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MUNICIPAL
DEVELOPMENT
FUND
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Environmental and Social Impact Assessment (EIA/ESIA)

Improvement of Sewerage System in Jaranwala and Construction of Wastewater Treatment Plant (WWTP)

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List of Abbreviations

Acronym	Definition
AHs	Affected Households
BOD	Biological Oxygen Demand
DPO	Deputy Program Officer
CO	Chief Officer
CPMT	Central Program Management Team
CTS	Complaints Tracking System
DPO	Deputy Program Officer
EHS	Environment Health & Safety
EIA	Environment Impact Assessment
EMMP	Environment Management and Monitoring Plan
EPA	Environment Protection Agency
ESFPs	Environment & Social Focal Persons
ESM	Environment & Social Management
ESMF	Environment & Social Management Framework
ESMP	Environment & Social Management Plan
ESMMP	Environment & Social Management and Monitoring Plan
ESSs	Environment & Social Safeguards
GoP	Government of the Punjab
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome
HSE	Health Safety & Environment
IEE	Initial Environmental Examination
LG & CDD	Local Government & Community Development Department
MC	Municipal Corporation/ Committee
MO-I	Municipal Officer Infrastructure
MO-P	Municipal Officer Planning
PEQS	Punjab Environmental Quality Standards
NOC	No Objection Certificate
OHS	Occupational Health & Safety
PAPs	Project Affected Persons
PC-I	Planning Commission Form-I
PCP	Punjab Cities Program
PCRs	Physical Cultural Resources
PD	Project Director
PDO	Program Development Objectives
PEPA	Punjab Environment Protection Act
PMDFC	Punjab Municipal Development Fund Company
PMU	Project Management Unit
PPEs	Personal Protective Equipment
PO	Program Officer
RoW	Right of Way

Acronym	Definition
RPF	Resettlement Policy Framework
SMP	Social Management Plan
SOPs	Standard Operating Procedures
SPO	Senior Program Officer
TORs	Term of References
WB	World Bank

Executive Summary

Background

This Environmental and Social Impact Assessment (EIA/ESIA) has been prepared for Improvement of Sewerage System in Jaranwala City and Construction of Waste Water Treatment Plant (WWTP) which is being funded by the World Bank through Punjab Cities Program and to be implemented by the Municipal Committee Jaranwala and supervised by consultants appointed by PMDFC.

Project Background

The development objective of the Punjab Cities Program is to strengthen the performance of participating urban local governments in urban management and service delivery. The Program focuses on urban management and improvement of municipal services infrastructure for the following sectors:

- Parks
- Water Supply and Filtration Plants
- Solid Waste Management
- Sewerage and Waste Water Treatment Plants
- Roads and Street Lights

Subproject Overview

Jaranwala is located in between two big cities i.e. Lahore and Faisalabad of Punjab Province. The increased population and improved socio-economic conditions have exerted immense pressure on city sewerage system. As a result of it, a part of system is outlived and its capacity has decreased due to additional built-up area and with little capacity available in sewer for which it was designed. As a result, sewer chocking causing unhygienic conditions are evident in the city. In addition, existing situation of Jaranwala sewerage system is far below the acceptable standards due to improper maintenance issues. Crown failure being occurred in trunk sewers. During last 30 years, the city has grown considerably but requisite extensions to sewerage system have not been followed.

Punjab municipal Development Fund Company (PMDFC) has engaged MM Pakistan (Pvt.) Limited to provide Consultancy Services for the preparation of design and EIA study of the proposed WWTP.

The three sites were considered out wich 2 sites rejected due to following reasons.

Site Alternative

Site #1: The proposed land for WWTP is near chack no 352/G-B, Jaranwala city.

- The present site of 55 acres land belongs to Government; However, land is hence, no land acquisition is required.
- sewerage water from disposal station toward waste water treatment plant through gradient and no pumping required for this and operational cost is minimum.
- The land available at technical feasible location preferably near the discharge point/pumping stations of the 240 Morr disposal station.
- Simplest wastewater treatment technology with least operational cost should be selected after alternative analyses, for example, OPs or WSPs
- Project site away from populated area
- No Public infrastructure demolished due to this project.
- Treated water exit in Burala Canal as per the PEQS established under PEPA 2012 and WHO guidelines for reuse.
- Project Land is Dense Cropping area so a Compensation Plan prepared for previous lease holder
- No direct impact to any socially or environmentally sensitive receptors.

Based on this environmental and social assessment, it is established that the project will cause minor to moderate environmental and low social manageable impacts during construction phase. Consequent to this assessment alternatives for the projects were not practical and the present site is best suited for the construction of the project. Therefore, the selected site is ideally suited for construction of the project and no other site was considered. Similarly, the project will benefit the local community creating job opportunities as well as it will solve long-standing issues of availability of public transport for nearby cities.

Site # 02:

2nd proposed land for WWTP is near chack no 238/G-B, Jaranwala city

- 35 acres Govt Land is available, no land acquisition required for this project.
- sewerage water from disposal station toward wastewater treatment plant transfer against the gradient through force main and pumping required for this movement so its operational and maintenance cost is Higher.
- The Land available at that point is not technically feasible location preferably in respective of sewerage water collection of city areas.
- Graveyard present at this govt land.
- Treated water exit in Gogera Canal as per the PEQS established under PEPA 2012 and WHO Guidelines for us

Site # 03:

3rd proposed land for WWTP is near chack no 128/G-B, Jaranwala city

- 40 acres Govt Land is available but it is far away as compared to other options, no land acquisition required for this project.
- sewerage water from whole city area collected in an irrigation Drain at different point and transfer toward waste water treatment plant that was rejected by WB Team during site visit.
- The Land available at that point is technically not feasible location preferably in respective of sewerage water collection of all city areas. They served on 30 % sewerage water of whole city if the irrigation drain is not used as collecting Conveyance System
- Treated water exit in irrigation drain as per the PEQS established under PEPA 2012

No Project Alternatives

In the first instance "without the project" health issues will continue to increase, whether they are by:

- Using the untreated water as per current practice and as vegetables are grown from untreated water within the peripheral areas of Jaranwala city. This has a direct relation to the large number of cases of Cancer, Hepatitis, Liver and Kidney related diseases and many other ailments.
- By living close to open sewerage systems and use of unclean water and this is the main cause for spreading vector species, such as Anopheles m o s q u i t o e s which is associated with the spread of malarial disease. Furthermore, these give rise to outbreak of multiple arbovirus infections, such as dengue virus, chikungunya, virus Zika. According to the various studies, Malaria was the most common health problem afflicting up mostly population while gastrointestinal issue also arises. Unclean drinking water and uncollected hazardous solid waste affected the transmission of these infectious diseases. In addition, fever and diarrhea, the typical symptoms of gastroenteritis, also observed.

- Without institutional arrangements to ensure the area becomes free from being used for garbage disposal dump, solid waste dumping would remain the cause for unpleasant odors and choaked of sewerage system of all urban areas. The solid waste dumping would remain a hazard to the health for the people living nearby and encourage the breeding of mosquitoes.
- In existing situation, the sewage water overflows in the streets resulting in hindrance in people's mobility and health hazards.
- With so many issues related to the city that exist without proper drainage network and with the rate the city is growing the issues are going to worsen with time and have an ancillary effect on health as such the "without project option" is a non- starter and it should be struck off and project should go ahead.
- If the things are left unabated and the population of the city continues to grow then a number of illegal residences will also continue to grow and some of them are found directly on top of the sewage systems. This would result in many diseases including cancer the cost of hospitalization part of which is borne by the governments and the resultant loss of income of daily wage worker whilst in hospital and property damage costs may be greater than the cost required to improving the system.

Category of the Sub-project

i- Sub-project categorized as E-1, S-2 because for new wastewater treatment plant, ESIA will be prepared as per local legal framework and WB policies and procedures. Fourteen (14) Affected Persons are identified and furthermore,

- Farmers Dera
- Crops (Sugarcane, Wheat, Vegetable Fodder.)
- Guava Farms
- Citrus (Lemon) Farm
- Trees
- Tube Wells (Approximately 04)

Hence, ARAP has been prepared.

Nature, Size and Location of the Sub-project

The proposed sub-project involves rehabilitation of existing and laying off new sewerage network, rehabilitation of disposal station in Mohalla 240 Mor and construction of WWTP in Chak No. 352 JB (55 acre).

Components	Details
Name of the Project	Improvement of Sewerage System in Jaranwala City and Construction of Wastewater Treatment Plant (WWTP)
Scope of Work	Project involves Improvement of Sewerage System and rehabilitation of Disposal Station in Jaranwala City and Construction of WWTP: a) Sewerage system b) Disposal station & Forcemain c) Rehabilitation of Drains Disposal chak 128 and P/F RPC manhole Cover d) Construction of Wastewater Treatment Plant (WWTP) e) Supply of Liquid Waste Machinery f) Desilting of Sewerage Lines
Location	**Sewerage Network** will cover: Mehboob Town, D-Hub Town, Mohallah Minto Park, Basti ESA Nagar, Ghazi Town, Mohallah Sadat Park, Raja Town, Housing Colony, Awan Town, Ghulam Rasool Colony, Muhammad Ali Park, Ali Park, Committee Chowk, Mohalla Lakar Mindi,, Katchi Basti, Mehmood Colony, Abdullah Park, Altaf Town, Mohalla Islam Pura, Faisal Town, Mohallah Safia Park, Hussain Nagar, Ahmad Park, Farooq Park, Bilal Gunj Ejaz Town, Mughal Pura, Muslim Town, Muhammad Pura, Ismail Abad, Mustafabad, Mohalla Islam Pura, Anwarabad, Ghousia Park et. Rehabilitation of Disposal Station at 240 Mor and Construction of WWTP at Chak No. 352-JB

Components	Details
Nature & importance of the Project	The proposed Sub-project involves improvement of sewerage network, Rehabilitation of disposal station at 240 Mor and construction of WWTP in Chak No. 352-JB (55 acre) in Tehsil Jaranwala, District Faisalabad.
Type & Category	The sub project is categorized as E-1, S-2. EIA/ESIA is prepared, according to PEPA Review of Initial Environmental Examination and Environmental Impact Assessment, Schedule (II) F (3), 2022.
Features and Area	• Area Served 11.87 km2 • Design population (Year 2050) 1,71,239 Persons • Design Flow 28.13 Cusecs • Sewer Lines 24.06 Km • Diameter Range 9-54 inches • Disposal Station 01 • Capacity of Disposal Station 42.0 Cusecs • WWTP(Capacity 6 MGD) 55 Acres
Cost of the project	PKR 2484.700million
ESIA implementation Cost	PKR 7.5 million
Project Duration	1 years approx.
Major Work Activities	Following sub project activities are proposed with respect to scope of work and cost. • Providing and Laying Trunk Sewer • Restoration of Roads (Trunk Sewer Rute) • Providing and Laying Branch Sewer • Restoration of Roads (Branch Sewer Rute) • Supply of Jetting and Suction Machine • Rehabilitation of Drain Disposal Chak 128 • Rehabilitation of Strom Water Drain • Providing & Fixing of Reinforced Plastic Composite (Rpc) Manhole • Covers 24" I/D With Rpc Frame • Desilting of Existing Sewerage Lines • Construction of Disposal Station • Force main • Construction of WWTP
Sponsoring	Government of the Punjab (through World Bank funding)

Components	Details
Executing Agency & Project Proponent	MC Jaranwala
Monitoring Agency	PMDFC through engagement of consultants

Sub-project Proponent

MC Jaranwala is the proponent of project and the Chief Executive Officer (CEO) of MC Jaranwala intends to get NOC for the said sub-project as the proponent by submitting the ESIA for the compliance of section 12 of Punjab Environment Protection Act, 2012.

Sub-project Consultant

The details of the Consultants are provided below:

MM Pakistan (Pvt.) Limited (MMP)
Regional Office
2nd Floor CTI Building, 27 Empress Road, Lahore.
+92 42-36292525-28
+92 423 636 3234
+92 423 666-5049 (Fax)
lhr@mmpakistan.com

Legal and Policy Framework

The Government of Pakistan and Government of Punjab (GOP) have enacted a range of laws, regulations, policies and procedures for management and mitigation of social and environmental impacts for infrastructure development Sub-projects. The federal, provincial and local policies and laws and WB policies and principles applicable for PCP to deal with the environmental and social issues.

Environmental & Social Bassline

Jaranwala is located at 31°20'0N 73°26'0E with an altitude of 184 meters (606 feet). It is located 35 km southeast of Faisalabad and 110 km from Lahore. The city serves as the headquarters of Jaranwala Tehsil, an administrative subdivision of the district. The Elevation is: 188m / 617feet and the Barometric Pressure is: 99 KPa.
Air, Noise, Water and Wastewater analysis were conducted.

- All other parameters, including CO, NO, NO2, SO2, and O3, are in compliance with PEQs, however SPM, PM10, and PM2.5 exceed the permissible limit. SPM and PM2.5 are at the highest of the level at city center. While, PM10 WWTP-1 proposed observed site.
- In this report, nine distinct sites in Jaranwala city were studied to analyze the noise level in order to reduce noise pollution during the day and night. According to the findings, no site had a value greater than the permissible limit. This signifies that there is no noise pollution in Jaranwala at those locations.

- The values of pH at WWTP Proposed site and TDS at Housing Colony are exceeding the PEQs permissible limit.
- The results of BOD and TSS at 240 Mor, whereas COD at Khurrian wala Road are not in compliance with PEQs.

The Social Receptors found at site as follow:

Sr#	Packages	Receptors	Mitigation Measures
1.	**Sewerage system**	07 Mosque, one shrine13 school, 5 collages, and 01 madrassa ,01 Govt Hospital and 15 are Private, One Graveyard within 100 meter of subproject sites 05 Mosque, one shrine 10 school, 2 collages, and 01 madrassa One Graveyard within 100 meter of subproject sites	Anticipated negative impacts are Odor and Air quality, Noise pollution, Traffic disruption . **Mitigation measures** are as follow: • odor control measures such as chemical dosing, covers on sewage channels, and ventilation systems will implement to minimize odors. • Maintenance will be ensured that the sewage system is in good working condition, reducing the likelihood of leaks or odors. • **Traffic management plan** will develop to minimize disruptions during construction and maintenance activities. work will schedule during non-peak hours if possible. • Consider providing alternate routes or access points to schools, mosques, Madrassas and Graveyard during construction or maintenance to minimize disruptions. **Positive impact**: The sewage system contributes to improved sanitation and public health by effectively managing wastewater
2.	**Disposal station & Forcemain**	The force main of length 12140 ft is laying 10 Mosque, one shrine01 Vocational institute, 2 Schools, 01 Masjid ,01 madrassa, One Graveyard	
3.	**Rehabilitation of Drain Disposal Chak 128 and P/F RPC manhole cover**	1 Mosque and 01 Shrine 01 graveyard	

4.	**Construction of wastewater treatment plant (WWTP)**	ii- Farmers Dera iii- Crops (Sugarcane, Wheat, Vegetable (Polls Shed/Tunnel technology) etc.) iv- Guava Farms v- Citrus (Lemon) Farm vi- Trees vii- Tube Wells (Approximately	ARAP has been developed for compensation.
5.	**Supply of Liquid Waste machinery**	No Sensitive Receptor	
6.	**Desilting of Sewerage lines**	No sensitive Receptor	

Socio economic profile of Jaranwala shows that agriculture is the mainstay of the economy, with a majority of the population engaged in farming and related activities. There are many educational institutes. Population of Jaranwala is 150,699 with annual growth rate 1.82. Average household size is 6.38. [1]It covers an area of 1811 km.[2] Jaranwala lies in the Faisalabad Division of Punjab province.

Environmental Impact Assessment

Identification of impacts and determining of their significance is one of the main purposes of an ESIA report. Environmental and social impacts of any project are identified taking into account all phases of the project cycle, including planning and construction. The environmental issues and impacts of a project depend upon the nature of the project activities, and the types and extent of interventions involved. It is not easy to predict the future since every impact has a different and multi-dimensional nature, and also because it involves personal and subjective judgment for many attributes.

The specific purpose of this section is to:

- Identify and assess the potential impacts and their severity;
- Explain the ways in which the project might affect the baseline setting;
- Suggest viable mitigation measures for the identified impacts.

[1] https://www.pbs.gov.pk/sites/default/files/population/2017/results/05702.pdf
[2] https://www.citypopulation.de/en/pakistan/distr/admin/faisalabad/70706__jaranwala/

Screening of Impacts: The E&S[3] and IRS[4]screening checklist suggested that environmental and social impacts of project are minor to moderate and temporary and can be mitigated and managed with prevailing civil construction measures.

The findings of environmental and social (E&S) safeguards screening checklist depict that:

- environmental and social safeguards screening checklist depict that:
- Damage of agriculture land;
- Damage of Crops (40 acres of Wheat and 34 Acres of Sugarcane and 40 Acres Fodder)
- Cutting of trees (70 Wood Tress and 50 Fruit Trees)
- 04 tube-well to be relocated
- Damage of Structures
- Sub-project will be of least hindrance in the movement of households of residential units and transport during its construction phase.
- Sub-project will generate loose earth material during construction activities, which can generate construction waste and waste water problems temporarily till it will be reused or disposed of on daily basis.
- There may be noise generation and exhaust emissions during boring and material transport which will be mitigated by using new and well-tuned machinery by the The Contractor.
- Safety issues may arise during movement of vehicle which will be mitigated
- Excavation may cause accidents particularly for children and elderly. Special attention will be given to remove irrelevant persons away from Sub-project site and install barricade and safety/ caution sign boards for the safety of local community.
- Mismanagement of construction activities / materials & equipment may impact inhabitants along the Sub-project.
- There are many masjids and schools near the proposed subproject, which are the sensitive receptors but located outside the RoW of the Sub-project and movement and educational activities of students/ commuters across the Sub-project sites will not be affected. The only minor or in-significant impact on these sensitive receptors will due to dust and noise during the construction activities.

E&S impacts during operational phase

During the operational phase, wastewater treatment plants have both environmental and social impacts. Here are some of the key impacts associated with wastewater treatment plants:

Environmental Impacts:

[3] Environment and Social Screening Checklist

[4] Involuntary Resettlement Screening Checklist

a. Water Quality: Wastewater treatment plants play a crucial role in maintaining water quality by treating wastewater before it is discharged into water bodies. The treated effluent can have positive environmental impacts by reducing the pollution load and improving the overall water quality.
b. Ecosystem Effects: If not properly designed or operated, wastewater treatment plants can have negative impacts on aquatic ecosystems. For instance, the discharge of inadequately treated effluent can introduce pollutants, such as nutrients and chemicals, into water bodies, potentially leading to eutrophication, oxygen depletion, and harm to aquatic life. In this subproject solar energy system is introduced for energy efficiency and safe use of energy
c. Energy Consumption and Greenhouse Gas Emissions: Wastewater treatment plants require energy to operate various treatment processes. The energy sources used can have environmental implications, such as greenhouse gas emissions if fossil fuels are predominantly used. Additionally, the construction and maintenance of treatment plants may contribute to carbon emissions.
d. Sludge Management: Wastewater treatment generates sludge, a byproduct that requires PEQs compliance. Sludge can be treated and used beneficially (e.g., as fertilizer or for energy generation), or if mishandled, it can release pollutants and contribute to environmental contamination. If chromium detected in sludge, it is ensured that usage of sludge management will be strictly prohibited.

Social Impacts:

a. Health and Sanitation: Wastewater treatment plays a crucial role in protecting public health by reducing the risk of waterborne diseases. Properly treated wastewater ensures a safe and clean water supply for communities, reducing the incidence of waterborne illnesses and improving overall sanitation.
b. Odor and Visual Impact: Wastewater treatment plants can sometimes emit unpleasant odors due to the treatment processes and the presence of organic matter. These odors can affect nearby communities and impact their quality of life. Similarly, the visual appearance of treatment plant infrastructure may affect the aesthetics of the surrounding areas.
c. Employment and Economic Opportunities: Wastewater treatment plants create job opportunities for operators, maintenance staff, engineers, and other professionals. These plants also support the local economy through the procurement of goods and services required for their operation and maintenance.
d. Community Engagement: The operation of wastewater treatment plants often involves community engagement and consultation. Communities may have concerns about odor, noise, or potential environmental impacts. Engaging with local stakeholders can help address these concerns, build trust, and ensure the plant's operations align with community needs and expectations.

To mitigate these impacts, wastewater treatment plants employ various technologies, monitoring systems, and management practices to ensure efficient treatment, minimize

pollution, and enhance overall environmental and social performance. Regulatory frameworks and compliance measures also play a critical role in ensuring wastewater treatment plants operate in an environmentally sustainable and socially responsible manner.

As per ESMF of PCP, Environment and Social Screening and Involuntary Resettlement Screening Checklists were used to screen the potential environmental and social impacts and to categorize the project which is categorized as E-1, S-2.

E-1 = All those sub-projects having adverse environmental impacts and or those sub-projects that come under Schedule I and II of Pakistan Environment Protection Agency Review of IEE and EIA Regulations 2000 will need to submit Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA)5 report

S-2= All those sub-projects having negative social impacts of significant nature on 1 – 40 households and or it require displacement/resettlement of 1- 40 households due to land acquisition, a Social Management Plan (SMP) will be prepared and implemented as a part of the ESMP. An Abbreviated Resettlement Action Plan (ARAP) will also be prepared and implemented. (However, the land is MC owned which has been selected for wastewater treatment plant and disposal station therefore there is no need to acquire land. Therefore, there is no need to develop ARAP)

For sewerage system and new construction of wastewater treatment plant, ESIA is prepared, aaccording to Punjab Environment Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment, Schedule (II)F (3), 2022, i.e., F (3) Combined wastewater treatment plants with treatment capacity greater than 100m^3/hour.

Environmental and Social Mitigation Measures

The specific mitigation measures for each of the anticipated E&S impacts that may emerge at planning, construction and operation phase, have been considered. These mitigation measures are proposed to significantly reduce the identified potential E&S impacts associated with sub-project activities. Proposed mitigation measures include but not limited to the use of PPEs by labor, water spraying for dust control, limiting noise activities during day hours, fencing of construction area, environment quality monitoring during construction and at operation phase, plantation and safety measures for prevention of COVID-19. For handling of odor and smell at operation phase of wastewater treatment plant, floating wetlands are introduced in the facultative ponds for bioremediation which will further reduce the Biochemical Oxygen Demand (BOD) enhance the aesthetic beauty of the overall environmental conditions of the area.

Environment & Social Management & Monitoring Plan

This ESIA report presents the project's site-specific baseline data, identification, assessment and evaluation of project impacts and preparation of environmental and social management and monitoring plan for mitigation of adverse impacts that may arise due to the proposed project interventions.

5 All the social impacts (except those that come under S1 and S2 Category of land acquisition) of E1 Category sub-projects will be covered in IEE/EIA report

Institutional Arrangements

Overall responsibility for Environmental Management and Monitoring will rest with the MC Jaranwala. ESM Wing will provide support to ESFPs for managing environment and social aspects of the Sub-project and implementation of the present ESMMP.

The Contractor will ensure implementation of on-site safety measures to protect community from any mishap/incident or accidents. The Contractor will install safety signage to aware public about on-going construction activities (caution, safety, construction work in progress etc.). The Contractor will also provide information about diversion routes (where necessary) with safety cautions/flagmen. The Contractor will also provide personal protective equipment (PPEs) to workers as per nature of their jobs.

The present ESIA will be included in the bidding/ contract documents and their implementation will be a contractual binding for the Contractors. In addition, The Contractor's guidelines prepared by PMDFC/ safeguards procedures will also be made part of contractual agreement.

Stakeholder Consultations

Stakeholder consultations were carried out during preparation of Environmental Management Monitoring Plan (EMMP). Meetings were held with MC Jaranwala Officials (CO, MOI, MOP, Sub-Engineers), political elites and local communities and key environmental and social issues were discussed. All the respondents were in favor of improvement of sewerage network and construction of WWTP in the larger interest of the public.

Grievance Redressal Mechanism

This Section outlines the policy and procedure for documenting, addressing, responding and employing methods to resolve project grievances and complaints that may be raised by the Affected Persons (APs) or community members arising from environmental and social performance, the engagement process, resettlement and/or unanticipated environmental or social impacts resulting from project activities that are performed and/or undertaken by PMDFC. The Section describes the scope and procedural steps and specifies roles and responsibilities of the parties involved in addressing the grievances.

Conclusion and Recommendation

Apart from the positive impacts, the proposed sub-project will also have some potential minor negative, temporary in nature environmental and social impacts during the construction and operational phases. Some significant impacts include loss of agriculture land, damages of crops, cutting of trees, soil contamination, health risks and work safety problems, traffic management during construction phase, sludge handling and odour issues. Major efforts were made to identify the key physical, ecological, social, cultural and environmental issues related to the construction and operation of the proposed sub-project. Various stakeholders including government departments and agencies were also contacted for obtaining salient information in this regard along with that from area residents. Most of these adverse impacts during construction are of a temporary nature.

In order to minimize, avoid or reduce the potential adverse impacts appropriate mitigation and remedial measures have been suggested against each identified impact. Efforts are made to

propose economical and sustainable mitigation and remedial measures which can be easily implemented. An ESMMP has also been developed to provide proper framework for the implementation of the suggested mitigation measures. A project will be executed under environmentally sustainable manner.

The implementation of these steps will ensure that the project is executed in an environmentally sustainable manner.

1 Introduction

1.1 General

Punjab is the most populous Province of Pakistan with a rapidly growing population and economy. Intermediary cities in Punjab are playing a crucial role in driving economic growth and development in the province. However, the municipal corporations of these cities often lack the resources, capacity, and political will to effectively deliver public services and promote local development. This can lead to a range of challenges, including inadequate infrastructure, poor public services, and limited economic opportunities, which can hinder the overall development of the province. To address these challenges, the Government of the Punjab established Punjab Municipal Development Fund Company (PMDFC) with the technical and financial assistance of the World Bank in 1998. Punjab Cities Program is one the major ongoing projects of PMDFC. The Program will support building systems in participating MCs for more transparency, accountability, responsiveness to citizens, and provision of improved municipal services, and putting the MCs on a structured path towards financial sustainability.

The Program Development Objectives (PDO) is to strengthen the performance of participating urban local governments in urban management and service delivery. By achieving the Program Development Objective (PDO), the operation is expected to contribute to the overarching goals of ending extreme poverty and promoting shared prosperity by delivering improved urban infrastructure on an inclusive basis and in ways that enhance economic growth and development in the participating cities. Achievement of the PDO will also make a significant contribution to attaining Sustainable Development Goal-11 (sustainable cities and communities).

1.2 Environment and Social Screening

The current project requires an Environment and Social Impact Assessment (ESIA) Report for its environmental approval under section 12 of the PEPA Act 1997 (amended 2012 & 2017). ESIA is a systematic identification and evaluation of potential impacts of proposed projects, plans, programs or legislative actions relative to the physical, chemical, biological, cultural and socio-economic components of the environment followed by mitigation measures in the form of Environmental and Social Management and Monitoring Plan (ESMMP) to ascertain the EPA Punjab requirements.

As per the Environmental and Social Framework (ESMF) of PCP, the sub-projects are categorized in E1, E2 and E3 category and S1, S2 and S3 category based on the magnitude and severity of the environmental and social impacts of the sub-project. This project is categorized as E-1 and S-2.

E-1 = All those sub-projects having adverse environmental impacts and or those sub-projects that come under Schedule I and II of Pakistan Environment Protection Agency Review of IEE and EIA Regulations 2000 will need to submit Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA)[6] report

6 All the social impacts (except those that come under S1 and S2 Category of land acquisition) of E1 Category sub-projects will be covered in IEE/EIA report

S-2= All those sub-projects having negative social impacts of significant nature on 1 – 40 households and or it require displacement/resettlement of 1- 40 households due to land acquisition, a Social Management Plan (SMP) will be prepared and implemented as a part of the ESMP. An Abbreviated Resettlement Action Plan (ARAP) has also been prepared. (The land is Government owned which has been selected for wastewater treatment plant and disposal station, However, 2 structures, 4 tubewells, 120 trees and 14 Affected households' crop are to be compensated. Therefore ARAP has been developed for this subproject.

Environmental & Social Screening Checklist and Involuntary Resettlement Checklists for all 05 major components of the subproject are attached as Annexure A.

1.3 Purpose of the Report

The main purpose of the EIA/ESIA report is:

- To identify the environmental issues pertaining to the operational site
- To evaluate the ability of the site in view of social acceptance and environmental soundness
- To provide the maximum information to the proponent and other stakeholders about the existing environmental conditions and the implications of the operational project
- To collect available data, reports, drawings and other relevant information about area of operational project
- To review the applicable Punjab Environmental Quality Standards (PEQS) attached as Annexure B.
- To propose mitigation measures in order to eliminate or to reduce the negative impacts to an acceptable level
- To develop well-resourced ESMMP including site-specific environmental and social mitigation plan.
- To prepare and submit an EIA/ESIA report to Environmental Protection Agency, Punjab for Environmental Approval.

1.3.1.1 Identification of Project and Proponent Nature, Size and Location of the Sub-project

The proposed sub-project involves rehabilitation of existing and laying off new sewerage network, rehabilitation of disposal station in Mohalla 240 Mor and construction of WWTP in Chak No. 352 JB (55 acre).

Table 1:Nature, Size and Location of the Sub-project

Components	Details
Name of the Project	Improvement of Sewerage System in Jaranwala City and Construction of Wastewater Treatment Plant (WWTP)

Components	Details
Scope of Work	Project involves Improvement of Sewerage System and rehabilitation of Disposal Station in Jaranwala City and Construction of WWTP: **a.** Sewerage system **b.** Disposal station & Forcemain **c.** Rehabilitation of Drains Disposal chak 128 and P/F RPC manhole Cover **d.** Construction of Wastewater Treatment Plant (WWTP) **e.** Supply of Liquid Waste Machinery **f.** Desilting of Sewerage Lines
Location	**Sewerage Network** will cover: Mehboob Town, D-Hub Town, Mohallah Minto Park, Basti ESA Nagar, Ghazi Town, Mohallah Sadat Park, Raja Town, Housing Colony, Awan Town, Ghulam Rasool Colony, Muhammad Ali Park, Ali Park, Committee Chowk, Mohalla Lakar Mindi,, Katchi Basti, Mehmood Colony, Abdullah Park, Altaf Town, Mohalla Islam Pura, Faisal Town, Mohallah Safia Park, Hussain Nagar, Ahmad Park, Farooq Park, Bilal Gunj Ejaz Town, Mughal Pura, Muslim Town, Muhammad Pura, Ismail Abad, Mustafabad, Mohalla Islam Pura, Anwarabad, Ghousia Park et. Rehabilitation of Disposal Station at 240 Mor and Construction of WWTP at Chak No. 352-JB
Nature & importance of the Project	The proposed Sub-project involves improvement of sewerage network, Rehabilitation of disposal station at 240 Mor and construction of WWTP in Chak No. 352-JB (55 acre) in Tehsil Jaranwala, District Faisalabad.
Type & Category	The sub project is categorized as E-1, S-2. EIA/ESIA is prepared, according to PEPA Review of Initial Environmental Examination and Environmental Impact Assessment, Schedule (II) F (3), 2022.
Features and Area	• Area Served 11.87 km2 • Design population (Year 2050) 1,71,239 Persons • Design Flow 28.13 Cusecs • Sewer Lines 24.06 Km • Diameter Range 9-54 inches • Disposal Station 01 • Capacity of Disposal Station 42.0 Cusecs • WWTP(Capacity 6 MGD) 55 Acres
Cost of the project	PKR 2484.700million
ESIA implementation Cost	PKR 7.5 million

Components	Details
Project Duration	1 years approx.
Major Work Activities	Following sub project activities are proposed with respect to scope of work and cost. • Providing and Laying Trunk Sewer • Restoration of Roads (Trunk Sewer Rute) • Providing and Laying Branch Sewer • Restoration of Roads (Branch Sewer Rute) • Supply of Jetting and Suction Machine • Rehabilitation of Drain Disposal Chak 128 • Rehabilitation of Strom Water Drain • Providing & Fixing of Reinforced Plastic Composite (Rpc) Manhole • Covers 24" I/D With Rpc Frame • Desilting of Existing Sewerage Lines • Construction of Disposal Station • Force main • Construction of WWTP
Sponsoring	Government of the Punjab (through World Bank funding)
Executing Agency & Project Proponent	MC Jaranwala
Monitoring Agency	PMDFC through engagement of consultants

1.3.1.2 Sub-project Proponent

Details of the Proponent of the proposed Sub-project are provided here under:

Chief Officer

MC Jaranwala

1.3.1.3 Sub-project Consultant

The details of the Consultants are provided below:

MM Pakistan (Pvt.) Limited (MMP)

Regional Office (2nd Floor CTI Building, 27 Empress Road, Lahore).

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+92 423 666-5049 (Fax)

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1.4 Study Approach & Methodology

1.4.1.1 Study Approach

The study has been conducted in accordance with National Regulatory framework and Environmental & Social Management Framework (ESMF) under PCP (World Bank funded program). The study is based on both primary and secondary data and information. Discussions were held with stakeholders including Government officials and community representatives. The main purpose of this approach was to obtain a fair impression on the people's perceptions of the project and its environmental and social impacts.

1.4.1.2 Methodology

i. Orientation

Meetings and discussions were held among the executing & implementing Agency. This activity was aimed at achieving a common ground of understanding various issues related to the project.

ii. Planning for Data Collection

Subsequent to the concept clarification and understanding obtained in the preceding step, a detailed data acquisition plan was developed for the internal use of the consultant. The plan included identification of specific data requirements and their sources, determined time schedules and responsibilities for their collection, and indicated the logistics and other supporting needs for the execution of the data acquisition plan.

iii. Data Collection

In this step, primary and secondary data were collected through field observations, environmental monitoring in the field, concerned departments and published materials to establish baseline profile for physical, biological and socio-economic environmental conditions. The following activities were undertaken to gather the required data:

- Environment and Social Screening
- Site Reconnaissance
- Analysis of Maps and Plans
- Literature Review
- Desk Research
- Public Consultations
- Field Observations & Studies
- Stakeholders Consultation
- Laboratory Analysis

a) Physical Environment

Information was gathered on the existing physical environment, particularly as related to geology, topography, soils, hydrology and drainage, water quality, air quality and noise.

1.4.1.3 Geology, Topography, Soils

A review was conducted of relevant literature on the geology, topography and soils in the project area.

1.4.1.4 Air Quality

Ambient air quality measurements are essential to provide a description of the existing conditions, to provide a baseline against which changes can be measured and to assist in the determination of potential impacts of the proposed construction on air quality conditions. Ambient air quality was monitored for Carbon Monoxide (CO), Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2), Particulate Matter (PM10) and other parameters mentioned in PEQS.

1.4.1.5 Noise

Noise level readings were taken for 24 hours and hourly average data was reported.

1.4.1.6 Water Quality

Water quality monitoring was conducted to determine the water quality situation prior to construction. It has been observed that the surface water and groundwater are the most important environmental variables to be affected due to the project. The extent of surface water and groundwater contamination in the project area was assessed based on the test results of chemical and microbiological parameters for surface and ground water. Dissolved oxygen (DO), pH and conductivity measurements were taken in situ at all sampling stations. Laboratory analyses were performed according to the recognized methods of American Society for Testing and Materials (ASTM), United States Environmental Protection Agency (USEPA), and American Public Health Association (APHA).

b) Biological Environment

The status of the flora and fauna of the study area were determined by ecological survey, a review of literature relevant to the area, and an assessment of terrestrial environments

1.4.1.7 Flora

The vegetative communities were identified and classified into plant community types. Identification was carried out of dominant tree species, assessment of stage of growth (mature or sapling) and assessment of canopy cover.

