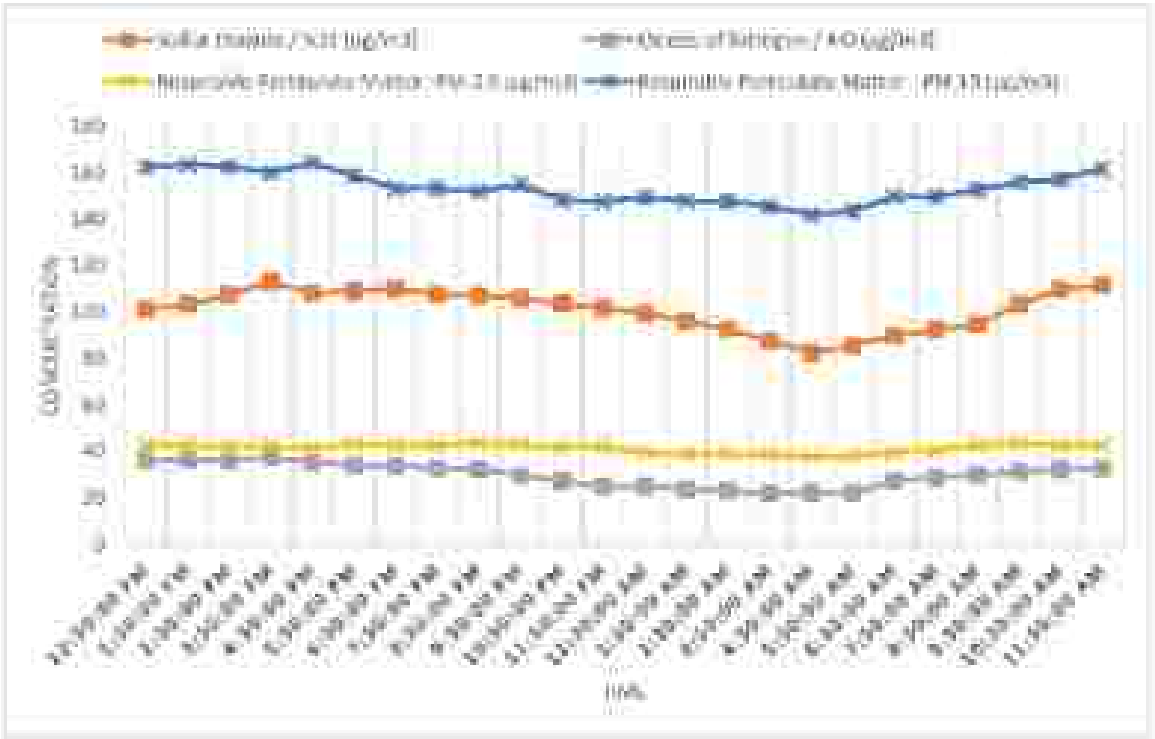


Figure 3-3 Graphical Representation of 24-hours Ambient Air Results Nasir Chowk, Forest Colony, Lahore

3.2 Noise Level Monitoring

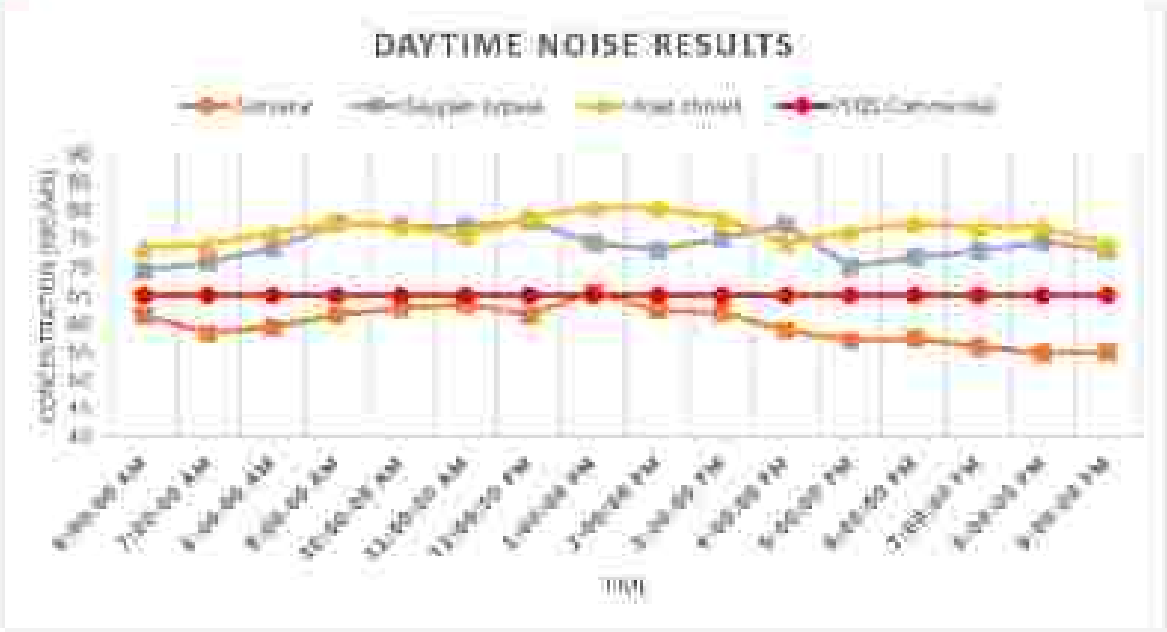
In this section, results of 24-hours Noise level Monitoring measured at identified projects site to get an overview of noise level in the designated areas. The hourly and average noise level results at different locations during day time are stated as follows in Table 3-4. Variations observed were due to constant traffic flow and increased on peak hours for periods at Saggian Wala Bypass Road & Nasir Chowk. As the

location at Sahasra had limited intervention of traffic, noise level was lower and showed minimum variations.

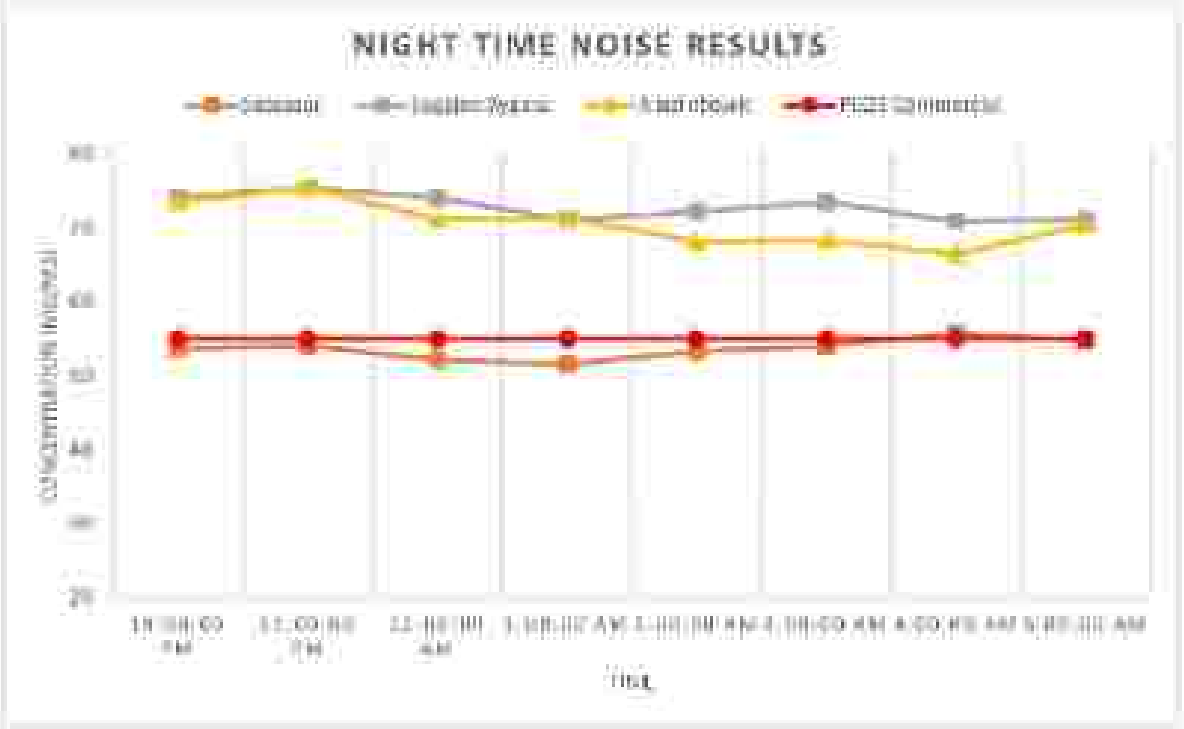
Table 3.4 Comparison of Hourly and Average Values of 24 Hours Noise Monitoring

Noise Level Results								
[illegible]	[illegible]		[illegible]		[illegible]		[illegible]	[illegible]
	Day	Night	Day	Night	Day	Night		
1	61.4	53.5	69.4	74.2	75.5	73.5	65	55
2	58.1	54.1	71	73.4	74.1	75.4	65	55
3	59.4	55.2	73.8	74.3	76.3	74.2	65	55
4	61.3	51.6	75.7	71.1	77.8	73.3	65	55
5	62.7	53.5	75.3	72.2	77.5	68.3	65	55
6	63.4	54	77.3	73.5	75.4	68.3	65	55
7	64.5	55.7	78.1	76.9	78.9	66.4	65	55
8	65.6	54.8	74.3	71.1	80.4	70.4	65	55
9	62.8		75.1		80.5		65	55
10	63.5		75.1		78.6		65	55
11	58.8		75.5		74.5		65	55
12	57		70.1		76.3		65	55
13	57.4		75.7		77.7		65	55
14	55.9		72.9		77		65	55
15	54.8		74.5		77.4		65	55
16	54.9		73.1		74.1		65	55
Average	59.8	53.6	74.1	73.8	76.8	70.5	65	55

[illegible]



Graphical Presentation of Noise measured at Sobatuor, Soggiot bypass & Nsuti Chowk (Day Time)



Graphical Presentation of Noise measured at Sobatuor, Soggiot bypass & Nsuti Chowk (Night Time)

3.2.1.1 Remarks & Discussion

24 hours Noise Monitoring was conducted at each site and compared with Punjab Environmental Quality Standards for Day & Night Time respectively. Overall the results showed similar trend in day and night time with high values of noise being observed at "Niazi Chowk" & "Saggian Bypass". This was due to high traffic volume and movement of Heavy Duty Vehicles. Moreover due to traffic and congestion, noise was generated from point sources such as car / van horns as well as rush of people passing through. The noise monitoring at "Sahuzzar" was within compliance due to limited traffic and vehicular access. The trend of noise production continued throughout the night at "Niazi Chowk" & "Saggian Bypass" due to 24 hours cycle of vehicles passing by or crossing.

3.3 Drinking Water Analysis

This section of the report presents the analysis of Drinking Water collected from three points, namely Sahuzzar, Saggian Wahn Bypass & Niazi Chowk. Results and details of these water samples from all three locations with coordinates & date have been provided in Tabular form in Table 3-3.

Table 3-5 Analysis results of Drinking Water samples collected

SN	Parameter	Unit	Method Detection Limit	Results			WHO
				Location 01 Nabanwa (0°18'55.24"N, 34°35'48.82"E) 14/10/2021	Location 02 Nagginia Bypass (0°18'42.08"N, 34°36'41.12"E) 14/10/2021	Location 03 Nasal Church (0°18'00.96"N, 34°36'32.92"E) 14/10/2021	
1	Taste	-	-	Acceptable	Acceptable	Acceptable	Not objectionable
2	Odor		-	Acceptable	Acceptable	Acceptable	Not objectionable
3	Color	[illegible]	<5	<5	<5	<5	15
4	Turbidity	[illegible]	<5	<5	<5	<5	<5
5	pH Value @ 25°C	-	0.01	7.20	7.20	6.96	6.5-8.5
6	Total Dissolved Solids (TDS)	[illegible]	5.0	202	362	362	[illegible]
7	Fluoride	mg/L	0.02	0.24	0.36	0.54	≤1.5
8	Nitrate NO_3	mg/L	0.04	1.09	0.8	1.2	≤50
9	Nitrite NO_2	mg/L	0.003	0.002	0.008	0.002	≤3
10	Residual Chlorine	mg/L	0.01	N.D	N.D	N.D	N.S
11	Cyanide	mg/L	0.002	N.D	N.D	N.D	≤0.07
12	Total Hardness (as $CaCO_3$)	mg/L	4.0	142	140	94	<500
13	Chloride	mg/L	1.0	69	89	31	<250
14	Phenolic Compounds	mg/L	0.05	N.D	N.D	N.D	N.S
15	Aluminum (Al)	mg/L	0.1	N.D	N.D	N.D	≤0.2
16	Antimony (Sb)	mg/L	0.02	N.D	N.D	N.D	≤0.005
17	Arsenic (As)	mg/L	0.01	0.013	0.15	0.01	≤0.01

Sl. No.	Parameter	Unit	Method / Detection Limit	Result			Limit
				Location 01 Sahasar (23°30'52.2"N, 72°51'40.2"E) 18/8/2021	Location 02 Sangam Bypass (23°34'2.3"N, 72°50'51.2"E) 18/8/2021	Location 03 Near Chowk (23°30'38.0"N, 72°51'49.0"E) 18/8/2021	
18	Boron (B)	mg/L	0.1	ND	ND	ND	0.5
19	Arsenic (As)	mg/L	0.1	ND	ND	ND	0.01
20	Cadmium (Cd)	mg/L	0.003	0.003	0.006	0.004	0.01
21	Chromium (Cr)	mg/L	0.01	ND	ND	ND	0.05
22	Copper (Cu)	mg/L	0.5	0.92	0.92	0.98	1.5
23	Lead (Pb)	mg/L	0.01	ND	ND	ND	0.05
24	Manganese (Mn)	mg/L	0.1	0.14	0.16	0.19	0.5
25	Mercury (Hg)	mg/L	0.001	ND	ND	ND	0.001
26	Nickel (Ni)	mg/L	0.01	ND	ND	ND	0.02
27	Zinc (Zn)	mg/L	0.5	ND	ND	0.51	5.0
28	Selenium (Se)	mg/L	0.010	ND	ND	ND	0.01
29	Pesticides	mg/L	0.1	ND	ND	ND	0.15
30	Total Coliform	mg/L	1	Absent	Absent	Absent	Absent
31	Faecal Coliform	P/A	-	Absent	Absent	Absent	Absent

3.3.1.1 Remarks & Discussion

Comparison of the results obtained showed that ground water obtained from all 03 locations had values within permissible limits of Drinking water quality as per Punjab Environmental Quality Standards. Among analysis of the heavy metals, all metals were within limits defined by Punjab Environmental Quality Standards, with arsenic showing values close to 0.05 mg/L standard national limit. If compared with guidelines defined by World Health Organization, the results are in non-compliant to latest international guideline value of 0.01 mg/L.

3.4 Surface Water Analysis

This section of the report presents the analysis of surface water sample collected from Ravi River, near Park View Society, Lahore having coordinates as 31°27'56.38"N, 74°10'25.13"E and its comparison with PEQS & WHO limits. Complete analysis results & details are in following Table 3-6 and we can observe that all results are within PEQS & WHO limits except microbiological contamination which showed major contamination of fecal coliforms. This is due to mixing and disposal of sewage & municipal wastewater in Ravi River.

Table 3-6 Analysis results of Surface Water Collected on 05/10/2021 from River Ravi near Park View Society (Coordinates 31°27'56.38"N, 74°10'25.13"E)

Sr.#	Parameter	Unit	MDL	PEQS Limit	WHO Limits	Results
1.	Taste	-	-	Not objectionable	-	Acceptable
2.	Odor	-	-	Not objectionable	-	Acceptable
3.	Color	Pt/Co	< 5	< 10		< 5
4.	Turbidity	NTU	< 5	< 5	-	< 5
5.	pH Value @ 25 °C	pH Unit	0.01	6.5 & 8.5	6.5 & 8.5	8.02
6.	Total Dissolved Solids (TDS)	mg/L	5.0	< 1000	1000	212
7.	Fluoride	mg/L	0.02	< 1.5	1.5	0.26
8.	Nitrate (NO3)	mg/L	0.04	< 50	-	0.09
9.	Nitrite (NO2)	mg/L	0.001	< 3	-	0.08
10	Residual Chlorine	mg/L	0.01	0.5	-	ND
11	Cyanide	mg/L	0.005	<0.05	0.07	ND

S.#	Parameter	Unit	MDL	PSQCA limit	[illegible]	Results
12.	Total Hardness (as $CaCO_3$)	mg/L	4.0	< 500	-	104
13.	Chloride	mg/L	1.5	< 250	850	47
14.	Phenolic Compounds	mg/L	0.05	N.S	-	N.D
15.	Aluminum (Al)	mg/L	0.1	≤0.2	5.0	0.05
16.	Antimony (Sb)	mg/L	0.005	≤0.005	-	N.D
17.	Arsenic (As)	mg/L	0.01	≤0.05	0.1	N.D
18.	Barium (Ba)	mg/L	0.1	0.7	-	N.D
19.	Boron (B)	mg/L	0.1	0.3	-	N.D
20.	Cadmium (Cd)	mg/L	0.003	0.01	0.01	N.D
21.	Chromium (Cr)	mg/L	0.05	≤0.05	0.05	N.D
22.	Copper (Cu)	mg/L	0.5	2.0	0.20	0.01
23.	Lead (Pb)	mg/L	0.05	≤0.05	0.05	N.D
24.	Manganese (Mn)	mg/L	0.1	≤0.5	0.20	0.04
25.	Mercury (Hg)	mg/L	0.001	≤0.001	0.02	N.D
26.	Nickel (Ni)	mg/L	0.01	≤0.02	0.20	N.D
27.	Zinc (Zn)	mg/L	0.5	5.0	5.0	0.06
28.	Selenium (Se)	mg/L	0.005	0.01	0.02	N.D
29.	Fluoride	mg/L	0.1	≤1.5	-	N.D
30.	Total Coliforms	cfu/100ml		Absent		DNC
31.	Fecal Coliform	cfu/100ml	-	Absent	-	DNC

3.4.1.1 Remarks & Discussion

Surface water sample collected was analyzed against Punjab Environmental Quality Standards for Drinking water. Overall the water was found to be in compliance with traces of heavy metals such as Aluminum, Copper & zinc present. Concentrations were found to be within limits. Bacterial Contamination was observed with presence of Total & Fecal Coliforms which are indicator organisms representing contamination due to mixture of wastewater. This may be due surface water being utilized for dumping various kinds of wastewater, ranging from municipal, industrial and cottage industries in nearby areas.

3.5 Wastewater Analysis

This section of the report presents the analysis of waste water samples collected from and their comparison with PEQS. As we can observe in Table 3-7, wastewater samples were collected from each point i.e "Sidewaan", "Saggian Bypass" & "Wazir Chowk". Samples were stored & preserved as per APHA protocols. The results of all three samples can be observed in Table 3-7 along with comparison with Punjab Environmental Quality Standards for Municipal and Liquid Industrial Effluents.

Table 3-7 Analysis results of wastewater samples collected

Sr. no	Parameter	Unit	Method Detection Limit	Samples			
				Location 01: Tailoring Unit (24°53'22.8"N, 74°37'13.4"E)	Location 02: Dyeing Unit (24°53'24.1"N, 74°37'15.2"E)	Location 03: Final Outlet (24°53'25.7"N, 74°37'17.0"E)	
1.	Temperature @ 25°	°C	0.1	28	28	28	-
2.	pH Value @ 25 °C	pH Unit	0.01	8.42	7.91	8.08	6.5 – 9.0
3.	Total Dissolved Solids (TDS)	mg/L	1.0	1964	4147	3827	2100
4.	Nitrates	mg/L	1.0	46	112	98	200
5.	Fluoride	mg/L	0.02	0.31	0.42	0.38	1.5
6.	Total Chlorine	mg/L	0.01	0.05	0.07	0.06	1.0
7.	Cyanide	mg/L	0.002	0.03	0.04	0.03	0.2
8.	Chloride	mg/L	1.0	712	1486	1381	1000
9.	Sulfide	mg/L	0.005	0.036	0.084	0.062	1.0
10.	Oil & Grease	mg/L	1.0	9.2	18.5	14.3	10
11.	Chemical Oxygen Demand (COD)	mg/L	5.0	378	756	612	250
12.	Biochemical Oxygen Demand (BOD)	mg/L	0.5	91	218	167	80
13.	Ammonia (NH3)	mg/L	1.0	5.2	9.8	8.1	40
14.	Phenolic Compounds	mg/L	0.1	0.18	0.41	0.33	0.3
15.	Total suspended Solids (TSS)	mg/L	1.0	134	286	231	200
16.	Arsenic (As)	mg/L	0.001	0.011	0.023	0.018	0.2
17.	Chromium (Cr)	mg/L	0.1	0.21	0.45	0.36	1.0

S.I	Parameters	UOM	Method	Results			MCL





3.5.1.1 Remarks & Discussion

All samples had high organic contamination with chemical oxygen demand and biological oxygen demand values higher than WQS in all three samples. This may be due to addition of sewage waste, industrial wastewater as well as other multiple sources of toxic water pollutants being dumped into water canals which end up in River Ravi. Moreover, presence of toxic metals such as arsenic and chromium was also observed but these values were within the prescribed Punjab environmental quality standards.

Conclusion

4 Conclusion

Water and Sanitation Agency (WASA), Lahore engaged National Engineering Services Pakistan (NESPAK) to carry out the Environmental & Social Impact Assessment (ESIA) for Establishment of Wastewater Treatment Plant at Baba Sabu, Lahore. In order to evaluate baseline environmental condition of the project area, NESPAK has utilized Punjab Environment Protection Department approved Third Party Environmental Laboratories, TK Testing Laboratories-Sustainable Environmental Services & Laboratory JV (TK-SESAL) to conduct Monitoring of Ambient Air Quality, Noise as well as sampling & analysis of Wastewater, Surface Water and Ground Water.

Ambient air of both Location #2 & #3 i.e. Saggian Bypass & Niazi Chowk point respectively had high concentration of ambient air pollution specifically dust levels were exceeding PEQS limitations in both. Moreover, high concentration of Carbon Monoxide was observed due to heavy vehicular traffic in both areas. Noise limits exceeding PEQS were observed at all locations as well.