1.4.1.8 Fauna

Information on fauna was gathered from existing literature on reported species as well as observations in the field.

c) Socio-Cultural Environment

The consultants utilized a combination of desk research, field investigations, census data, structured interviews and reports to generate the data required for description of the existing social environment and assessment of the potential impacts of the construction of the proposed project.

iv. Identification and Evaluation of Environmental Impacts

The impacts of the project on the physical, biological and socio-economic environment at the design, construction and operational phases were identified and evaluated based on their type and magnitude.

v. Mitigation Measures and Implementation Arrangements

Adequate mitigation measures and implementation mechanisms were proposed so that the proponent could incorporate them beforehand in the design phase.

1.5 Structure of the ESIA Report

Report Organization

The ESIA report has been organized in 10 chapters:

Chapter 1: Introduction

Describes the introduction and purpose of this report

Chapter 2: Policy, Legal and Administrative Framework

Description of the national & provincial legislation, regulations and policies those are relevant to project activities and initial environmental examination process.

Chapter 3: Description of Project

This chapter includes the project description, raw materials details and utility requirements and project alternatives.

Chapter 4: Environment & Social Baselines

This chapter describes the present environmental settings and socioeconomic value of the project area and surroundings.

Chapter 5: Potential Environmental Impacts and Mitigation Measures

Deals with the identification of potential environmental and social impacts of project for preparation of environmental management and monitoring plan.

Chapter 6: Environmental and Social Management and Monitoring Plan

Deals with the implementation of mitigation measures and monitoring of environmental parameters against likely environmental impacts.

Chapter 7: Stakeholder Consultation

Deals with the consultations held during surveys

Chapter 8: Capacity Building

Chapter 9: Grievance Redress Mechanism

Grievance Redress Mechanism (GRM) description. GRM and its different tiers.

Chapter 10: Conclusion and Recommendations

The conclusion of EIA/ESIA report.

2Legal and Policy Framework

2.1 Introduction

This section provides an overview of the policy framework and national legislation that applies to the proposed project. The sub-project is expected to comply with all national/ provincial legislation regulations, EPA guidelines, World Bank Operational Policies and guidelines which are relevant and applicable to the sub-project.

2.2 National Policy and Legal Framework

The Constitution of Pakistan distributes the legislative powers between the federal and the provincial governments through "Federal and Concurrent Lists" attached to the Constitution as appendices. The Federal list depicts the areas and subjects on which the Federal government has exclusive powers. The second, concurrent list contain ns areas and subjects on which both Federal and Provincial governments can enact laws.

The Pakistan National Conservation Strategy (NCS) that was approved by the federal cabinet in March 1992 is the principal policy document on environmental issues in the country (EUAD/IUCN, 1992). The NCS outlines the country's primary approach towards encouraging sustainable development, conserving natural resources, and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment. The core areas that are relevant in the context of the proposed project are pollution prevention and abatement, restoration of rangelands, increasing energy efficiency, conserving biodiversity, supporting forestry and plantations, and the preservation of cultural heritage.

Prior to the adoption of the 18th Constitutional Amendment, the Pakistan Environmental Protection Act (PEPA) 1997 was the governing law for environmental conservation in the country. Under PEPA 1997 the Pakistan Environmental Protection Council (PEPC) and Pak EPA were primarily responsible for administering PEPA 1997. 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.

2.2.1.1 Regulations for Environmental Assessment, Punjab EPA

Under Section 12 (and subsequent amendment in 2012 and then 2017) of the PEPA (1997), a project falling under any category specified in Schedule I of the IEE/EIA Regulations 2022 requires the proponent of the project to file an IEE with the concerned provincial EPA while projects falling under any category specified in Schedule II require the proponent to file an EIA with the provincial agency, which is responsible for its review and accordance of approval or request any additional information deemed necessary. As this subproject under Punjab Cities Program is funded by World Bank, so in compliance of the WB policies and ESMF of PCP, EIA report has mandatory part of

social impact assessment social management plan in the ESMMP and vice versa and termed as Environment and Social Impact Assessment (ESIA) report.

2.2.1.2 Regulatory Clearances, Punjab EPA

In accordance with provincial regulatory requirements, an IEE/EIA satisfying the requirements of the Punjab Environmental Protection Act (amended 2012&2017) will be marked cleared by Punjab-EPA and No Objection Certificate (NOC) will be issued for it.

2.2.1.3 Guidelines for Environmental Assessment, Pakistan EPA

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

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

These guidelines have been adopted by the Punjab Environment Protection Agency after 18th amendment.

2.2.1.4 Punjab Environmental Quality Standards (PEQS), 2016

The Punjab Environmental Quality Standards (PEQS), 2016 specify the following standards:

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

These standards apply to the gaseous emissions and liquid effluents discharged by batching plants, campsites and construction machinery. The standards for vehicles will apply during the construction as well as operation phase of the project. The PEQs of Air, Noise and Water Quality is attached as Annexures B.

2.2.1.5 Other Environment Related Legislations

Several laws, regulations, procedures, and technical guidelines have been developed at the federal and provincial levels to address key environmental and social risks. The legal framework includes legislation addressing land acquisition, social analysis as part of the EIA, and labor protections among many others. The most important of these overarching laws and regulations related to the sub-project include the following (Table 2):

Table 2:National and Provincial Legislative Framework

Sr.#	Act	Description	Applicability to Sub-project
1.	**Punjab Environment Protection Act, 1997 (as amended up to 2017)**	• The Act establishes the Environmental Protection Agency that deals with the preparation of national environmental policies, prepare & publish national environment report, ensure the enforcement of National Environmental Quality Standards, establishment of ambient air, water and land quality standards, measures to control environmental pollution. • Additionally, under this Act, 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 (EIA/ESIA), and has obtained from the approval in respect thereof.	• Section 11, 12, 13 and 14 of PEPA, 2012 will be applicable throughout the length of project and during operation phase of WWTP.
2.	**Punjab Environment Protection Review of IEE/EIA Regulations 2022**	• Provided that the proponent shall file an environmental impact assessment, if the project is likely to cause an adverse environmental impact	• Schedule II- F (3) is applicable under which this EIA (ESIA) report is developed. • As this subproject under Punjab Cities Program is funded by World Bank, so in compliance of the WB policies and ESMF of PCP, EIA report has mandatory part of social impact assessment social management plan in the ESMMP and vice versa and termed as Environment and Social Impact Assessment (ESIA) report
3.	**Pakistan Penal Code, 1860**	• The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions and disposal of effluents.	• The provisions of the Penal Code, 1860 are applicable to the project in terms of penalties for effecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.

Sr.#	Act	Description	Applicability to Sub-project
4.	**Motor Vehicle Rules, 1969**	• It defines powers and responsibilities of Motor Vehicle Examiners (MVEs). The establishment of MVE inspection system is one of the regulatory measures that can be taken to tackle the ambient air quality problems associated with the vehicular emissions during operation phase.	• This act is applicable to the gaseous emission that will be released from the vehicles in operation phase at machinery used during construction phase of this subproject.
5.	**The Land Acquisition Act, 1894**	• The Land Acquisition Act, 1894, is a "law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be paid on account of such acquisition".	• This act will not be triggered as no land acquisition is required.
6.	**The Punjab Land Acquisition Rules, 1983**	• It describes the land acquisition procedure for public purposes or for a company.	• This act will not be triggerd as no land acquisition is required.
7.	**Pakistan Antiquities Act 1975 and Punjab Antiquities Amendment Act 2012**	• The Punjab Antiquities Amendment Act, 2012 is adopted from the Pakistan Antiquities Act of 1975 with a few minor changes. The Antiquities Act, 1975 (amended in 1990) states the following: • "Ancient" is any object that is at least 75 years old; • All accidental discoveries of artifacts must be reported to the Federal Department of Archaeology; • The Government is the owner of all buried antiquities discovered on any site, whether protected or otherwise; • All new construction within a distance of 200 feet from protected antiquities is forbidden; • No changes or repairs can be made to a protected monument, even if it is owned privately, without approval of the responsible authorities; and • The cultural heritage laws of Pakistan are uniformly applicable to all categories of sites regardless of their state of preservation and classification as monuments of national or world heritage.	• The law will be applicable to the project due to its provision that if any accidental archaeological discoveries may occur during the excavation works for the construction of proposed sub-project.
8.	**Punjab Restriction of 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	• The relevance of this act to the project will be to prohibit child employment for construction of the proposed sub- project

Sr.#	Act	Description	Applicability to Sub-project
		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.	activities and it will be applicable throughout the construction and operational phase.
9.	**The Punjab Occupational Safety and Health Act, 2019**	• The Punjab Occupational Safety and Health Act, 2019 (IV of 2019) An Act to provide for occupational safety and health at workplace. • It is necessary to make and consolidate the law for the occupational safety and health of the persons at workplace and to protect them against risks arising out of the occupational hazards; to promote safe and healthy working environment catering to the physiological and psychological needs of the employees at workplace and to provide for matters connected therewith or ancillary thereto.	• The Punjab Occupational Safety and Health Act, 2019 relevant sections to the proposed projects are: • 8. Safety and Health, 10. Consultation 13. Notification and investigation of accidents, dangerous occurrences and occupational illness. Adopting this act, PMDFC has developed SOPs for health and safety of the labor and communities which will be applicable in this subproject.

2.3 International Treaties and Conventions

Pakistan has been a party to several international environmental treaties and agreements. This section describes the international treaties and conventions.

Table 3:International Laws/Treaties

#	International Laws/Treaties	Description
1	The Convention on Conservation of Migratory Species of Wild Animals, (1981)	The Convention requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or cooperate with other countries in matters of research on migratory species. There are no endangered species of plant life or animal life in the vicinity of the Project.
2	Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)	The convention requires Pakistan to impose strict regulation (including penalization, confiscation of the specimen) regarding trade of all species threatened with extinction or that may become so, in order not to endanger their survival further.

		By controlling the trade in these species, CITES aims to ensure their survival and prevent overexploitation, which can indirectly impact ecosystems and the quality of water resources.
3	International Union for Conservation of Nature and Natural Resources Red List (2000)	It lists sensitive ecological resources that are experiencing various levels of threats internationally. However, the IUCN Red List indirectly relates to WWTPs by assessing and categorizing species that may be impacted by pollution, habitat destruction, or other factors associated with human activities, including inadequate wastewater treatment. By evaluating the conservation status of species, the Red List helps identify the potential threats they face and the need for conservation measures to protect their habitats.
4	Ramsar Convention on Wetlands of International Importance 1971	The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The convention is an international treaty for the conservation and sustainable utilization of wetlands. It is the only global environmental treaty that deals with a particular ecosystem. Additionally, the Ramsar Convention emphasizes the importance of international cooperation and exchange of information among member states to address shared wetland concerns. This can include sharing best practices in wastewater treatment and management to ensure that wetland ecosystems are adequately protected.

2.4 World Bank Policy Core Principles and Applicability on Sub-project

Core Principles	Applicability
Core Principle 1 Environmental and social management procedures and processes are designed to A. Avoid, minimize, or mitigate against adverse impacts; B. Promote environmental and social sustainability in program design; and C. Promote informed decision making relating to a program's environmental and social effects.	ESIA prepared under the light of this Principle in order to mitigate negative impacts envisaged in this Sub-project. ESMMP implementation will help in achieving environmental and social sustainability
Core Principle 2 Environmental and social management procedures and processes are designed to avoid, minimize, and mitigate against adverse effects on natural habitats and physical cultural resources resulting from the program	Table 7.2 prepared to mitigate all minor impacts anticipated during the course of the Sub-project.
Core Principle 3 Program procedures ensure adequate measures to protect public and worker safety against the potential risks associated with (a) construction and/or operations of facilities or other operational practices developed or promoted under the Program and (b) exposure to toxic chemicals, hazardous wastes, and otherwise dangerous materials	All the mitigation measures have been incorporated in the Table 7.2 to address risks associated with workers and community health and safety. The Contractor will ensure compliance with these attributes.
Core Principle 4 Land acquisition and loss of access to natural resources are managed in a way that avoids or minimizes displacement, and affected people are assisted in improving, or at least restoring, their livelihoods and living standards	This core principle trigger in this Sub-project as the proposed sites is government owned However, the land is under use of people construction of WWTP.
Core Principle 5 Due consideration is given to cultural appropriateness of, and equitable access to, program benefits, giving special attention to rights and interests of indigenous peoples	No indigenous/ Vulnerable groups exist in the Sub-project sites.

Core Principles	Applicability
and to the needs or concerns of vulnerable groups.	
Core Principle 6 Avoid exacerbating social conflict, especially in fragile states, post-conflict areas, or areas subject to territorial disputes.	This principle doesn't trigger in this Sub-project.

2.4.1.1 World Bank Environmental, Health and Social Guidelines

The principal World Bank publications that contain environmental and social guidelines are listed below.

- Environment, Health, and Safety (EHS) Guidelines prepared by International Finance Corporation and World Bank in 2007

The relevant EHS Guidelines[7] are as below:

- **Environmental**
  - Air Emissions and Ambient Air Quality
  - Energy Conservation
  - Wastewater and Ambient Water Quality
  - Water Conservation
  - Hazardous Materials Management
  - Waste Management
  - Noise
  - Contaminated Land
- **Occupational Health and Safety**
  - General Facility Design and Operation
  - Communication and Training
  - Physical Hazards
  - Chemical Hazards
  - Biological Hazards
  - Radiological Hazards
  - Personal Protective Equipment (PPE)
  - Special Hazard Environments
  - Monitoring
- **Community Health and Safety**
  - Water Quality and Availability
  - Structural Safety of Project Infrastructure
  - Life and Fire Safety (L&FS)
  - Traffic Safety
  - Transport of Hazardous Materials
  - Disease Prevention
  - Emergency Preparedness and Response

[7] https://documents1.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final-General-EHS-Guidelines.pdf

- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues.
- Social Analysis Sourcebook
- WB Committee on disability-inclusive development
- WB guidelines on labour influx
- WB Group Gender Strategy

2.5 PMDFC Environment Health and Safety SOPs for labor/workers (including Women)

EHS SOPs for labor/workers (including women workers) will be applicable during the labor work and made part of the contractual agreement of the Contractor.

3 Sub-Project Description

3.1 Overview

This section of the report provides an overview of the rational of the project, brief description of the project, type and category, its objectives location, land use, vegetation features, cost and magnitude of operation and various phases followed by Environmental Approvals or an approach adapted to conduct ESIA of Improvement of Sewerage System in Jaranwala City and Construction of WWTP in Chak No. 352-JB, Jaranwala city. For planning horizon 2050, the sewerage system has been proposed in existing MC areas as well as in unserved areas and this will provide 100% coverage of sewerage facilities to the population up to the design horizon. The rehabilitation of existing system and inclusion of missing links in un-covered areas has been proposed as the existing sewerage system is more than 30 years old and needs almost complete replacement due to numerous issues (under capacity sewers, old aged Sewerage network etc). For these zones, sewerage system has been proposed considering the land uses (residential, commercial and industrial). The proposed sewerage system comprises sewage collection (sewage network) disposal and its treatment. The collection system will consist of trunk sewers, submain and lateral sewers. The sewage generated will be disposed of into proposed one disposal station from where sullage carrier and force main will convey the wastewater into wastewater treatment plant.

3.2 Type and Category of Sub-project

This ESIA is developed for proposed subproject “Improvement of Sewerage System in Jaranwala City and Construction of WWTP. The current project requires an ESIA report for its environmental approval under section 12 of the PEPA Act 1997 (amended 2012 & 2017). EIA/ESIA is a systematic identification and evaluation of potential impacts of proposed projects, plans, programs or legislative actions relative to the physical, chemical, biological, cultural and socio-economic components of the environment followed by mitigation measures in the form Environmental Management Plan (EMP) to ascertain the EPA Punjab requirements:

As per the ESMF under PCP, the sub-projects are categorized in E1, E2 and E3 category and S1, S2 and S3 category based on the magnitude and severity of the environmental and social impacts of the sub-project.

This project is categorized as E-1 and S-2. Environmental & Social Screening Checklist and Involuntary Resettlement Checklists is attached as Annexure A. For new construction of disposal station and wastewater treatment plant, ESIA will be prepared, according to Review of IEE/EIA, Schedule (II)F (3),2022.

3.3 Sub-project Objectives

Subproject Objectives:

The Sub-project comprises of the Replacement of old, outlived, damaged or worn-out components in existing infrastructure for; -

- Improved sewerage system will be provided in served and unserved areas and will cater the future needs of population residing in above areas.
- Sanitation and hygienic conditions will be improved and consequently, Govt. health spending will be reduced.
- After treatment of domestic sewage through wastewater treatment plant (WWTP), the risk of spread of diseases due to pathogens in wastewater will be reduced.
- Ponding issues due to chocking of sewers will be resolved in the city.
- By this Project, the existing practice of disposing sewage to agriculture fields will be eliminated.
- After treatment of wastewater and it disinfection treated water will be used for agriculture purpose which take part in National Growth.
- The existing sewerage system was laid without branch sewer lines. Open drains are connected without gully gratings. Hence, chocking problems frequently occurred the low-lying areas start overflowing. The resident of the areas suffering bad environmental conditions and difficult to move any side.
- To improve the service delivery by laying of trunk sewer according to topographic conditions. It will provide Improvement of service delivery level of the municipal services in the served areas of the city for provision of better basic urban services for improved livability of the citizen.
- The new system is proposed keeping in view to reduce in annual O&M cost of the infrastructure due to reduced repairs in the forthcoming years because of repair or replacement of infrastructure components.
- On completion of scheme about to main disposal stations i.e Housing Colony and AC residence along with 6 to 9 dewatering sets will be eliminated and sewage water flow by gravity. It will cause in reduction and prompt redressed of the public complaints regarding municipal service delivery.
- The major areas are without sewer along the planned route of trunk sewer which will be benefited with sewerage facility and environmental condition will be improved.
- The main project to provide the wastewater treatment facility along with disinfection of treated water which can used for irrigation purpose. It will also take part in national growth.
- To provide the wastewater treatment facility for reduction of BOD to bring the effluent within permissible limits of the PEQSs to be discharged into surface water body without harming the environment and the treated water can be used for irrigation purposes meeting the WHO and USEPA Guidelines.
- With the improvement of environmental standards, the growth potential and the local economy of the city will be improved. Hence, the objectives of the project are in line with the sector objectives.

3.4 Sector Objectives

The sector objectives include:

- Provision of efficient and effective municipality services to the masses.
- Improvement of existing sewerage system in Jaranwala City
- To improve existing environmental conditions by provision of wastewater treatment facilities in Jaranwala City.

3.5 Location and Site layout of the Project

Main areas included in this project are etc. The salient features of proposed sewerage system of Zone 1 are as under: Mehboob Town, D-Hub Town, Mohallah Minto Park, Basti ESA Nagar, Ghazi Town, Mohallah Sadat Park, Raja Town, Housing Colony, Awan Town, Ghulam Rasool Colony, Muhammad Ali Park, Ali Park, Committee Chowk, Mohalla Lakar Mindi,, Katchi Basti, Mehmood Colony, Abdullah Park, Altaf Town, Mohalla Islam Pura, Faisal Town, Mohallah Safia Park, Hussain Nagar, Ahmad Park, Farooq Park, Bilal Gunj Ejaz Town, Mughal Pura, Muslim Town, Muhammad Pura, Ismail Abad, Mustafabad, Mohalla Islam Pura, Anwarabad, Ghousia Park etc.

Figure 1: Site Pictures

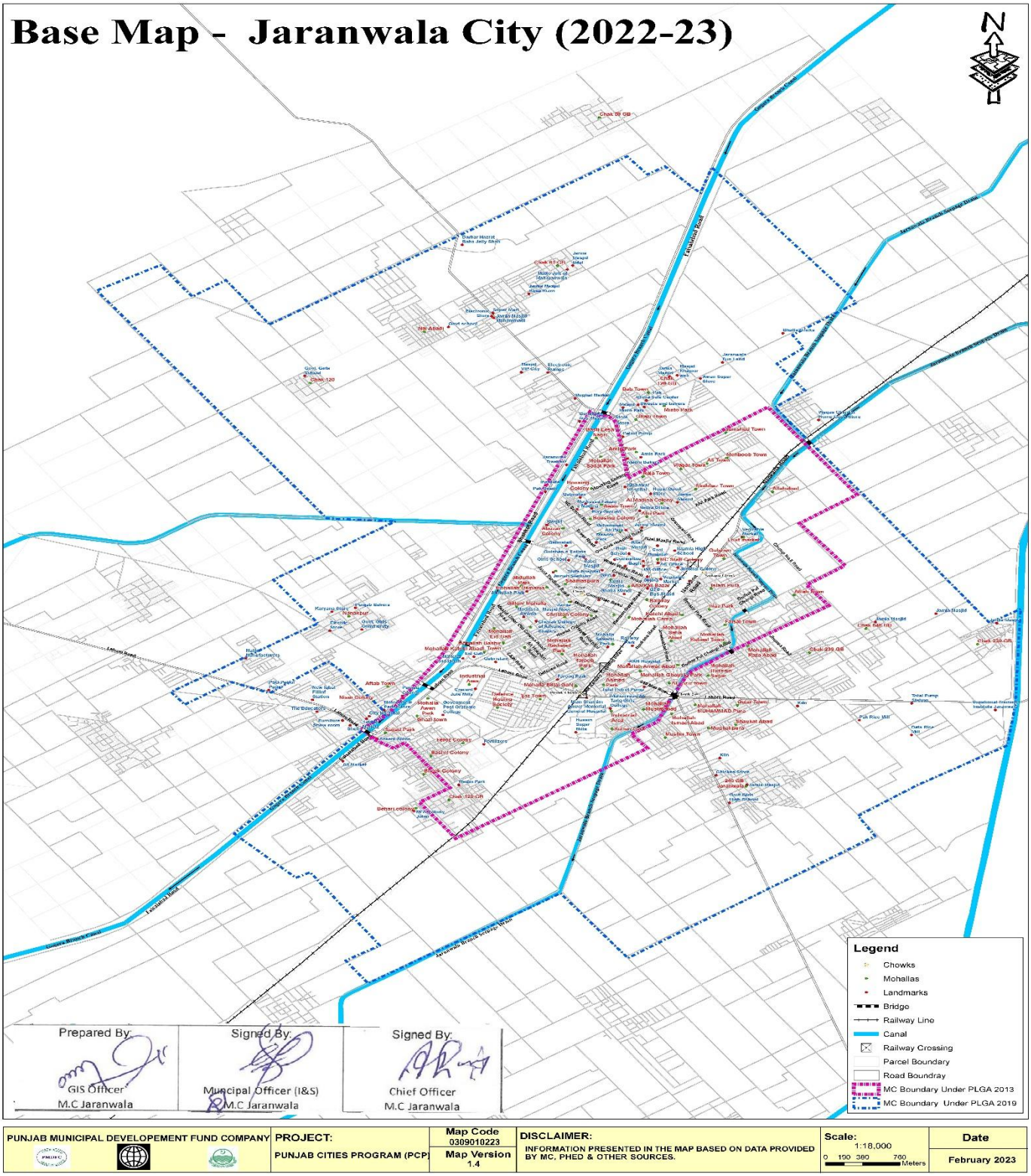


Figure 2:Basemap of Jaranwala

3.6Objectives Of EIA/ESIA Report

The predominant objectives of this EIA/ESIA report are:

- To assess and report the prevailing environmental conditions of the project area.
- To develop a baseline in order to evaluate the suitability of the project in particular area.
- To recognize activities during pre-construction, construction and operational phases and associated impacts.
- To assist the proponent for planning, designing and implementation of the project, keeping in view the elimination or minimization of negative impacts.
- To develop proper mitigation as well as monitoring plans for the uniform implementation.
- To provide opportunity for the public for a better understanding of the project as well as its impacts on community and environment in context of sustainable development.

To prepare an EIA/ESIA report for the submission to Environmental Protection Agency, Punjab for Environmental Approval.

3.7 Project Alternatives

Alternatives can be defined as different means of meeting the general requirements of the activity, which may include:

- ✓The property on which or location where it is proposed to undertake the activity.
- ✓The type of activity to be undertaken.
- ✓The design or layout of the activity.
- ✓The technology to be used in the activity.
- ✓The operational aspects of the activity

The purpose of alternatives is to select the best option amongst all available options for sustainability of the project. It is mandatory to suggest alternatives that are most suitable through site visits, analysis, road access, basic infrastructure or by considering public interest during formulation of EIA/ESIA report. Hence, during Project preparation, various alternatives were proposed, screened, and studied against technical, economic, social, and environmental criteria. The primary objective is to identify and adopt options with the least adverse environmental and social impacts followed by maximum environmental benefits.

The improvement of sewerage network and construction of disposal station and WWTP project is proposed on an open straight land. The main consideration for the selection of site for the development of a project was availability of suitable land with minor environmental and social ramifications. The present site belongs to Government, based on this environmental and social assessment, it is established that the project will cause minor to moderate environmental and low social manageable impacts during construction phase. Consequent to this assessment alternatives

for the projects were not practical and the present site is best suited for the construction of the project. Therefore, the selected site is ideally suited for construction of the project and no other site was considered. Similarly, the project will benefit the local community creating job opportunities as well as it will solve long-standing issues of availability of public transport for nearby cities.

Eligibility criteria for the implementation of wastewater treatment plants is as under:

(a) Conflict-free land and should be owned by MCs or the provincial government and should be available at technically feasible location preferably near the discharge point/pumping stations of the drain.

(b) Simplest wastewater treatment technology with least operational cost should be selected after alternative analyses, for example, OPs or WSPs.

(c) EIA should be done as per the requirements of PEPA 2012, and accordingly, NOC should be obtained from PEPA before execution of project.

(d) Capacity of wastewater treatment of 50,000 m3/day has been established based on present and projected population of cities for the next 20 years, average water consumption per person per day, wastewater discharges per day, and pollution load of wastewater

(e) Effluent from wastewater treatment should comply with the PEQS established under PEPA 2012 and WHO guidelines for reuse.

This design criteria are established by WB in ESSA and technology selected for wastewater treatment plant in Jaranwala is most suitable for meeting these requirements.

3.7.1No-Project Option

If no project option is triggered, then we will lose all benefits, opportunities and positive impacts originate due to the project such as:

- The project comprises of replacements of components of the existing municipal infrastructure to improve the service delivery of MC. Presently, the recovery from user charges is very low because of unsatisfactory service delivery but with improvement of service delivery, it is expected that the revenue recovery will also improve.
- MC is proposed to levy user charges on the services provided by MC which will increase the revenue from the Project.
- Increase in efficiency of all infrastructure components
- Improved service delivery level
- Improved hygienic conditions in the city
- Reduction in vector breeding and generated diseases
- Elimination of obnoxious smell
- Reduction in medical expenditures by Public on healt

3.7.2 Site Alternatives

The purpose of alternatives is to select the best option amongst all available options for sustainability of the project. It is mandatory to suggest alternatives that are most suitable through site visits, analysis, road access, basic infrastructure or by considering public interest during formulation of EIA/ESIA report. Hence, during Project preparation, various alternatives were proposed, screened, and studied against technical, economic, social, and environmental criteria. The primary objective is to identify and adopt options with the least adverse environmental and social impacts followed by maximum environmental benefits

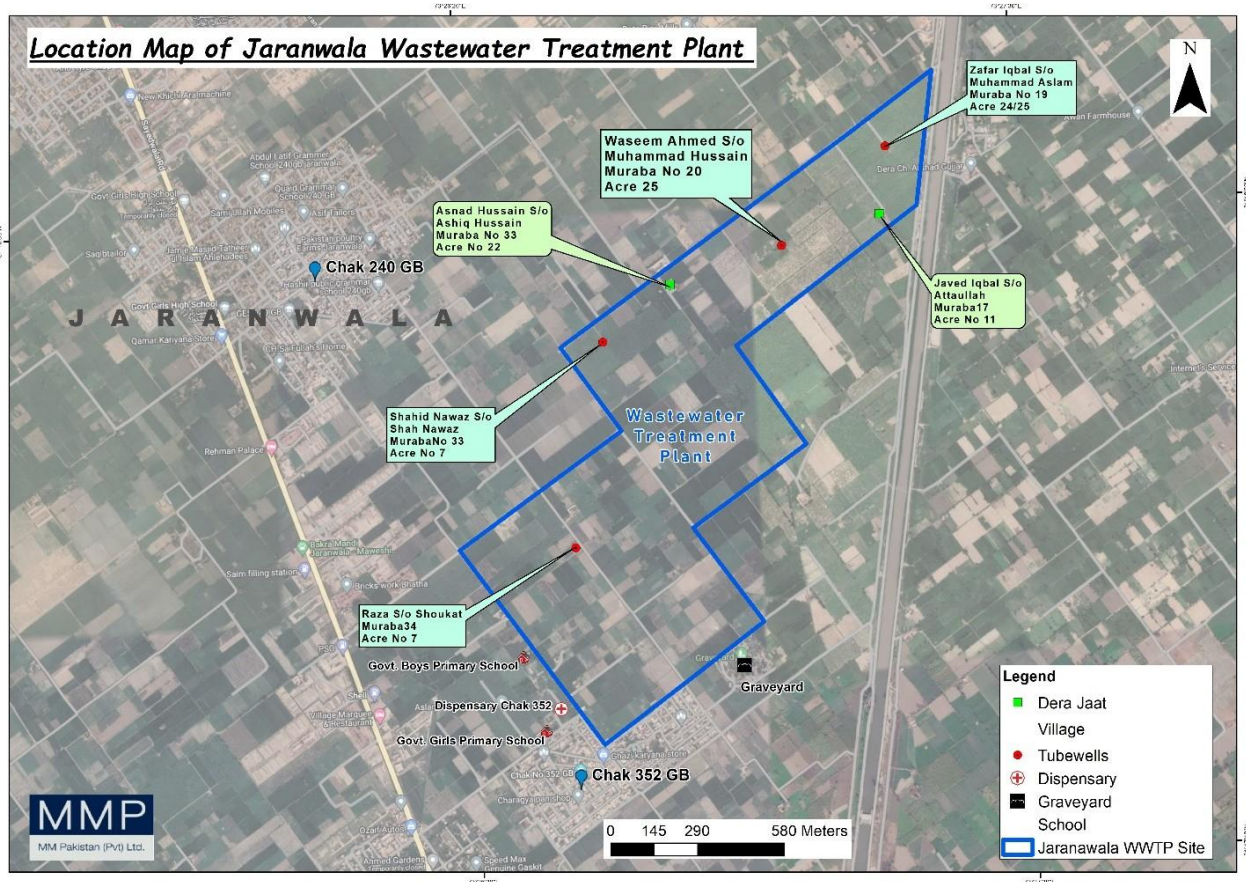
The basic purpose of "Analysis of Site Alternatives" is selecting the best possible site in terms of less environmental degradation while minimizing the environmental, social and monetary cost. The improvement of sewerage network and construction of disposal station and WWTP project is proposed on an open straight land. The main consideration for the selection of site for the development of a project was availability of suitable land with minor environmental and social ramifications.

Site #1: The proposed land for WWTP is near chack no 352/G-B, Jaranwala city.

- The present site of 55 acres land belongs to Government; However, land is hence, no land acquisition is required.
- sewerage water from disposal station toward waste water treatment plant through gradient and no pumping required for this and operational cost is minimum.
- The Land available at technically feasible location preferably near the discharge point/pumping stations of the 240 Morr disposal station.
- Simplest wastewater treatment technology with least operational cost should be selected after alternative analyses, for example, OPs or WSPs
- Project site away from populated area
- No Public infrastructure demolished due to this project.
- Treated water exit in Burala Canal as per the PEQS established under PEPA 2012 and WHO guidelines for reuse.
- Project Land is Dense Cropping area so a Compensation Plan prepared for previous lease holder
- No direct impact to any socially or environmentally sensitive receptors.

Based on this environmental and social assessment, it is established that the project will cause minor to moderate environmental and low social manageable impacts during construction phase. Consequent to this assessment alternatives for the projects were not practical and the present site is best suited for the construction of the project. Therefore, the selected site is ideally suited

for construction of the project and no other site was considered. Similarly, the project will benefit the local community creating job opportunities as well as it will solve long-standing issues of availability of public transport for nearby cities.



SITE ALTERNATIVES-2

2nd proposed land for WWTP is near chack no 238/G-B, Jaranwala city

- 35 acres Govt Land is available, no land acquisition required for this project.
- sewerage water from disposal station toward waste water treatment plant transfer against the gradient through force main and pumping required for this movement so its operational and maintenance cost is Higher.
- The Land available at that point is not technically feasible location preferably in respective of sewerage water collection of city areas.
- Graveyard present at this govt land.
- Treated water exit in Gogera Canal as per the PEQS established under PEPA 2012 and WHO Guidelines for use.

SITE ALTERNATIVES-2

3rd proposed land for WWTP is near chack no 128/G-B, Jaranwala city

- 40 acres Govt Land is available but it is far away as compared to other options, no land acquisition required for this project.
- sewerage water from whole city area collected in an irrigation Drain at different point and transfer toward waste water treatment plant that was rejected by WB Team during site visit.
- The Land available at that point is technically not feasible location preferably in respective of sewerage water collection of all city areas. They served on 30 % sewerage water of whole city if the irrigation drain is not used as collecting Conveyance System
- Treated water exit in irrigation drain as per the PEQS established under PEPA 2012 and WHO guidelines for reuse

3.7.3No Project Alternatives

In the first instance “without the project” health issues will continue to increase, whether they are by:

- Using the untreated water as per current practice and as vegetables are grown from untreated water within the peripheral areas of Jaranwala city. This has a direct relation to the large number of cases of Cancer, Hepatitis, Liver and Kidney related diseases and many other ailments.
- By living close to open sewerage systems and use of unclean water and this is the main cause for spreading vector species, such as Anopheles m o s q u i t o e s which is associated with the spread of malarial disease. Furthermore, these give rise to outbreak of multiple arbovirus infections, such as dengue virus, chikungunya, virus Zika. According to the various studies, Malaria was the most common health problem afflicting up mostly

population while gastrointestinal issue also arises. Unclean drinking water and uncollected hazardous solid waste affected the transmission of these infectious diseases. In addition, fever and diarrhea, the typical symptoms of gastroenteritis, also observed.