Wastewater analysis indicated organic contamination at all #4 sites with presence of traces of heavy metals. Organic contamination in form of Chemical Oxygen Demand & Biological Oxygen Demand were higher than Punjab Environmental Quality Standards, while metals were currently within prescribed limits. Drinking water analysis indicated all values within Punjab Environmental Quality Standards with traces of metals such as arsenic & cadmium. Surface water collected was analyzed and compared with PEQS as well as WHO limits for surface water analysis for irrigation and all values were within prescribed limits.

ANNEX III: THE SOCIAL SURVEY TOOL (SOCIO-ECONOMIC, GENDER SITUATION SURVEY AND PUBLIC CONSULTATION PROFORMA)

SOCIO-ECONOMIC PROFORMA
(FILLED)

NATIONAL ENGINEERING SERVICES PAKISTAN (PVT) LIMITED (NESPAK)

Environment Impact Assessment of Waste Water Treatment

Rohi Nala, Lahore

Socioeconomic Baseline Survey of the Project Area

A. Name of Interviewer: _____ Date: 12.04.04

B. Site Location:

Sub-village: _____ Village/Town: _____

Union Council: _____ Tehsil & District: _____

Permanent Address:

_____

_____

1. Name of Respondent: _____ Father's name: _____

2. Gender: i. Male ii. Female ✓

3. What is your age?

Age (year)	
15 – 25	
25 – 35	
35 – 45	
Above 45	✓

4. Marital Status:

i. Married ✓ ii. Unmarried _____

5. What is your family size?

Number: i. Male 5 ii. Female 3

6. What is your caste/ethnic group? Punjabi

7. What is your language? Punjabi

8. What is your qualification?

i. Illiterate ✓ ii. Primary _____ iii. Middle _____

iv. Matric _____ v. Intermediate _____ vi. Above Inter _____

9. What is your profession? Housewife

1 of 4

10. What is type of your family system?

i. Joint ✓ ii. Nuclear _____

11. What is employment status of your family members?

i. Government Employee ii. Private employee iii. Self Employed

iv. Unemployed ✓ v. Household

12. What are your major sources of income?

i. Agriculture ✓ ii. Cattle (meat) _____

iii. Trade-Business _____ iv. Other _____

v. General Labour _____ vi. Milk/Ghee Selling _____

vii. Service _____ viii. Any other _____

13. What is your average monthly income?

Rs. Less than 10,000 _____

10,000 – 15,000 _____

15000 – 20,000 _____

20,000 – 25,000 _____

Above 25,000 ✓

14. How much is your average monthly expenditure

Rs. Less than 10,000 _____

10,000 – 15,000 _____

15000 – 20,000 _____

20,000 – 25,000 ✓

Above 25,000 _____

15. What is type of ownership of your house

i. Self Owned ✓ ii. Rented _____

iii. Free on Landlord property _____ iv. Relative house (Free) _____

16. What is nature of construction of your house?

i. Pacca _____ ii. Semi Pacca ✓ iii. Kacha _____

17. Which of the following facilities are available in your house

i. Electricity ✓ ii. Water Supply ✓ iii. Gas _____

iv. Telephone ✓ v. Sewerage ✓

18. What is the source of energy for cooking and lightening in this area?

i. Wood ✓ ii. _____ iii. _____

19. Is there any educational institute in this area?

1. Yes 2. No

If yes, then

Name_____ Place_____

20. Is there any health facility available in this area?

1. Yes 2. No

If yes, then

Name_____ Place_____

21. What are the major common diseases in project area?

1. Hepatitis ✓ 2. Cholera _____ 3. Diarrhoea ✓

4. Skin infection _____ 5. Abdominal Pain _____ 6. Diarrhea ✓

7. High blood pressure ✓

22. Reasons of these diseases?

Water borne ✓ Poor hygienic conditions ✓

Hereditary _____ any other (pls specify) _____

23. What is the principle mode of transport being used by you (respondent) in this area?

Mode of transport Motor cycle

24. What are the sources of water for you domestic use

I. Public Water Supply _____ II. Hand Pumps _____

III. Machinery ✓ IV. Any other _____

25. Any smell and bad taste of water due to drain? Yes ✓ No ✓

26. Are you satisfied with the quality of this water

I. Yes _____ II. No ✓

If no, then reason Polluted by fertilizer chemicals

27. What is your Landholding in Acres? 2 acres

28. Type of Property likely to be affected ☑ Land ☐ Structure ☐ Landstructure

29. What is status of cultivation of your land?

30. I. Owner ✓ II. Owner-cum-tenant _____ III. Tenant _____

31. What are the sources of water for your agricultural use

I. Canal _____ III. Tube well ✓

IV. Rain _____ V. Any Other _____

32. Use of sewerage water for agricultural purposes Yes ✓ No ✓

33. What do you grow mostly in your agriculture land

I. Wheat ✓ II. Maize III. Sugarcane

IV. Fodder ✓ V. Vegetable

VI. Hindu Orthodox VII. Any other

34. Is there any archaeological or religious site in the town?

I. Mosque ____ II Church ____

III. Shrine ____ IV Any Other Historical Place ____

38. Specify the existing Non-Governmental Organizations (NGOs) in your area and state their area of work?

Name of Organization: NIL Area of interest: ____

36. Are you satisfied with current sewerage drain in the area?

I. Yes ____ II. No: Poor drainage system

If no, then reasons ____

37. Any odor problem due to sewerage water in the area? Yes ✓ No ____

38. Water pounding in the area due to open drain? Yes ✓ No ____

39. Do you know that wastewater treatment plant is being constructed in the area?

I. Yes ✓ No

[If not, then fact has about the proposed Project]

40. In your opinion, should this Project be implemented here

I. Yes ✓ II. No ____

If yes, then reasons: Project to provide safe water to the town

If no, then reasons: ____

41. In your opinion, what will be possible impacts of this Project

During Construction: Dust & noise; Pollution

After Construction: Reduction of sewerage problem within the town

42. What protective measures do you suggest to safeguard your interests? Work should complete as soon as possible

43. In your opinion, what will be pressing needs of this area? Drinking water, waste water treatment.

GENDER SITUATION PROFORMA
(FILLED)

NATIONAL ENGINEERING SERVICES PAKISTAN (PVT) LIMITED (NESPAK)

Environment and Social Impact Assessment (ESIA) of Waste Water Treatment Plant
Baba Sabu, Lahore

Gender Situation Survey

A. Name of Interviewer: _____ Date: _____

B. Site Location:

Sub-village: _____ Village/Town: _____

Union Council: _____ Tehsil & District: _____

Permanent Address:

_____

1. What is your age? _____ Years
2. What is your relationship? _____
3. Are you married? _____
4. If married what was your age at the time of marriage? _____ Years
5. Does your relative work?
   i. Yes _____ ii. No _____
6. What is your occupation?
   i. House Wife _____ ii. Working Woman _____
   (If housewife then go to Q. No. 11)
7. In case of working woman what is your nature of work?
   i. Office _____ ii. Field _____ iii. Other _____
8. How many hours per day do you work? _____ Hours
9. How much salary do you receive per month? Rs. _____
10. Are you satisfied with your current salary?

i. Yes _____ ii. No _____

11. How many children do you have?

i. Male 3 ii. Female 3 iii. Total 6

12. How many dependent children do you have? 3

13. What is the age of dependent children (may select more than one)

i. Less than 1 year old
ii. 1, 2 years old
iii. 3, 4 years old
iv. 5, 6 years old
v. 7, 8, 9 years old

14. What is the main source of child care when you are at work?

i. Partner / spouse
ii. Baby sitter
iii. Day care centre
iv. Living in-laws
v. Children at school
vi. Other

15. How many hours in an average week do you spend in care for your children?

i. Less than 5
ii. 5-10
iii. 11-15
iv. 15-20
v. Over 20

16. Do you have full power to control your money the way you like?

i. Yes _____ ii. No _____

17. Does your spouse actively support you in your career?

i. Yes _____ ii. No _____

18. Do you still work in the agriculture fields?

i. Yes _____ ii. No _____

19. If yes, how many hours per day? _____ Hours

i. Part Time _____ ii. Full Time _____

20. Do you receive extra money from your husband/wife income every month?

i. Yes _____ ii. No _____

21. Is this area safe enough to travel alone for women?

2 of 4

I. Yes ✓ II. No _____

If no why? _____

22. If Yes do you know what protective measures should be taken to avoid these disturbance?

_____ _____

_____ _____

23. Do you want to share some skills for running your community?

I. Yes ✓ II. No _____

If yes, what type of skills? Vocational Training Schools (girls)

24. Should women get education?

I. Yes ✓ II. No _____

25. Health Facility available in the area ✓

26. Are you satisfied with health facility? Yes _____ No ✓

If No why? _____

27. What are the sources of water for your domestic use

I. Public water Supply ✓ II. Hand Pumps III. Channel IV. Any other _____

28. What are the receiving canals of the wastes of this area

_____

_____ Natural Channel Direct Use

29. Is there any organizations working for peoples in this area?

I. Yes _____ II. No ✓

If yes then what is its name and results of work

_____

_____

30. Do you know about the proposed Project?

I. Yes _____ II. No ✓

31. In your opinion, should this Project be implemented here

I. Yes ✓ II. No _____

If yes, then reasons

_____

If no, then reasons

_____

12. In your opinion, what will be beneficial impacts of this Project?

During Construction

After Construction

PUBLIC CONSULTATION PROFORMA (FILLED)

NATIONAL ENGINEERING SERVICES PAKISTAN (PVT) LIMITED (NESPAK)

Environment Impact Assessment of Waste Water Treatment
Plant at Baba Sabo Lahore

Public Consultation

A. Name of Facilitator: Malik Fateh Ahsan Date: 8/7/18

B. Site Location: Peshawar Nadra Kings Enclave

Sub-Village: [illegible] Village/Town: [illegible]

Union Council: UC 125 Tehsil & District: Lahore

C. Demographic Information

Population: [illegible] Houses: [illegible]

Area of the village: [illegible] Distance from main road: [illegible]

Vehicle: [illegible]

A) POINTS TO BE DISCUSSED

1. Introduction of the project.
2. Description of various components of the project, its activities and impacts.
3. Needs, priorities and reactions of the affected people.
4. Description of scheme of evaluation of buildings and other infrastructure.
5. Description of scheme of evaluation of land and trees.

B) MAJOR CONCERNS/ ISSUES RAISED BY THE PARTICIPANTS

2) Compensation will cause interference in the working schedule.

2) They are concerned about compensation under the relation to loss of assets due to project interventions.

1 of 2

a) Local people should design activities to increase employment opportunities such as employment opportunities

b) Construction and implementation of water conservation activities should be avoided to minimize the pollution of water

c) The presence of outside labour may increase the prevalence of local women working in nearby project

C) SUGGESTIONS DURING CONSULTATION SESSIONS

1) All affected people should provide the compensation which does not burden local people & should be based on their ability to pay at present.

2) Compensation should be provided as per the

3) Workers should be provided to local people on priority basis

4) Training of people should provide to avoid their problems

5) Local people should be involved in project committee to increase their confidence in the project

6) Awareness should be created to minimize impact on women's working environment & provide more women's literacy, sensitization and collect their views.

D) PARTICIPANTS

Sr.No	Name	Occupation	Signature
1	Ahmad Waseem	Village Owner	
2	Obaid Ullah	Farmer	
3	Rawaan	Property dealer	
4	Mohammad Imran	Tractor Owner	

2 of 2

5			
6			
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ANNEX IV: CLIMATE STUDY CONDUCTED BY GROUPE HUIT CONSULTANT

ANNEX V: EMERGENCY REPONSES PLAN

Emergency Response Plan

Introduction

Emergency management can be defined as the organization, coordination and implementation of a range of measures to prevent, mitigate, respond to, overcome and recover from the consequences of emergency events affecting the community, its assets and the environment.

Purpose of Plan

This plan intends to provide a framework for safety and security to infrastructure, people and vehicles. It assigns responsibility to organizations and individuals for carrying out specific actions at projected times and places in an emergency situation that exceeds the capability or routine responsibility of any one agency.

The emergency response plan provides guidance to:

- Prevent any potential sources causing hazard to the resources during all stages of the project;
- Coordinate between various organizations to take actions in case of emergencies;
- Protect people and property in emergencies and disasters;
- Develop procedures to respond to the emergencies efficiently;
- Identify and ensure availability of personnel, equipment, facilities, supplies, and other resources for use in order to provide timely and efficient response and recovery operations; and
- Confirm that measures taken in an incident are adequate to recover the affected resources or further improvements are needed.

=

Planning

Emergency Response Team

A group/team shall be dedicated to identify and control potential emergencies during the construction and operation of the project. The roles and responsibilities of the group members shall be clearly defined.

The primary responsibilities of the group are described below:

- Identify the potential hazard or risk sources that can lead to emergency situations;
- Ensure availability of adequate resources, procedures and communication system to deal with the identified emergency situations;
- Ensure awareness and training of the staff to facilitate implementation of the emergency response plan;
- Maintaining the records of any previous incidents; and
- Post-event analysis to bridge the gaps of the existing risk prevention procedures.
- The emergency response team shall include but not limited to the following;
  1. Team Leader
  2. Safety Engineer
  3. Reporting officer Inspector

Team Leader

- Approve/ modify devised measures to prevent or mitigate the risks associated with the identified risk sources.
- Arrange resources for dealing with potential emergencies including, financial, equipments and personnel required to deal with emergencies.
- Assure that the Emergency Response plan is adequate, effective and can be implemented practically.

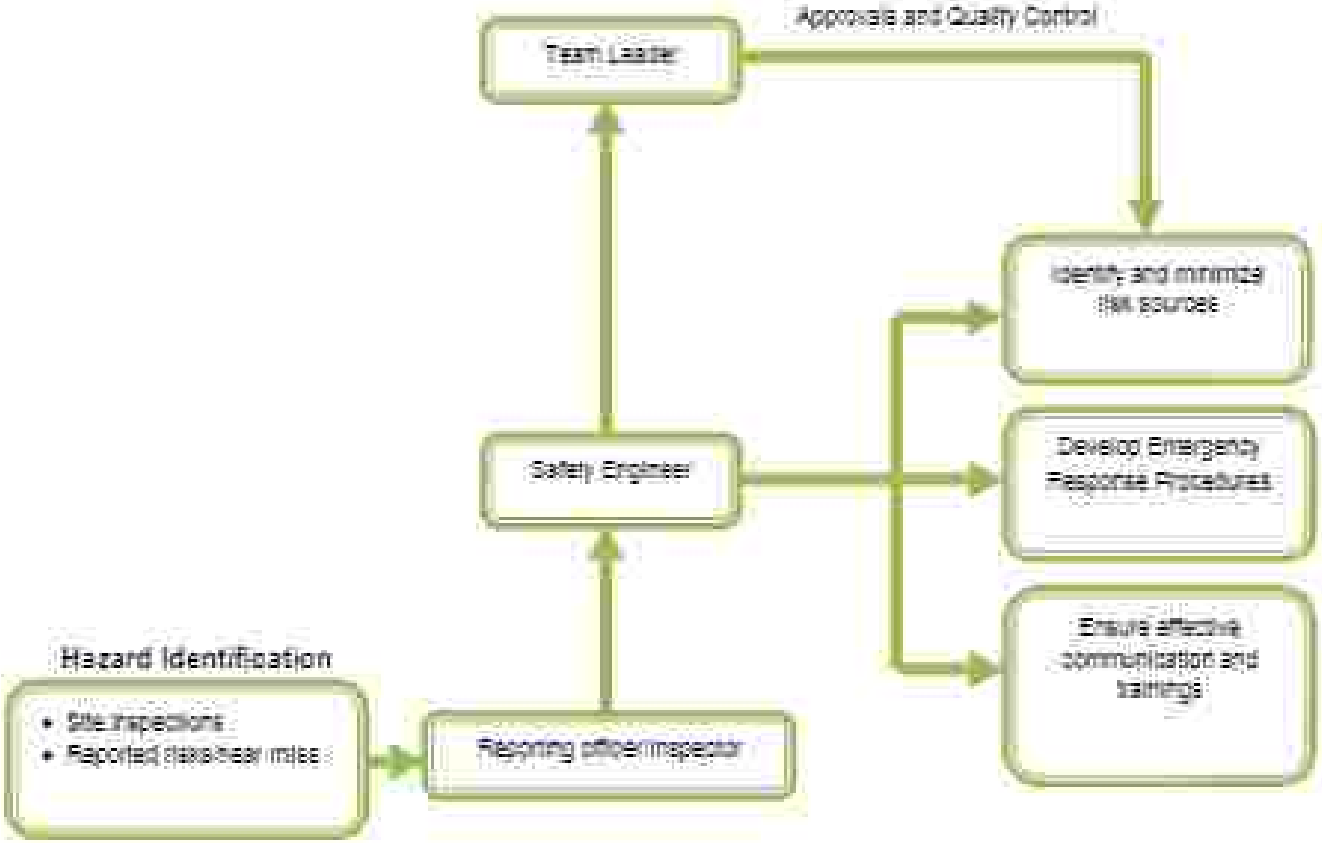
Safety Engineer

- Analyze the identified risk sources and devise measures to prevent or mitigate the risks in close consultation with the Team Leader.
- Develop and implement the Emergency Response Procedures, in case of the possible emergencies arise.
- Ensure effective internal and external communication, and
- Provide regular trainings and arrange drills to make people aware of dealing with emergencies.

Reporting officer/inspector

- Regular inspections of the site, to identify potential risks associated with equipments, materials and work practices.
- Anybody from the site can notify the reporting officer about potential risk and/or near misses on the site.
- Record any identified risks and mitigation measures to control the identified risk; and
- Notify the issue and control measures taken thereby to the safety engineer.

The designation, roles and responsibilities of each member shall be clearly defined and communicated to the employees. An outline of the framework of responsibilities is presented in the following organizational chart:



A comprehensive identification and evaluation of the hazards/risks likely to cause an emergency shall be done by Emergency Response Team (ERT). Major potential emergencies identified in road projects are as follows:

- Structural failure
- Disruption of Utility (Power, Water, Telecommunications, Gas, etc)
- Accidents
- Vehicle accident
- Fog
- Smoke
- Power/equipment failure or Vandalism
- Fire
- Earthquake
- Terrorism including bombing
- Disease Outbreak

Prevention and Mitigation

The ERT shall work to eliminate or reduce the impact of identified emergencies and increasing the resilience of an affected community to recover from the consequences of such events. These activities include:

- Design considerations to control flooding, earthquakes and adequate lightening for fog etc.,
- Regular inspection and maintenance of construction machinery and the structural integrity;
- Review of work schedules based on weather updates; and
- Security controls based on political situations.

Emergency Preparedness

The ERT shall be prepared with all necessary resources and the personnel's shall be trained regularly

Resources:

Finance and administration

The finanical resources shall be reserved for dealing with any emergencies arising on site during construction and operation. Responsibilities of the person managing the resources in case of emergencies shall be clearly defined and the required resources shall be adequate and updated regularly.

Equipments

All the necessary equipments needed in an event of emergencies shall be made available, as a minimum, the equipments needed include:

- Personal Protective Equipments
- Alarms/ Warnings
- Fire extinguishers
- Crowd control, flashlights, signs, barricades
- First Aid Facility
- Detection instruments, e.g. personal alarm kits, smoke detection instruments

- Tools to fix minor vandalism
-

Communication

All external and internal communication systems shall be made available. Local emergency numbers shall be clearly posted and communicated to the personnel involved in construction and during operation.
The local emergency numbers are given below, which shall be regularly updated.

Emergency Numbers

	Service	Lahore (042)
1	Edhi Ambulance	4401921-4444501
2	Emergency Police	15
3	Bomb Disposal	9212111
4	Rescue	1122
5	Fire Brigade Center	16
6	Jinnah Hospital (Casualties)	99231400
7	Mian Munshi Hospital	99330046
8	Services Hospital	99203402

Trainings

Personnel shall be made aware of the importance of safety, potential emergencies and how to respond in case of emergencies. One day training and mock exercise shall be done to prepare, the personnel to deal with emergencies.

Emergency Response

Response includes actions taken to reduce the impacts of an emergency event, and to limit the threat to life, property and the environment.

The emergencies can be dealt with:

- On-Site Management of the situation
- Off-site coordination to arrange necessary resources to support the on-site management.
- Providing advice and reports of the situation to stakeholders

Emergency Response Procedure

Any person can report about an emergency, an on-site worker, an outside agency, or the public. Circumstances change during the course of an emergency in different events, thus, the procedure will vary as per the specific situation on ground. However, a basic action plan to be followed in an emergency is discussed below. This order of response is applicable to almost any emergency and should be followed in sequence.

Assess the situation:

The most important thing to do in case of emergency is to stay calm and avoid panic. Assess the situation, the cause and most immediate requirement to control, limit and/or manage the immediate, ongoing, or further damage.

Immediate control:

The most senior person on the scene should take control and contact, or delegate someone to contact emergency services as posted and communicated by ERT and inform the reporting

officer of ERT and explain the situation. The area of emergency shall be restricted by barricades, tapes and adequate signage, if and as required.

Protection from further losses:

Once the site is restricted, to provide protection and reduce further losses, the source causing the emergency shall be controlled including equipments, materials, environment and accident scene from continuing damage or further hazards to the area and people, e.g; suppress fire, prevent objects from falling, shut down equipment or utilities, and take other necessary measures as required depending upon the type of emergency.

- Provide first aid if required or in doing so.
- Designate people to emergency duties, e.g; assign personnel to guide emergency services on arrival.
- Headcount People/personnel to identify any missing persons.
- People/ personnel shall be directed to safe location.
- Arrange diversions for the traffic to reduce disturbance to the flow of traffic, if and as far as possible.
- Preserve the accident scene until experts main if safe, only disturb what is essential to maintain life or relieve human suffering and prevent immediate or further losses.

Communication:

Emergency service providers:
The emergency service providers needs to be kept informed of the situation. On site, personnel from the emergency services shall be guided towards the emergency scene, brief about the event, ongoing and potential hazards and cause(s), if known.

Emergency Response Team and Management:
Members of ERT shall be immediately informed and the management shall also be kept informed.

Public:
Timely notifications to public shall be disseminated through electronic and print media depending upon the requirement and urgency of the emergency so that they can adopt alternate routes and avoid the hazards associated with the emergency encountered.