- Without institutional arrangements to ensure the area becomes free from being used for garbage disposal dump, solid waste dumping would remain the cause for unpleasant odors and choaked of sewerage system of all urban areas. The solid waste dumping would remain a hazard to the health for the people living nearby and encourage the breeding of mosquitoes.
-
- With so many issues related to the city that exist without proper drainage network and with the rate the city is growing the issues are going to worsen with time and have an ancillary effect on health as such the "without project option" is a non- starter and it should be struck off and project should go ahead.
- If the things are left unabated and the population of the city continues to grow then a number of illegal residences will also continue to grow and some of them are found directly on top of the sewage systems. This would result in many diseases including cancer the cost of hospitalization part of which is borne by the governments and the resultant loss of income of daily wage worker whilst in hospital and property damage costs may be greater than the cost required to improving the system

3.8 Area of Influence

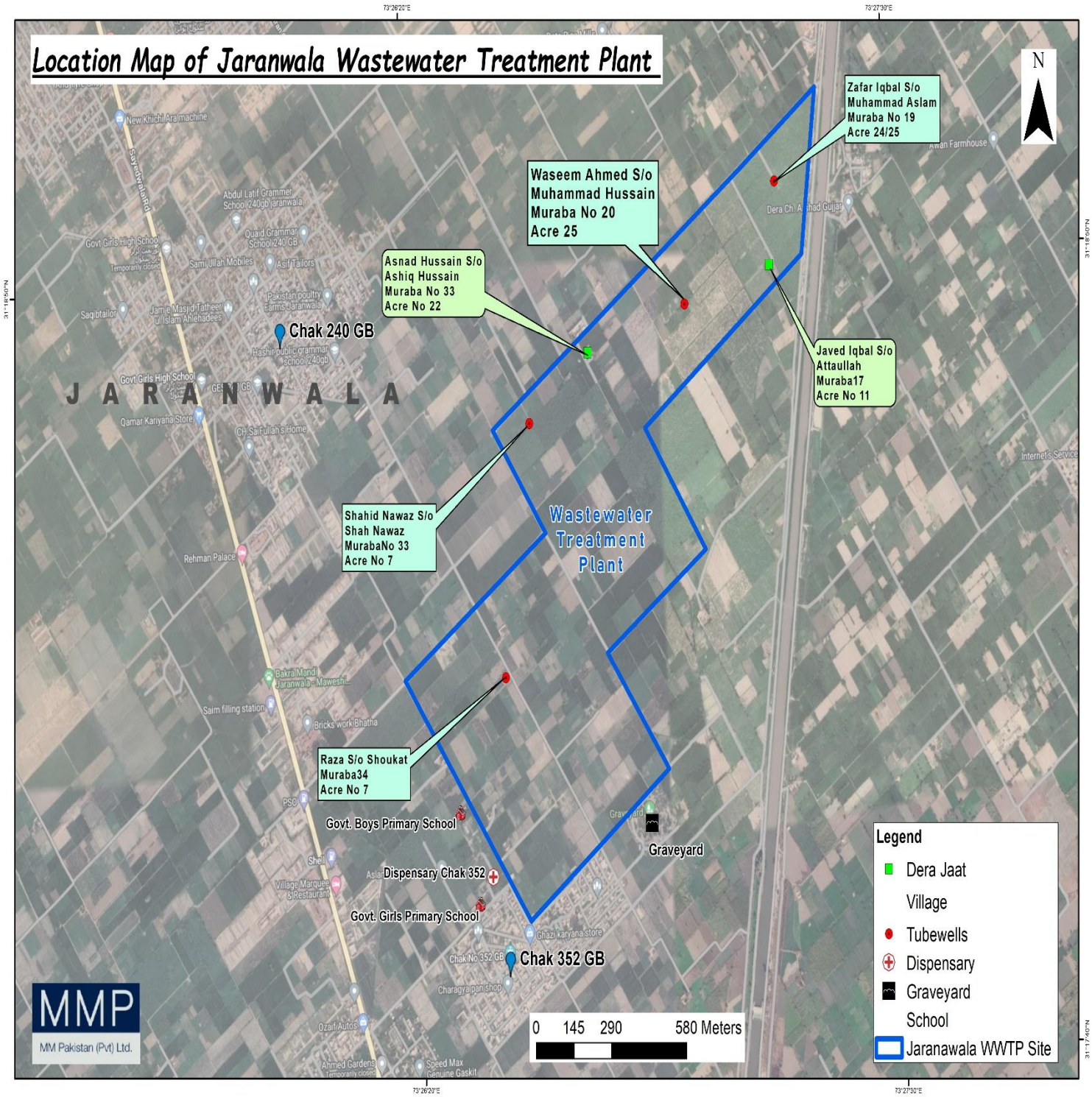


Figure 3 Location Map of Jaranwala Waste Water Treatment Plant

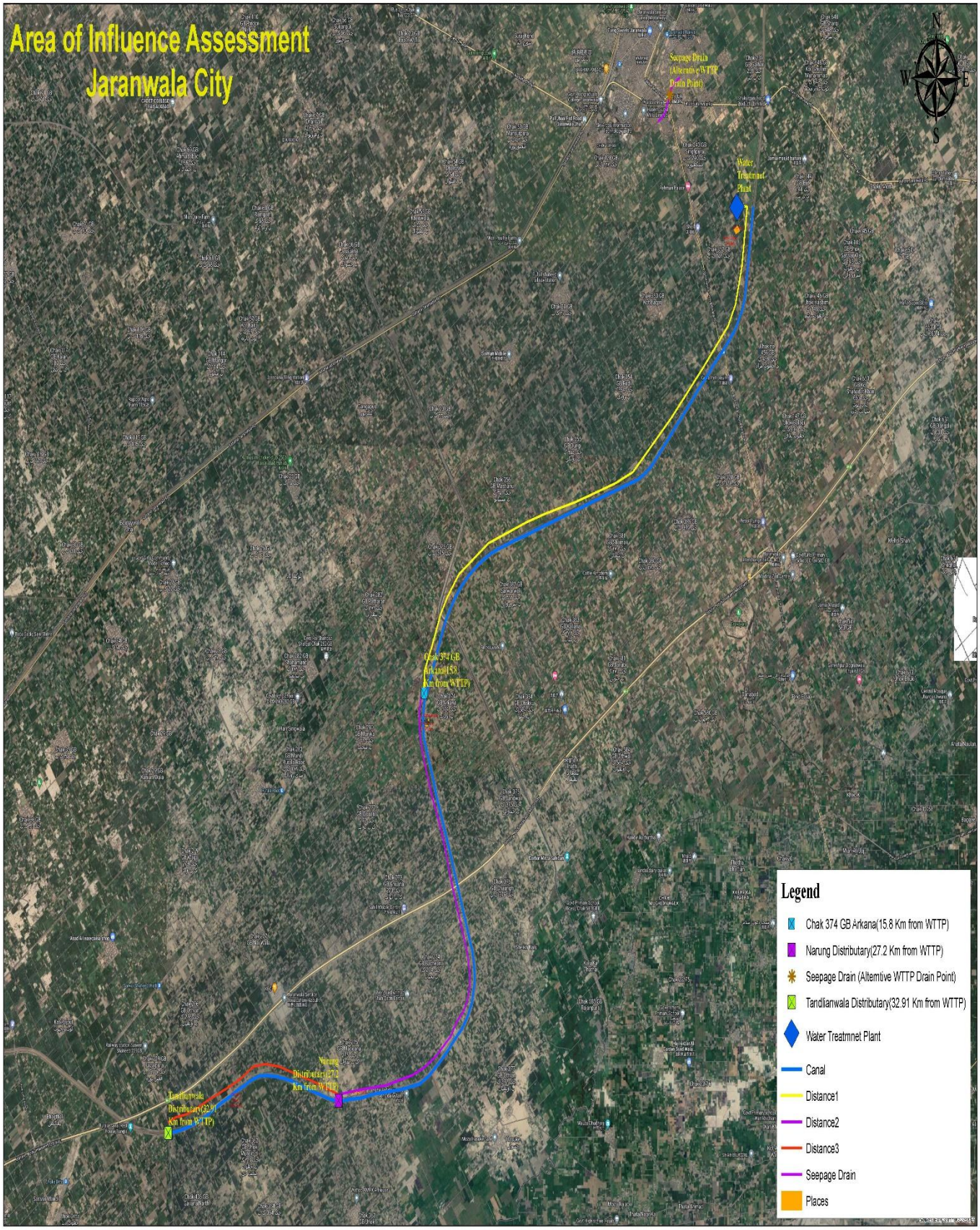


Figure 4 Area of Influence Assessment

3.9 Why Treatment of Wastewater is Important?

Treatment of wastewater is important for several reasons:

- **Environmental Protection:** Wastewater contains pollutants such as nutrients, organic matter, and pathogens that can have a detrimental hazardous effect on the environment if discharged untreated into water bodies. Treatment of wastewater removes pollutants from it, reduces the risk to ecological life, aquatic life and other living organisms that rely on water.
- **Public Health:** Wastewater may contain harmful bacteria, viruses, and other pathogens that can cause disease in humans. Proper treatment of wastewater before it is discharged into water bodies can reduce the risk of these pathogens entering the human food chain, and prevent the spread of waterborne diseases.
- **Water Conservation:** Wastewater can be treated and reused for non-potable purposes such as irrigation, industrial processes, urban gardening, landscaping and even toilet flushing. By treating wastewater, we can reduce the amount of freshwater required for these purposes, which helps to conserve our precious water resources.
- **Regulatory Compliance:** Pakistan has regulations in place that require the treatment of wastewater before it is discharged into water bodies. Compliance with these regulations is essential to avoid penalties, legal action, and damage to a company's reputation.

Technology Options for various methods of wastewater treatment were searched for feasibility, however, wastewater stabilization ponds were selected as the most suitable option for Jaranwala

3.10 What are Waste Stabilization Ponds?

Waste stabilization ponds, also known as oxidation ponds, are large shallow ponds used for the treatment of wastewater. They are designed to use natural processes, such as biological and physical interactions, to treat the wastewater and reduce its pollutants.

Waste stabilization ponds can be classified into three types based on their function and operation: anaerobic ponds, facultative ponds, and maturation ponds. Anaerobic ponds are designed to break down organic matter in the absence of oxygen, while facultative ponds use both aerobic and anaerobic processes to treat wastewater. Maturation ponds are the final step in the treatment process, designed to provide further treatment and disinfection of the wastewater before it is discharged.

Waste stabilization ponds have been used in many parts of the world as a low-cost and effective method of treating wastewater. They require less energy and maintenance than other treatment methods, such as activated sludge systems, and can be used in areas where there is limited access to electricity or other resources. However, they do require a large land area and are sensitive to climate conditions, such as temperature and rainfall.

[8]Floating wetlands with wastewater stabilization ponds:

Floating wetlands combined with wastewater stabilization ponds (WSPs) are an innovative approach to wastewater treatment. The concept involves adding a layer of floating plants on top of a wastewater stabilization pond to enhance the removal of nutrients and other pollutants from the wastewater.

The floating wetlands act as a natural filter, removing pollutants through a combination of physical, chemical, and biological processes. The plants absorb nutrients such as nitrogen and phosphorus, which are commonly found in wastewater, and use them for growth. The roots of the plants also provide a habitat for beneficial microorganisms, which further break down pollutants.

Studies have shown that the addition of floating wetlands to wastewater stabilization ponds can significantly improve the treatment efficiency and reduce the number of pollutants discharged into the environment. Additionally, the use of floating wetlands can enhance the aesthetic value of wastewater treatment facilities and provide habitat for wildlife.

However, the effectiveness of floating wetlands is influenced by several factors, such as plant species, climate conditions, and the design of the system. Therefore, careful planning and monitoring are essential to ensure that the system is operating effectively and efficiently. Figure 05 and 6 depicts Systematic view of Floating Wetland and Pictorial view of floating wetlands with WSP respectively.

[8] Chen, Y., Chen, L., Zhang, Y., & Yang, Y. (2016). Floating treatment wetlands for wastewater treatment: A review. International Journal of Phytoremediation, 18(11), 1153-1166.
Vymazal, J., & Březinová, T. (2015). The use of Floating wetlands with floating macrophytes for wastewater treatment. Ecological Engineering, 81, 111-122.
USEPA. (2010). Floating Treatment Wetlands: A Technology Information Sheet. Retrieved from https://www.epa.gov/sites/production/files/2015-06/documents/floating-treatment-wetlands.pdf

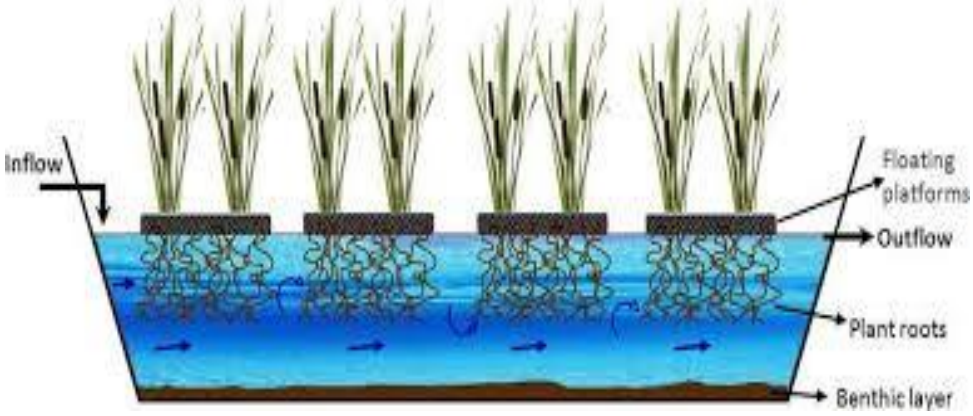


Figure 5:Systematic view of Floating Wetland

Figure 6: Pictorial view of floating wetlands with WSP

Important factors that can influence floating wetlands in WSP:

Several factors can influence the performance of floating wetlands in wastewater stabilization ponds (WSPs). These include:

- Plant species: The selection of plant species is crucial for the successful performance of floating wetlands in WSPs. Different plant species have different capacities for nutrient uptake and pollutant removal, and their growth and survival can be affected by the water quality parameters and climatic conditions of the WSP.
- Hydraulic loading rate (HLR): The HLR is the volume of wastewater that is applied to the WSP per unit area per day. The HLR can affect the growth and survival of the plants in the floating wetlands and the treatment efficiency of the system. A high HLR can lead to hydraulic overload and cause plant stress, while a low HLR may reduce the contact time between the wastewater and the plants.

- Water quality parameters: The water quality parameters of the WSP, such as pH, temperature, dissolved oxygen, and nutrient concentrations, can affect the growth and survival of the plants in the floating wetlands. For example, a low dissolved oxygen concentration can limit plant growth, while high nutrient concentrations can lead to excessive plant growth and biomass accumulation.
- Climate conditions: The climatic conditions of the WSP, such as temperature, rainfall, and wind, can affect the growth and survival of the plants in the floating wetlands. Extreme weather events, such as droughts or floods, can also affect the performance of the system.
- Design and operation: The design and operation of the floating wetlands in the WSP can affect their performance. The size, shape, and placement of the floating wetlands can affect the contact time between the wastewater and the plants, while the frequency and timing of maintenance activities can affect the growth and survival of the plants.

Proper consideration and management of these factors are essential to ensure the effective and efficient performance of floating wetlands in WSPs.

[9]Best plant species for floating wetland in WSP:

The selection of plant species for floating wetlands in WSPs depends on several factors, such as the local climate, the water quality parameters of the WSP, and the treatment goals. Some plant species that have been commonly used in floating wetlands in WSPs include:

Cattails (Typha spp.): Cattails are commonly used in floating wetlands due to their high capacity for nutrient uptake and their ability to tolerate fluctuating water levels.

Bulrushes (Scirpus spp.): Bulrushes are tolerant of varying water depths and can remove nutrients and metals from wastewater.

Water hyacinth (Eichhornia crassipes): Water hyacinth has a high growth rate and can remove nutrients such as nitrogen and phosphorus from wastewater. However, it is considered an invasive species in some regions as showed in Figure 9.

Duckweed (Lemna spp.): Duckweed is a fast-growing floating plant that can remove nutrients and organic matter from wastewater.

[9] Souza, T. F., Gonçalves, J. R., & Duarte, E. M. (2017). Evaluation of floating macrophytes as an alternative to the wastewater treatment process. Journal of Environmental Science and Health, Part A, 52(2), 177-184.

Zhang, Y., Chen, Y., & Chen, L. (2019). Nitrogen and phosphorus removal from simulated wastewater by floating treatment wetlands with water hyacinth and duckweed. Ecological Engineering, 134, 113-121.

Water lettuce (Pistia stratiotes): Water lettuce has a high capacity for nutrient uptake and can tolerate a wide range of water quality conditions. Water lettuce showed in figure 6.

Several studies have evaluated the performance of different plant species in floating wetlands in WSPs. For example, a study conducted in Brazil found that the combination of cattails and bulrushes was effective in removing nutrients and improving the water quality of the WSP (Souza et al., 2017). Another study conducted in China found that the combination of water hyacinth and duckweed was effective in removing nutrients and organic matter from wastewater (Zhang et al., 2019).

Figure 8: Water lettuce (Pistia stratiotes)

Figure 7:Duckweed (Lemna spp.):

Figure 9: Water hyacinth (Eichhornia crassipes)

Is Jaranwala (Pakistan) climate supporting for floating wetlands in WSP?

Jaranwala is located in the Punjab province of Pakistan and has a semi-arid climate with hot summers and relatively cool winters. Climatic conditions of Jaranwala are presented in figure 10. The climatic condition climatic conditions of Jaranwala can affect the performance of floating wetlands in (WSPs).

While there are no specific studies on the performance of floating wetlands in WSPs in Jaranwala, several studies have evaluated the use of floating wetlands in other regions of Pakistan with similar climatic conditions. For example, a study conducted in Lahore, which is located in the same province as Jaranwala, found that the use of floating wetlands in WSPs

was effective in improving the water quality of wastewater (Tariq et al., 2017). Another study conducted in Karachi, which has a similar climate to Jaranwala, found that floating wetlands were effective in removing nutrients and organic matter from wastewater (Murtaza et al., 2019).

Overall, the semi-arid climate of Jaranwala is suitable for the use of floating wetlands in WSPs.

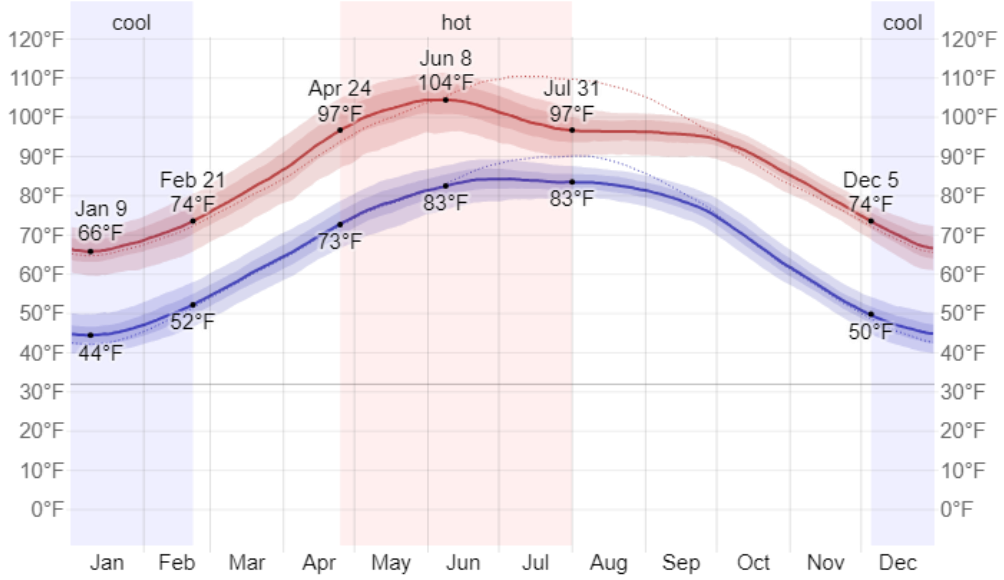


Figure 10: Climatic Conditions in Jaranwala[10]

Successful story of WSP with floating wetlands in Pakistan[11]:

The Floating Wetlands of Chokera:

Faisalabad, an industrial city in Pakistan, faces severe environmental problems due to rapid industrialization, including untreated industrial effluent discharge polluting water sources and soil. To address this crisis, floating treatment wetlands have been implemented in Chokera, replicating successful global examples.

WWF-Pakistan, in collaboration with National Institute for Biotechnology and Genetic Engineering (NIBGE) and Water and Sewerage Authority (WASA), has replicated the concept of floating wetlands in Chokera. There are stabilization ponds, covering an area of approximately 400 acres, with the capacity of 20 million gallons per day, to manage the city's wastewater and the floating wetlands have been built in these ponds. The mats or floats are made from thermopol sheets and the common reed plant species, locally known as naro, are used.

The system aims to reduce pressure on depleting groundwater by reusing treated wastewater. Similar systems have been successful in Canada and India, showing positive results in water treatment and habitat restoration. The implementation in Chokera is leading to positive

[10] https://weatherspark.com/y/107732/Average-Weather-in-Jar%C4%81nw%C4%81la-Pakistan-Year-Round

[11] https://medium.com/panda-musings/the-floating-wetlands-of-chokera-5524aa17f63f

changes, with a return of birds to the area previously affected by unpleasant odors from the ponds.

[12]Measures to Make WSPs with Floating Wetlands more Aesthetical

WSPs with floating wetlands can be designed to be aesthetically pleasing, while still providing effective treatment of wastewater. Here are some measures that can be taken to make WSPs with floating wetlands more aesthetically appealing:

Select attractive plant species: Choosing plant species that are visually appealing can enhance the aesthetic value of the floating wetland. Some plant species, such as lotus (Nelumbo nucifera) and water lilies (Nymphaea spp.), have attractive flowers and can provide shade and habitat for wildlife (EPA, 2002).

Add landscaping elements: Incorporating landscaping elements, such as rocks, boulders, and driftwood, can enhance the natural aesthetic of the floating wetland. These elements can also provide additional habitat for wildlife (Miklasz, 2014).

Use natural materials: Using natural materials, such as stones and wood, can help blend the floating wetland into the surrounding landscape. These materials can also provide a natural, rustic look that is visually appealing (EPA, 2002).

Incorporate lighting: Adding lighting can enhance the nighttime aesthetic value of the floating wetland. Lighting can also provide safety for visitors and wildlife (Miklasz, 2014).

Provide public access: Providing public access to the floating wetland can increase its aesthetic value by allowing visitors to experience its natural beauty. This can be achieved through the construction of boardwalks or viewing platforms (EPA, 2002).

3.11 [13]Other Technologies Options to Treat Wastewater:

[12] Environmental Protection Agency (EPA). (2002). Floating wetlands manual: floating wetlands for wastewater treatment. Retrieved from https://nepis.epa.gov/Exe/ZyPDF.cgi/2000LYOD.pdf?Dockey=2000LYOD.pdf
Miklasz, K. (2014). The importance of aesthetics in floating wetland design. World Environmental and Water Resources Congress, 109-115.

[13] United States Environmental Protection Agency. (2019). Wastewater treatment technologies. Retrieved from https://www.epa.gov/water-research/wastewater-treatment-technologies

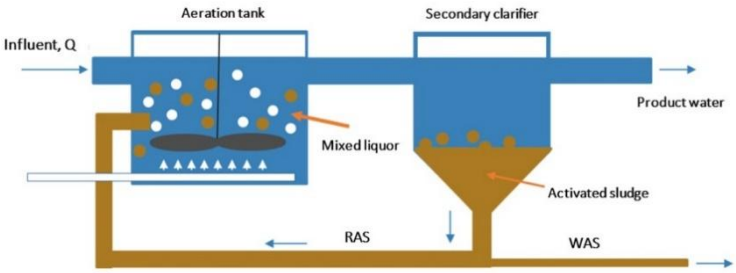
Verlicchi, P., Al Aukidy, M., & Zambello, E. (2015). Wastewater treatment and energy efficiency: a review on sustainability challenges and opportunities. Resources, Conservation and Recycling, 105, 163-173.

In addition to wastewater stabilization ponds (WSPs) and floating wetlands, there are several other conventional technologies that can be used to treat wastewater, including:

Activated Sludge: Activated sludge is a biological treatment process in which microorganisms are used to break down organic matter in wastewater. It is commonly used in municipal wastewater treatment plants.

Advantages: High removal efficiency of organic matter, nutrients and pathogens; compact and efficient process; widely used and well understood technology.

Disadvantages: Sensitive to variations in flow and composition of wastewater; requires significant energy and infrastructure; generation of large quantities of sludge.



Trickling Filters: Trickling filters are a biological treatment process that use microorganisms attached to a medium to treat wastewater. Wastewater is distributed over a bed of rocks or other media and microorganisms in the media break down organic matter.

Advantages: Simple and robust technology; low energy consumption and infrastructure requirements; can be easily retrofitted into existing treatment systems.

Disadvantages: Limited removal efficiency of nutrients and pathogens; high maintenance requirements; limited ability to handle high peak flows.

Rotating Biological Contactors: Rotating biological contactors are a type of trickling filter in which a series of rotating disks are used to provide a surface for microorganisms to grow on. Wastewater is sprayed onto the disks and the microorganisms break down organic matter.

Advantages: Efficient removal of organic matter and nutrients; low energy consumption and infrastructure requirements; compact and modular design.

Disadvantages: Sensitive to variations in flow and composition of wastewater; limited ability to handle high peak flows; limited removal efficiency of pathogens.

Membrane Bioreactors: Membrane bioreactors use a combination of biological treatment and membrane filtration to treat wastewater. Microorganisms in the wastewater break down organic matter, and a membrane is used to filter out solids and bacteria.

Advantages: High removal efficiency of organic matter, nutrients, and pathogens; small footprint and high flexibility; high-quality effluent suitable for reuse.

Disadvantages: High energy consumption and operating costs; prone to fouling and membrane damage; expensive initial capital costs.

Disinfection: Disinfection is a process that uses chemicals, such as chlorine or ultraviolet light, to kill pathogens in wastewater. Disinfection is often used as a final step in the treatment process to ensure that the wastewater is safe for discharge into the environment.

Advantages: Efficient removal of pathogens; widely used and well understood technology; simple and easy to operate.

Disadvantages: Limited removal efficiency of organic matter and nutrients; potential for formation of disinfection byproducts; requires careful handling and safety precautions.

Each of these conventional technologies has its own advantages and disadvantages depending on the specific situation. The choice of technology will depend on factors such as the quality and quantity of the wastewater, the available land and resources, and the regulatory requirements for wastewater treatment in the area.

3.12 Description of Project

Package-1 Sewerage system

Package-2 Disposal station & Forcemain

Package-3 Rehabilitation / Desilting of Drains, sewer line and P/F RPC manhole Cover

Package-4 Construction of Wastewater Treatment Plant (WWTP

Package-5 Supply of Liquid Waste Machinery

Package-6 Desilting of Sewers

Table 4: Technical Detail of the Interventions

A. Flow	
Total population	171238 Persons
Av: dry weather Flow @40 GPCD	10.80 Cusec
Peak Factor	2.55
Peak	27.59 Cusec
Storm Water Allowance 50% of Peak flow	13.80. Cusec
Total	41.93 Cusec
Say	42 Cusec
B. Screening Chamber	
Area of Screen	2 time of the Flow Area 2 x X- sectional area 2 x3.142 *4.5*4.5*0.25 31.79 Sft.
Height of water to conduct screen	4.5 Ft.
Clear Width of Screen	31.79/4.5= 7.07
Proposed Clear opening of Screen	2 inches
No. of opening required	7.07x12/2 = 43
Say	43 +1 = 44
Total Area of Screen	43x 2 + 44* x 0.375 102.50 inches 8.54 ft
Say	9 ft
C. Wet Well	
Designed Peak flow	42 Cusec
Proposed retention period	05 Minutes
Maximum flow per minute	42 x 60 = 2520
Capacity of proposed Tank	2520 x 5= 12600Cft.
Working depth	6.5Ft.
Surface area required	12600/65 = 1938.46ft.
Proposed No. of Tank	02 No.
Surface area of Tank	969.23/2 = 1050 Sft.
Dia of Tank	969.23 = 3.14 x d2 /4

	d2= 969.23 x 4 /3.14 d ½ = 1264.681/2 d= 35.13 ft
Say	35 ft.
Total depth of Tank	Road Level+2- invert level +6.5 =(625.59+1)-599.87+ 6.5 = 33.22
Tanking 1.5ft suction allowance	1.50 ft
Total	33.72
Say	35.00 ft
D. Forcemain	
Proposed dia of forcemain	750mm
Type of material	HDPE PN-10
Proposed velocity (ft / Sec) Gradient Head Losses (Per ft. run) V= 1.318* n* r0.63. n0.54 = 1.318*140* 0.775* n0.54 n0.54 = 5.61 / 143.04 n= 0.0025	5.61
Length of Forcemain	12140ft
Head Losses of line	12140 x 0.0025 30.35
Head Losses of specials & other pump house installations	2.65.00 ft
Level difference	7.00 ft
Total Losses	40.0 ft.
Capacity of proposed dia of pipe	27.56Cusec
Design discharge	27.56 Cusec
E. Design of Pumping Machinery	
Proposed size of pump	12 & 6 Cusec
Ultimate Discharge	42.00 Cusec
No of pump required	05 Nos.
Size of pump 12 cusec	02 Nos.
Size of pump 6 cusec	03 Nos.
F. Design of Head of Pumping Machinery	
Depth of Tank	35 ft
Clearance between suction pipe and bed	1.50 ft
Suction lift + other depth inside tank	33.5 ft
Losses inside pumping chamber	2.00 ft
Total	(33.5+2+40) =73.50 ft
Head	75ft
G Disposal Station	
240 More Lahore Road	42.0 Cusecs Mx. Lifting Capacity

3.12.1.1 Site Selection for WWTP

Criteria

The selection of a suitable site is a critical step in the design and implementation of a wastewater treatment plant. The following are the criteria for site selection:

- **Proximity to the source of wastewater -** The site should be located as close as possible to the source of wastewater to reduce the cost and energy required to transport the wastewater to the treatment plant.
- **Topography -** The site should have a level or gently sloping topography to minimize the cost of earthworks, excavation, and construction. A flat site also allows for easy access and operation of the treatment plant.
- **Geology -** The site should be located on stable geology with minimal risk of soil subsidence, landslides, or other geological hazards. The soil should also have good permeability to allow for efficient percolation of treated effluent.
- **Hydrogeology -** The site should be located in an area where groundwater is not easily contaminated by the treated effluent. The groundwater table should also be low enough to prevent flooding of the treatment plant and surrounding areas.
- **Access to utilities -** The site should be located near existing water, electricity, and gas utilities to minimize the cost of providing these services to the plant. The site should also be accessible by road or other means of transportation.
- **Environmental sensitivity -** The site should be located away from environmentally sensitive areas, such as wetlands, protected habitats, and areas prone to flooding or erosion. The site should also have adequate buffer zones to minimize the impact of odors and noise on neighboring communities.
- **Land availability -** The site should be large enough to accommodate the required infrastructure and allow for future expansion. The land should also be available for purchase or lease at a reasonable cost.

By considering these criteria for site selection, the project team has identified and selected a suitable site that meets the project's technical, economic, and environmental requirements.

Factors to Consider when Selecting a Site

When selecting a site for a wastewater treatment plant, several factors must be considered to ensure that the site is suitable for the project's needs. The following are some factors that should be considered:

- **Environmental regulations -** It is important to consider local, state, and federal environmental regulations and restrictions when selecting a site. The site should comply with regulations and permit requirements related to water quality, air quality, waste management, and other environmental concerns.

- **Population density -** The population density in the surrounding area should be considered to minimize the impact of odors and noise from the treatment plant on nearby residents.
- **Land use -** The land use in the surrounding area should be evaluated to avoid conflicts with other land uses, such as residential, commercial, or industrial activities.
- **Accessibility -** The site should be accessible by road or other means of transportation to facilitate the transport of raw wastewater and treated effluent.
- **Topography -** The site's topography should be evaluated to ensure that the land is suitable for the construction of a treatment plant, including the excavation of ponds and basins.
- **Soil and geology -** The soil and geology of the site should be evaluated to ensure that the soil can support the construction of the treatment plant's infrastructure, and that the site is not susceptible to subsidence or other geological hazards.
- **Hydrogeology -** The site's hydrogeology should be evaluated to ensure that the groundwater is not easily contaminated by the treated effluent, and that the groundwater table is low enough to prevent flooding of the plant and surrounding areas.
- **Cost -** The cost of purchasing or leasing the land, constructing the treatment plant, and providing utilities and other infrastructure should be evaluated to ensure that the project is economically viable.
- By considering these factors when selecting a site, the project team has identified a suitable location that meets the project's technical, economic, and environmental requirements.

Site visit for the Wastewater Treatment Plant

A site visit for a wastewater treatment plant is an essential step in the project planning process. The purpose of the site visit is to assess the suitability of the proposed site and identify any potential challenges or issues that may need to be addressed during the project design and implementation phases. During the site visit, the project team has conducted a detailed assessment of the site, including the following:

- The site for the treatment plant was evaluated based on various factors, including the topography, soil and geology, hydrogeology, accessibility, proximity to residential areas, availability of utilities, land use of the surrounding area, and environmental regulations.
- The topography of the site was assessed to determine its suitability for the construction of the treatment plant and excavation of ponds and basins. The soil and geology of the site were also evaluated to ensure that the soil could support the infrastructure and that the site was not susceptible to subsidence or other geological hazards.
- The hydrogeology of the site was assessed to ensure that the groundwater was not easily contaminated by the treated effluent and that the groundwater table was low enough to prevent flooding of the plant and surrounding areas.
- The accessibility of the site was evaluated to ensure that it was easily accessible by road or other means of transportation to facilitate the transport of raw wastewater and

treated effluent. The proximity of the site to residential areas was also assessed to determine the impact of odors and noise from the treatment plant on nearby residents.

- The availability of utilities such as water, electricity, and gas were assessed to ensure that these services were easily accessible and could be provided to the treatment plant. The land use of the surrounding area was evaluated to ensure that there were no conflicts with other land uses, such as residential, commercial, or industrial activities.
- Finally, the environmental regulations and permit requirements for the site were assessed to ensure that the project complied with all applicable regulations related to water quality, air quality, waste management, and other environmental concerns.

By conducting a thorough site visit and assessment, the project team has identified potential challenges or issues that may need to be addressed during the project design and implementation phases. This information can then be used to make informed decisions about the suitability of the site and the design of the treatment plant.

On June 8th, 2022, a visit to Jaranwala was conducted to survey sites for the construction of Wastewater Treatment Plants (WWTP). During the visit, a detailed discussion was held with the Municipal Officer (Infrastructure Services) regarding sewage disposal and the availability of suitable land for the construction of WWTP in Jaranwala city. The team conducting the survey inspected one operational site and also visited two other potential sites for the construction of new WWTP in the area. Photographs of the sites were taken for further evaluation and consideration.

The purpose of the visit was to identify suitable locations for the construction of WWTP in Jaranwala city that will be effective and efficient in treating the sewage generated by the population. The visit and survey will provide valuable information to aid in the planning and design of the WWTP for the city, ensuring that they are constructed in appropriate locations and meet the needs of the community (Figure 9).

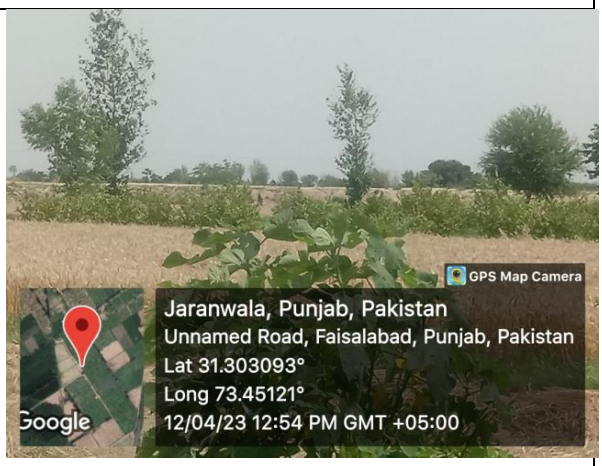

GPS Map Camera
Jaranwala, Punjab, Pakistan
Unnamed Road, Faisalabad, Punjab, Pakistan
Lat 31.303093°
Long 73.45121°
12/04/23 12:54 PM GMT +05:00
Google

Figure 11:Site Photographs

Design and Capacity of WWTP

The proposed wastewater system for Jaranwala city includes several key components to effectively manage and treat wastewater. At the core of the system is a network of main trunks and lateral sewers that will collect domestic sewage from residential and commercial areas. These sewers will transport the wastewater to a centrally located wastewater treatment plant (WWTP) near Chak No. 352-JB, with a capacity of 06 million gallons per day (MGD). The WWTP will employ various treatment processes to remove pollutants and pathogens from the wastewater. Additionally, a force main will be installed to transport wastewater from low-lying areas to the WWTP, overcoming gravity limitations. A disposal station at 240 Mor will be an integral part of the system, facilitating the proper disposal of wastewater. The schematic aims to ensure the safe and efficient management of wastewater, protecting public health, preserving the environment, and promoting sustainable water management practices in Jaranwala city.

1. It is a waste stabilization ponds technology merged with floating wetlands concept.
2. It required an area of 18.61 Acres approx. with design period till 2032.
3. The mean temperature consider for design is 20° C (justification is provided in the later section of this chapter).
4. The boundary will cover 100 ft plantation buffer zone all around the boundary.
5. Main components of Waste water treatment plant are as:

SR#	Components	Numbers
1.	Sewage Collecting pit / Chamber	1
2.	Course & fine Screening Chamber	1
3.	Grit Chamber	1
4.	Sullage Drains	
5.	Anaerobic ponds	4
6.	Facultative ponds	4
7.	Sludge drying beds	4

8.	Administration block	1
9.	Floating plants	10% of Facultative ponds area
10.	Effluent water course	1

6. Area utilized for different components is as

@ Temperature 20°C				**For 06 MGD /9.28 cusec**
	Area at top		**No. of ponds**	
	Top length (L) ft	**Top Width (W) ft**	**N**	**Area (Acres)**
Anaerobic Ponds (APs)	290	194	4	5
Facultative Ponds (FPs)	840	247	4	20
Area under road				25
Auxiliary Facilities including sludge treatment roads, composing, 100 feet plantation buffer along the boundary, grit chambers, fine screens, bar screens, lab facility, admin block etc.				15
Total Area				**40 acres**

- Removal efficiency in term of BOD will be as:

Ponds	**Detention Time**	**BOD**
BOD in[14]		128 mg/l
BOD after APs	2 Days	56.4 mg/l
BOD after FP	2 Days	11.7 mg/l
Effluent BOD after FP with floating plantation/wetlands	**4 days**	11.7 mg/l

The AP - FP + Floating wetland configuration has been selected based on the following rationale:

- APs work as primary treatment to remove settleable solids and associated BOD and COD. Domestic sewage usually has appreciable amount of settleable solid and associated BOD and COD. Same is the case for Jaranwala wastewater.
- FPs work as secondary ponds in order to remove colloidal and dissolved pollution loads.

Considering above aspects, the AP-FP+Flotaing Wetlands scheme has been selected.

Description of all components is given below.

Inlet Chamber

[14] BOD was determined after wastewater quality analysis at the time of design (reports are attached in the annexures)

One (01) inlet channel has been proposed which shall carry sewage/ wastewater from distribution chambers to series of anaerobic ponds. The inlet channel is designed as the water retaining/distribution structure on the basis of hydraulic retention time. The purpose of the inlet channel is to uniformly distribute influent wastewater into the WSP modules. A summary of the design specifications of the inlet channel is provided in Table below:

DESIGN OF WASTEWATER TREATMENT PLANT JARANWALA				
A	INLET CHAMBER			
i	Capacity / Av. Flow		6	MGD
ii	Peak Flow		27.59	Cusec
iii	Minimum Flow 50%		3	MGD
			13.80	Cusec
iv	Retention period		20	sec
v	Volume		551.80	ft^3
vi	Water depth taken		3.00	ft
vii	Area required (proposed circular)		183.93	ft^2
viii	Dia of tank		15.30	ft
	Say		15.50	ft
B	DRAIN			
	Peak Flow		27.59	Cusec
	Width of drain		4.00	ft
	Water depth taken		3.00	ft
	Velocity		2.30	ft/sec
B	COURSE SCREEN			
i	Capacity / Av. Flow		6	mgd
ii	Peak Foow		27.59	Cusec
iv	Width of Screen		4	ft
v	Depth of water		3	ft
vi	Velocity		2.3	ft/sec
vii	Area contact to screen		18	ft^2
viii	X-sectional		12	ft^2
ix	Clear width of screen		4	ft
x	Spacing of opening		48	inches
xi	Spacing of opening		2	inch c/c
xii	No. opening required		24	No.
xiii	Thickness of strip to be used		0.38	inch
xiv	Area required		9.00	inches
xv	Overall width		57.00	inches
			4.75	ft
	Say		5.00	ft
C	**FINE SCREEN**			
i	No. of battery		2	No.
ii	velocity through screen assumed		2.3	ft/sec
iii	Area		12.00	ft^2
iv	Depth of water		3	ft
v	Area of opening required		4.00	ft
			47.98	inches
vi	Spacing		0.58	inches
vii	No. of opening required		83	No.
viii	Strip thickness		0.375	inch
ix	Area cover by bar		31.02	inch

Anaerobic Ponds (APs)

Anaerobic ponds shall be provided for primary treatment. Total four (4) numbers of APs shall be provided for primary treatment of wastewater. Each AP shall receive equal sewage flow of 3 MGD from inlet channel. These ponds will receive high strength wastewater and will reduce BOD of the sewage/wastewater through anaerobic processes. A summary of the design specifications of the APs is provided in Table below

Retention time of anerobic ponds are 2 days.

Desludging of APs is normally carried out after 2-3 years. Drying of sludge is proposed to be carried out inside anaerobic pond on periodic basis. During desludging period, flow to respective anaerobic pond will be closed. At one time, one aerobic pond will be dewatered and settled sludge at bottom of pond, allowed drying under sunshine. Once sludge drying process will be completed, dried sludge will be removed from the pond and transported for safe disposal.

D	ANAROBIC PONDS			
i	Discharge		10.8	cusec
ii	Total volume of sewage		933120	ft^3/day
			26420	m^3/day
iii	Area of Anarobic Pond			
	$A_a = L_l Q/ð_s * D_a$			
	A_a			
	L_l = BOD i.e =128 mg/lit	140.8	141	
	Q = Volume of effluent 10.1			
	T= 20° C Average in Pakistan during cold weather			
	ð = (20*20)- 100 = 300	300		
	Ref: Duncun Mara Book Table 10.1			
	Dϑ = Depth of effluent taken = 3.5 m	3.5		
	Aa		3547.80	m2
			38188.50	ft2
iv	To check the retention period			
	ϑa = AaDa/Q		0.47	day
	Minimum Retention period (Duncun Mara)	2		day
	Revised Area		15097.01	m2
			162232.51	ft2
	Removal of sludge (2T+20)%	60%		
	Ref: Table 10.2 Duncan Mara Book			
v	No of Ponds	4		
	Area of each Anarobic pond		40558.13	ft2
vi	Assume it Mid span area			
vii	Proposed Slop	2.5:1		
vii	Free board	2		ft
viii	proposed length in mid span		255	ft
ix	Width in mid span		159	ft
x	Water depth taken	3		m

		10		ft
xi	Free board	2		ft
xii	Depth above mid span	7		ft
xiii	one slop	17.303		
xiv	Total slop	34.607		
xv	Say	35		ft
xvi	Total length at of pond		290	ft
xvii	Total width at of pond		194	ft
	Area at Top		56161	ft2
	Total Length at bottom of pond		220	ft
	Total width at bottom of pond		124	ft
	Area at bottom		27291	ft2
	Taking Depth of silt		3	
	length on top of silt		235	ft
	width on top of silt		139	ft
	Total Area in Acre		5	
				m3/p year
	Population		171180	persons
	Accumulation of Silt per annum		3424	m3
			120918	
	depth of silt		1.01	
	taking 4 years	3	3	
xviii	Depth of pond		13	ft
xvv	Total depth of Tank		16.5	ft

Facultative Ponds (FPs)

Facultative ponds (FPs) shall be provided for secondary treatment. Total four (4) FPs have been proposed for WWTP. Each FPs will receive a cumulative flow of 6 MGD wastewater flow one (01) APs.

A summary of the design specifications of the FPs is provided in Table below

The removal rate of BOD in WSPs will depend upon the ambient temperature. In the summer months, the removal rate will be higher due to an increase in temperature, however, in winter months, the removal efficiency of the pond will be less. As per estimates, the unfiltered effluent BOD will remain in the range of 30-60 mg/l in the summer months (March to November), provided that the WSP will be properly operated and managed. However, in the winter months, it may slightly exceed from the PEQS limits and may range between 70-88 mg/l. However, it is estimated that the filtered effluent BOD will remain in the range of 17-27 mg/l throughout the year.

In FPs, the floating wetlands will be introduced at 10% area of FP.

E	FACULTATIVE PONDS			
i	No of ponds		4	
ii	Discharge		10.8	cusec
vi	Total volume of sewage		933120	ft^3/day
			26419.77	m^3/day
vi	$A_f = 10\ L_i\ Q / \delta_s$			

	A_f = Area of faculative Ponds			
	L_i = BOD entering in Facultative Ponds	56.4		mg/l
	Q = Volume of effluent			
	T= 20° Average in Pakistan during cold weather			
	$ð_s$= 350(1.107-0.002T)^(T-25)	253.073		
vi	A_f		58879.25	m^2
	= Retention period			
	$ϑ_f = 2A_fD_f/2Q-(0.001eA_f)$			
	D = depth of Liquid	2		m
	e = 5	5		
vii	$ϑ_f$		4	days
	Let us take minimum retention period of 5 days (Ref. Duncan Mara), ϑf=	5		days
	Af = 2ϑfQ/2D-(0.001eϑf)			
	Revised Area according to 5 days, Af =		66465	m^2
ix	Area at mid span		16616.21	m^2
			178856.89	ft^2
x	Proposed length of FP at mid span		813	
xi	width		220	
xi	Length at top			
xii	Slop	2.5:1		
xiii	Depth of water from mid span	3.28		ft
xiv	Free board	2		ft
xv	Total hiegt from mid depth	5.28		ft
xvi	Add slop slop length		13.2	ft
xvii	Take two side		26.4	ft
xviii	say		27	ft
xviv	by adding slop length top length of tank become		840	ft
xvv	by adding slop length top width of tank become		247	ft
	Area of Each Facultative Pond		207477	
	Area in Acres of each pond		5	
	Removal of BOD			
	Le(unfiltered) = Li/(1+k_1 ϑf)			
	k_1 = 0.1 design value for secondary facultative pond	0.1		
	Le(unfiltered)		38.9	mg/l
	Le(filtered) = F_{na}*(Le(unfiltered))			

3.13 Wastewater Sampling

Wastewater composite sampling was taken from two (02) points Disposal 240 Mor, Colony Disposal Khurrianwala. Selected waste water quality parameters describing physiochemical properties of the wastewater have been carried out for describing the wastewater properties and assessing the impact of the proposed project. The waste water quality analysis is given below:

The results of water analysis shows that physical parameters (Temperature, pH, and Total Dissolved Solids are within permissible limits of Punjab Environmental Quality Standards

(PEQs). However, BOD and COD values are exceeded from permissible limit at both disposals. While, values of TSS and Chlorides are exceeded from permissible limit at 240 Mor disposal.

Similarly, Chemical parameters Greases & Oil, Phenolic Compound, Chloride (as Cl1-), Fluoride, An Ionic detergent as MBAs, Sulphate, Sulphide (S2-), Ammonia (NH3), Cadmium, Chromium, Copper, Lead, Mercury, Selenium, Nickel, Silver, Total Toxic Metals, Zinc, Arsenic, Barium, Iron, Manganese, Boron (B), Iron, Manganese, Boron, Chlorine , Sodium, and Cyanide are within permissible limits of Punjab Environmental Quality Standards (PEQS) at all sites.

Sr. No.	Parameters	Unit	PEQS	Disposal, 240 Mor	Colony Disposal, Khurrianwala Road
				Results	Results
1.	Biological Oxygen Demand (BOD_5 at 20 ^{0}C) ^	mg/L	80	118*	128*
2.	Chemical Oxygen Demand (COD) ^	mg/L	150	184*	208*
3.	Total Suspended Solids (TSS) ^	mg/L	200	240*	150
4.	Total Dissolved Solids (TDS) ^	mg/L	3500	2060	1680
5.	Greases & Oil	mg/L	10	0.1	0.1
6.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005
7.	Chloride (as Cl^{1-}) ^	mg/L	<250	275*	110
8.	Fluoride (F^{1-})	mg/L	10	1.9	1.4
9.	An Ionic detergent as MBAs	mg/L	20	0.914	0.859
10.	Sulphate (SO_4^{2-}) ^	mg/L	600	190	177
11.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1
12.	Ammonia (NH_3) ^	mg/L	40	18.6	16.4
13.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010
14.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010
15.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001
16.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010
17.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001
18.	Selenium (Se)	mg/L	0.5	0.0001	0.0001
19.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010

20.	Silver (Ag)	mg/L	1.0	0.0100	0.0100
21.	Zinc (Zn)^	mg/L	5.0	0.1335	0.1783
22.	Arsenic (As)	mg/L	1.0	0.0001	0.0001
23.	Barium (Ba)	mg/L	1.5	0.0500	0.0500
24.	Iron (Fe)^	mg/L	8.0	1.7212	2.8808
25.	Manganese (Mn)^	mg/L	1.5	0.1319	0.1117
26.	Boron (B)	mg/L	6.0	0.0100	0.0100
27.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01
28.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	-
29.	Sodium^	mg/L	-	143.0950	125.0380
30.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001

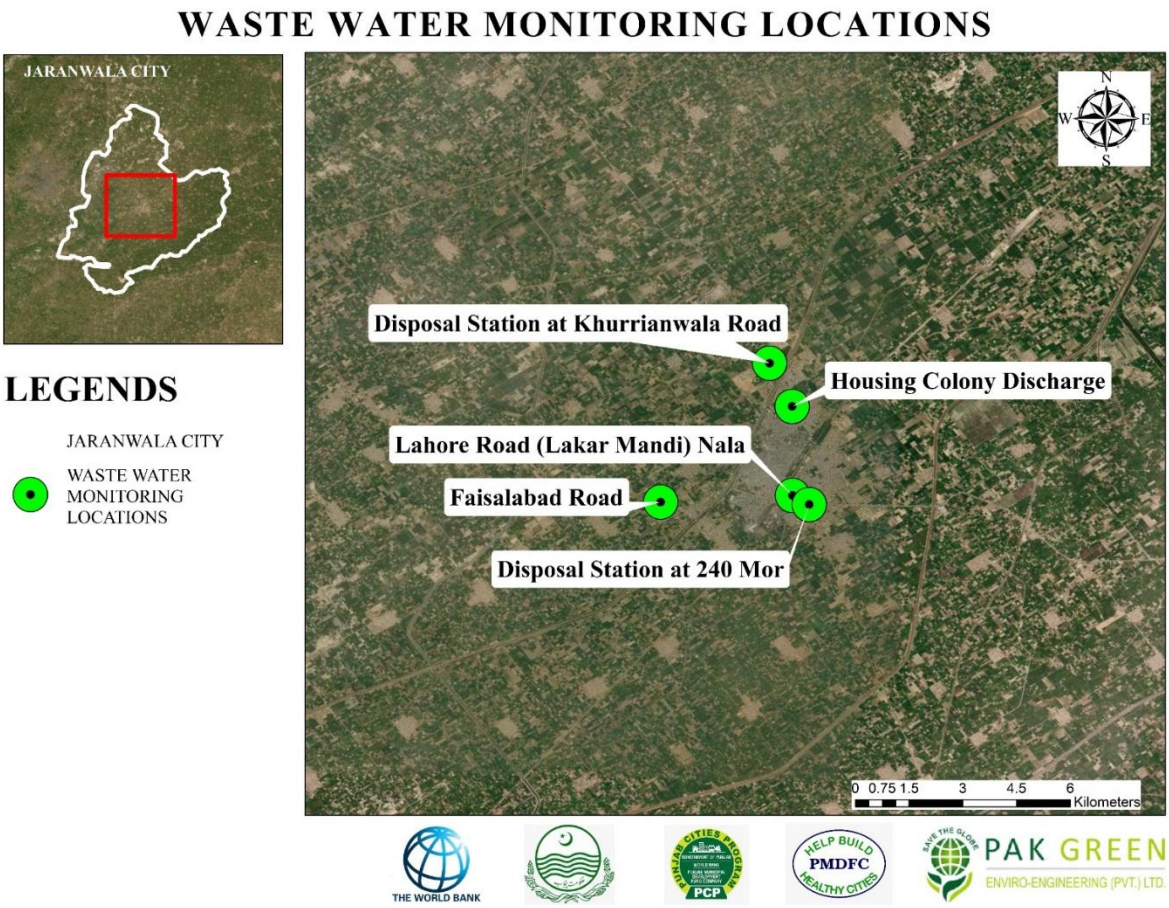


Figure 12: Wastewater Monitoring Locations

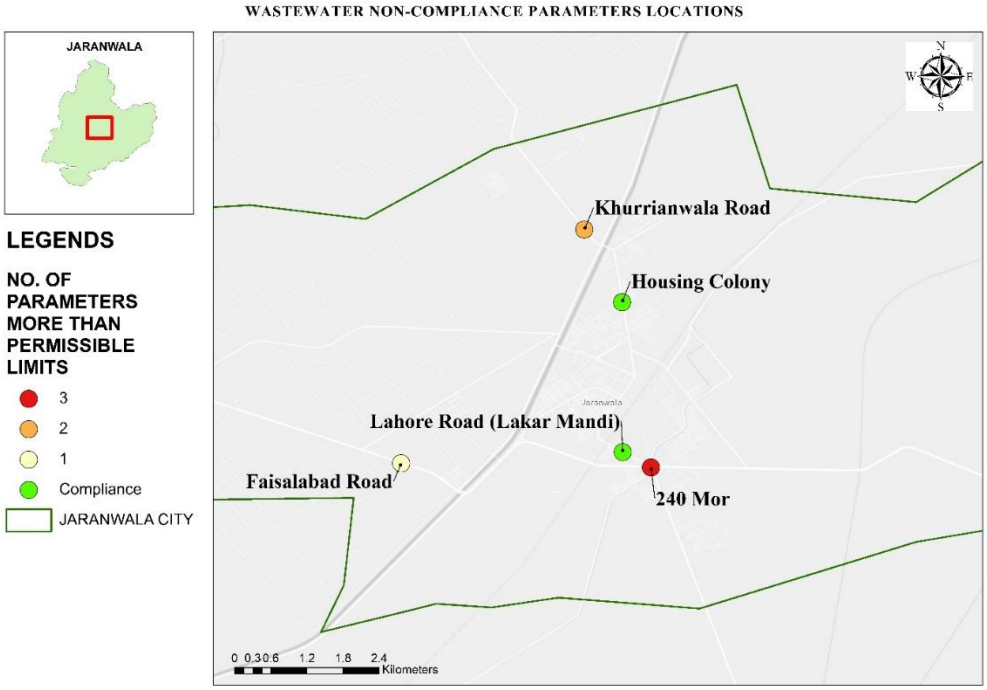


Figure 13:The Base map of non- compliance parameters in Waste Water of Jaranwala, Pakistan

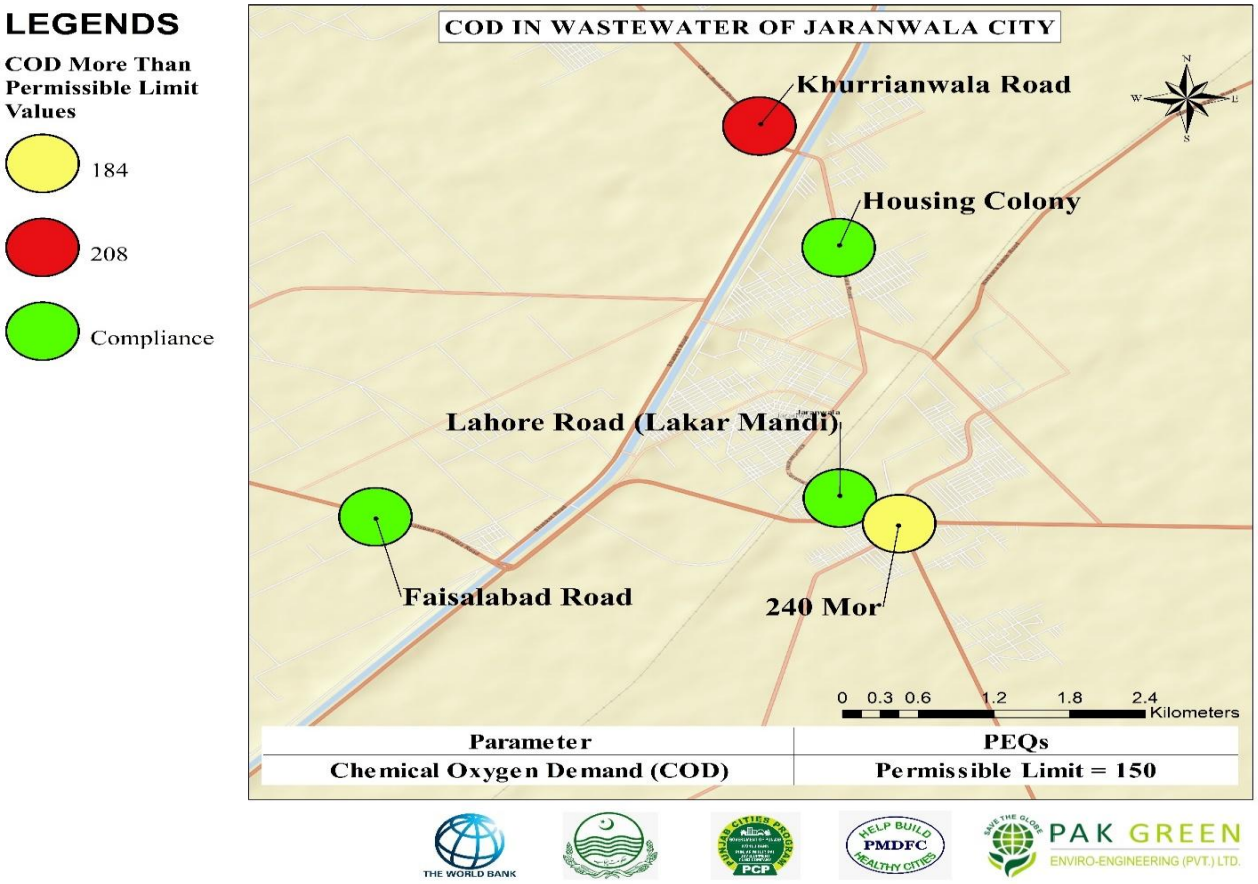


Figure 14:The map of COD in Waste Water of Jaranwala, Pakistan

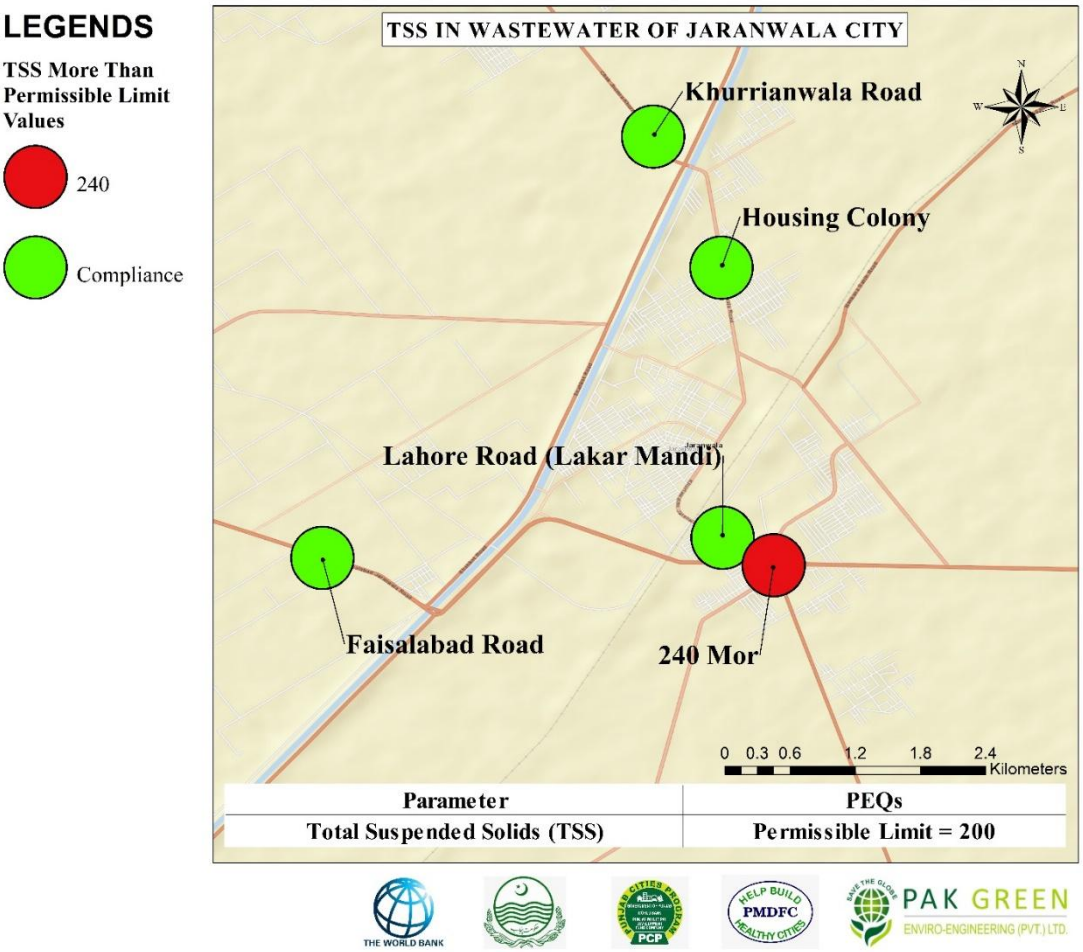


Figure 15:The map of TSS in Wastewater of Jaranwala, Pakistan

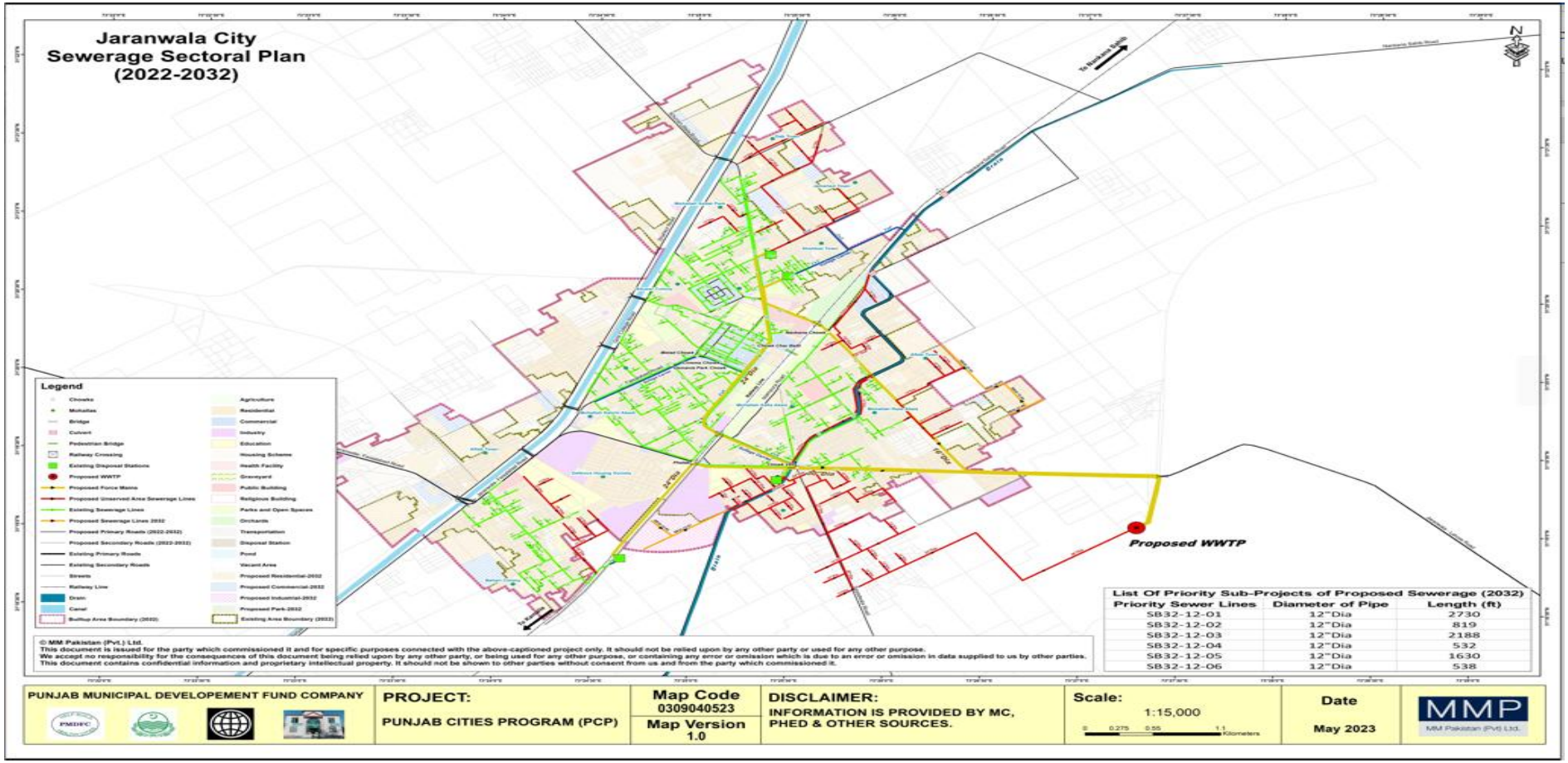


Figure 16: Proposed Sewerage Network of Jaranwala Ci

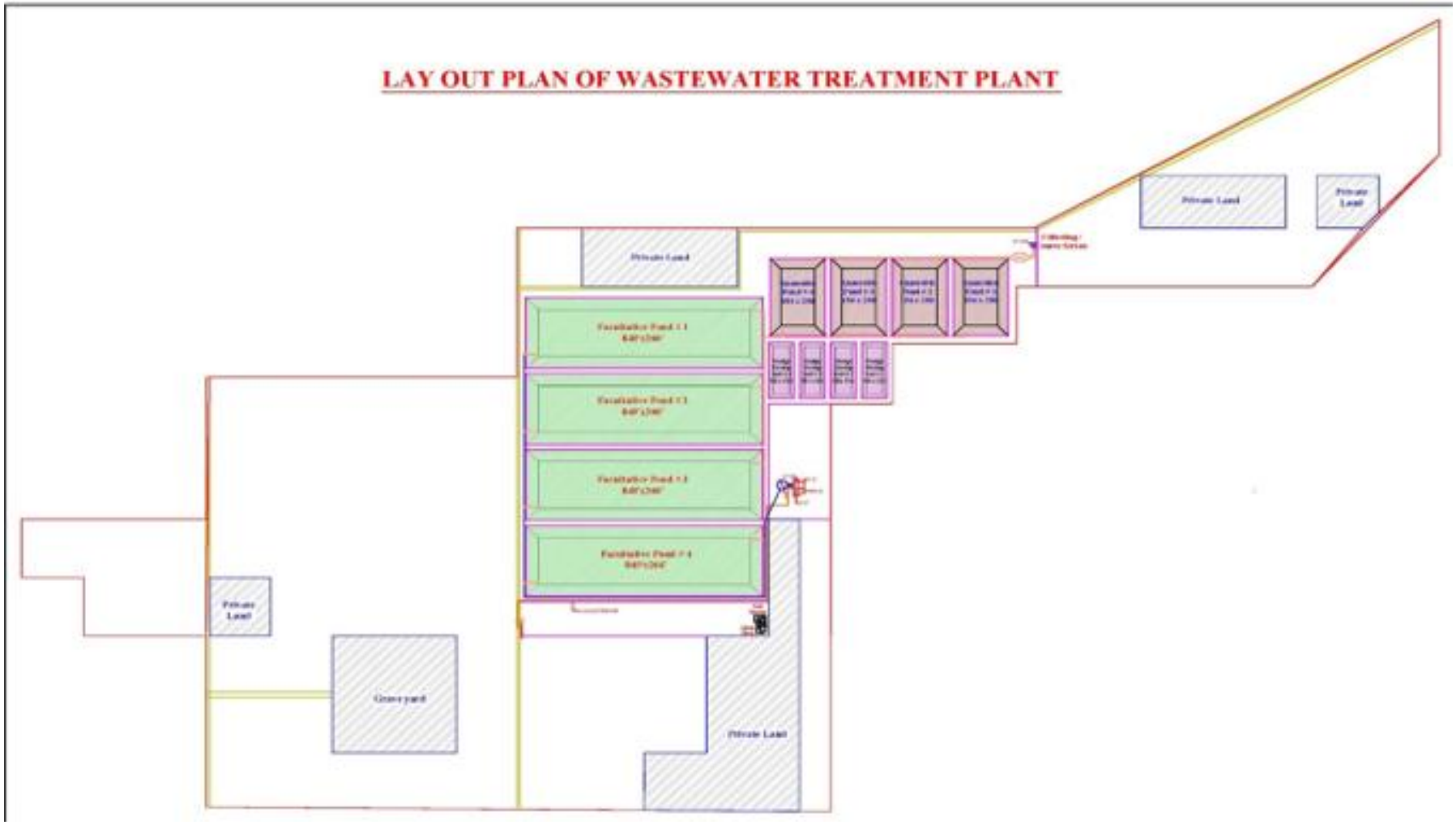


Figure 17: Layout plan of WWTP

3.14Access Roads

The access road is fine and good condition. The proposed project can be accessed through various route covering the areas. The Sewerage network collects sewage from the whole city. The problems of existing roads are unclear traffic signs, poor lane markings, poor road surfaces and bad road design.

3.15 Construction Scheduling

The project is anticipated to commence by July 2023 and to be completed by the end of June 2024 with project implementation period of 12 months.

The Contractor will be instructed to bore and excavate earth avoiding excessive dust generation. The Contractor will immediately pump and remove all wastewater generated. The Contractor will remove earth material excavated at designated place approved by supervision consultants or reuse it as construction material with the approval of supervision Consultant. The Contractor will also dump construction material in a way to cause minimum construction waste as well as minimum hindrance to commutation of general public simultaneously. The Contractor will make all necessary arrangements for the safety of his workers. The Contractor will take all necessary mitigations to make Sub-project environment friendly and socially sustainable.

3.16 Capital Cost of Project

The total cost of the project is estimated to be PKR 2484.700million/-PKR, which is further divided into various components/items as shown in **Table 7**:

Table 5:Captial Cost

Sr.No.	Description	Cost in Million (PKR)
1.	Package-1 Sewerage system	632.00
2.	Package-2 Disposal station & Forcemain	682.11
3.	Package-3 Rehabilitation of Drain Disposal Chak 128 and P/F RPC manhole Cover	29.70
4.	Package-4 Construction of Wastewater Treatment Plant (WWTP)	786.95
5.	Package-5 Supply of Liquid Waste Machinery	52.76
6.	Package-6 Desilting of Sewerage Lines	6.39
7.	Environmental & Social (ESMMP) Cost & ARAP cost	33.94
8.	Total Cost (Rs.)	2,223.85
9.	Add 2% contingencies (Less Serial no 12)	43.80
10.	Add 5% PST (Less serial No. 5, 8 & 12)	106.54
11.	Add 16% PST for serial No. 8	1.02
12.	Add 5% escalation (Less Serial no 12)	109.50
13.	Grand Total Cost (Rs. In millions)	2,484.70
	Total Cost (Rs.)	1 ,908.07

Sr.No.	Description	Cost in Million (PKR)
	Add 2% contingencies	38.16
	Add 5% PST (Less serial No. 9)	95.08
	Add 16% PST for serial No. 9	1.02
	Add 5% escalation	95.40
	Grand Total Cost (Rs. In millions)	**2,137.75**

4 Environment & Social Baseline

For any development project, the prevailing environmental conditions need to be assessed prior to the stages of planning, designing and execution of the project. Identification of physical, ecological and social aspects of environment and collection of relevant data is essentially important for the evaluation of impacts as well as for the suggestion of adequate mitigation measures, which forms the basis for the implementation of the proposed project in terms of prevailing environmental and social conditions in the study area.