Utilities:
In case of disruption of utilities, the utility control authorities shall be immediately contacted to control the situation.

Recovery:
Emergency affected individuals, communities and infrastructure shall be restored in terms of emotional, economic, and physical well being including the following as a minimum.

- A detailed analysis and assessment of causes of emergency , extent of damage and gaps if any, in managing the emergency;
- Recovery/replacement of the assets and infrastructure;
- Reinstatement of disrupted services;
- Road and bridge repairs;
- Updation of safety arrangements and Emergency response procedures to ensure better safety and security in any other arising emergencies.

ANNEX VI: CONSTRUCTION WASTE MANAGEMENT PLAN

CONSTRUCTION WASTE MANAGEMENT PLAN

Construction waste material consists mainly of concrete, masonry, limestone, sandstone, metal, and wood, depending on the construction type.

Origins and causes of construction waste:

Origins of waste	Causes of waste
Contractual	• Errors in contract documents • Contract documents incomplete at commencement of construction
Design	• Design changes • Design and detailing complexity • Design and construction detail errors • Unclear/unsuitable specification • Poor coordination and communication (late information, last minute client requirements, slow drawing revision and distribution)
Procurement	• Ordering errors (i.e., ordering items not in compliance with specification) • Over allowances (i.e., difficulties to order small quantities) • Supplier errors
Transportation	• Damage during transportation • Difficulties for delivery vehicles accessing construction sites • Insufficient protection during unloading • Inefficient methods of unloading
On-site Management and Planning	• Lack of on-site waste management plans • Improper planning for required quantities • Delays in passing information on types and sizes of materials and components to be used • Lack of on-site material control • Lack of supervision
Material storage	• Inappropriate site storage space leading to damage or deterioration • Improper storing methods • Materials stored far away from point of application
Material handling	• Materials supplied in loose form • On-site transportation methods from storage to the point of application • Inadequate material handling
Site operation	• Accidents due to negligence • Unused materials and products • Equipment malfunction • Poor craftsmanship • Use of wrong materials resulting in their disposal • Time pressure • Poor work ethics
Residual	• Waste from application processes (i.e., over preparation of mortar) • Off-cuts from cutting materials to length • Waste from cutting uneconomical shapes • Packaging

Origins of waste	Causes of waste
Other	• Weather • Vandalism • Theft

Construction Waste Management Plan

1) **Waste Management Goals**

To establish that this project shall generate at least 50% less waste into landfills and the processes shall be employed to ensure that this goal is met. These shall include prevention of damage to materials to be incorporated into the work due to mishandling, improper storage, contamination, inadequate protection or other factors as well as minimizing poor quantity estimation, as well as through building design.

2) **Responsibility**

The Project Director shall be responsible for the implementation of the administrative portions of this program, including the notification of subcontractor management, the training of the site supervisor and the onsite posting of this plan.

The site supervisor will be responsible for the implementation of the onsite portions of this program including the training of subcontractor personnel.

3) **Waste Prevention Planning**

- In addition to other requirements specified herein it is a requirement for the work of this project that the contractor comply with the applicable city waste disposal requirements.
- Of the inevitable waste that is generated, the waste materials designated in this specification shall be salvaged for reuse and or recycling where practical and possible.
- Project Construction Documents: The General Contractor will contractually require all subcontractors to comply with these recycling guidelines. A copy of this "Construction Waste Management Plan" will accompany all subcontractor agreements and require subcontractor participation.
- The "Construction Waste Management Plan" shall be implemented and executed as follows and as on the chart.
- Salvageable materials will be diverted from disposal where feasible.
- There will be a designated area on the construction site reserved for materials that can be recycled.
- Areas shall be marked to designate what recycle materials are to be stored there.
- Hazardous waste will be managed by a licensed hazardous waste vendor.

4) **Communication & Education Plan**

- This Construction Waste Management Plan will be posted onsite.
- Each subcontractor will be made aware of the intent of this project with respect to reduction of waste and recycling.
- Onsite recycling containers and or areas will be plainly marked.
- The subcontractor will be expected to make sure all their crews comply with the Waste Management Plan.
- All recycling containers/areas will be clearly marked.
- Lists of acceptable/unacceptable materials will be posted at the site.
- All subcontractors will be informed in writing of the importance of non-contamination with other materials or trash.

5) **Motivation Plan**

The General Contractor will conduct a pre-award meeting for subcontractors. Subcontractors under consideration will be required to attend the meeting to review project goals and requirements with the project team. Attendance will be a prerequisite for award of subcontracts. This document will be an attachment to every subcontract. Copies of the attachment will be posted prominently at the job site.

6) **Expected Project Waste, Disposal, and Handling**

The following chart identifies waste materials expected on this project, their expected disposal methods and handling procedures. New items may be added as needed.

Material	Quantity	Disposal Method	Handling Procedure
Land clearing debris		Keep separate for reuse and or wood sale. Separate topsoil and rock for future landscaping use.	Keep separated in designated areas onsite.
Clean dimensional wood and pallets wood		Keep separate for reuse by on-site construction or by site employees for either heating stoves or reuse in home projects. May be offered to public.	Keep separated in designated areas onsite.
Plywood, OSB, particle board		Reuse onsite when possible, landfill or recycle off site.	Keep separated in designated areas onsite. Place in "Trash" container.
Painted or treated wood		Reuse, off site recycle, landfill.	Keep separated in designated areas onsite. Place in "Trash" container.
Concrete		Recycle when possible.	
Concrete Masonry Units		Keep separate for re-use by on-site construction or by site employees.	Keep separated in designated areas onsite.
Metals		Recycle off site when possible. Separate copper wire when possible.	Keep separated in designated areas onsite. Place in "Metals" container.
Paint		Reuse onsite.	Keep separated in designated areas onsite.
Insulation		Reuse, landfill.	
Flooring		Reuse, landfill.	
Carpet and pad		Reuse or recycle with carpet manufacturer.	
Glass		Glass Bottles: recycle locally.	Keep separated in designated areas onsite.
Plastics		Plastic Bottles: recycle locally, be aware of plastics that are acceptable to recycle facility.	Keep separated in designated areas onsite.
Beverage		Recycle locally.	Keep separated in designated areas onsite.
Cardboard		Recycle locally.	Keep separated in designated areas onsite.

Material	Quantity	Disposal Method	Handling Procedure
Paper and newsprint		Recycle locally	Keep separates in designated areas onsite.

7) Waste Disposal Company
   To be determined for each area
   a) Contact:

8) Recycle Hauler
   To be determined for each area
   b) Contact:
   c) Some or all recycle may be hauled by the builder.

9) Possible recycle locations and acceptable materials
   i) Coordinate with companies which are registered with local Municipality that accept materials for recycle; and
   ii) Using the above as a resource, a list will be kept indicating local opportunities for recycle of expected materials. New locations should be added as needed.

ANNEX VII: CHANCE FIND PROCEDURE

CHANCE FIND PROCEDURES

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 of Archaeology, Tourism, Archeology and Museum Department, Govt. of the Punjab 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.

Directorate General of Archaeology, Tourism, Archeology and Museum Department
Govt. of the Punjab
Office of the Directorate General of Archaeology, inside Lahore Fort, Lahore
Phone #: 04299210870-71
Fax #: 04299332671
Email: info@archaeology.punjab.gov.pk; arch.punjab@gmail.com

ANNEX VIII: TRAFFIC MANAGEMENT PLAN (TMP)

GUIDELINE TRAFFIC MANAGEMENT PLAN

Need for Plan

During the construction period of the project, considerable vehicular movement carrying large amounts of material and machinery is expected. This will definitely interrupt the local traffic and is therefore important to manage the traffic to avoid the nuisance to local residents in terms of noise, dust, congestion and inconvenience.

The plan
The objective of Traffic Management Plan (TMP) is to define the requirements that should be implemented to mitigate any potential negative risks to the environment, workers or the community resulting from construction traffic.

The TMP will advise and inform site Contractors and external suppliers of equipment and materials of access and entry points along with other key information such tipping areas and wash-out areas. It is intended to compliment and work alongside relevant EMP. The TMP will be classed as "live" and therefore be subjected to updates as required.

The Contractor, at the time of the execution of the project, will prepare a comprehensive TMP in coordination with local traffic police department, WSO, emergency services and local administrative department. WSO and CSC will review and approve the Contractor's TMP. The Contractor's TMP shall include following mitigation measures during its preparation:

- Undertake a road conditions assessment prior to and following the peak construction period, to assess any damage to road infrastructure that can be attributed to Project development.
- Repair damage as appropriate or enter into a voluntary agreement with the relevant roads authority to reimburse the cost of any repairs required to the public road network as a result of the Project.
- Spoil dumpsites located close to project site to minimize journey distance and limit movements to site access roads.
- Construction of worker accommodation on site to reduce light vehicle movements relating to travel to/ from the site.
- Provision of bus/minibus services for personnel living in nearby settlements.
- Movements of construction workers will be planned to avoid the busiest roads and times of day when traffic is at its greatest.
- Schedule deliveries and road movements to avoid peak periods.
- Driver training for HGV drivers and refresher course every six months for project drivers.
- Speed restrictions for project traffic travelling through communities (to be agreed with National Highway Authority).
- Run a safety campaign to improve the people's knowledge of the traffic hazard on their roads, public information and other activities to address the issues.

- Run a pedestrian awareness programme
- Temporary signage

The traffic management plan for the project corridor is provided below.

Other Recommendations

It is important to manage public access routes during construction because it can cause delay to local traffic and create a safety hazard both on and offsite. People working and living near the tower sites would be annoyed by the emissions, noise and visual intrusion of queuing vehicles. Some important factors involved in access routes and site traffic are as follows:

Public Access Routes

The use of public road for site access may be restricted in terms of:

- Vehicle size, width and type of load
- Time limits
- Parking
- Pedestrian conflicts

Contractor should have consultation with the local police or local authority to address these issues and to effectively manage them before the beginning of the construction.

Site Workers Traffic

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

Site Rules

- Access to and from the site must be only via the specified entrance.
- On leaving the site, vehicles must be directed to follow the directions given.
- Drivers must adhere to the site speed limits.
- All material deliveries to site must keep allocated time limits.
- No material or rubbish should be left in the loading-unloading area.
- Develop a map for alternate routes showing material delivery services.
- Assign designated personnel on site to receive deliveries and to direct the vehicles.
- Monitor vehicle movement to reduce the likelihood of queuing or causing congestion in and around the area.
- Project vehicles should have a unanimous badge or logo on windscreen displaying that they belong to the project.

Contractor's Obligation

The traffic management plan of the Contractor should be safe enough and widening of any access roads and construction of the detours (as applicable and practical) must be completed prior to start of project construction activities so that heavy vehicular transportation for construction activities do not hinder the normal course of traffic lanes. Contractor must ensure

that road closures are carried out by a competent person. The Contractor obligation must include the display of traffic signs according to the need to divert the traffic volume and to guide the road users in advance. The traffic sign, traffic light should be placed from any diverting route or road marking.

The Contractor should consider the environmental and social impacts of the traffic during construction. It will be sole responsibility of the Contractor to implement a plan which produces minimum nuisance to the local people and to the environment. Safety of the people should be given due importance. It will be under Contractor obligation to notify the traffic management plan and its later changes to DSC, WSD, emergency services and Traffic Police, and also publish weekly programme in the local newspaper.

ANNEX IX: LABOUR MANAGEMENT PLAN

LABOUR MANAGEMENT PLAN

International Legislation

ESS2 Labor and Working Conditions: This Standard obliges the Developer (UNRA) to develop and implement written labor management procedures applicable to the project. These procedures will set out the way in which project workers will be managed, in accordance with the requirements of national laws; and

IFC Performance Standard: Recognizes that, the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. IFC PS2 sets out policies and standards of international good practice related to labour and working conditions. The objectives of the PS2 are:

- To establish, maintain and improve the worker-management relationship;
- To promote the fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labour and employment laws;
- To protect the workforce by addressing child labour and forced labour; and
- To promote safe and healthy working conditions, and to protect and promote the health of workers.

IFC PS2 is in part guided by a number of ILO Conventions, and PS2 requires complying with four core labour standards of ILO including child labour, forced labour, nondiscrimination and freedom of association and collective bargaining. Liberty and its Contractors will comply with the requirements of these conventions during the construction and operation phases of the Project.

Labour Management in Context of National Legislation

Work Contract

While Article 18 of the Constitution affords every citizen with the right to enter upon any lawful profession or occupation, and to conduct any lawful trade or business, the Industrial and Commercial Employment (Standing Orders) Ordinance was enacted in 1958 to address the relationship between employer and employees and the contract of employment. The Ordinance applies to all industrial and commercial establishments throughout the country employing 20 or more workers and provides for security of employment. In the case of workers in other establishments, domestic servants, farm workers or casual labour engaged by contractors, their labour contracts are generally unwritten and can be enforced through the courts on the basis of oral evidence or past practice.

Work Hours

Under the Factories Act 2015, no adult employee, defined as a worker who has completed his or her 18th year of age, can be required or permitted to work in any establishment in excess of nine hours a day and 48 hours a week. Similarly, no young person (under the age of 16), can be required or permitted to work in excess of seven hours a day and 42 hours a week. The

Factories Act 2016, which governs the conditions of work of industrial labour, applies to factories, employing ten or more workers.

Leaves

As provided in the Factories Act 2016, every worker who has completed a period of 12 months continuous service shall be allowed, during the subsequent period of 12 months, holidays for a period of 14 consecutive days. If a worker fails in any one such period of 12 months to take the whole of the holidays allowed to him or her, any holidays not taken by him or her shall be added to the holidays allotted to him or her in the succeeding period of 12 months. In addition to the 14 days of annual leave with pay, the Factories Act 2016 provides that every worker is entitled to 10 days casual leave with full pay and further 16 days sick or medical leave on half pay. Casual leave is granted upon contingent situations such as sudden illness or any other urgent purpose. It should be obtained on prior application unless the urgency prevents the making of such application.

While article 37 of the Constitution makes reference to maternity benefits for women in employment, there are two central enactments, one federal and the other provincial providing maternity benefits to women employed in certain occupations. The Maternity Benefit Ordinance, 1958 stipulates that upon the completion of four months employment or qualifying period, a worker may have up to six weeks prenatal and postnatal leave during which she is paid a salary drawn on the basis of her last pay.

Prohibition of Child Labour

Article 11(3) of Pakistan's Constitution and the Employment of Children Act (ECA) 1991 expressly prohibits the employment of children below the age of eighteen years in any factory, mine or other hazardous employment. In addition, the Constitution makes it a Principle of Policy of the State of Pakistan to protect the child, to remove illiteracy and provide free and compulsory education within the minimum possible period and to make provision for securing just and human conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex.

Employee Associations

The right to association is guaranteed by Article 17 of the Pakistani Constitution imparting on every citizen the right to form associations or unions, subject to any reasonable restrictions imposed by law in the interest of sovereignty or integrity of Pakistan, public order or morality. Under Article 3 of the IRO (Industrial Relations Ordinance) 2002, workers as well as employers in any establishment or industry have the right to establish and to join associations of their own choosing, subject to respect of the law. Both workers' and employers' organizations have the right to establish and join federations and confederations and any such organization, federation and confederation shall have the right to affiliate with international organizations and confederations of workers' and employers' organizations.

Grievance Redress

As per ESS2 and Guidance Note a grievance mechanism will be provided for all direct workers and contracted workers to raise workplace concerns. The Grievance Mechanism shall provide:

- A channel to receive grievances such as comment/complaint form, suggestion boxes, email, a telephone hotline that might also be anonymous;
- Stipulated timeframes to respond to grievances;
- A register to record and track the timely resolution of grievances; and
- A responsible section/committee to receive, record and track resolution of grievances

The complaints may be received in Urdu. The complaints shall be addressed within the defined timeframe of the grievance mechanism.

Potential Impact:

This can be particularly acute in smaller communities hosting a largely male workforce and/or a workforce from other regions which may result in conflicts between locals and non-locals concerning employment opportunities, wages and natural resources. Mobile workers can also contribute significantly to gender-based social impacts and risks.

Risk of social conflict: Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources. Tensions may also arise between different groups within the labor force and pre-existing conflicts in the local community may be exacerbated. Ethnic and regional conflicts may be aggravated if workers from one group are moving into the territory of the other.

Increased risk of illicit behavior and crime: The influx of workers and service providers into communities may increase the rate of crimes and/or a perception of insecurity by the local community. Such illicit behavior or crimes can include theft, physical assaults, substance abuse, prostitution and human trafficking. Local law enforcement may not be sufficiently equipped to deal with the temporary increase in local population.

Increased burden on and competition for public service provision: Presence of construction workers and service providers (and in some cases family members of either or both) can generate additional demand for the provision of public services, such as water, electricity, medical services, transport, education and social services. This is particularly the case when the influx of workers is not accommodated by additional or separate supply systems.

Increased risk of communicable diseases and burden on local health services: The influx of people may bring communicable diseases to the project area, including sexually transmitted diseases (STDs), COVID- 19 or the incoming workers may be exposed to diseases to which they have low resistance. This can result in an additional burden on local health resources. Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the project's medical facility and instead go anonymously to local medical

providers, thereby placing further stress on local resources. Local health and rescue facilities may also be overwhelmed and/or ill- equipped to address the industrial accidents that can occur in a large construction site.

Inadequate waste disposal and illegal waste disposal sites: Large populations of workers generate increased amounts of waste, for which no sufficient local waste management capacities may exist, which would likely lead to improper disposal practices.

Camp related land use, access roads, noise and lights: The camp use can result in increase in noise and light pollution especially at night. The construction of new access roads can also lead vegetation removal and landscape transformation.

Mitigation Measures

- Local population and APs will be given preference in construction related jobs. Most unskilled workers will be hired from local communities, while for skilled manpower also, first choice will be given to local area residents.
- The Contractor will prepare the construction camp management plan which, in addition to other components, will include the labor management plan. This will be reviewed and approved by funding agency.
- The Contractor will select the specific timings for the construction activities particularly near the settlements, so as to cause least disturbance to the local population, particularly women.
- Contractor will take due care of the local community and observe sanctity of local customs and traditions by his staff. Contractor will warn the staff strictly not to involve in any unethical activities and to obey the local norms and cultural restrictions.
- The Contractor will carry out the construction activities in such a way that the open defecation timings by the local community should not be affected. The normal defecation timings are early in the morning and at late in the evening. So, the Contractor will have to take care of these timings.
- SOPs related to the construction industry to control spreading of COVID-19, should be implemented by the contractor and should be strictly monitored;
- During construction activities, if privacy of the nearby households is affected, the Contractor will inform the house owner to make some arrangements. Similarly, Contractor will take care as much as possible that the construction activities should not affect the privacy.
- The contractor will also ensure that solid waste and wastewater is disposed of in an environmentally friendly manner in designated areas and by approved methods only.
- The contract will explore alternative water sources and ensure that water usage by the project does not affect or compete with water requirements of the local community, and
- The Contractor will also ensure that noise and light pollution from the labor camp is kept at minimal levels especially at night.

ANNEX X: ENVIRONMENTAL HEALTH AND SAFETY GUIDELINES

ENVIRONMENTAL HEALTH AND SAFETY GUIDELINES

World Bank Group Environmental Health and Safety Guidelines

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors.

Local Legislation

The Punjab Occupational Health and Safety Act 2019 is the applicable local legislation as this Act applies to all Workplaces. The duties of the employer are as follows:

1. Undertake practical measures for Safety &Health and Welfare;
2. Identify, assess and address existing & new hazards;
3. Report and investigate incidents;
4. Provide and apply Safe Systems of Work, Safe tools & equipment & appliances
5. Safe use, handling, storage, disposal and transport of materials and substances
6. Control physical, chemical, biological, ergonomic, psychosocial or other hazards affecting workers and others;
7. Provide Information, Instruction and Training to ensure Safety &Health at Work;
8. Maintain workplace in safe, clean, orderly and risk -free condition with safe means of access;
9. Inform workers regarding work hazards, risks involved and preventive and protective measures;
10. Provide adequate PPE to prevent risk from injury and ill health;
11. Maintain records of all accidents at workplace;
12. Provide first aid arrangements and emergency provisions;
13. Take measures to prevent fires & measures in the event of fire; and
14. Collaborate in the case of simultaneous operations or joint premises.

The duties of workers and volunteers are identified as follows:

1. Ensure safety &health of others who may be affected by his acts & omissions & not willfully do anything to endanger himself or others;
2. Use & take care of PPE provided by the employer;
3. Do not willfully interfere or misuse any appliance or equipment or convenience provided for safety &health of persons at workplace;
4. Resolve any situation being unsafe posing immediate threat with the employer or cease work until the dispute is resolved;
5. Until the dispute is resolved, employer may assign the affected workers some temporary alternative work; and
6. Worker shall report any occupational accident, occupational Disease, dangerous occurrences, or commuting accident as per company OSH Policy.

The general duties of suppliers have been identified below:

1. Design & construction to be safe & without risk to safety & health;
2. Testing & examination;
3. Adequate information;
4. substance to be safe & without risk; and
5. includes supply, handling, assembling, installing, erecting & testing of tools, machinery & equipment.

The Act calls for:

1. Written Statement of Policy;
2. Consultation – formation of OHS Committee with worker representation, appointment of OHS officer;
3. Training of Health & Safety Representative;
4. Precautions against Contagious & Infectious Disease at Workplace; and
5. Compulsory Vaccination and Inoculation

The Act has also fixed penalties and offences in case of non-compliance with the provisions of the Act. The maximum penalty for non-compliance is Rs.250,000/- The Punjab Occupational Health & Safety Rules 2019 outline the measures to be undertaken to implement the health and safety requirements during construction of the project.

Potential Impact

Occupational Health and Safety (H&S) related impacts will arise during construction phase activities including clearing of earth, leveling, compaction, carpeting, pavement finishing and testing & commissioning. Eye injury can be caused by stone or metal particles. Hazard of being hit by falling objects, major hand-arm and whole body vibration hazards, skin and respiratory tract irritation from exposure to cement dust, overexertion and awkward postures etc. will be another impact. Welding hazards include electric shock, fumes and gases, fire and explosions, falls from height, eye and head injuries etc.