This section provides baseline data (physical, biological and socio-economic parameters) related to the project area. Information provided is both quantitative and qualitative and is based on secondary and primary data collected, site field visits and desk studies.

A baseline consists of the existing environmental and socio-economic and cultural status of the project area. The baseline information and indigenous knowledge is required for scoping potential environmental issues associated with the implementation of the project. On the basis of baseline information, the project interventions are assessed and mitigation measures are proposed. The baseline information also helps to locate the specific issues to be monitored during project execution as well as during operational phase.

4.1 Physical Environment

The following section provides an overview of the information on physical environment of the proposed Sub-project study area collected from primary as well as secondary sources. The major parameters covered include Geography, Physical Features, Geology, Climate etc.

4.1.1.1 Geography[15]

It is located at 31°20'0N 73°26'0E with an altitude of 184 meters (606 feet). It is located 35 km southeast of Faisalabad and 110 km from Lahore. The city serves as the headquarters of Jaranwala Tehsil, an administrative subdivision of the district. The Elevation is 188m / 617feet and the Barometric Pressure is 99KPa.

4.1.1.2 Soil

The soil consists of young stratified silt loam or very fine sand loam which makes the subsoil weak in structure with common kankers at only five feet. The course of the rivers within subject area are winding and often subject to frequent alternations. In the rainy season, the currents are very strong. This leads to high floods in certain areas which do last for a number of days. The river bed does include the river

15 https://www.latlong.net/place/jaranwala-faisalabad-punjab-pakistan-23979.html

channels which have shifted the sand bars and low sandy levees leading to river erosion. There is a mild slope from the northeast to the southwest with an average fall of 0.2–0.3 metres per kilometre.

4.1.1.3 Climate[16]

The climate of the area touches two extremes. The maximum temperature in summer reaches up to 44oC. In winter it goes down to 1ºC. The mean maximum and minimum temperature in summer are 41 and 27 centigrade and in winter 19 and 4 centigrade respectively. The summer season starts from April and continues till October. May, June and July are the hottest months. The winter season on the other hand starts from November and continues till March. December, January and February are the coldest months.

In Jaranwala, the summers are sweltering, humid, and clear and the winters are short, cool, dry, and mostly clear. Over the course of the year, the temperature typically varies from 44°F to 104°F and is rarely below 40°F or above 111°F (Figure 13).

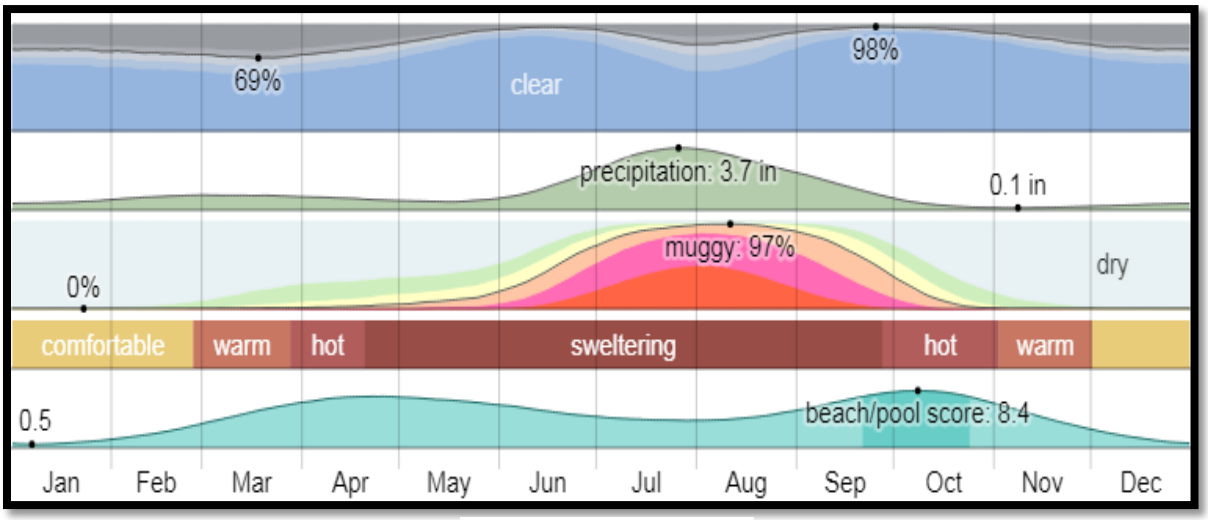


Figure 18:Climate

4.1.1.4 Temperature[17]

The hot season lasts for 3.2 months, from April 24 to July 31, with an average daily high temperature above 97°F. The hottest month of the year in Jaranwala is June, with an average high of 103°F and low of 83°F.

[16] https://weatherspark.com

[17] https://weatherspark.com

The cool season lasts for 2.6 months, from December 5 to February 21, with an average daily high temperature below 55°F. The coldest month of the year in Jaranwala is January, with an average low of 45°F and high of 67°F (Figures 14-15).

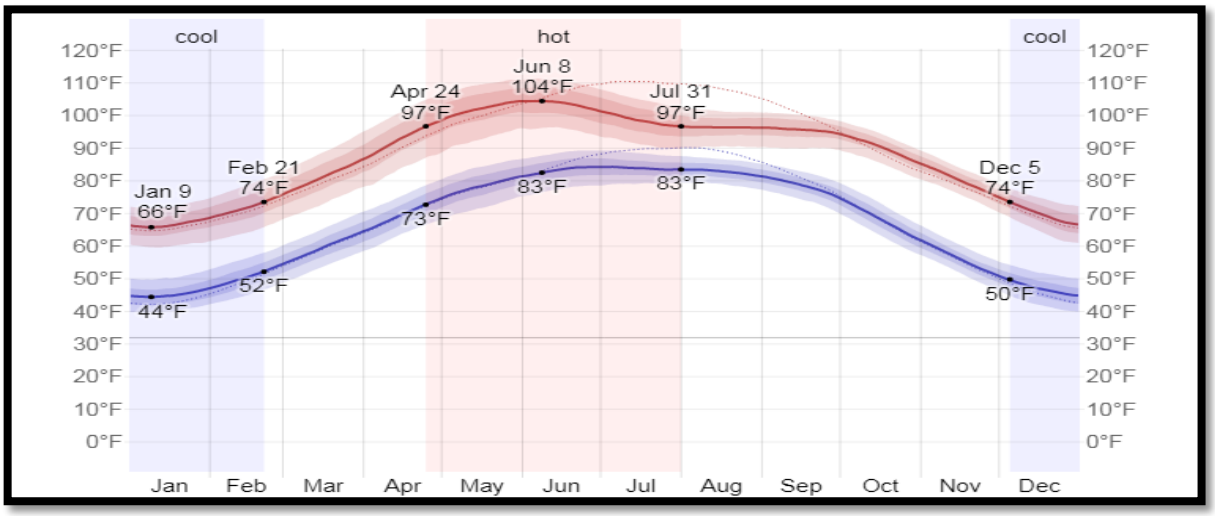


Figure 19:Average High and Low Temeprature

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	67°F	72°F	82°F	93°F	102°F	103°F	99°F	96°F	96°F	90°F	80°F	70°F
Temp.	55°F	61°F	71°F	82°F	91°F	94°F	91°F	90°F	87°F	79°F	67°F	58°F
Low	45°F	51°F	60°F	70°F	79°F	83°F	84°F	83°F	78°F	68°F	56°F	47°F

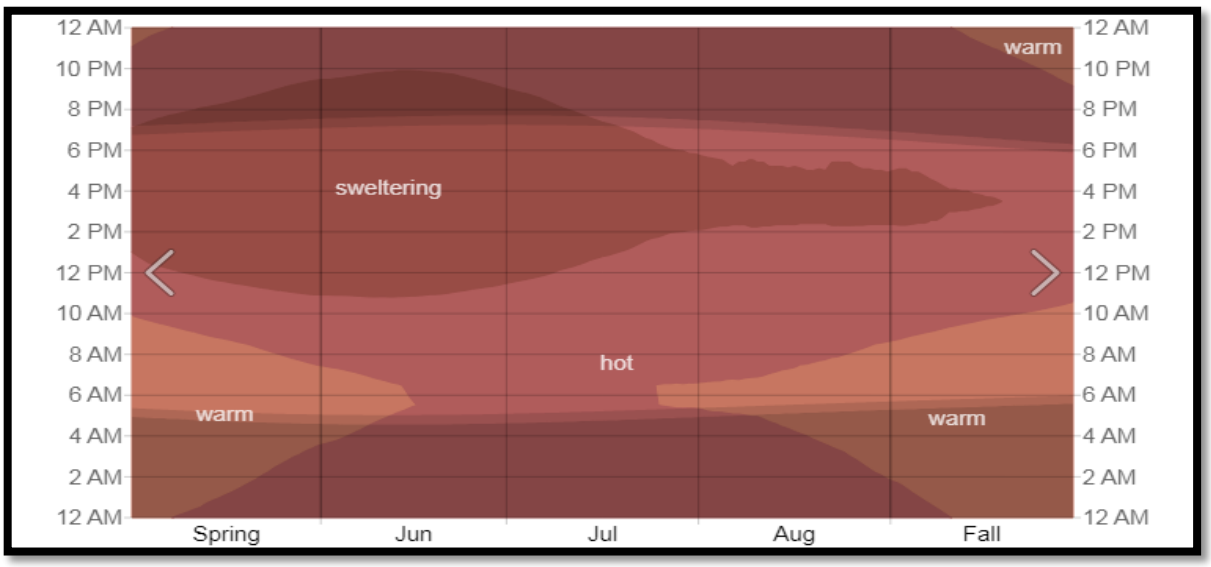


Figure 20:Average Hourly Temperature

4.1.1.5 Clouds

The summer in Jaranwala experiences essentially constant cloud cover, with the percentage of time that the sky is overcast or mostly cloudy remaining about 10% throughout the season. The highest chance of overcast or mostly cloudy conditions is 19% on July 30. The clearest day of the summer is June 15, with clear, mostly clear, or partly cloudy conditions 98% of the time. For reference, on March 18, the cloudiest day of the year, the chance of overcast or mostly cloudy conditions is 31%, while on September 25, the clearest day of the year, the chance of clear, mostly clear, or partly cloudy skies is 98% (Figure 16).

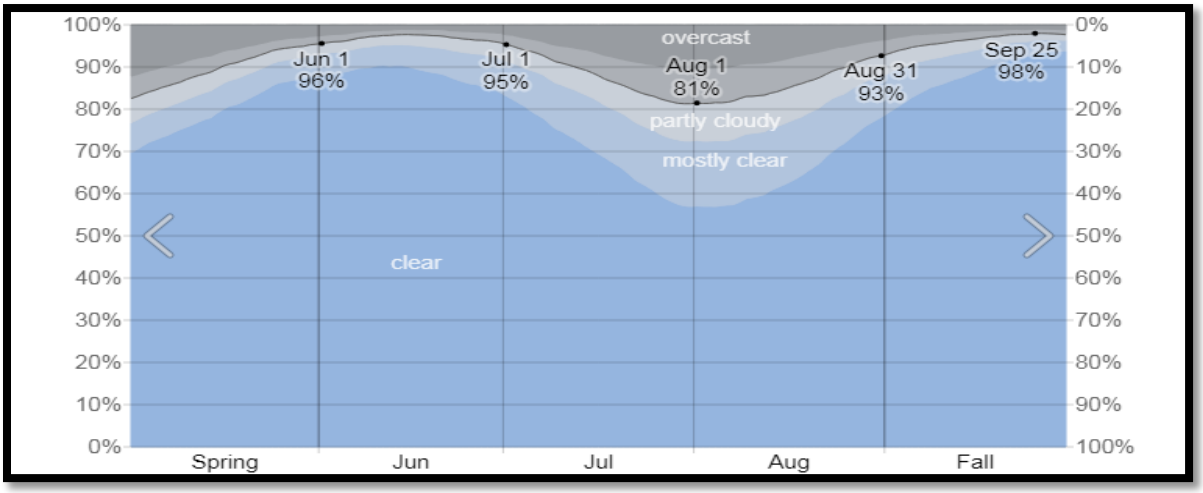


Figure 21:Probability of Precipitation

4.1.1.6 Precipitation

A wet day is one with at least 0.04 inches of liquid or liquid-equivalent precipitation. In Jaranwala, the chance of a wet day over the course of the summer is very rapidly increasing, starting the season at 12% and ending it at 25%. For reference, the year's highest daily chance of a wet day is 42% on July 23, and its lowest chance is 2% on November 5 (Figure 17).

Figure 22:Average Monthly Rainfall

The percentage of days in which various types of precipitation are observed, excluding trace quantities: rain alone, snow alone, and mixed (both rain and snow fell in the same day).

4.1.1.7 Rainfall

To show variation within the season and not just the monthly totals, we show the rainfall accumulated over a sliding 31-day period centered on each day. The average sliding 31-day rainfall during the summer in Jaranwala is rapidly increasing, starting the season at 0.7 inches, when it rarely exceeds 1.7 inches or falls below 0.1 inches, and ending the season at 2.2 inches, when it rarely exceeds 4.5 inches or falls below 0.5 inches. The highest average 31-day accumulation is 3.7 inches on July 27 .

4.1.1.8 Sun

Over the course of the summer in Jaranwala, the length of the day is rapidly decreasing. From the start to the end of the season, the length of the day decreases by 1 hour, 12 minutes, implying an average daily decrease of 48 seconds, and weekly decrease of 5 minutes, 34 seconds. The shortest day of the summer is August 31, with 12 hours, 51 minutes of daylight and the longest day is June 21, with 14 hours, 11 minutes of daylight (Figure 18).

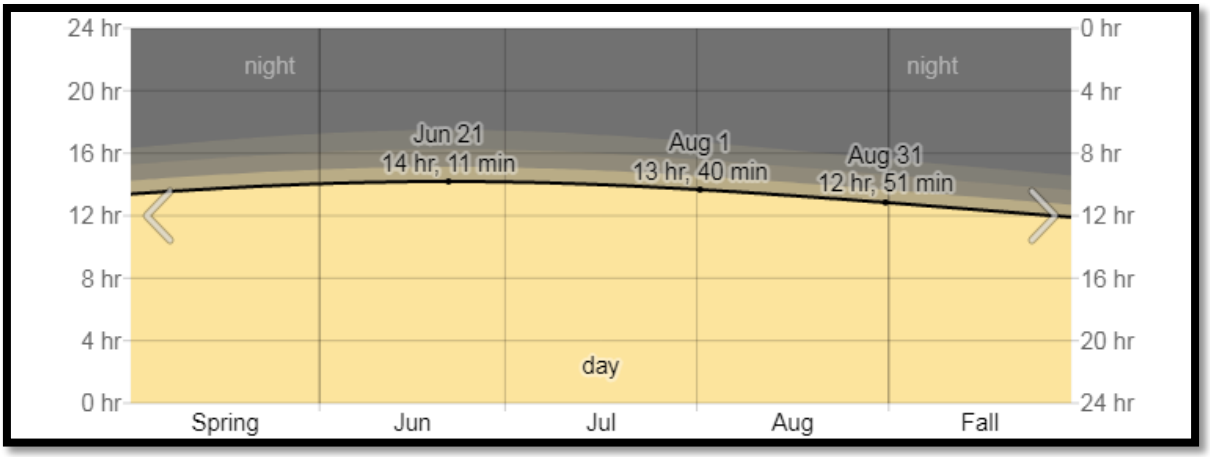


Figure 23:Sunrise & Sunset with Twilight

The number of hours during which the Sun is visible (black line). From bottom (most yellow) to top (most gray), the color bands indicate: full daylight, twilight (civil, nautical, and astronomical), and full night. The earliest sunrise of the summer in Jaranwala is 5:01 AM on June 12 and the latest sunrise is 40 minutes later at 5:41 AM on August 31. The latest sunset is 7:14 PM on June 30 and the earliest sunset is 43 minutes earlier at 6:31 PM on August 31. Daylight saving time is not observed in Jaranwala during 2023. For reference, on June 21, the longest day of the year, the Sun rises at 5:02 AM and sets 14 hours, 11 minutes later, at 7:13 PM, while on December 22, the shortest day of the year, it rises at 7:01 AM and sets 10 hours, 7 minutes later, at 5:07 PM (Figure 19).

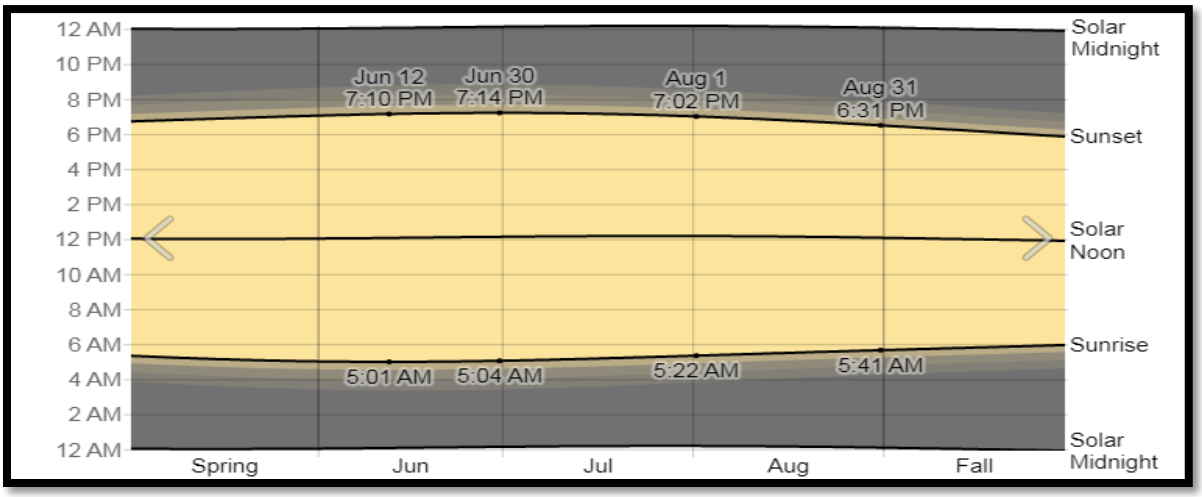


Figure 24:Solar Elevation and Azimuth

The solar day in the summer. From bottom to top, the black lines are the previous solar midnight, sunrise, solar noon, sunset, and the next solar midnight. The day, twilights (civil, nautical, and astronomical), and night are indicated by the color bands from yellow to gray.

The figure below presents a compact representation of the sun's elevation (the angle of the sun above the horizon) and azimuth (its compass bearing) for every hour of every day in the reporting period. The horizontal axis is the day of the year and the vertical axis is the hour of the day. For a given day and hour of that day, the background color indicates the azimuth of the sun at that moment. The black isolines are contours of constant solar elevation (Figure 20).

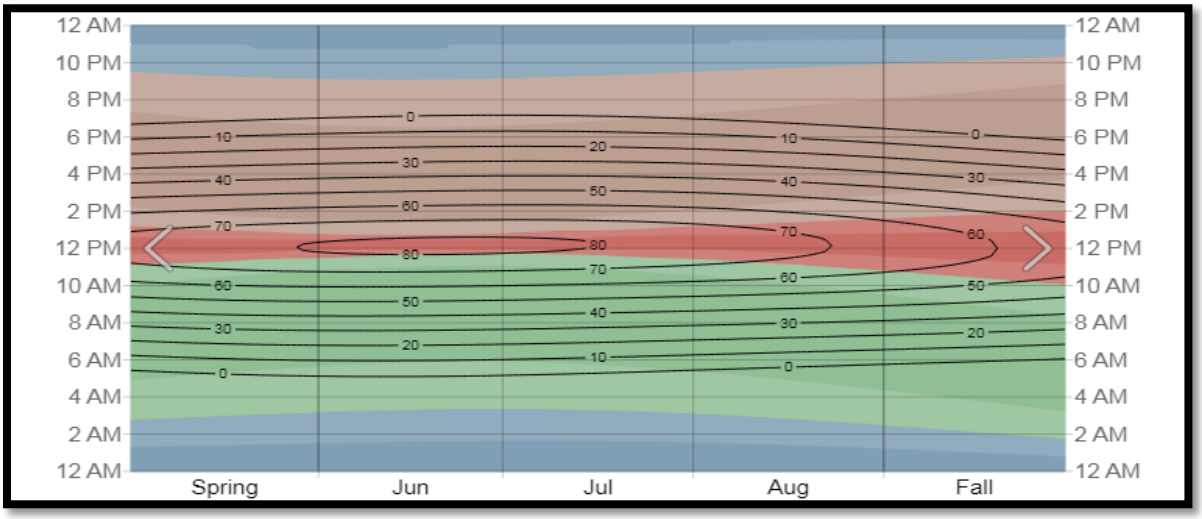


Figure 25:Moon Rise, Set & Phases

Solar elevation and azimuth in the the summer of 2023. The black lines are lines of constant solar elevation (the angle of the sun above the horizon, in degrees). The background color fills indicate the azimuth (the compass bearing) of the sun. The lightly tinted areas at the boundaries of the cardinal compass points indicate the implied intermediate directions (northeast, southeast, southwest, and northwest).

4.1.1.9 Moon

The figure below presents a compact representation of key lunar data for the summer of 2023. The horizontal axis is the day, the vertical axis is the hour of the day, and the colored areas indicate when the moon is above the horizon. The vertical gray bars (new Moons) and blue bars (full Moons) indicate key Moon phases. The label associated with each bar indicates the date and time that the phase is obtained, and the companion time labels indicate the rise and set times of the Moon for the nearest time interval in which the moon is above the horizon.

The time in which the moon is above the horizon (light blue area), with new moons (dark gray lines) and full moons (blue lines) indicated. The shaded overlays indicate night and civil twilight.

4.1.1.10 Humidity

We base the humidity comfort level on the dew point, as it determines whether perspiration will evaporate from the skin, thereby cooling the body. Lower dew points feel drier and higher dew points feel more humid. Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night.

The chance that a given day will be muggy in Jaranwala is very rapidly increasing during the summer, rising from 20% to 89% over the course of the season. The highest chance of a muggy day during the summer is 97% on August 11. For reference, on August 10, the muggiest day of the year, there are muggy conditions 97% of the time, while on January 2, the least muggy day of the year, there are muggy conditions 0% of the time (Figure 22). The percentage of time spent at various humidity comfort levels, categorized by dew point.

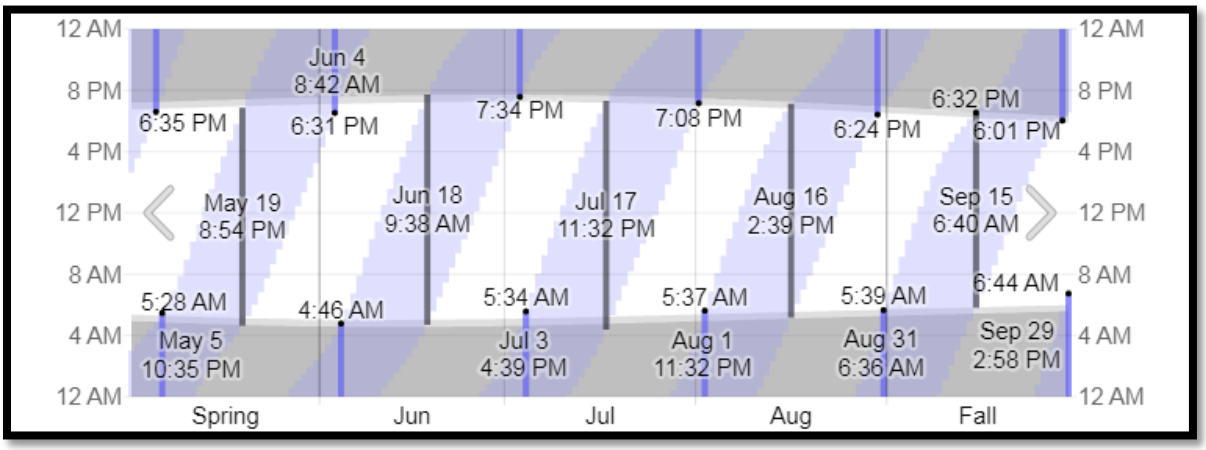


Figure 27:Humidity Comfort level

4.1.1.11Wind

This section discusses the wide-area hourly average wind vector (speed and direction) at 10 meters above the ground. The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages. The average hourly wind speed in Jaranwala is decreasing during the summer, decreasing from 6.2 miles per hour to 4.9 miles per hour over the course of the season.

The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands. The wind direction in Jaranwala during the summer is predominantly out of the west from June 1 to June 11 and the south from June 11 to August 31 (Figure 23).

For reference, on June 23, the windiest day of the year, the daily average wind speed is 6.2 miles per hour, while on October 14, the calmest day of the year, the daily average wind speed is 4.4 miles per hour. The highest daily average wind speed during the summer is 6.2 miles per hour on June 24 (Figure 24).

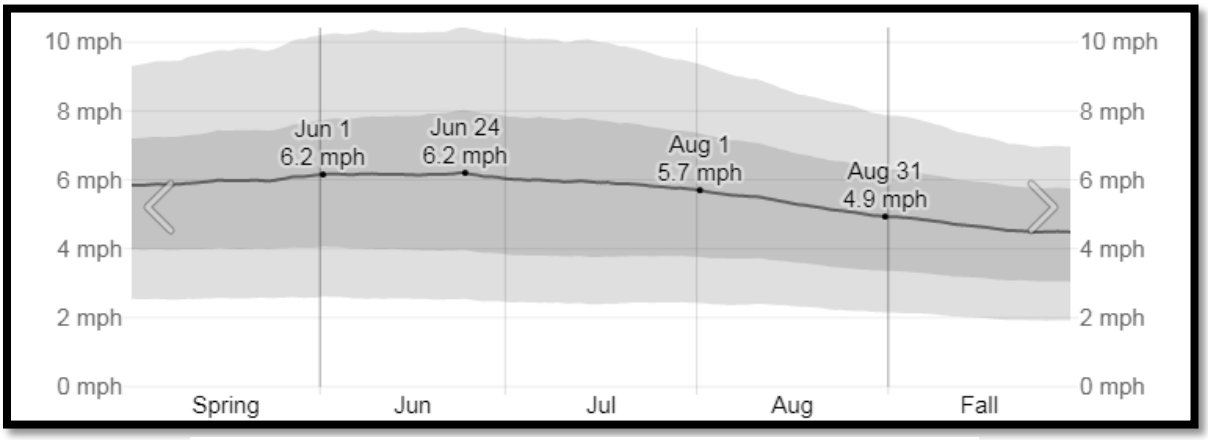


Figure 28:Wind Direction

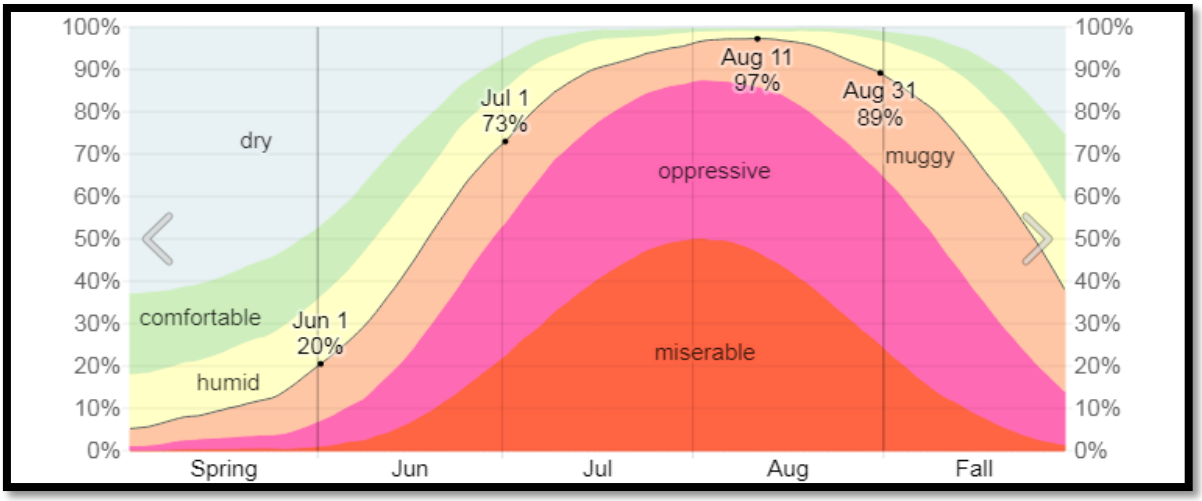


Figure 29: Average Wind Speed

The percentage of hours in which the mean wind direction is from each of the four cardinal wind directions, excluding hours in which the mean wind speed is less than 1.0 mph. The lightly tinted areas at the boundaries are the percentage of hours spent in the implied intermediate directions (northeast, southeast, southwest, and northwest).

4.1.1.12 Topography

The geographical coordinates of Jarānwāla are 31.333 deg latitude, 73.433 deg longitude, and 627 ft elevation. The topography within 2 miles of Jaranwala is essentially flat, with a maximum elevation change of 39 feet and an average elevation above sea level of 625 feet. Within 10 miles is also essentially flat (92 feet). Within 50 miles is essentially flat (305 feet). The area within 2 miles of Jaranwala is covered by cropland (77%) and artificial surfaces (23%), within 10 miles by cropland (99%), and within 50 miles by cropland (91%).

4.1.1.13 Environmentally Sensitive Receptors

Environmental sensitive areas are more prone towards human disturbance. For this Sub-project, Borala Canal is near to the WWTP otherwise no estuarine, river, protected areas lie within scope of work and no significant environmental impacts has been envisaged, and however mitigation measures have been recommended against less significant environmental concerns

4.1.1.14 Environmental Analysis

Environmental Analysis for air, water and noise was carried out by EPA certified Laboratory Pak Green Pvt. Ltd.

for specifically proposed project improvement of sewerage system and construction of WWTP to meet the requirement of EPA.

Ambient Air Quality Analysis

Study on air quality status in the vicinity of the proposed projects is an essential and primary requirement for assessing the impacts on air quality due to any proposed developmental activity as degradation of air quality is a predominant environmental concern these days. Air quality analysis has been carried out by EPA certified laboratory. Lab reports of air quality is attached as Annexure E.

According to Air quality analysis reports in Jaranwala city, at nine (09) different locations air quality was analyzed. Particulate Matter (PM10 and PM 2.5 SPM) found exceeded the limits of PEQs at all points.