Other impacts will be fall from height, contact with heavy electrical and mechanical equipment, equipment failure, uncontrolled movement, unguarded moving mechanical equipment parts, fatigue, unbalanced load, falling objects, hand injury, slip and trip hazards, wind / storm activity, injury from releasing load too soon etc. Operating mechanical and electrical equipment will trigger the H&S issues e.g. struck by moving vehicles or other equipment, slips or trips, struck by flying objects, such as dirt or splashed fluids, caught in pinch points, shear points, crush points, falling from machine etc. The proposed project area is also sensitive from the law and order point of view and the security as well as the safety of the Contractor and Consultant staff will be a major issue. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.

Mitigation Measures

Following mitigation is given to avoid the accidental risks:

- The contractor will be required to strictly follow WB EHS Guidelines.
- Providing basic medical training to specified work staff and basic medical service and supplies to workers;

- 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;
- Training of workers in construction safety procedures, environmental awareness, equipping all construction workers with safety boots, helmets, gloves and protective masks, goggles, shields and monitoring their proper and successful usage;
- Contractor will ensure the provision of medicines, first aid kits, ambulance etc. at the camp site;
- Moreover, proper planning should be done for food storage, setting up of kitchens, production of sewage and waste water may result in multiplication of rodents like rats, mice and shrew etc. and vectors like mosquitoes, bugs and flies which will have a negative impact
- Work areas will be cordoned off where necessary;
- Contractors will instruct their staff to use Personnel Protective Equipment (PPE) (e.g., wire containment, displaying warning signs along the work site, communicating available warnings to staff) to enhance the safety; and
- Safety lookouts will be built to prevent people and vehicles from passing at the time of hot or cold work; and
- An emergency management plan must be devised by the contactor in close coordination with the provincial emergency services.

ANNEX XI: GUIDELINES TO COMBAT WITH COVID-19

PRECAUTIONARY ACTION AGAINST THE POTENTIAL RISK OF NOVEL CORONAVIRUS

INTRODUCTION

On February 11, 2020 the World Health Organization announced an official name for the disease that is causing the 2019 novel coronavirus outbreak, first identified in Wuhan China. The new name of this is coronavirus disease 2019, abbreviated as COVID-19. In COVID-19, "CO" stands for "corona," "VI" for "virus," and "D" for disease. Formerly, this disease was referred to as "2019 novel coronavirus" or "2019-nCoV".

Coronaviruses are a large family of viruses. Some cause illness in people, and others, such as canine and feline coronaviruses, only infect animals. Rarely, animal coronaviruses that infect animals have emerged to infect people and can spread between people. This is suspected to have occurred for the virus that causes Coronavirus Disease 2019 (COVID-19). Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) are two other examples of coronaviruses that originated from animals and then spread to people.

The risk of exposure to COVID-19 is no different for employees of Employer, Engineer, Contractor, and suppliers than for the general population. Contractor, therefore, must consider the physical well-being and safety of all the persons entitled to be on the Site and follow reasonable guidelines and recommendations of Government authorities and healthcare professionals. As experience has shown in other countries, confirmed cases of COVID-19 expand exponentially if health and safety controls are left unheeded.

Contractor should enforce all health and safety procedures at Site including sanitary protocols, proper hygiene, social distancing, use of personal protective equipment (PPE), toolbox talks on special COVID-19 requirements, and prompt reporting of health issues related to COVID-19. Contractors must put safeguards in place to keep workers exposed to COVID-19 away from Site for at least 14 days after the last potential exposure.

WHO declared the COVID-19 as a Public Health Emergency of International Concern (PHEIC) in January 2020 and afterwards announced the COVID-19 outbreak as pandemic on 11th March 2020 due to the widespread of the disease in 114 countries at that time. WHO Director General urged the countries to take action now to stop the disease.

The rapid spread of COVID-19 hits all the provinces of Pakistan Sindh, Balochistan, Punjab & Khyber Pakhtunkhwa including the Gilgit Baltistan and Azad Jammu & Kashmir. The prevailing virus creates the menacing and distressing situation when it arrived around the closed proximities of the Project Area.

Government of Pakistan has launched the National Action Plan for COVID-19 Pakistan to combat the challenge of prevailing virus, also available at https://www.nih.org.pk/wp-content/uploads/2020/03/COVID-19-NAP-VZ-13-March-2020.pdf. The Government of Pakistan has launched the real-time data portal for COVID-19 http://covid.gov.pk/. These measures are mostly relating to the containment and awareness and capacity building. Besides this COVID-19 daily situation report is also available at https://www.nih.org.pk/wp-content/uploads/2020/04/COVID-19-Daily-Updated-SitRep-03-April-2020.pdf.

All the stakeholders are on board to jointly prevent/ limit/ control the spread of COVID-19. All of the staff is required to take precautionary measures as well as maintain social distances. The use of thermal guns for checking every single person body temperature, placement of

relevant flyers and disinfection spray inside of all the containers are few of the measures to combat COVID-19.

OBJECTIVE

Following are the objectives of this report to jointly prevent / limit/ control the spread of COVID-19 at Site that can hamper the progress of proposed Project:

1. To enhance understanding of the evolving COVID-19;
2. To share knowledge on COVID-19 and preparedness measures being implemented at Site;
3. To generate recommendations for adjusting COVID-19 containment and response measures; and
4. Outline the measures taken at Site. The advised measures will help all the stakeholders to plan their work continuity in response to the COVID-19.

Due to the evolving situation of the COVID-19, this document should be read in conjunction with the latest relevant advisories issued by WHO (especially "Getting your workplace ready for COVID-19, 3 March 2020") and Government of Pakistan.

WHAT IS CORONA VIRUS (COVID-19)

The COVID-19 belongs to a family of viruses known as the Coronaviruses, which can cause illnesses ranging from the common cold to more severe diseases, such as the Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS)[*].

SYMPTOMS

The symptoms of the COVID-19 are similar to that of regular pneumonia. Typical symptoms include:

- Fever;
- Cough;
- Difficulty in breathing;
- Pneumonia;
- Runny nose;
- Sore throat; and
- Feeling of being unwell.

MODE OF SPREAD

Infected person – person transmission; Infected people can spread COVID-19 through their respiratory secretions via droplets produced when an infected person coughs or sneezes, similar to how influenza and other respiratory pathogens spread. The spread from person-to-person is most likely among close contacts (about 6 feet).

- Infected animals' dead or Alive;
- Air by coughing and sneezing;
- Close personal contact, such as touching or shaking hands;
- Touching an object or surface with a virus on it; and
- Touching your mouth nose or eyes before washing your hands.

GENERAL STANDARDIZED PRECAUTIONARY MEASURES

[*] Source: World Health Organization

Following measures/recommendations are suggested as a general guidance to be followed for the protection of potential impacts of COVID-19:

Since, there is no vaccine available to protect against human Coronavirus infections. Therefore, transmission can be prevented through following measures:

- Cover your mouth while cough or sneeze;
- Avoid close contact with people who are sick;
- Avoid the use of hard soap;
- Wash your hands often with liquid soap and water for at least 20 seconds;
- All the employees should ensure sanitization of hands at appropriate time;
- Avoid touching your eyes, nose, and mouth with unwashed hands;
- If you are concerned about your symptoms you should see your health care provider at site or in office;
- Use of Personal Protective Equipment (PPE) according to risk (a surgical or N95 mask);
- Do not spit, wrap your oral and nasal secretion with tissue and throw it in a covered dustbin;
- Balance your nutrition and exercise moderately;
- Sterilization / disinfection of medical devices at Site dispensaries; and
- Do not touch, buy or eat wild animals (game). Try to avoid visiting markets that sell such animals.

PROJECT SITE SPECIFIC PRECAUTIONARY MEASURES

Measures for protecting staff and labour from exposure to, and infection with, the COVID-19 depend on the type of work being performed and exposure risk, including potential for interaction with infectious people and contamination of the work environment. Regardless of specific exposure risks, following are the main actions that have been jointly taken at Site to combat the COVID-19:

Employer's Side:

Employer should issue the notification containing the precautionary measures in the light of GoS guidelines to be implemented at Site. Upon receiving the Employer notification all the mentioned precautionary measures will be communicated to Engineer staff for compliance. Employer technical staff is also complying with the GoS guidelines and Contractor suggestion to control the spread of COVID-19 at Site in the best interest of the Project and country.

Consultant's Side:

Consultant's top management will issue the orders in the light of GoS guidelines containing the precautionary measures to control the spread of COVID-19 for the staff working at Site.

Consultant staff at Site will fully complying with the orders including photographic evidence. Considering the severity of the prevailing virus Engineer devised the Standard Operating Procedure (SOP) containing precautionary action against the potential risk of novel corona virus.

Besides, above Consultant will ensure the following precautionary measures at Site:

- Adequate signage and information at all entrances and exits showing what is Corona Virus, how it spreads, what are the symptoms, standard precautions.

- The awareness session for the Contractor staff is equally important as of Consultant staff to combat the COVID-19 at Site. The Consultant will ensuring that Contractor is arranging such session at Site from time to time to reduce the potential risk of COVID-19. Further, all the newly inducted and existing staff have been given HSE training by the Consultant & Contractor.

Contractor's Side

Contractor will communicate various precautionary measures to Employer and Engineer through letters to control the spread of COVID-19 at Site. Following are the major steps to be taken by the Contractor:

- Contractor will convey the instructions and requirements of its superior unit for the prevention and control of COVID-19 epidemic at Site.
- Contractor will establish a special organization for epidemic prevention and control on the Project Site that is responsible for arranging, implementing, publicizing and supervising the epidemic prevention and control measures.
- Launch the plan for epidemic prevention and control on the project Site that includes:
    - All personnel in temporary camp are required to wear masks,
    - Contractor personnel incharge of Site to wear masks,
    - Arranged special personnel to measure and record the temperature of all personnel when entering or leaving the temporary camp,
    - If any person with fever, cold and other symptoms are found, they will be admonished to go home for isolation and asked about the development of the disease every day; and
    - Propagate and implement the epidemic prevention measures for the staffs and labours and warn them not to go outside and home as much as possible.
- All these meetings should carried out through video conference.

Contractor is not limited to the above precautionary measures but practicing and implementing the following:

- Contractor will prepare a pamphlet for the awareness of Site staff to combat the COVID-19; it will also place/posted at strategic points at Site.
- Launch awareness campaign to inform all the staff and labour about the coronavirus, to use facemask, hand hygiene, cough etiquette, and avoidance of close contact with animals and consumption of their raw products.
- Everyday awareness speech in English and Urdu in the temporary camp.
- All the employees are not allowed to go outside of the Project Area or on vacation to their homes and on daily basis visit to sites;
- Contractor will provide medical masks and antibacterial liquid hand wash to all personnel.
- Contractor will prepare the isolation facility at Site and provided three isolated rooms for such patients inside the temporary camp. Each room have three beds, oxygen cylinder, sanitizers, isolation kit, hand wash.
- Thermal scanning will be carried out continuously in the morning for everybody at the main gate of temporary camp.
- Record will be maintained for everybbe that includes the temperature value of each person with their names, every morning and afternoon go to each department for scanning separately and noted down their name with temperature values.
- Contractor carry out disinfectant spray on daily basis morning and afternoon in each office and rooms and all the area of the camp.

- LWASA and Consultant staff will also requested by Contractor to do not interact physically rather through electronically by emails or video conferencing.

RECOMMENDATIONS FOR THE CONTROL OF COVID-19 AT SITE

To Avoid Transmission

For all personnel at Site, it is always a good to practice the following precautionary measures:

- Workers to remain at least two meters apart from each other at all times (social distancing) – i.e. spread out and reduce the number of people working together in one area of the site.
- Avoid eating lunch in the form of group in available mess canteens at Site.
- Close site canteens' food preparation and eating areas (avoid gatherings) – workers to bring their own prepared lunch to site and eat alone e.g. in their van, car, or in an open space.
- Avoid in-person meetings if possible. In the case that an in-person meeting is unavoidable, make sure to have it in a well-ventilated area with sufficient space for attendees to distance themselves from one another. For meetings such as toolbox talks, consider breaking them up into smaller group meetings versus one large meeting.
- Introduce enhanced cleaning procedures across the Site and touch points e.g. office equipment, plant and machinery controls, taps/toilet/washing facilities, handrails.
- Stagger start times on site to avoid congestion in entrance areas.
- Reduce the number of people on site inductions at any one time and hold them outdoors if possible.
- Stop workers moving across various sites (potential for cross contamination).
- No outsiders should be at the Project Site.
- Contractor, Consultant and Employer personnel are advised to avoid travelling and in case traveling is unavoidable, prior approval from the management should be essential. In case of travelling, the above mentioned measures need to be strictly followed by the traveller.
- Prompt identification and isolation of potentially infectious individuals is a critical first step in protecting workers and other Site staff. An isolated area should be available at Site to immediately isolate suspected person, as it is most important to stop its spread at Site.
- Rapid Response Team should be formed and be informed immediately in case of suspect and confirmed case of COVID-19.
- Medical team at Site should separate the suspected person displaying fever, cough or difficulty breathing from other personnel; and
- If a person has had close contact with an individual that has confirmed COVID-19, that person will not be allowed to return to the Site until he/she has been symptom free for 14 days.
- Clean and fumigate all the workplaces at Site on daily basis.
- Ask people to stay at home if they have fever, cough, difficulty in breathing, runny nose, sore throat as per organizational rules.
- An immediate replacement of solid soap with liquid anti-bacterial soap bottles may be appropriate.
- Provision of alcohol-based hand sanitizer need to available for all staff.
- Clean the religious places carpets and rugs. Have them washed in place over the weekend and then do regular cleaning.
- Have the cleaners/ maintenance crews regularly clean surfaces that are touched frequently by personnel with disinfectants such as in and out doors.

- Fresh medical tests of staff working should be carried out at Site;
- Dispose of all contaminated waste (gloves, paper, swab handles, etc.) into biohazard waste bags for disposal;
- Ensure that panic is not created. In fact the posters should start with statements such as do not panic and fear the virus but know and prevent; and
- Ensure proper ventilation system for all the personnel at Site.

Use of Personal Protective Equipment (PPEs)

- Necessary PPE should be available at Site all the times and are being issued to each personnel at Site;
- Practice of using masks is also being ensured by all parties at Site (a surgical or N95 masks);
- Re-usable PPE should be thoroughly cleaned after use and not shared between workers. Single use PPE should be disposed of so that it cannot be reused.

Outside Visitors

- Visitors should enter with strictly wearing visitors card;
- Ensure sanitization of hands;
- All parties should ensure that the sick persons should be wearing a surgical or N95 masks;
- Note down the complete information of outsiders before entrance;
- Proper screening should be carried out before entering the Site;
- Refrain from handshakes. Rather than shaking hands, visitors may explain why handshakes can contribute to the risk of spread;
- Attempt to maintain a general six (6) feet distance between themselves. This will be challenging to follow at all times but it is Engineer recommendation to follow;
- Refrain from and/or limit touching of workplace surfaces; and
- In addition to these on-site procedures, it is advised to follow their respective organizational instructions related to Site visits.

ANNEX XII: TREE PLANTATION PLAN

TREE PLANTATION/ AFFORESTATION PLAN

The basic purpose of afforestation/plantation of suitable species in the project area is to reduce the risk been made due to cutting of trees for the proposed project. The risk made will be compensated by planting of saplings to enhance green cover and improve the overall environment of the area. Afforestation will not only reduce the risk been made but will also increase the carrying capacity of the area regarding many positive aspects.

Plantation will be done after the removal of trees during the construction work immediately. Plantation of indigenous trees species is highly important to maintain the biodiversity and ecological balance. It is also important to prevent global warming, soil erosion and pollution. Afforestation purifies the environment and helps in reducing the carbon dioxide level. Along with the importance of construction, the afforestation activity will further help in enhancing the socio-economic condition of the area and project sustainability.

Note: *The compensation for wood trees, fruit trees and orchards may be notified by the Forest and Agriculture or competent authority with Ecologists consultant team after proper filed survey/assessment and consultation with local communities, for this purpose special team to be constituted under the approval of competent authority, to assess the losses and propose compensations.*

IMPORTANCE OF TREE PLANTATION

- Trees contribute to their environment by providing oxygen, improving air quality, climate amelioration, conserving water, preserving soil, and supporting wildlife.
- Trees control climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer.
- Trees also preserve warmth by providing a screen from harsh wind.
- Trees also lower the air temperature and reduce the heat intensity of the greenhouse effect by maintaining low levels of carbon dioxide.
- Both above and below ground, trees are essential to the eco-systems in which they reside.
- Trees absorb and store rainwater which reduce runoff and sediment deposit after storms. This helps the ground water supply recharge, prevents the transport of chemicals into streams and prevents flooding.
- Trees, shrubs and turf also filter air by removing dust and absorbing other pollutants like carbon monoxide, sulfur dioxide and nitrogen dioxide.

OBJECTIVES

- To Restore native species
- To improve the quality of air and reduce its pollution
- To add color to the landscape and enhances the beauty of the environment
- To uplift the quality of our living environment through active planting, proper maintenance and preservation of trees together with other vegetation.
- To Protect and conserve flora and fauna of the project area.
- To attract rain which is a positive impact on the project area at all.
- To reduce sedimentation by plantation in the project area which will act as protection wall against wind born dust particles.

Plantation Plan

Plants will be raised along the suitable places along perimeter of WWTP and along conveyance channel. Distance from the outer boundary of the ROW and between two plants will be kept as 4 meters. Thus in one kilometer, 250 number of plants are to be raised in single row. Total number of plants to be raised is 21,500 Number. Thus a total of 21,500 trees shall be planted in lieu of expected 1920 effected plants. The tree count is tentative and GIS based which may be authenticated during construction phase of the project.

The Punjab Forest Department may update the standards of planting and choice of species as per the requirements and suitability.

Trees Recommended

Following Trees are Recommended for Plantation.

Sr. No.	Local Name	Scientific Name
1.	Neem	*Azadirachta indica*
2.	Sukh Chain	*Pongamia pinnata*
3.	Simis	*Acacia lebbek*
4.	Jacarnda	*Jacaranda mimosaifolia*
7.	Silver Oak	*Grevillea robusta*
8.	Pilkan	*Ficus virens Spp*
9.	Jamun	*Eugenia jambolina*
10.	Kachnar	*Bauhinia variegate*

PLANTATION TECHNIQUE

Plantation of suitable broad leaved species is to be carried out in the project area or immediate vicinity (as per suitability) of the project area. The project area can be afforested and vegetation cover can be improved by adopting standard afforestation technique of digging pits. The project area is suitable for plantation activities and can be managed thoroughly with care.

WHEN TO PLANT

Planting should be completed early in the rains in as short a time as possible. The trees must be given time to become well established prior to the dry season. A good rule of thumb is to start planting when the soil is moist to a depth of 15-25 cm or to the bottom of the planting hole. Failures because planting is too late are more common than failures because of planting too early. To obtain good results and avoid labor shortage in these areas considerable preparatory planning is needed. The size of the plantation might have to be adapted to the availability of labor. If dry sites cannot be planted in time, plan

Cost

Break-up of Expenditure per Avenue kilometer @ Rs. 1500/- per diem. Break-up of Expenditure per Avenue kilometer or 250 plants @ Rs. 1500/- per diem.

FIRST YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Layout	1 Av km	2 MD/Av km	3000.00
2.	Digging of Pits 2.5 ft. each 2.5x250 = 625 cft.	625 cft.	6 MD/Av km	7500.00
3.	Cost of Land Preparation / Plant	250 No.	Rs100/- plant	25,000.00
4.	Cost of planting of plants	250 No.	Rs. 25/- plant	6250.00
5.	Carriage of plants from private nursery to site including loading/unloading	250 No.	Rs. 10/- plant	2500.00
6.	Cost of Manure and Bhall (silt) including carriage	1 Av. Km		20,000.00
7.	Hiwatering 50 times 250x50 with water bowser, one driver and one coolie	12500 no.	5MD/per %0	100,000.00
8.	Weeding twice 250x2	500 no.	2 MD/per %	15,000.00
9.	Reopening of Pits twice (250x2)/off/pit	500 cft.	2 MD/per %	15,000.00
10.	Unforeseen			6750.00
Total				200,000.00

SECOND YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Cost of Land Preparation / Plant 20% Restocking	50 No.	Rs.100/- plant	5,000.00
2.	Cost of planting	50 No.	Rs. 25/- plant	1250.00
3.	Carriage of plants	50 No.	Rs. 10/- plant	600.00
4.	Hiwatering 50 times with water bowser, one driver and one coolie	12500 no.	5MD/per %0	100,000.00
5.	Reopening of Pits twice (250x2)	500 cft.	2 MD/per %	1,5000.00
6.	Weeding twice 250x2	500 no.	2 MD/per %	1,5000.00
7.	Unforeseen			1250.00
Total				1,38, 900.00

THIRD YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Cost of Land Preparation / Plant 10% Restocking	25 No.	Rs.100/- plant	2500.00
2.	Cost of planting	25 No.	Rs. 25/- plant	625.00
3.	Carriage of plants	25 No.	Rs. 10/- plant	250.00
4.	Hi/watering 40 times x250 no.	10,000 no.	5MD/per %0	75000.00
5.	Reopening of Pits twice (250x2)	500	5MD/per %0	3750.00
6.	Unforeseen			2875.00
Total				85,000.00

FOURTH YEAR

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Hi/watering 30 times	7500 no.	5MD/per %0	56250.00
5.	Pruning and cleaning of plants	250 no.	5MD/per %0	1875.00
6.	Unforeseen			1875.00
Total				60,000.00

Cost for raising 1 Av. Km and Maintenance or 250 plants in single row = Rs.4,83,000/-
For 4 years

Total cost for 21,500 standard Plantation and maintenance for 4 years = 41,538,000 PKR

Total Cost (A) = **41.54 Million PKR**

Cost for purchasing one plant = 2000 PKR

Total Plants need to be purchased for 1st year = 21,500 numbers

Plants need to be purchased for restocking in 2nd and 3rd year (30% of total) = 6,450 numbers

Total Plants need to be purchased = 27,950 numbers

Total cost of purchasing plants = 2000 x 27,950

= 55,900,000 PKR

Total Cost (B) = **55.9 Million PKR**
Grand Total Cost (A+B) = **97.44 Million PKR**

ANNEX XIII: REFERENCES