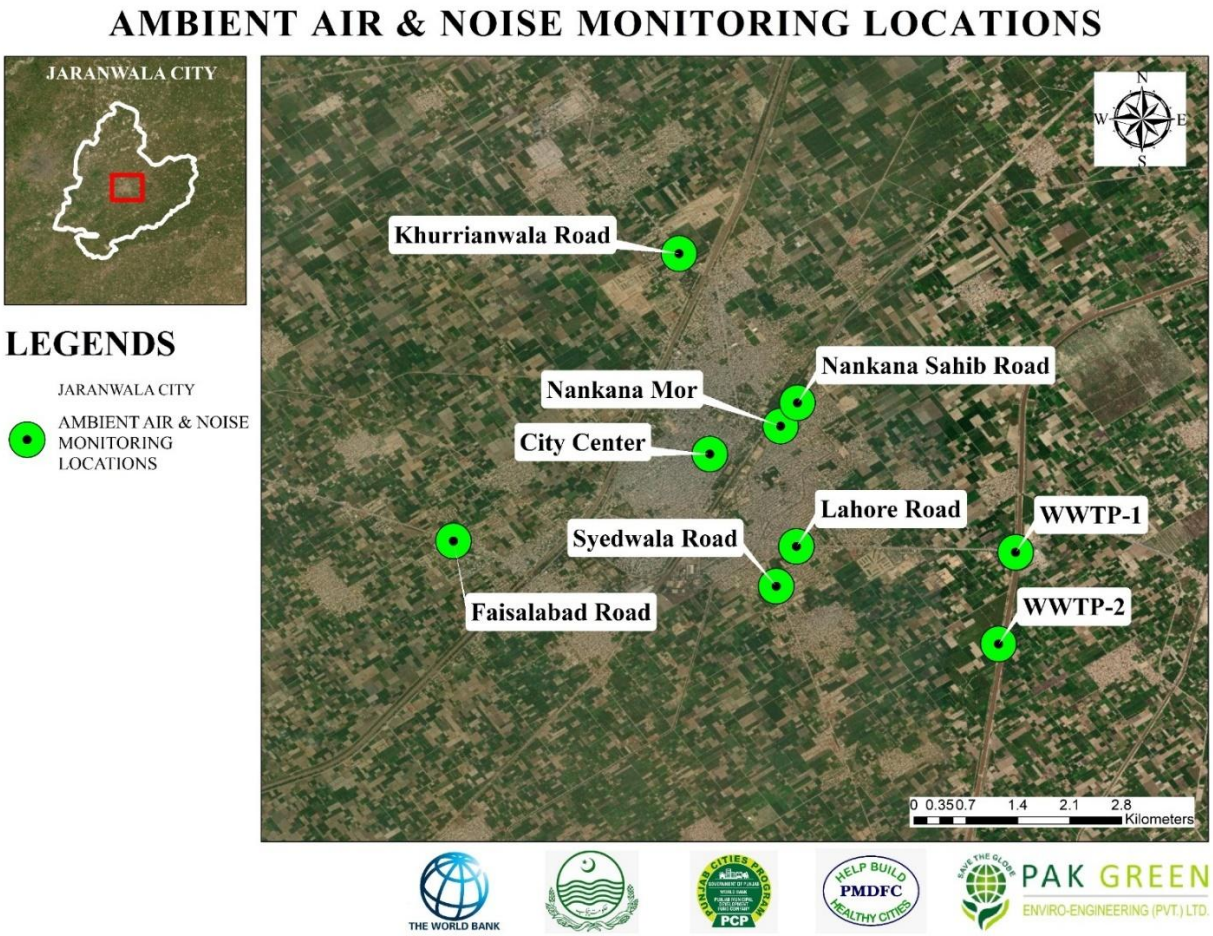


Figure 30: Base map for Air & Noise Locations

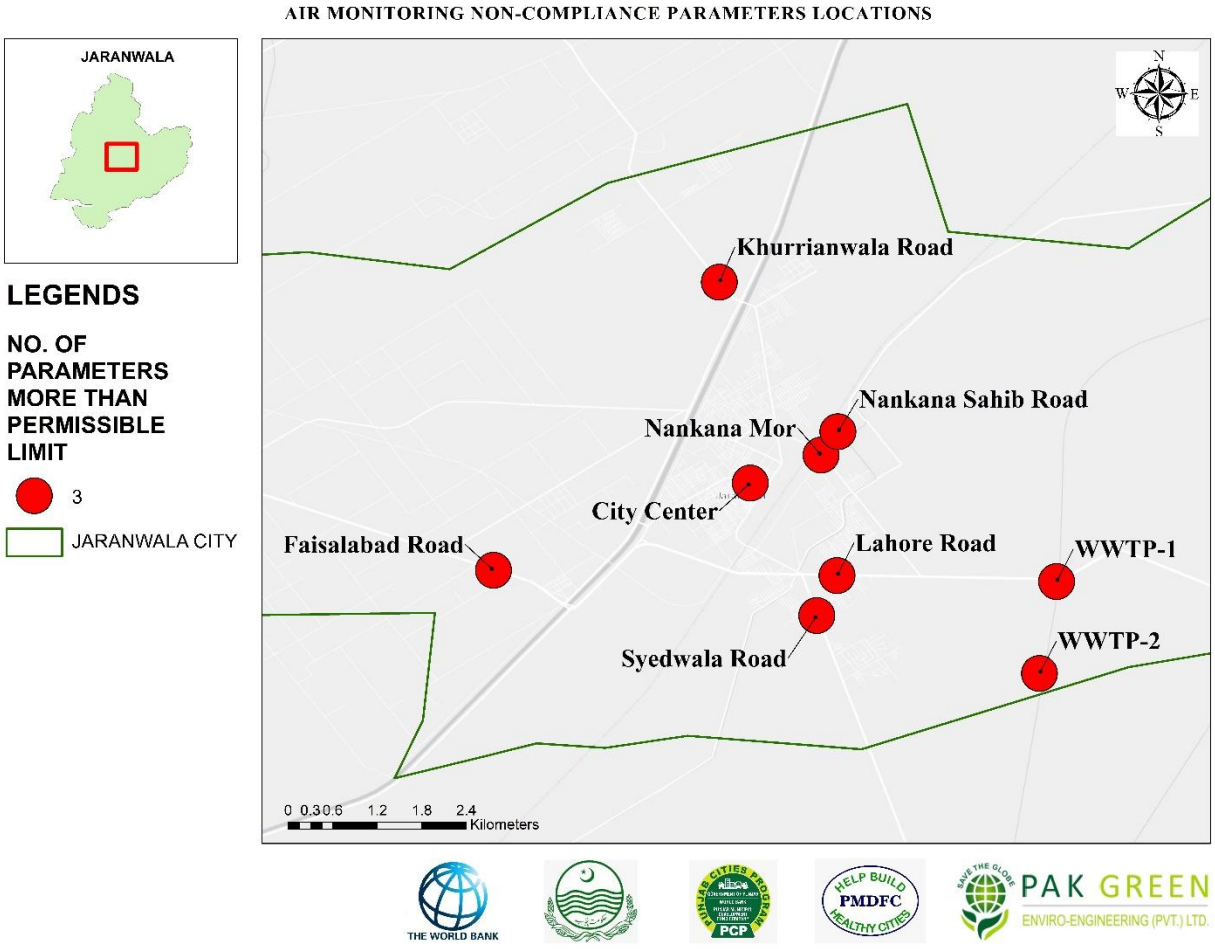


Figure 31:The Base map of Air Quality Monitoring Non- Compliance Parameters of Jaranwala, Pakistan

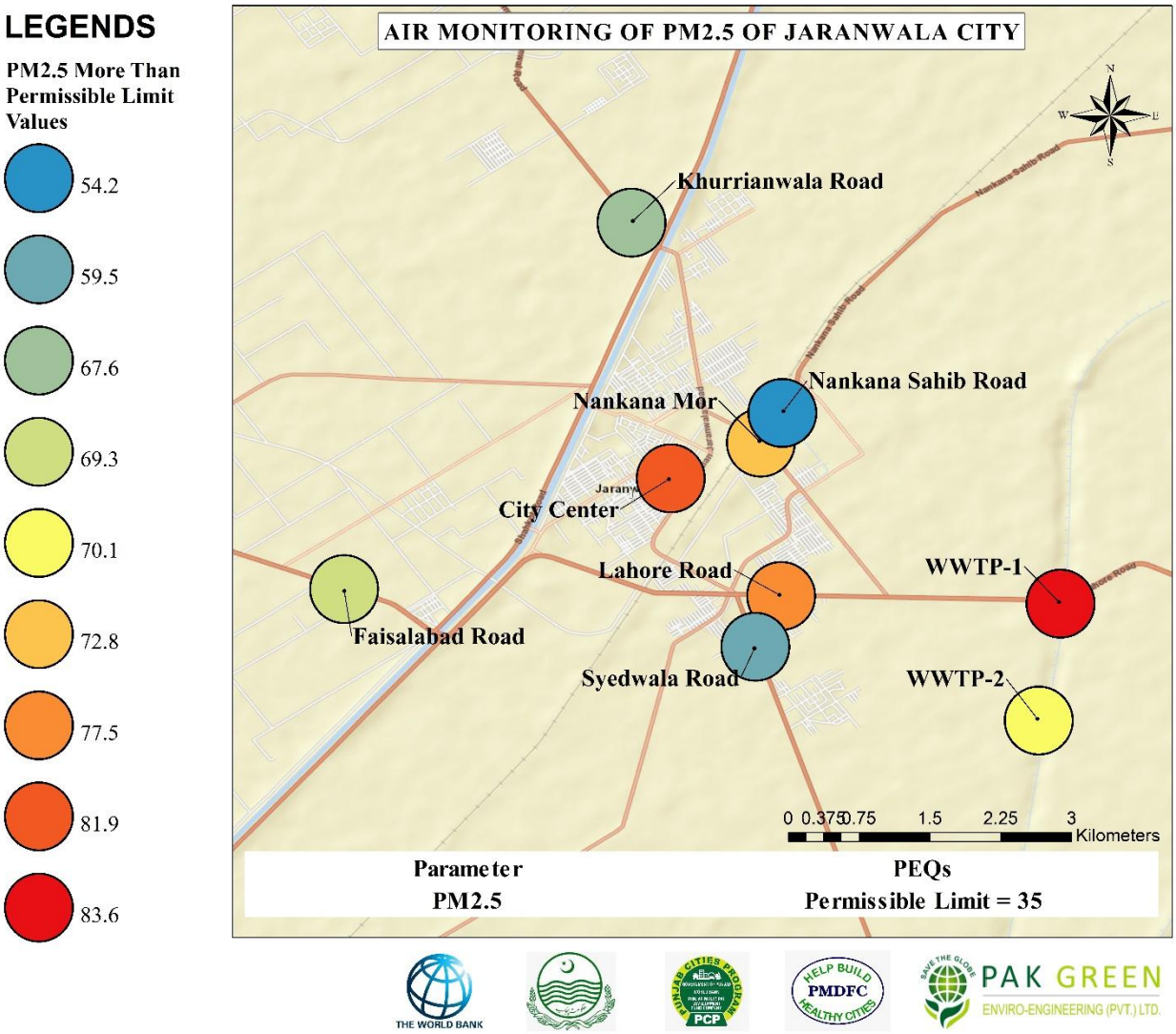


Figure 32:The Air Quality Monitoring Map of PM2.5 of Jaranwala, Pakistan

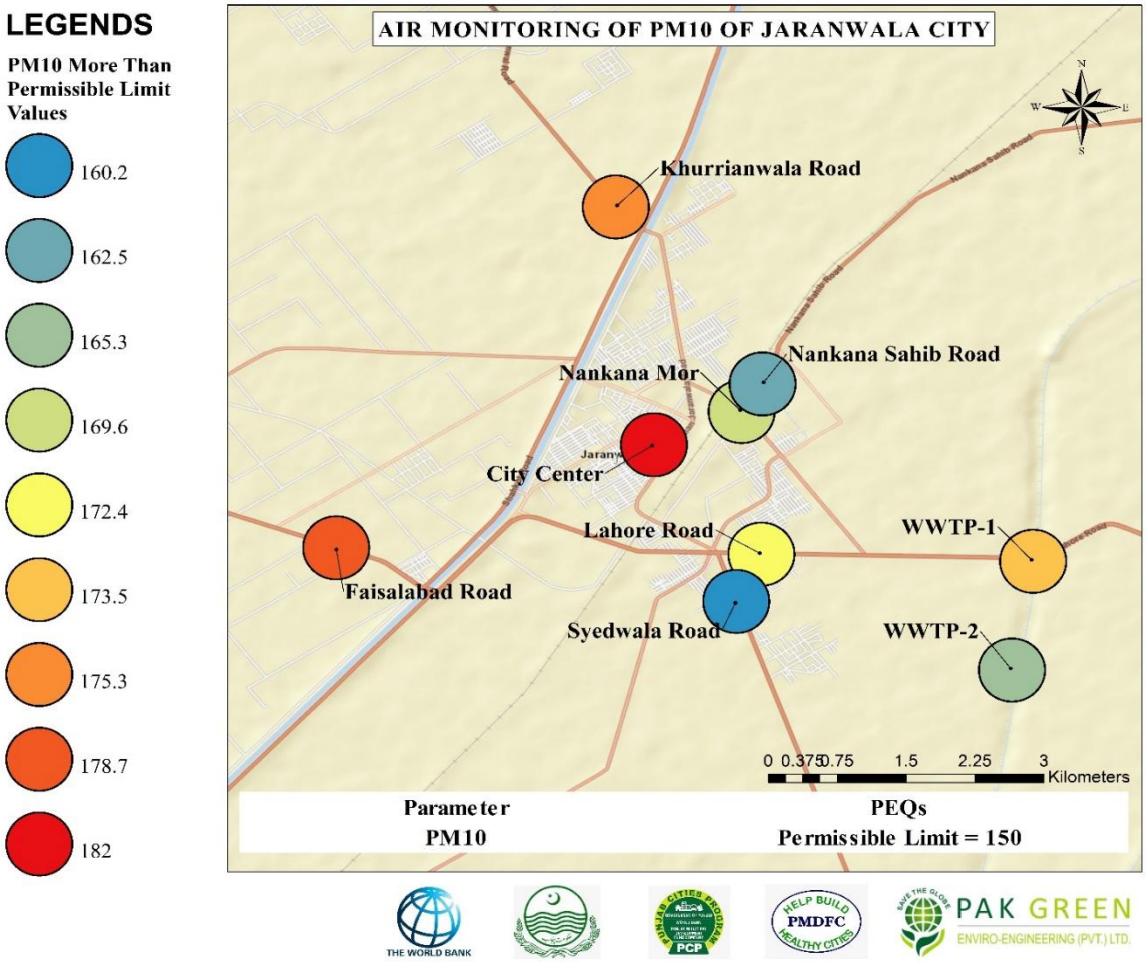


Figure 33:The Air Quality Monitoring Map of PM10 of Jaranwala, Pakistan

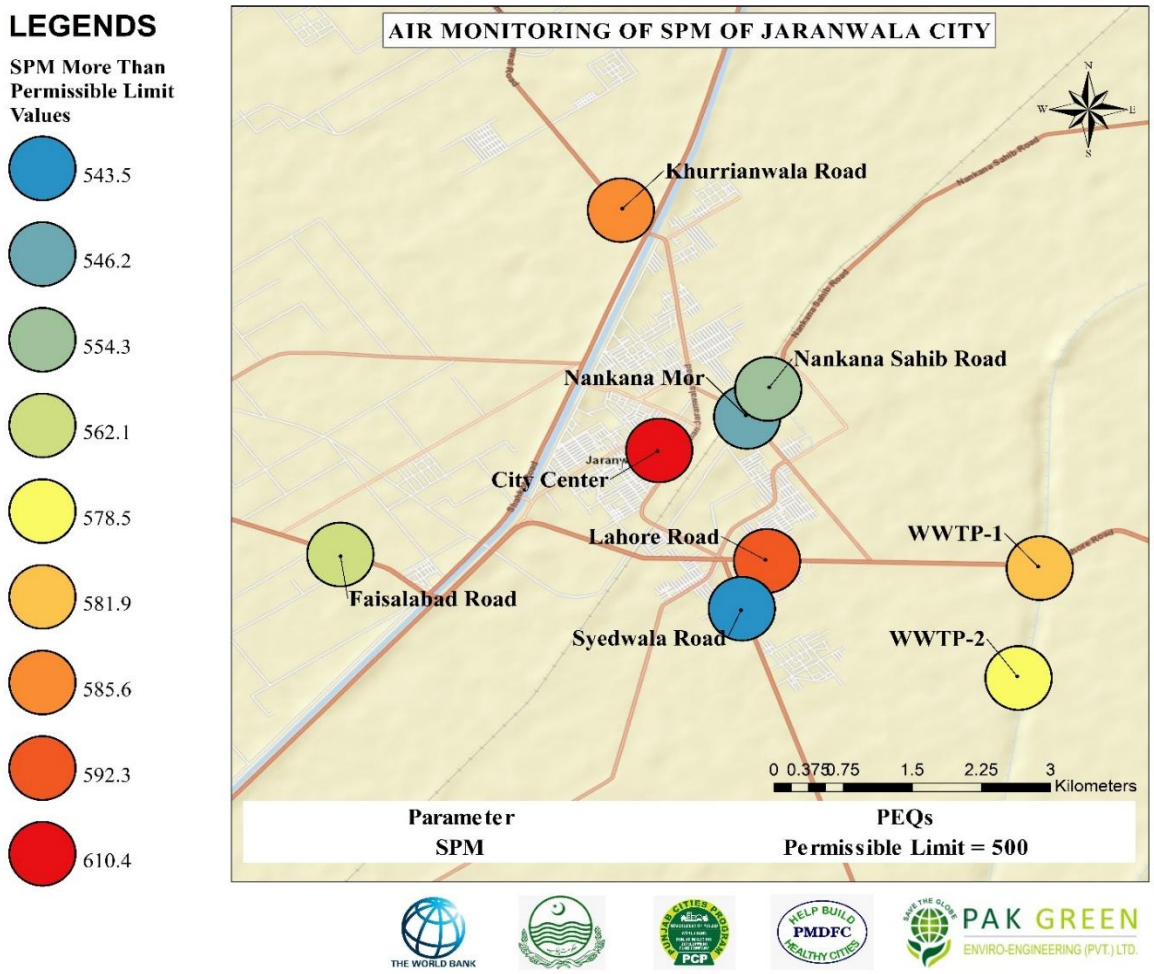


Figure 34:The Air Quality Monitoring Map of SPM of Jaranwala, Pakistan

Noise Level Analysis

Noise is considered to be a source of environmental pollution even though it is contemplated to be less damaging for humans when comparison is made with water, air or land pollution. However, when it comes project activities, noise will not be the major concern as there is no nearby residential areas that is likely to be affected due to generation of noise. At this stage, noise monitoring and analysis has been carried out and will be done during execution phase, if level exceeds to certain limit, then effective noise abatement measures are to be implemented to minimize the impact. Noise analysis has been carried out by EPA certified laboratory. The Noise analysis are given in table below and Lab reports of Noise Quality is attached as Annexure F.

Table 6: Noise sampling points and results

Sr. No.	Sampling location	Equivalent Noise dB(A)
1.	WWTP-Point 01	59.9
2.	WWTP-Point 02	60.7
3.	Lahore Road Jaranwala	61.9
4.	Nankana Mor	60.4
5.	Faisalabad Road	61.0
6.	City Center	62.3
7.	Syed Wala Road	61.4
8.	Khurrianwala Road	63.1
9.	Nankana sahib Road	64.3

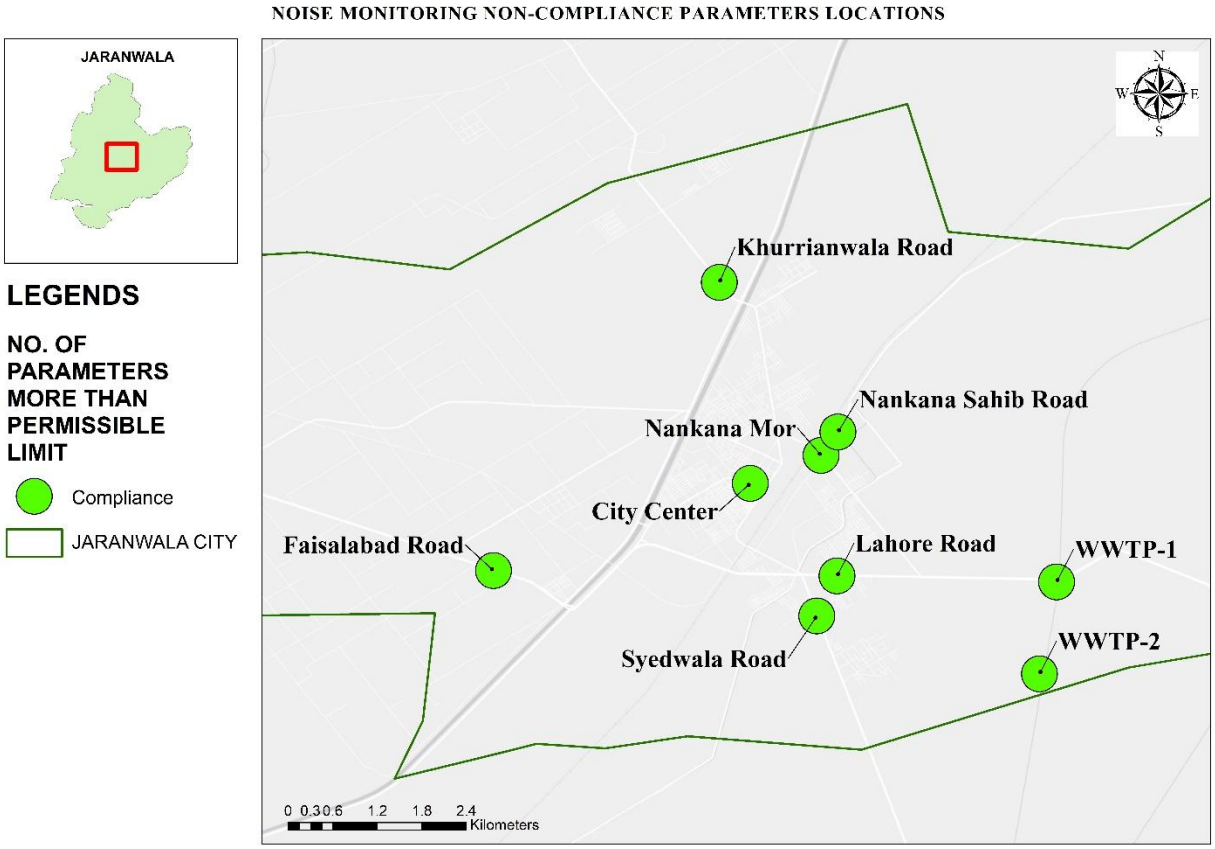


Figure 35:The Base map of Noise Level Monitoring of Jaranwala, Pakistan

Water Quality Analysis

Ground Water samples were collected from Twelve (12) different location near proposed site of sewerage network and WWTP. Selected water quality parameters describing physiochemical properties of the water have been carried out for describing the water environment and assessing the impact of the proposed project. Water Quality analysis has been carried out by EPA certified Laboratory Pak Green Pvt. Ltd. The water quality analysis is given in Table 9 below:

Table 7: Drinking Water Quality Analysis

Sr. No.	*Sampling location*	Source	Parameters not in compliance	Results	PEQs
1.	Nankana Road	Hand Pump	TDS	1500	1000mg/l
2.	Housing Colony	Hand Pump 110 Ft	TDS	1360	1000mg/l
3.	Kabir Town	Hand Pump 100 Ft	TDS	1760	1000mg/l
4.	Lahore Mor	Hand Pump 80 Ft.	Compliance		
5.	Aftab Town Near Punjab Hospital	Hand Pump 70 Ft,	Compliance		
6.	Master Park City	Hand Pump 70 Ft	TDS	1840	1000mg/l
7.	Khurrianwala	Hand Pump 110 Ft.	Compliance		
8.	Khurrianwala Road	T Tube well 160 Ft	Compliance		
9.	Faisalabad Road	Tube well 140 Ft.	TDS	1340	1000mg/l
10.	Syedwala	Tube well 150 Ft.	TDS	1345	1000mg/l
11.	Lahore Road	Tube well 150 Ft.	Compliance		
12.	WWTP Proposed Site	GW-1378,	Compliance		

Lab analysis reports of water quality is attached as Annexure G Water analysis map is given below in figure 30. The results of drinking water analysis shows that physical parameters (pH, Color taste, odor, turbidity are within permissible limits of Punjab Environmental Quality Standards (PEQs). While in 6 sample total dissolved solids are above the permissible limits

Chemical parameters Total Hardness, Aluminum, Antimony, Arsenic, barium, Boron, cadmium, Chloride, copper, Fluoride, Lead, Manganese, Mercury, Nickle, Nitrate, Nitrite, Selenium, residual Chlorine, Zinc, Phenolic Compound, Sodium, potassium, Total iron and Chromium are within permissible limits of Punjab Environmental Quality Standards (PEQS).

Similarly, Biological Parameter are within permissible limits of Punjab Environmental Quality Standards (PEQS).

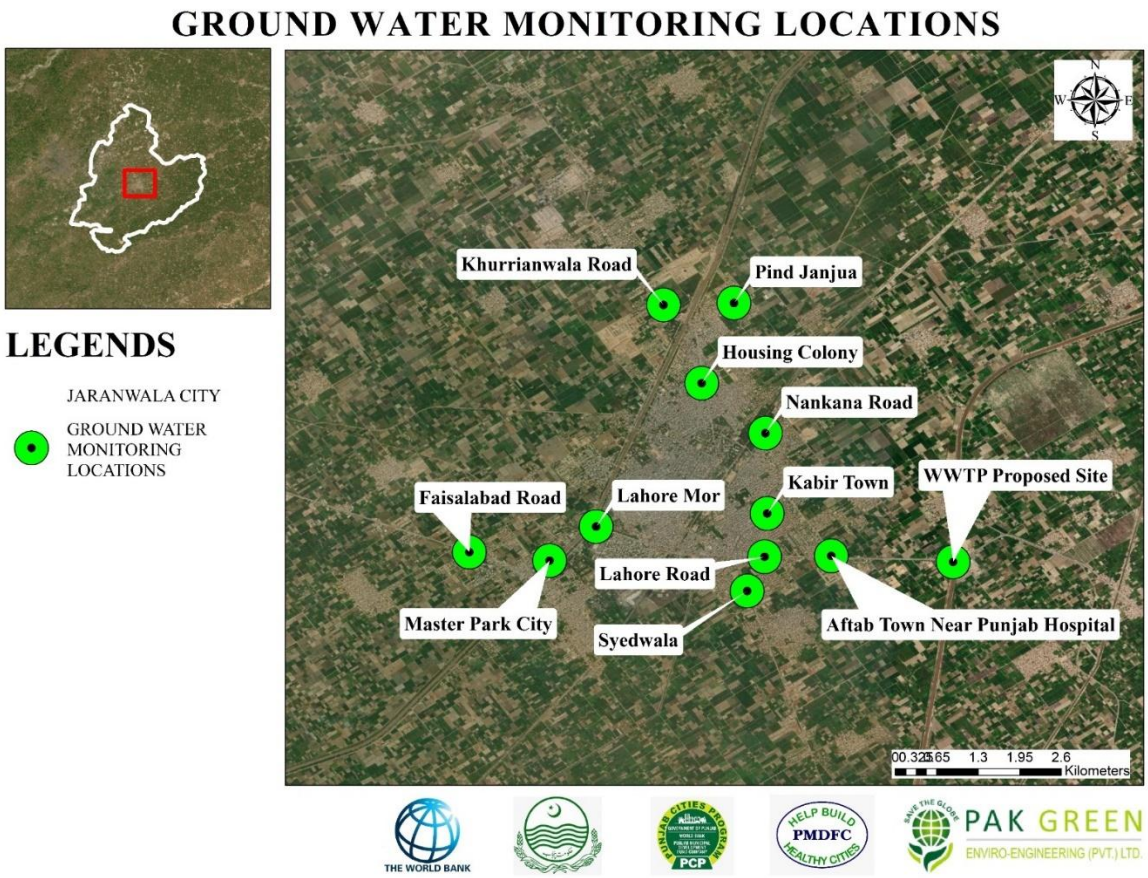


Figure 36: Base map of Ground water Monitoring Locations

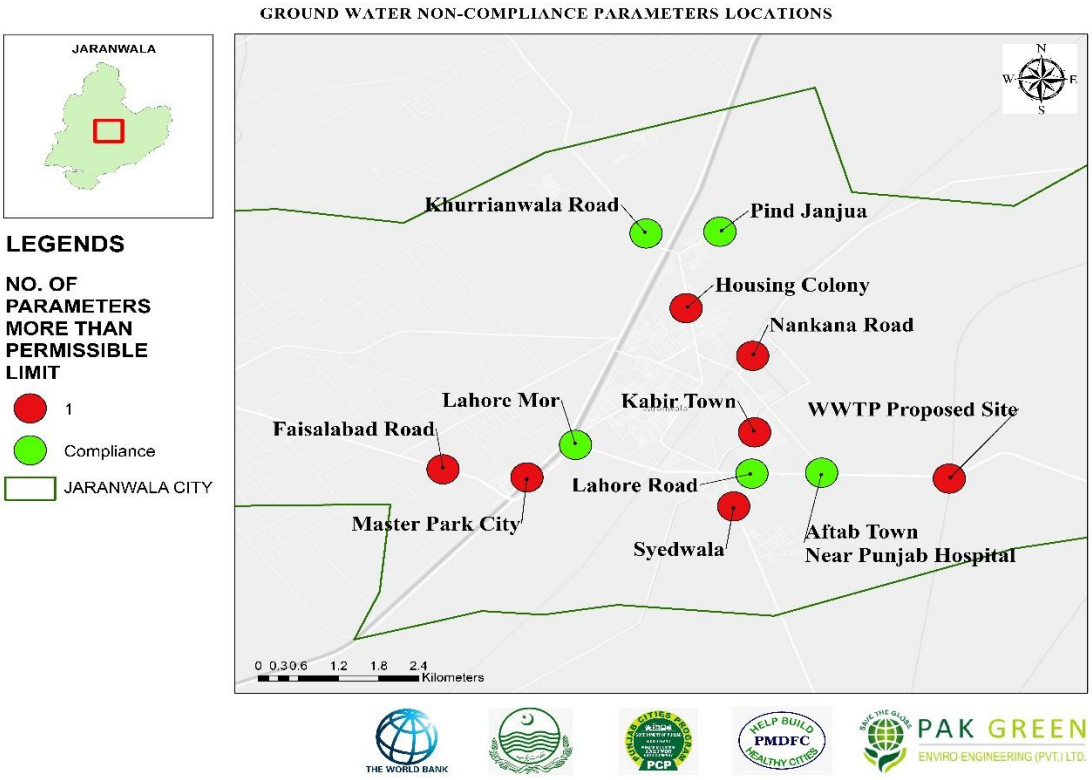


Figure 37: The Base map of non- compliance parameters of Ground Water of Jaranwala, Pakistan

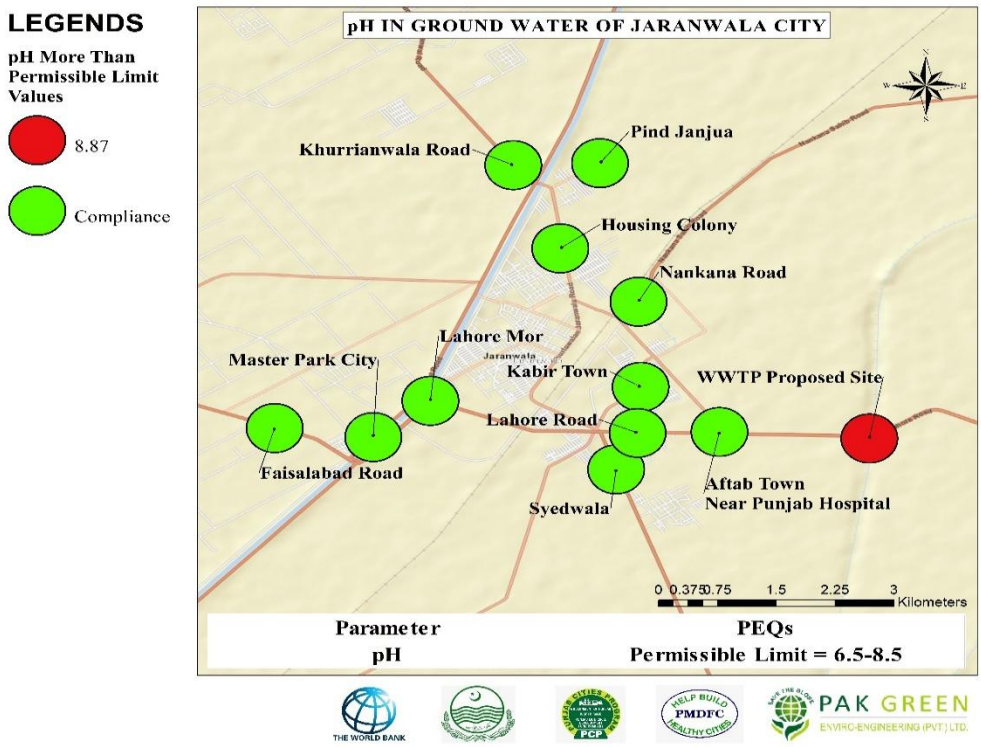


Figure 38:The Ground Water map of pH level of Jaranwala, Pakistan

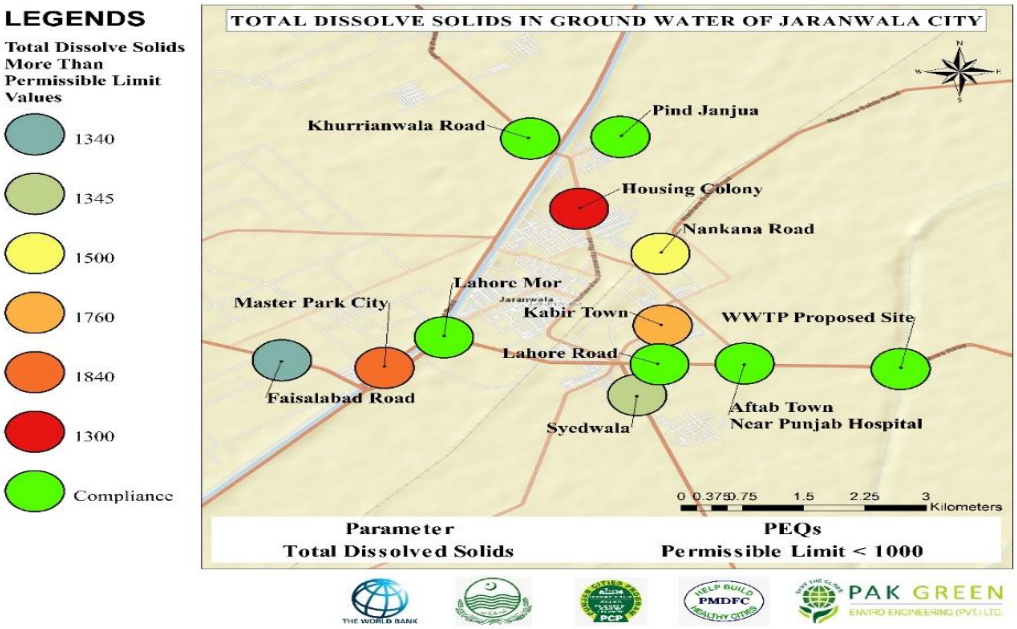


Figure 39:The map of TDS level in Ground Water of Jaranwala, Pakistan

4.2 Biological Environment

Biological baseline of the area has been collected using standard assessment technique based on primary and secondary information and inclusion of additional information collected during site visit, discussion with Government departments and meetings with groups of communities/public living in and around Project Area coupled with expert visual observations. Following is the description of the baseline ecological environment of the area.

4.2.1.1 Flora[18]

Jaranwala'a name originates from a Bohar, Bargad Banyan tree known as Jaranwala Bohar. Jaranwala is combination of two Punjabi words: Jaran and Wala, where Jaran means "roots" and "Wala" means place. Among plants and trees Shisham is very much common and useful tree which is used for wood work like furniture carved doors. Windows etc. Kikar (acacia) is another common tree found everywhere in the Jaranwala. Its wood is usually used as firewood, for making several agricultural implements. The land is abundaned by a number of other trees of several kinds and species. The soils are very fertile therefore, climate supports variety of agricultural crops and vegetables, with scare growth of indigenous flora and grasses. Original flora of the tract consisted of mainly of three kind of trees, Jand (Prosopis spicigera), Karir (Capparis aphylla), and Wan (Salvadora oleoides). Natural forest cover has been significantly reduced in the past. Some of the older stands of trees, consisting of these species still survive on slaught of urbanization in remote barren areas or in graveyards. The land owners also raised trees like Kikar (Acacia Arabica), Shisham or Tahli (Delbergia sissoo), Beri (Zizyphus jujube), Toot (Morus Alba), Sharin (Albizzia lebbek), Dherek (Melia azedarach), etc, along the boundaries of their agricultural fields. Pipal (Ficus religiosa) and Bohr (Ficus bengalansis) are grown for shade in their houses or deras. Pilchhi (Tamarix dioica) is found on moist sandy soil along the river and is used for wicker work & basket making etc. Among fruits, citrous fruit is in abundance here in both sweet as well as sour varieties, and a third variety with a taste between sweet and sour is also produced. Jaman (rennet) is also a common fruit of Jaranwala city. Green and yellow melon and Water Melon of different verities and size is a common fruit liked very much by the rural people.

4.2.1.2 Fauna[19]

The area, once covered with forests, and now has been converted into agricultural land. Most of the natural fauna has also been eradicated with the removal of natural Tropical Thorn Forest. Jaranwala is rich with its wild and domestic animals but the buffalo and cows of different varieties and species occupy the most important place for their qualities of milk and meat. Camel, Horse, Sheep, Goat. Donkeys, Dogs, Cats are found in abundance throughout the Jaranwala City. Among wild-animals or beast wolf, the wild-cat. pig, hares are found more or less all over the Jaranwala. The area (where the WWTP will be constructed) being agricultural land and is not very rich in wildlife Mammals. However, common mammals are Squirrel (Funambulus), Rats (Mus musculus) and Mangoose (Herpestes auropunctatus). Porcupine (Hystrix indica) is common and causes lot of damage to young plants and crops. Domestic animals include goats, sheep, camels, cows and buffaloes.

[18] The data was collected to the locals and Forest and Wildlife Officials during consultation

[19] The data was collected to the locals and Forest and Wildlife Officials during consultation

Another important domestic draught animal of the area is donkey which is used for pulling carts etc. a common sight in the tract. Common reptiles found in the area include snakes like Rat eater Snakes. Small and medium sized Lizards are also a common sight. Important bird species found in the tract are Common Crow, Common Mynah, House Sparrow and Common Teal are abundant in the area and are frequently sighted. Bulbul and Koel were also noticed in the project area during field visits.

4.3 Socio-economic Environment

This section presents socio-economic baseline of Tehsil Jaranwala established through a combination of primary survey data, secondary data and stakeholder consultation. Status of existing population, administrative setup, available healthcare services, and economic activity and literacy levels of the project area is essential to understand project affected communities, potential benefits to recipient and likely challenges, on the basis of baseline information, the impact of any project interventions are assessed and mitigation measures are proposed. The information also helps to indicate the specific issues to be monitored during project execution as well as during operational phase.

4.3.1.1 Jaranwala Snapshot

It is located 35 km southeast of Faisalabad and 110 km from Lahore. The city serves as the headquarters of Jaranwala Tehsil, an administrative subdivision of the district. The famous industrial area, Khurrianwala, is located in Jaranwala, and Makuana. Jaranwala is subdivided into 57 Union Councils. Jaranwala Town is the headquarter of the Tehsil Jaranwala under the jurisdiction of Faisalabad district which is located from 30º to 42’ to 30º to 47' North latitudes and 72º - 40’ to 73º to 40’ East longitude.

The tehsil is a flat alluvial plain formed by Chenab and Ravi rivers. The rivers Ravi flows along the south-eastern boundary of the district. The land close to the river is relatively lower than that away from the river towards the west. The area is exceptionally favorable for irrigation. There is no interruption in the monotony of the plain and there is only a fall of some 38 meters from north-east to the south-west of the district. The general elevation of the land is about 150 meters above the sea level.

4.3.1.2 Community Structure[20]

According to MMP’s socio-economic survey, the main ethnic communities in the Sub-project area are Rajpoot, Gujjar, Rehmani, Shiekh and Arain. Between the urban and rural population of the Sub-project area there is a marked contrast regarding gender equality, population composition and traditions. In the Sub-project area, majority of the people are Muslims with different caste systems.

4.3.1.3 History[21]

[20] Information taken during field visit

[21] http://tmashorkot.lgpunjab.org.pk/mcjaranwala.lgpunjab.org.pk/wwwroot/History.html

The city is almost 400 years old. According to legends, a Banyan tree with long hanging roots was positioned at the bank of a pond near Chak No. 240 GB. Because of that Banyan tree, the place was later to be known as Jaranwala. The word Jaranwala has two parts: Jaran and Wala. Jaran means roots and wala means place. Combining both words formed the name Jaranwala, meaning, and place of roots.

The existing city was founded by the British government in 1908. Mr. Micheal Ferrar deputy commissioner of Faisalabad inaugurated this town in 1909 and Sir Ganga Ram designed the city.

Bhagat Singh, who was an influential figure in the Indian independence movement, was born in Chak 105 GB which is now part of Jaranwala. There is a 100-year-old gate, the Pakistani Gate, in front of Rail Bazaar in Jaranwala, which was later redesigned and rebuilt by the town municipality.

4.3.1.4 Etymology[22]

Jaranwala'a name originates from a Bohar, Bargad Banyan tree known as Jaranwala Bohar. Jaranwala is combination of two Punjabi words: Jaran and Wala, where Jaran means "roots" and "Wala" means place.

4.3.1.5 Administrative Setup[23]

Under the PLGA 2013, The Tehsil Municipal Administration has been converted into Municipal Committee, which consists of The Administrator, Vice Administrator, Chief Officer, 4 Municipal Officers and other officials of the Local Council Service and officials of the offices delegated to the Municipal Committee. An Administrator is the head of Municipal Committee and exercises all functions and powers as have been assigned to him under the PLGA 2013. The Chief Officer is acting as coordinating and administrative officer in-charge of the Municipal Officers.

4.3.1.6 Demographic Status[24]

According to the 2017 Census of Pakistan, Jaranwala Tehsil has a population of 150,699. Its natives speak the Jatki dialect of Punjabi, while others speak other dialects, such as Majhi and Doabi.

4.3.1.7 Social and Religious Life

Generally, the dress of the people in rural areas consist of a shirt and majhla (a white cloth tied round the loins and reaching halfway below the knees), chaddar (a white cloth hanging loose on the shoulders), pug (a piece of thin cloth round the head) and a pair of chappals (shoes). In the cold weather they also wrap a blanket around their shoulders. The urban population also wears shirt and shalwar and the educated class wear European dresses. The women on festive occasions wear bright printed clothes of silken material in rural areas and generally in towns. A dupatta is an essential article of female dress. In winter, clothes are made of heavier materials. Punjabi is predominant language of the city. The staple food is chappati of barley or wheat flour made with butter, milk, ghee, and gram. Bajra, jawar and maize are also eaten. Farmers in the rural areas take two meals a day

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[22] https://trek.pk/jaranwala/

[23] https://mcjaranwala.lgpunjab.org.pk/about-us/administrative-setup/

24 https://www.pbs.gov.pk/sites/default/files/population/2017/results/05702.pdf

and drink milk and lassi. The urban population mostly eats chappatis, pulses, vegetables, mutton or beef. Now rice is also consumed in considerable quantity. The betrothals and marriage customs in this city are similar to those of many other districts of Punjab. On marriages the people of Jaranwala are known to spend large amount of money and run into debts as well. Generally, watta-satta system i.e. Exchange of daughters given in marriage is practiced. Such marriages at times are not successful. Family feuds arise and last for generations. These are not being encouraged now. A few days before marriage, a ceremony known as Mehndi is celebrated in which hands and feet of the bride are smeared with Henna (Mehndi). On the marriage day bride groom goes in marriage procession to the house of the bride where Nikkah is performed and the bride leaves with the groom and stays with her in-laws for a few days and then returns to her parent's house after the Walima (reception) ceremony. After a few days / weeks groom goes to his father in law's house to bring his bride back. This visit is called Muklawa.

When a child is born, Maulvi of the village Mosque says Azan in his / her ears. When the child is a week old his head is shaved, called the Jhand, people sacrifice two goats for a boy and one for a girl and the meat is distributed among the poor, friends and relatives. This custom is called Aqiqa. Deaths are hideously mourned in some families and work is suspended for many days. In uneducated classes, the death of the octogenarians is celebrated like festivities.

4.3.1.8 Culture[25]

Culture can be defined in many different ways. Culture may be defined as behavior peculiar to human beings together with material objects used. Culture consists of language, ideas, values, attributes, beliefs, customs, codes, institutions, work and art, religion, law, morality, ceremonies and festivals. Its rich cultural heritage and vibrant local customs. The city has a diverse population that is made up of various ethnic and religious groups, each with its own unique traditions and customs. One of the most important aspects of Jaranwala's culture is its traditional music and dance. The city has a rich tradition of folk music and dance, and local performances can often be seen at festivals and celebrations. Religion plays an important role in the city's culture. The majority of the population is Muslim, and the city has a number of mosques and religious institutions. There are also a number of shrines and tombs of Sufi saints that are considered to be important cultural landmarks. Its traditional crafts and artwork. The city has a number of artisans and craftsmen who produce a wide range of traditional handicrafts, including pottery, textiles, jewelry, and woodwork. Food is also an important part of Jaranwala's culture. The city has a diverse culinary tradition and is known for its spicy and flavorful dishes. Local specialties include dishes such as korma, biryani, and tikka.

[25] https://www.traveltill.com/destination/Pakistan/Jaranwala/culture.php

Pictorial View

4.3.1.9 Languge[26]

The main languages spoken in Jaranwala, Pakistan are Punjabi and Urdu. Punjabi is the local language of the region and is spoken by the majority of the population. Urdu is also widely spoken and is the national language of Pakistan. Many people in Jaranwala also speak English, which is used in education and business. Punjabi is a rich and diverse language that has many dialects, and in Jaranwala, the most commonly spoken dialect is known as “Majhi” which is considered the standard dialect of the Punjabi language. This dialect is spoken by the majority of the people in the region and is considered to be the most widely understood dialect of Punjabi.

4.3.1.10 Economy[27]

Jaranwala is the centre of a purely agriculturally based society. Agriculture is the chief source of income and employment in Jaranwala. Wheat and cotton are the principal crops. Other crops grown include rice, sugarcane, corn (maize), oilseeds, fruits, and vegetables. Livestock and poultry are also raised in large numbers in Tehsil Jaranwala.

Economic activity in Jaranwala has picked up considerably in recent years, due to cheaper land and relatively skilled labour. Due to favorable conditions for agriculture, a number of crops are grown in the area, including Rabi, Kharif, sugarcane, cotton, wheat, bajra, maize and rice. Jaranwala is also famous for its handicrafts mastered by Jaranwala via artists and artisans. The economic status of local population is poor and middle class. The per capita income is Rs. 12,000 to 20,000 per month

[26] https://www.traveltill.com/destination/Pakistan/Jaranwala/culture.php

[27] https://www.traveltill.com/destination/Pakistan/Jaranwala/economy.php

approx. People mostly work on daily wages (labor). Some people do their own small business-like shops, vendors etc.

Famous Ghalla mandi (grain market) is one of the busiest markets in Punjab. It is also the most prominent buyer of fertilizers by volume in Pakistan. Jaranwala has one commercial sugar processing mill, Husein Sugar Plants.

4.3.1.11 Industry[28]

Jaranwala has fertile land. It produces crops like rice, wheat, sugarcane, vegetables and fruits. Jaranwala grain market is one of the busiest markets in Punjab. In Jaranwala Tehsil most of the people are farmer in profession in villages. They are engaged in agriculture either directly or indirectly. Industrial labour has increased after the establishment of factories in different places of the city. Some people are engaged in-business and Government service also. Irrigation through the modern canal system makes the land highly fertile. The area is abundant in lush green fields and farms. Wheat, corn, rice, and sugarcane are famous crops that are cultivated here. The farming of fruits and vegetables is plentiful as well.

The city is famous for its two prominent things: Ghalla mandi and industry. The expansion of the modern industry on the outskirts of Faisalabad is outreaching Jaranwala. Khurrianwala is the famous industrial area located at Jaranwala Tehsil. Notable industries include:

- Rafhan Maize Items Plant
- Crescent Jute Items Ltd. built up in 1965, this was the biggest jute plant in Pakistan. It is now closed.
- Aslam Textile Mills
- Husein Sugar Mills
- Lyallpur Chemicals & Fertilizers Restricted, Jaranwala

Famous Ghalla mandi (grain market) is one of the busiest markets in Punjab. It is also the most prominent buyer of fertilizers by volume in Pakistan. Jaranwala has one commercial sugar processing mill, Husein Sugar Plants. "The economic status of local population is poor and middle class. The per capita income is Rs. 15,000 to 30,000 per month approx. People mostly work on daily wages (labor). Some people do their own small business-like shops, vendors etc.

4.3.1.12 Natural Resources

a) Agriculture[29]

It was reported during community consultation that although farming is widely practiced in the project area, Families undertake subsistence agriculture on small plots of land and seek to produce enough food to feed their families. Often the yields are not enough to feed the family until the next harvest. This has been attributed to the lack of rain, tools, and poor farming methods, prolonged droughts, pests and diseases. Since agriculture is the source of income, food and general livelihood for these

[28] http://www.amis.pk/AgroBase/Jaranwala.aspx

[29] Information taken during consultation

rural farmers, sometimes they are faced with situations where they have to sell part of their produce to cater for emerging basic needs such as access to health facilities, payment of school fees etc. In many cases they sell their produce at very low prices because the market is not readily available. Middlemen exploit them when they are desperate to sell. Jaranwala has fertile land. It produces crops like rice, wheat, sugarcane, vegetables and fruits. Its grain market is one of the busiest markets in Punjab. It is also the biggest consumer of fertilizers by volume in Pakistan.

4.3.1.13Important Places[30]

The city has been famous throughout history for its multicultural and multi-ethnic diversity. Kot BalakRam is a historic place. Shiv mandir was built in 1909. Khalsa Gurdwara, a congregational worshiping place of the Sikh community, was built in 1931. Hindu temple Gita Bhavan was built in 1934.

At Lakar mandi, there situated a church of historical significance as well. Famous Mahtab Masjid is located at the Jaranwala gate. The most significant attraction of this city, which makes it unique from other cities, is Ghoda (Horse) Train.

Sir Ganga Ram, a civil engineer, and architect by profession established this mode of transportation in 1903. This city is also famous for being the great freedom fighter's birthplace: Bhagat Singh, who was born in 1907 at Chak 105 GB. Mirza, of the famous tragic romance folklore of Punjab, Mirza Shahiban, also belongs to this tehsil. The city hosts tourist attraction points and archaeological finds. The remains of the palace constructed by Dara Shikoh, eldest son of Mughal emperor Shah Jehan, is of historical significance. The palace was constructed as a hunting ground for Mughal emperors.

4.3.1.14Water Supply System[31]

The existing water supply system was constructed by Public Health Engineering Department in the year 2006-08. The city was divided in three zones with respect to the commanded area of the water sources. The detail of the components is given in following paras.

The inhabitants have their own water sources such as hand pumps or motorized pumps. Due to lack of awareness about potable water, the citizen is extracting contaminated water from the shallow aquifers. However, 07 No's ultrafiltration plants have been installed in the city for supply of potable water to the citizen and most of the residents are fetching drinking water from these filtration plants.

The city has brackish sub soil water which is unfit for human consumption. Gogera Branch Canal (GBC) is flowing at the western periphery of the city and Burala Branch Canal is flowing at the eastern periphery of the city. Both canals have developed fresh water belts along both of the banks because of the seepage of fresh water from the sides and bed of the canals. Skimming tube wells have been installed on the banks of these canals to harness fresh subsoil water from the shallow aquifers being recharged by these canals.

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[30] https://www.pakpedia.pk/jaranwala/

[31] Gap Analysis Report, Jaranwala

4.3.1.15 Sewerage System[32]

The coverage of the sewerage system is 60% of the total city area. In most of main streets and roads main sewers have been laid but lateral sewers in the streets have not been laid. On some of the main roads, gravity flow sullage carriers have been constructed to tap the water from the surface drains. These sullage carriers have enough sections to take the storm water as well but in dry weather these sullage carriers take the dry weather flow from the streets. The city area is divided in three drainage areas which are drained off through four disposal stations and streets.

4.3.1.16 Solid Waste Management [33]

The city has low efficiency in solid waste management because the resources available to handle the solid waste are too meager to serve the entire area of the city. The entire city is not served with solid waste collection and disposal. The efficiency of the services is 65% as given below. Most of the areas of the city remain either un-served or these are partially served.

4.3.1.17 Location of the Sensitive Receptors in the Sub-project

There are so many sensitive receptors are located near the proposed sub-project components like schoold, masjids and hospitals. No public infrastructural damage is envisaged as per scope of work. No settlements, cultural heritage sites, graveyard, hospital etc. will be disturbed by the Sub-project. Alternate access routes are available to facilitate commuting during the implementation of the Sub-project. Anticipated impacts of the Sub-project are presented in Chapter 6. To overcome localized social & environmental impacts; mitigation plan has been prepared. Sensitive receptors and their respective sensitivity are listed in the Table 10.

Table 8:Sensitive Receptors

Sr#	Packages	Receptors	
1.	Laying of Trunk RCC sewers (18- 60 inch) of (Eidgah to kalma chowk along Faisalabad Road and shero aana pull to committee chowk), and De silting of Sewer Lines, Jaranwala	07 Mosque, one shrine13 school, 5 collages, and 01 madrassa ,01 Govt Hospital and 15 are Private, One Graveyard within 100 meter of subproject sites	Anticipated negative impacts are Odor and Air quality, Noise pollution, Traffic disruption . **Mitigation measures** are as follow: • odor control measures such as chemical dosing, covers on sewage channels, and ventilation systems will implement to minimize odors. • Maintenance will be ensured that the sewage system is in good working
2.	Rehabilitation and Laying of Trunk and sub main RCC sewers (9- 36 inch) of (Chack 128, Rasheed Park, Altaf Park, Usmania Park, Mahmood colony,	05 Mosque, one shrine 10 school, 2 collages, and 01 madrassa One	

[32] ibid

[33] ibid

	Islam pura, Grid Station, shah Jamal Park, Ahmad Park, Sreet no 1,1,3 Bilaal Park, Chamra Mandi, shahid Town, Gillani Mohallah, Bheek Colony,) of Zone II, Jaranwala	Graveyard within 100 meter of subproject sites	condition, reducing the likelihood of leaks or odors. • traffic management plan will develop to minimize disruptions during construction and maintenance activities. work will schedule during non-peak hours if possible. • Consider providing alternate routes or access points to schools, mosques, Madrassas and Graveyard during construction or maintenance to minimize disruptions. **Positive impact**: The sewage system contributes to improved sanitation and public health by effectively managing wastewater
3.	Laying of Forcemain from 240 Morr Disposal toward WWTP Site, Jaranwala.	The force main of length 12140 ft is laying 10 Mosque, one shrine01 Vocational institute, 2 Schools, 01 Masjid ,01 madrassa, One Graveyard	
4.	Rehabilitation of Disposal Station Near 240 Morr, Jaranwala	1 Mosque and 01 Shrine 01 graveyard	
5.	Waste Water Treatment Plant Jaranwala City. (55 Acre approx.)	viii- Farmers Dera ix- Crops (Sugarcane, Wheat, Vegetable (Polls Shed/Tunnel technology) etc.) x- Guava Farms xi- Citrus (Lemon) Farm xii- Trees Tube Wells (Approximately 4)	ARAP has been developed for compensation.

Vocational Training Institute
Jaranwala

INFORMATICS
JARANWALA CAMPUS

GOVT. GIRLS
PRIMARY SCHOOL

FUNGO FOUNDATION

A W

ابراهیم فارمیسی

FARAN
485
485

THE EDUCATORS
A Project of Innovations
AL-WASAY CAMPUS

HAYAT EYE CENTER

ARMY FOUNDATION
HUSSAIN LAW COLLEGE
Army Foundation

تحصیل ہیڈکوارٹر ہسپتال جڑانوالہ

DIVISIONAL PUBLIC
SCHOOL & COLLEGE

النور
پبلک گرامر گرلز ہائی سکول

GOVT ELEMENTARY SCHOOL

P.S.F
COLLEGE OF SCIENCE & ARTS

زاہدہ بتول کیمپس

Figure 40:Sensitive Receptors

4.3.1.18 Transportation[34]

Jaranwala is 10 kilometres (6.2 mi) from the M3 motorway interchange. There are daily bus services from and to Lahore and Faisalabad. There are many trains coming from Lahore on the Shorkot–Sheikhupura Branch Line. The nearest airport is the Faisalabad International Airport, which is approximately 50 kilometres (31 mi) from the city.

4.3.1.19 Main roads

There are seven main roads from Jaranwala to other cities.

- Lahore - Jaranwala Road
- Faisalabad - Jaranwala Road
- Jaranwala - Nankana Road
- Jaranwala - Satiana Road
- Jaranwala - Shahkot Road
- Jaranwala - Khurrianwala Road
- Jaranwala - Syedwala Roadfor tourists or visitors.

4.3.1.20 Telecommunication

Particularly telecommunication services, plays a role of significant importance in connecting distant people either through wired or wireless voice services. These telecommunication technologies have been changed immensely in the last twenty years.

The Cellular Service Providers in the city include Mobilink, Telenor, Ufone, Warid and Zong. The map on right, identifies total number of telecommunication towers distributed over the different parts of the city.

4.3.1.21 Tourism[35]

The city has been famous throughout history for its multicultural and multi-ethnic diversity. Kot Balak Ram is a historic place. Shiv mandir was built in 1909. Khalsa Gurdwara, a congregational worshiping place of the Sikh community, was built in 1931. Hindu temple Gita Bhavan was built in 1934. At Lakar mandi, there situated a church of historical significance as well. Famous Mahtab Masjid is located at the Jaranwala gate. The most significant attraction of this city, which makes it unique from other cities, is Ghoda (Horse) Train. Sir Ganga Ram, a civil engineer, and architect by profession established this mode of transportation in 1903. This city is also famous for being the great freedom fighter's birthplace: Bhagat Singh, who was born in 1907 at Chak 105 GB. Mirza, of the famous tragic romance folklore of Punjab, Mirza Shahiban, also belongs to this city.

The city hosts tourist attraction points and archaeological finds. The remains of the palace constructed by Dara Shikoh, eldest son of Mughal emperor Shah Jehan, is of historical significance. The palace was constructed as a hunting ground for Mughal emperors.

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[34] https://trek.pk/jaranwala/

35 https://khushhaalpakistan.com/jaranwala/

4.3.1.22 Healthcare Facilities[36]

Health is the most important factor which plays the key role in determining the human capital. Better health improves the efficiency and the productivity of the labour force and thus ultimately contributes the economic growth and leads to human welfare. On the other hand, there is a strong relationship between poverty and poor health. Health facilities include hospitals, clinics, maternal & birth centers, dispensaries and other forms of health care centres. No one can deny the role of hospitals. However, hospitals in Jaranwala are doing a good job in maintaining a healthy society. Jaranwala is among the important cities of Pakistan and different hospitals are present in the city. They are providing medical attention and nursing care to people of different age groups. The majority of hospitals in Jaranwala have specialized staff and equipment. Hospitals in Jaranwala can be categorized into different classes. There are General Hospitals that offer different types of healthcare facilities with limited capacity. They provide treatment to patients with different various disease conditions such as surgical, obstetrics, medical, pediatrics, ENT, etc. On the other side, special hospitals usually limit their service to specific medical conditions such as oncology, geriatrics, maternity, orthopedics, and others. However, the aim of teaching cum research hospital is to provide education in different domains such as pharmacy, dental, or nursing besides offering medical care. City International Hospital.

Table 9:Health Facilities

Sr.No.	Health Facilities by Type	Numbers
1.	Basic Health Unit	50
2.	Dispensaries	19
3.	Rural Health Centre	05
4.	Tehsil Head Quarter	01
5.	Private Hospitals	07

4.3.1.23 Educational Facilities[37]

Education is a prerequisite for good governance and sustainable national development because it transforms people into good citizens, equipped to contribute to the social-economic transformation of the nation. In general Literacy levels in the city has improved and continue to be a priority among development strategies. Due to data constraints in terms of various indicators of quality inputs, this section only described the available physical facilities in schools, which is the most important pillar of quality input to education. School buildings, drinking water, boundary walls, electricity and toilets for students are considered basic facilities (Table 12).

Table 10:Education Facilities

Sr.No.	Education Facilities by Type	Numbers

[36] Primary and Secondary Healthcare Department (Govt. of the Punjab)

[37] School Information Centre (Govt. of the Punjab)

1.	Schools	608
2.	Collages	07
3.	Post Garaduate Collages	02

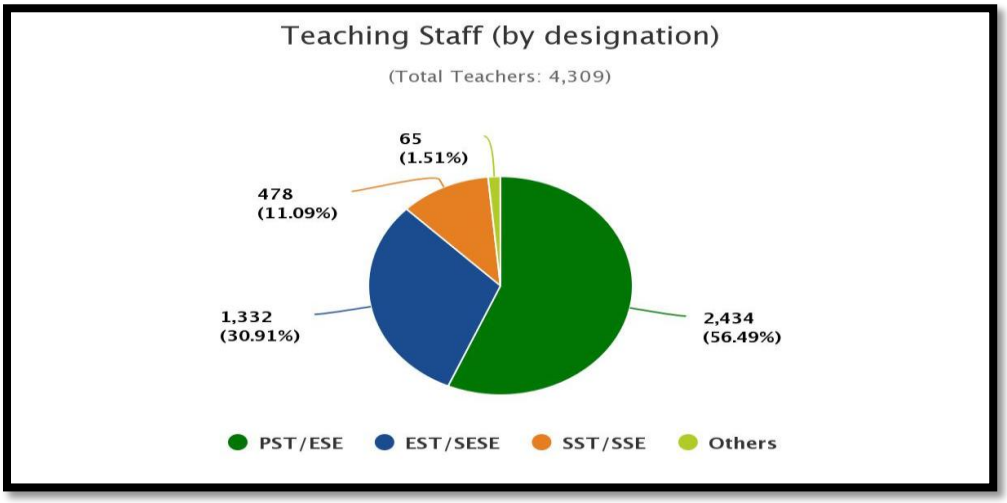


Figure 41: Teaching staff (By Designation)

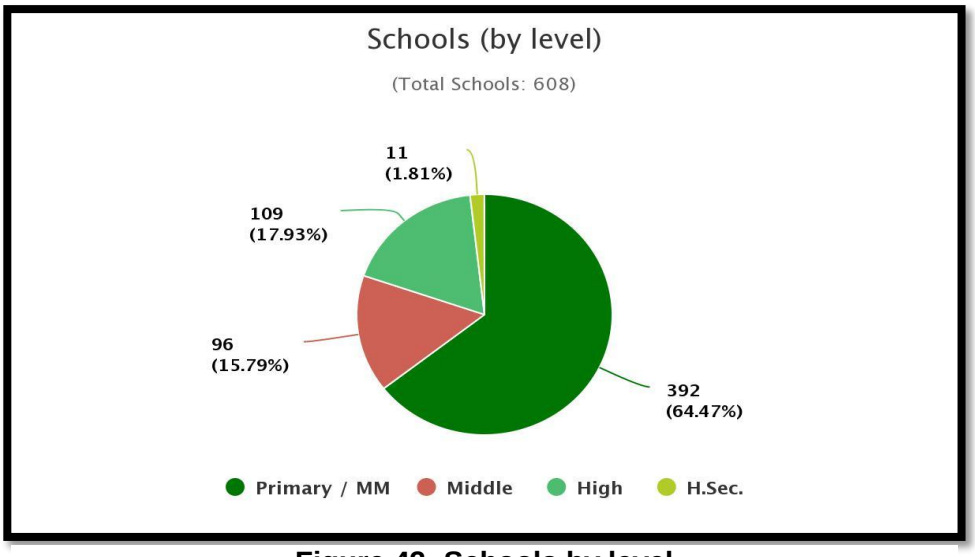


Figure 42: Schools by level

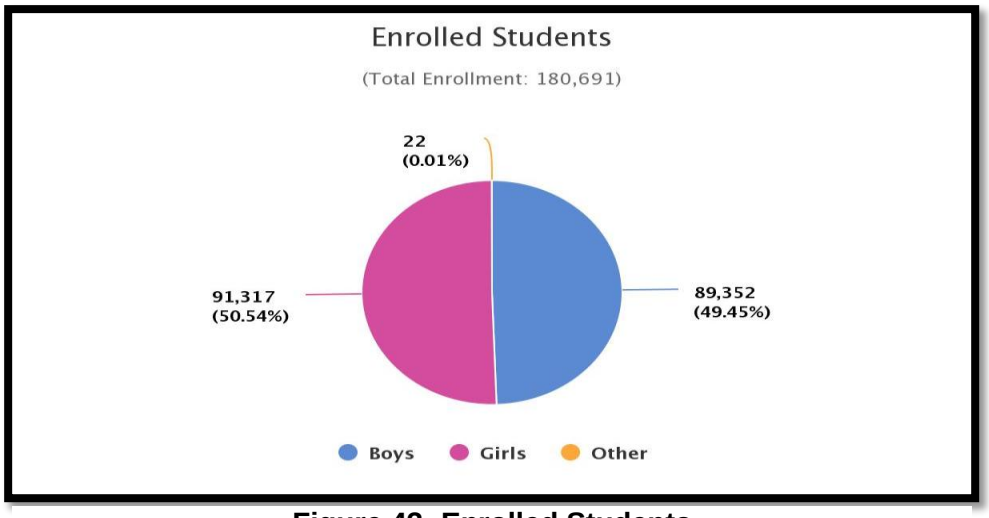


Figure 43: Enrolled Students

4.3.1.24 NGOs and Social Organizations[38]

There are many NGOs working in the Jaranwala City. There is a strong group of non-profit organizations that are involved in the rehabilitation, counselling and financial support of the communities. The famous NGOs working in the area are Social Welfare Society, Natural Life Development Organization, Anjuman Islah-e-Moashra Islam Pura, Rural Community Development Welfare Organization Chak No. 124 G.B, Patient Welfare Society THQ, Anjuman Flah-e-Binnat, Ikhlaki Islahi Tanzeem, Social Youth Organization Buchiana, Roshan Welfare Foundation, Itfaq welfare Society, Helping Hands Foundation, ehrik-e-Khidmat-e-Insani, Anjuman Samaji Behbood and Insan Dost Tehrik.

4.3.1.25 Mechanism for Resolving Disputes

According to normal social practices in the society, people have various disputes / conflicts on different issues like other parts of the country. During survey, the people in the Sub-project area told that they have two options available for conflict resolution. First is the government judiciary system and second is mutually resolution of dispute (Council of elders) system. The people of Sub-project area are believed to be peaceful but sometimes a dispute between two individuals, from two casts, may generate problems. Usually, the individuals go to government Judiciary system if they are not satisfied with their own resolutions. Ordinarily, whenever there is a dispute between two persons /parties, the notables of one side go for reconciliation to the other party and sit together to resolve the issue. Sometimes the dispute is resolved through imposition of penalties in the form of cash, land and kind. In case of serious matters local political influential intervene to settle the dispute. Police and court of law is the last option.

4.4 Gender Issues in the Sub-project area

Women in Pakistan are playing an important role in the society, with the majority living in the rural areas. However, the condition of women in the country is very adverse especially in rural areas. Gender issues are gaining importance in development projects because female members of the community are generally neglected while designing, assessing and implementing such projects.

[38] https://swd.punjab.gov.pk/system/files/faisalabad.pdf

Females are generally more vulnerable than male members of the society. The FGD with female members of communities was the main source of data collection for the women folks of the settlements near the Sub-project. The female is horizontal bonding within social capital, whose opinion and decisions are always considered as vital and final on gender aspects of socio–economic issues, therefore, women were taken on board in FGDs. All women in the focus groups were within the age group of 30 to 50 years. The educational level of participants is very low.

Mostly consulted women are housewives and remain engaged on a full-time basis in household chores including food preparation, cleaning / housekeeping, caring and rearing of children and taking care of old and sick members of the family. Some of the women were contributing in household income through both indoor and outdoor activities, such as teaching, dress making and shop keeping. These numbers are likely indicative of the role's women play in the Sub-project area. Women are also engaged in the informal rural economy through the rearing of animals.

In general, the project area reflects a male dominated society. Women face difficulties in getting education and are not consulted for most of the decision–making processes. The gender situation is affected by early marriage of girls, restriction on women's mobility and many household chores. Women in project area have been victim of patriarchy, male chauvinism, social discrimination, resource deprivation and denial of human rights. Despite constitutional and legislative provisions, the customary law often prevails making it difficult for women even to claim their legal rights which are supposedly guaranteed. Although Islamic laws of inheritance provide a share to daughter in father's property but the custom does not allow it.

The economic participation of women in the project area is different from that of men. Women participate in both indoors and outdoors duties which are considered to be a free labour. Women fetch water, collect fuel wood, look after animals, fetch fodder for cattle, process milk into butter, sour milk and cheese, and work with wool. Mostly women in project areas they performing house hold activates cooking serving foods and washing clothes and other dependent members. Whereas participation of rural women in agricultural activates is very low. Women are very good at producing handicrafts they made traditional cloths, handmade crochet, Cushion and bed sheets. The traditional polygamy keeps them victim of inferiority complex. Mostly women practiced Pardah (Segregation) and overall women Autonomy is very weak. The women without children are treated as an outsider by the family including her husband.

4.5 Primary Socio-economic Condition of the Project Area

4.5.1.1 Overview

The socio-economic baseline has been developed in line with tasks outlined in the Terms of Reference for the assignment. Socio–economic baseline of the project area has been established by utilizing both primary and secondary data sources. In addition, baseline was strengthened by socio-economic survey of the respondents living within the sub-project area. During survey, primary data has been collected through formal and informal consultation with primary stakeholders.

The review of the present assignment suggests that the fundamental logic behind the present multi-sectorial and multi-dimensional strategy for the project rests on the consultation process including participation, inclusion, ownership and equity of genuine development of resources on a sustainable

basis through this survey. The socio-economic survey has been designed keeping in view the following essentials of the sub-project;

a) Civic amenities acceptability,
b) Technical appropriateness,
c) Supply-demand gaps
d) Financial viability,
e) Environmental friendliness,
f) Pro-poverty reduction,
g) Gender positive and
h) Long-term sustainability prospects

4.5.1.2 Socio-economic Baseline

Socio-economic baseline has been developed with the aim of having information about main socio-economic characteristics prevailing in the sub-project area. The study will also serve the purpose of providing knowledge about the livelihood and other main conditions of the primary stakeholders of the project area which will help to plan the project which will be socially acceptable and beneficial for the area. Baseline information consists of both secondary and primary sources of data.

The information regarding socioeconomic baseline survey is based on the primary data collected from the Project Area through field visit that was carried out. There were two basic aims of the survey; firstly to inform and consult the local communities about what is the proposed project and what would be the likely interventions and impacts and secondly to carry out an in–depth socio economic survey to establish the baseline and socio economic conditions. Some basic objectives of the study presented as under;

- To know about the socio-economic conditions, depth and associated civic amenities characteristics of the communities in the targeted area.
- To assess the existing situation of the proposed sub-project area.
- To analyse the socioeconomic impact of the proposed sub-project on the adjacent communities.
- To collect the communities expectations and fears about proposed sub-project.
- To specify the issues to cater during the sub-project implementation.
- To build a prior trust between stakeholders of sub-project and concerned communities.
- Providing an opportunity for the public to influence the sub-project design in a positive
- manner;
- Increasing public confidence in front of proponent, reviewers and decision makers;
- Providing better transparency and accountability in decision making;
- Reducing conflict through the early identification of contentious issues, and working *through these to find acceptable solutions; and*
- *Creating a sense of ownership of the proposal in the minds of the stakeholders.*

4.5.1.3 Approach and Methodology for Socio-economic Survey

The following two approaches has been adopted for data collection.

- Consultative approach

- Participatory approach

A consultative approach has been adopted with the aim of completing a survey for information collection, which based on shared expectations and joint ownership. The process has been started with review of the previous data/studies/investigation/survey reports for the need of the sub-project.

A participatory approach advocates actively involving 'the community' in decision-making processes, whereby the relevant 'community' depends upon the topics addressed during the consultation. The community can be informant persons, average citizens, the stakeholders of a particular project or policy, experts and even members of government and private industry. In general, policy processes can be seen as a three-step cycle of planning, implementation and evaluation, whereby a participatory approach may be used in some or all of these steps. Primary data has been gathered and analysed by the MM Pakistan's civic amenities experts. A comprehensive questionnaire was framed which is prepared by PMDFC for primary data collection. Data was collected from respondents which were randomly selected in such a way that the selected sample was the true representative of the sub-project area.

Quantitative and qualitative data has been populated into Excel spreadsheets and organized in tables and graphs. Averages and percentages has been calculated while patterns and trends has also been noted. Surveys responses have provided valuable information on perceptions and opinions on socioeconomic conditions in the sub-project area.

4.5.1.4 Important Socioeconomic Features

Important features of the socio-economic baseline of the community members has been described as following;

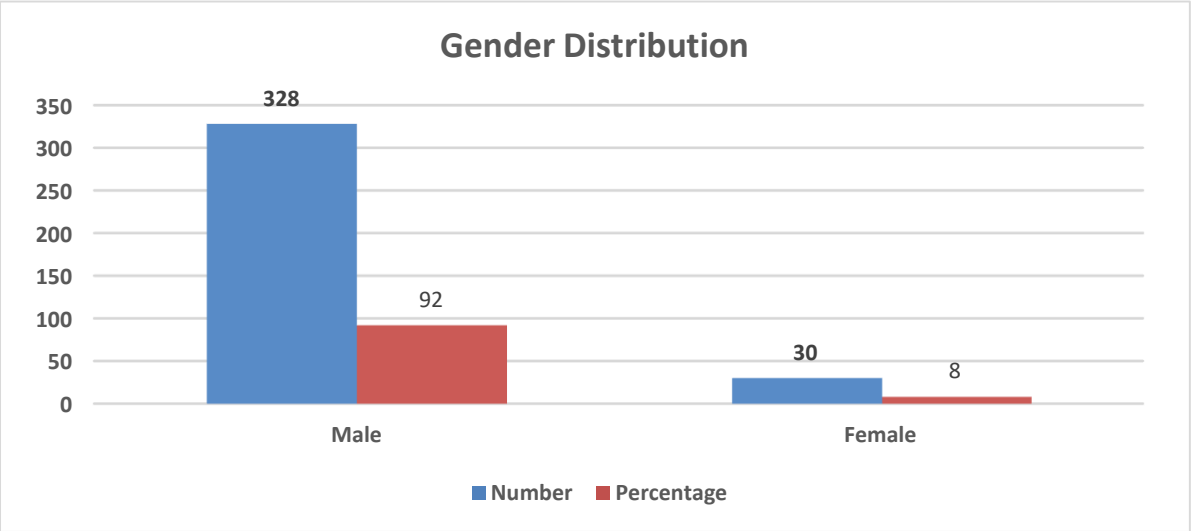
- Gender Distribution
- Age Composition
- Education Level
- Occupational Status
- Ethnic Structure
- Language
- Religion
- Family System
- Income of the Respondents
- Expenditure of the Respondents
- Ownership Status of the Houses
- Housing Construction Pattern
- Mode of Transport
- Civic Amenities
- Health Facilities
- Education Facilities
- Mechanism for Resolving Disputes
- Acceptability of the Proposed Project
- Current Issues related to the Sewerage System in Jaranwala City
- Gender Analysis

Gender Distribution

About 358 respondents, comprising 92% male and 8% female population in the Sub-project was contacted to carry out socio-economic and impact assessment survey. Although only 8% female respondents sample was not a sufficient representation in the study but due to un-interested attitude and law and order situation in the sub-project area, it was difficult to have an access to the females in households or females refused to provide such information. Females were reluctant in providing any information. Table Below shows gender distribution of the sampled respondents.

Table 11:Gender Distribution of the Respondents

Gender Distribution	Number	Percentage
Male	328	92
Female	30	08
Total	358	100



Age Composition

The demographic characteristics of the survey show Table below that 3.35% of the respondents were 16 to 20 years of age. About 12.80% and 12.20% of the respondents were between the age group of 21 to 25 years and 26 to 30 years respectively. About 10.98% and 13.71% of the respondents were between the age group of 31 to 35 years and 36 to 40 years respectively. The remaining 46.96% were bearing up to 41 years of age and above of this age group. These age brackets of the respondents

show that by and large respondents were mature enough to express their opinion/concerns about construction of proposed Sub-project and foresee its impacts.

Table 12:Age Composition of the Respondents

Age	Number	Percentage
16-20	11	3.35
21-25	42	12.80
26-30	40	12.20
31-35	36	10.98
36-40	45	13.71
41 and Above	154	46.96
Total	328	100

4.5.1.5 Education Level

Educational distribution of the respondents is shown in Table Below. The data in the table presents that majority 29% of the respondents were matriculate, which is very good sign. Moreover, 17% were educated up to primary level, 23% were with middle schooling, and 8% were higher secondary school education. Whereas, 6% respondents were reported bachelor and above education level. While the remaining 17% was those who are illiterate or un-educated. The graphical representation of educational status of Sub-project people is depicted in Figure below:

Table 13:Level of Formal Education of the Respondents

Sr. No.	Education	Number	Percentage
1.	Primary	55	17
2.	Middle	75	23
3.	Matric	94	29
4.	Higher secondary school	28	8
5.	Bachelor and Above	20	6
6.	Un-educated	56	17
Total		328	100

4.5.1.6 Occupational Status

Socio-economic condition of the respondents was also studied during the field survey. Majority (40%) of the respondents were doing different types of business. While 17% were reported themselves as Government and Private Employees. In the Project Area, farming is being done in the area where 13% of the respondents reported their profession as farming and 24% were doing different type of labour including agriculture, industrial and general labour for earning their livelihood. During survey, efforts were made to interact with the people representing all walks of life. The detailed statistics regarding occupational status of the respondents is presented in Table below. Below Figure shows the graphical view of occupational status of the interviewed people in Project Area of influence.

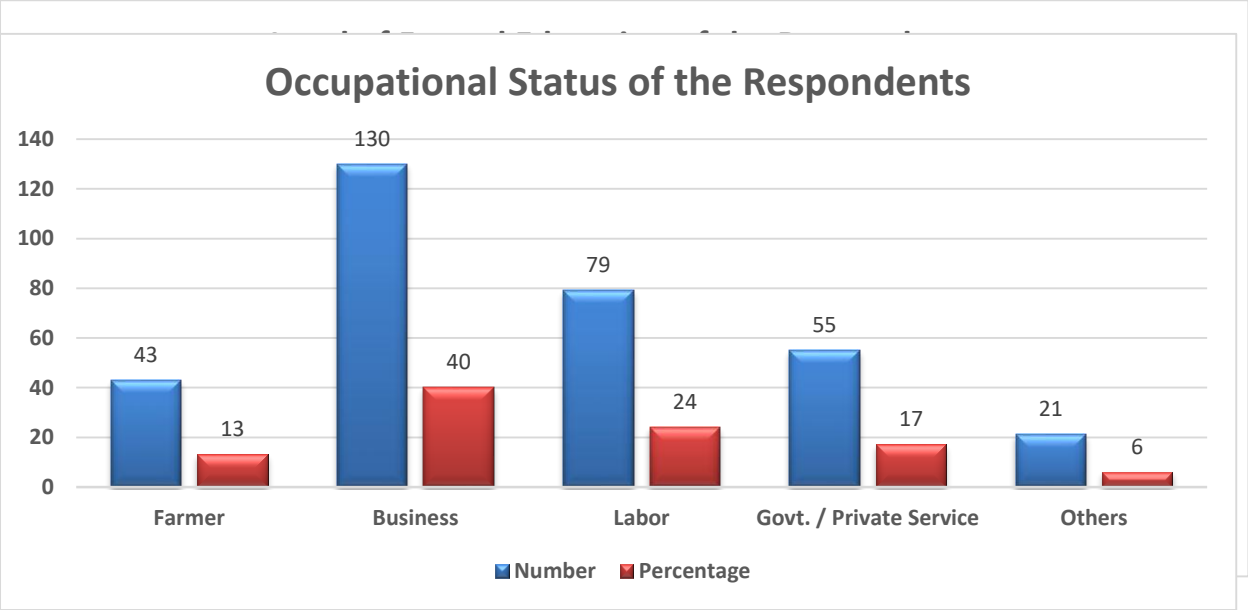


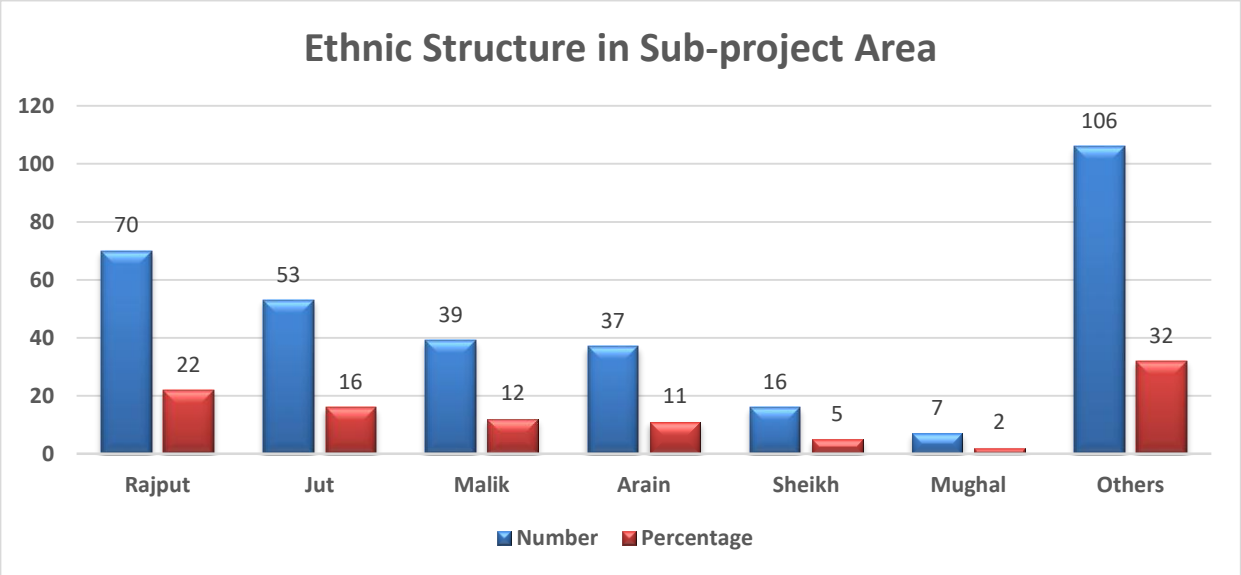
Table 14:Occupational Status of the Respondents

Sr. No.	Occupation	Number	Percentage
1.	Farmer	43	13
2.	Business	130	40
3.	Labor	79	24
4.	Govt. / Private Service	55	17
5.	Others	21	6
Total		328	100

4.5.1.7 Ethnic Structure

There are various castes and sub castes in the area. The most common ethnic groups found in sub-project area is presented in Table below. The field data shows that majority of the respondents' i.e. 22% were Rajput while Jut and Malik were 16% and 12% respectively. Other than these casts Arain were 11% while Sheikh and Mughal were 5% and 2% in the Sub-project Area.

Table 15:Ethnic Structure in Sub-project Area



Sr. No.	Cast	Number	Percentage
1.	Rajput	70	22
2.	Jut	53	16
3.	Malik	39	12
4.	Arain	37	11
5.	Sheikh	16	5
6.	Mughal	7	2
7.	Others	106	32
Total		328	100

4.5.1.8 Language

In the sub-project area, Punjabi is the dominant language being spoken by 90% respondents with different dialect. It was reported that 5% of the respondents speak Urdu and 5% were those who use Saraiki language to communicate others, as shown in Table Below and are depicted in Figure below:

Table 16:Languages Spoken in Sub-project Area

Language	Number	Percentage
Punjabi	294	90
Urdu	16	5
Saraiki	16	5
Total	328	100

4.5.1.9 Religion

Muslim proportion of the population is dominant with almost 93 percent. The remaining population consists of minorities such as Christians and Sikhs. All peoples belongs to Muslims Sunni school of thought, almost every individual pray five time a day.

4.5.1.10Family System

About 70% sampled population were living in joint family system where grandparents are also living under same roof and 30% percent respondents reported as nuclear family system. The detail is shown in Table 7 below:

Table 17:Family System

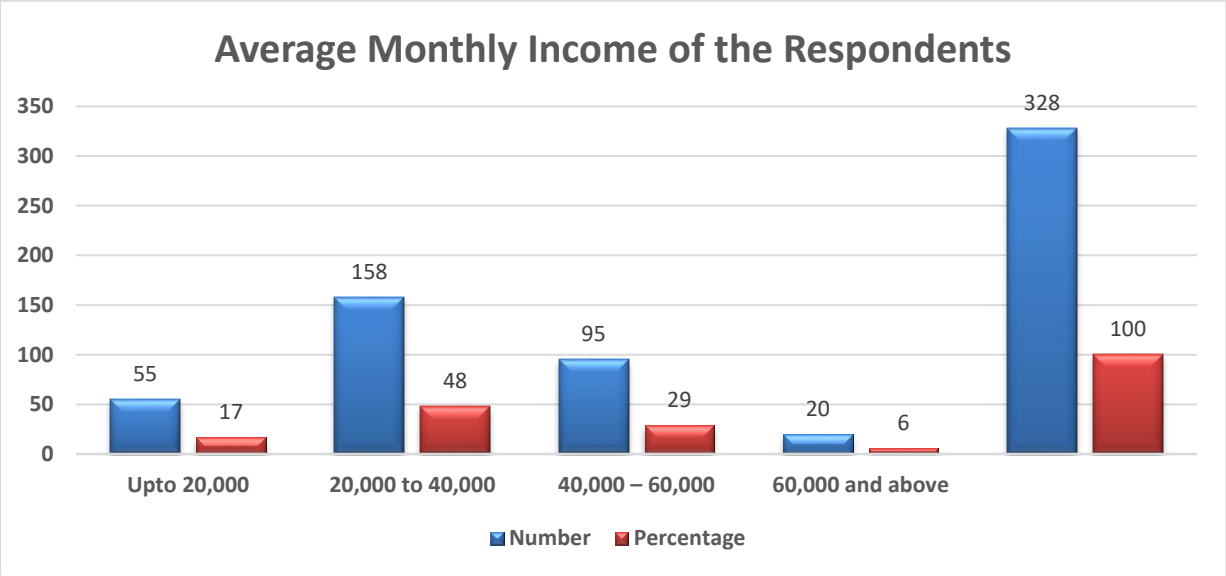
Sr. No.	Family Structure	Number	%
1.	Joint	251	70
2.	Nuclear	107	30
Total		358	100

4.5.1.11Income of the Respondents

From the Table below, it is clear that 17% of the respondents fall in the low income group of up to rupees 20,000, The majority 48% from the range 20,001 to 40,000 rupees, and 29% of the respondents were earning their monthly income between the ranges of 40,001 to 60,000 rupees per month. Whereas, the 6% were getting more than 60,000 per month. Amongst the remaining population rate of unemployment is high due to absence of major industries and under developed agriculture and livestock sectors do not form a potential for labour absorption. Average household monthly income is very low.

Table 18:Average Monthly Income

Sr. No.	Average Monthly Income	Number	Percentage
1.	Upto 20,000	55	17
2.	20,001 to 40,000	158	48
3.	40,001 – 60,000	95	29
4.	60,001 and above	20	6
Total		328	100



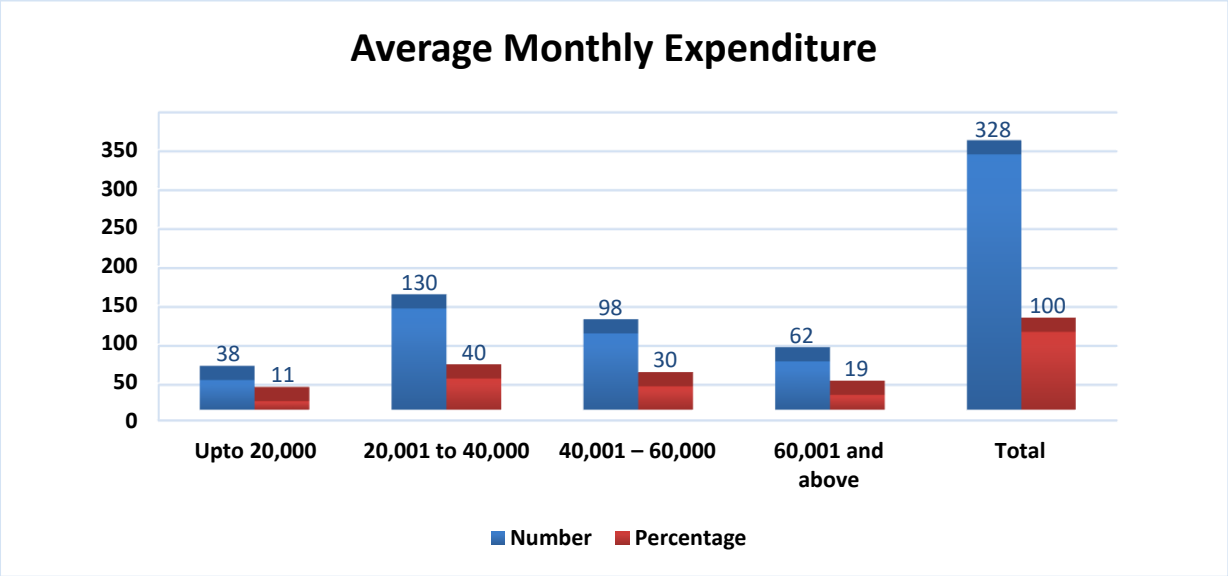
4.5.1.12Expenditure of the Respondents

Household expenditure depends on the earning and about 8% of respondents reported their monthly expenditure up to 20,000, and 66% respondents found within the range of 20,001- 40,000 per month. While, 19 percent fall between the expenditure ranges of 40,001 to 60,000. While 7% of the respondents were having their expenses more than 60,000 per month. The graphical view of average monthly expenditures is shown in Figure below:

Table 19:Average Monthly Expenditure

Sr. No.	Average Monthly Expenditure	Number	Percentage
1.	Upto 20,000	38	11
2.	20,001 to 40,000	130	40

3.	40,001 – 60,000	98	30
4.	60,001 and above	62	19
Total		328	100

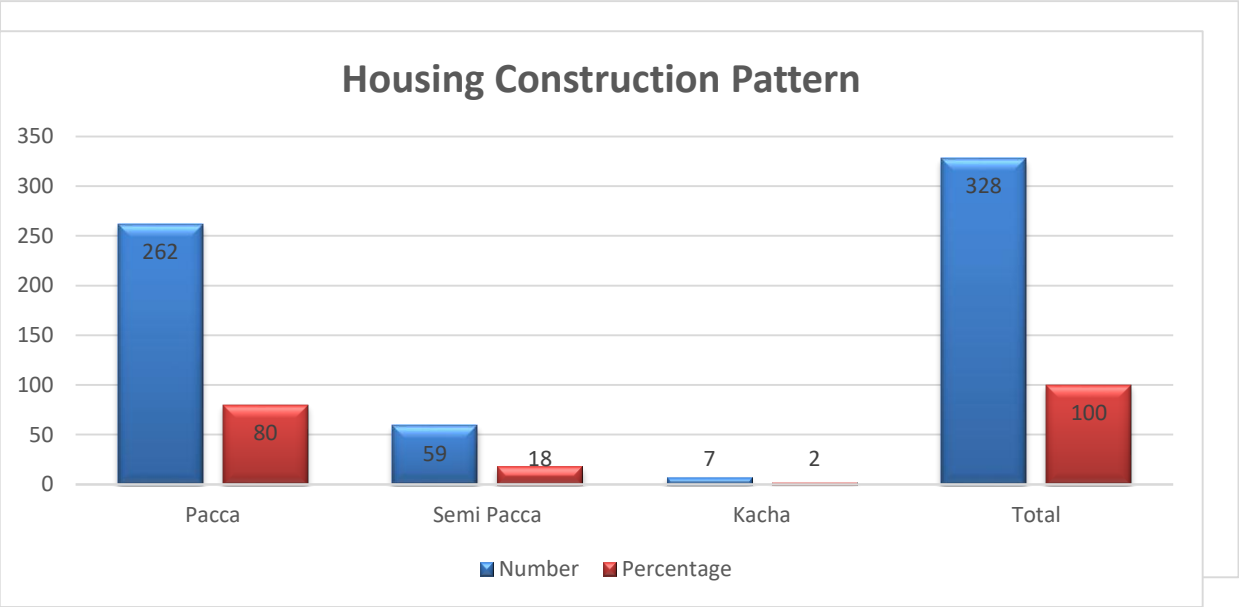


4.5.1.13 Ownership Status of the Houses

Sampled respondents were asked about their housing ownership status in order to know their level of living standard as reflected in Table below. Majority of respondents (55%) were living in their own houses and 45% rented in their houses.

Table 20:Ownership Status

Sr. No.	Ownership Status	Number	Percentage
1.	Owner	180	55
2.	Rented	148	45
Total		328	100



4.5.1.14Housing Construction Pattern

A mix housing pattern has been observed in the sub-project area where 80% of the respondents live in pacca houses that are constructed with superior materials and workmanship while 18% respondents have semi pacca houses that are houses made of bricks masonry with mud mortar. Only 2% of the respondents mentioned that they live in katcha houses made with mud and straws Table below shows construction pattern of houses in sub-project area.

Table 21:Housing Construction Pattern

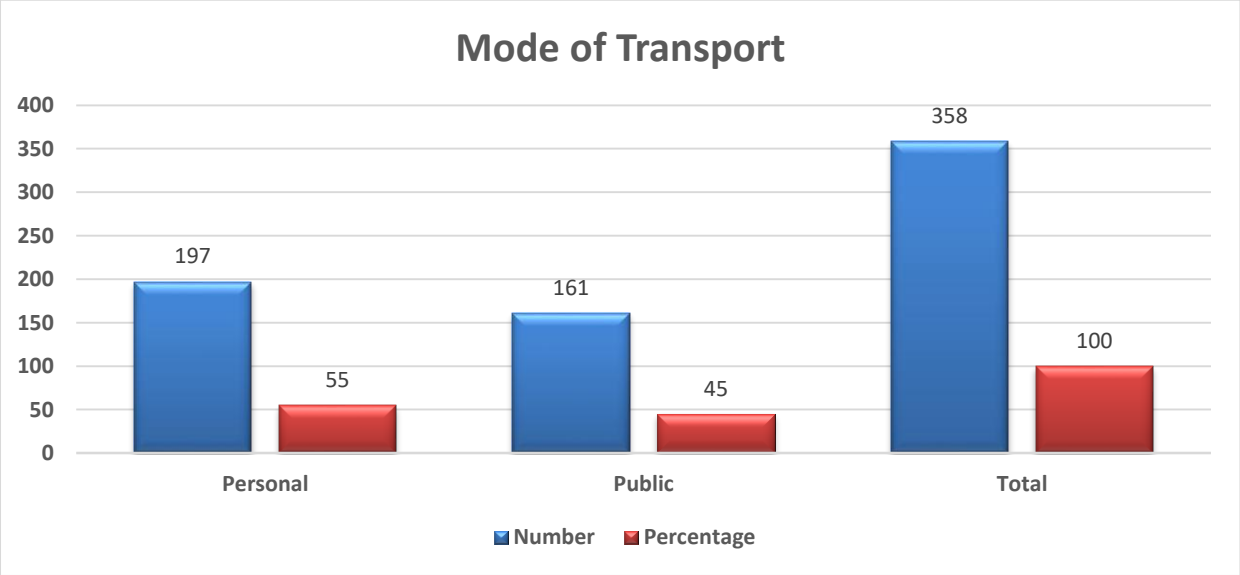
Sr. No.	Type	Number	Percentage
1.	Pacca	262	80
2.	Semi Pacca	59	18
3.	Kacha	7	2
Total		328	100

Mode of Transport

The Table below describes the mode of transport being used by the respondents sampled during the survey. The facility of public transport in the Sub-project Area is infrequent, therefore, about 55% of respondents reported using their own private transport and only 45% of the respondents were using public transport.

Table 22:Mode of Transport

Sr. No.	Mode of Transport	Number	Percentage
1.	Personal	197	55
2.	Public	161	45
Total		358	100



4.5.1.15 Civic Amenities

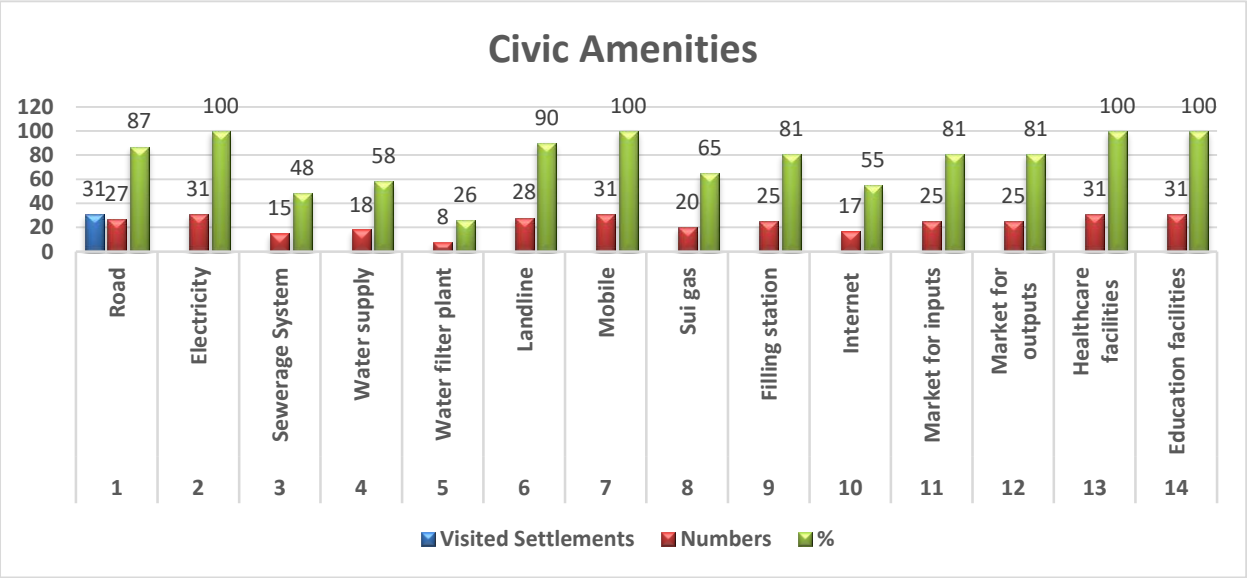
Access to civic amenities is believed to be essential for quality of life, and is especially critical for women and children. Table below indicates that most of the important civic amenities infrastructural facilities are available in the settlements of the sub-project areas. The most important and basic facilities are electricity, Sui gas, roads network, transport means, markets, telephone and communications. Other civic amenities s available in the sub-project area are like bank, post office, masjid and graveyard.

The result of the survey revealed that 100% of the households had electricity facility, water supply was available for the 48% of the sampled households, while the health care facilities and education facilities were mentioned by 100% of the surveyed population. Facility of Sui gas was available to 65% of the respondents in the sub-project area. Poor sewerage system mentioned by the respondents only 48% of the respondents mostly living in the city area mentioned this facility in the area they are living. Mobile and landline service is available in the sub-project area and its surroundings at satisfaction level. The information with respect to access to civic amenities and their quality of services is given in Table Below.

Table 23:Civic Amenities

Sr. No	Facility	Visited Settlements	Numbers	%
1.	Road	31	27	87
2.	Electricity		31	100

Sr. No	Facility	Visited Settlements	Numbers	%
3.	Sewerage System		15	48
4.	Water supply		18	58
5.	Water filter plant		08	26
6.	Landline		28	90
7.	Mobile		31	100
8.	Sui gas		20	65
9.	Filling station		25	81
10.	Internet		17	55
11.	Market for inputs		25	81
12.	Market for outputs		25	81
13.	Healthcare facilities		31	100
14.	Education facilities		31	100



4.5.1.16 Health Facilities

Health is the most important factor which plays the key role in determining the human capital. Better health improves the efficiency and the productivity of the labour force and thus ultimately contributes the economic growth and leads to human welfare. On the other hand, there is a strong relationship between poverty and poor health. No one can deny the role of hospitals. However, hospitals in Jaranwala are doing a good job in maintaining a healthy society. Jaranwala is among the important cities of Pakistan and different hospitals are present in the city. They are providing medical attention and nursing care to people of different age groups. The majority of hospitals in Jaranwala have specialized staff and equipment. Hospitals in Jaranwala can be categorized into different classes. There are General Hospitals that offer different types of healthcare facilities with limited capacity. They provide treatment to patients with different various disease conditions such as surgical, obstetrics, medical, pediatrics, ENT, etc.

Table 24:Health Facilities

Sr.No.	Health Facilities by Type	Numbers
1.	Basic Health Unit	50
2.	Dispensaries	19
3.	Rural Health Centre	05
4.	Tehsil Head Quarter	01
5.	Private Hospitals	07

Source: Primary and Secondary Healthcare Department (Govt. of the Punjab)

4.5.1.17 Education Facilities

Education is a prerequisite for good governance and sustainable national development because it transforms people into good citizens, equipped to contribute to the social-economic transformation of the nation. In general Literacy levels in the city has improved and continue to be a priority among development strategies. Due to data constraints in terms of various indicators of quality inputs, this section only described the available physical facilities in schools, which is the most important pillar of quality input to education. School buildings, drinking water, boundary walls, electricity and toilets for students are considered basic facilities.

Table 25:Education Facilities

Sr. No.	Education Facilities by Type	Numbers
1.	Schools	608
2.	Collages	07
3.	Post Graduate Collages	02

Source: School Information System (Govt. of the Punjab)

4.5.1.18 Mechanism for Resolving Disputes

According to normal civic amenities practices in the society, people have various disputes / conflicts on different issues like other parts of the country. The people in the sub-project area have two options available for conflict resolution. First is the government judiciary system and second is Panchayat System (Council of elders). The people of sub-project area are believed to be peaceful but sometimes a dispute between two individuals, from two casts, may generate problems. Usually the individuals go to government Judiciary system if they are not satisfied with their Panchayat. Ordinarily, whenever there is a dispute between two persons /parties, the notables of one side go for reconciliation to the other party and sit together to resolve the issue. Sometimes the dispute is resolved through imposition of penalties in the form of cash, land and kind. In case of serious matters local political influential intervene to settle the dispute. Police and court of law is the last option.

4.5.1.19 Acceptability of the Proposed Project

During the survey, almost (100%) of respondents favoured the proposed sub-project keeping in view its importance and need. The respondents told that the whole area is unserved and there are so many problems faced by the local communities regarding sewerage. The reason for accepting the proposed sub-project is particularly, the silted or choked sewer lines and drainage channels are serious hazards to the urban environment. The situation aggravates in the monsoon season causing flooding in many places and resulting in not only impediment to traffic and business but also degradation of sanitary environment.

4.5.1.20 Current Issues related to the Sewerage System in Jaranwala City

Jaranwala is located in between two big cities i.e. Lahore and Faisalabad of Punjab Province. The increased population and improved socio-economic conditions have exerted immense pressure on city sewerage system. As a result of it, a part of system is outlived and its capacity has decreased due to additional built-up area and with little capacity available in sewer for which it was designed. As a result, sewer chocking causing unhygienic conditions are evident in the city. In addition, existing situation of Jaranwala sewerage system is far below the acceptable standards due to improper maintenance issues. Crown failure being occurred in trunk sewers. During last 30 years, the city has grown considerably but requisite extensions to sewerage system have not been followed.

Municipal services infrastructure has been degraded because of improper repairs and non-replacement of the old, outlived and damaged components due to non-sustainable medals and constrained municipal budgets. If these components are not rehabilitated or replaced at this stage, the services may reach a point where major portion of the infrastructure may have to be closed due to mal operation.

The only way to keep these services operational is to provide the required rehabilitation and replacement of components through this project to address the major deficiencies and shortcomings of the systems which have been prioritized as per dire need of the city.

4.6 Gender Analysis

Gender approaches focus on men as well as women, and on the relations between them. Gender refers to the socially or culturally established roles of women or men. Although gender is universally one of the key ways in which societies and cultures demarcate rights and responsibilities.

Gender issues are gaining importance in development projects because female members of the community are generally neglected while designing, assessing and implementing such projects. Females are generally more vulnerable than male members of the society. In general, the project area reflects a male dominated society. Women face difficulties in getting education and are not consulted

for most of the decision–making processes. The gender situation is affected by early marriage of girls, restriction on women's mobility and many household chores. Women in sub-project area have been victim of patriarchy, male chauvinism, social discrimination, resource deprivation and denial of human rights. Despite constitutional and legislative provisions, the customary law often prevails making it difficult for women even to claim their legal rights which are supposedly guaranteed. Although Islamic laws of inheritance provide a share to daughter in father's property but the custom does not allow it.

4.6.1.1 The Consultation with Women

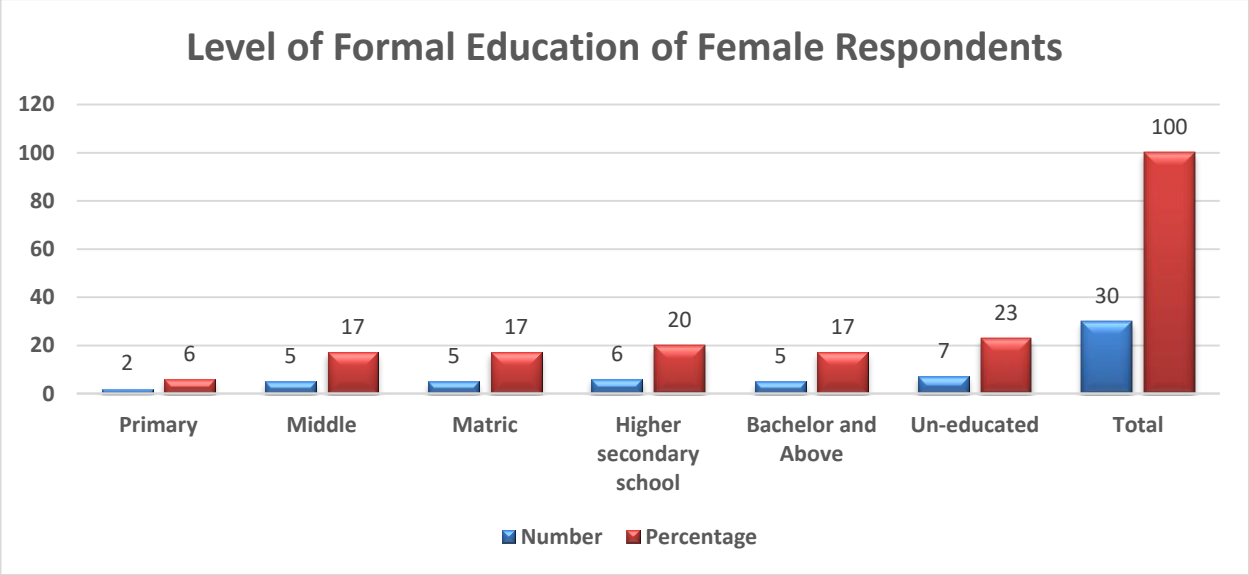
The consultation with female members of communities was the main source of data collection for the women folks of the settlements falling within the sub-project area. The female is horizontal bonding within civic amenities capital, whose opinion and decisions are always considered as vital and final on gender aspects of socio–economic issues, therefore, women were taken on board. Mostly consulted women are housewives and remain engaged on a full-time basis in household chores including food preparation, cleaning / housekeeping, caring and rearing of children and taking care of old and sick members of the family. Some of the women were contributing in household income through both indoor and outdoor activities, such as teaching, dress making and shop keeping. These numbers are likely indicative of the roles women play in the Sub-project area. Women are also engaged in the informal rural economy through the rearing of animals.

4.6.1.2 Level of Education

The Table Below illustrate that level of formal education of respondents. In this table the significant result shows that mostly respondents are un-educated with 28%, and 17% is primary, and a small number of the respondents having intermediate and above education.

Table 26:Level of Formal Education of Female Respondents

Sr. No.	Education	Number	Percentage
1.	Primary	2	6
2.	Middle	5	17
3.	Matric	5	17
4.	Higher secondary school	6	20
5.	Bachelor and Above	5	17
6.	Un-educated	7	23
Total		30	100

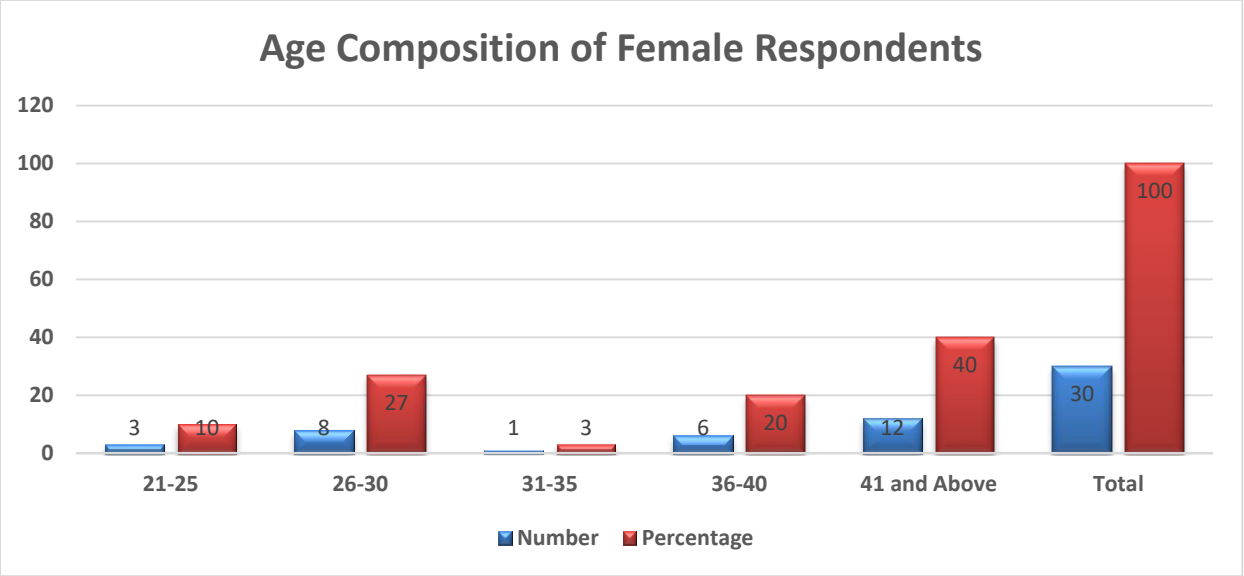


4.6.1.3 Age Composition

All women were within the age group of 20 to 65 years. The demographic characteristics of the survey show Table below that 10% of the respondents were 21 to 25 years of age. About 27%, 3% and 20% of the respondents were between the age group of 26 to 30 years, 31 to 35 and 36 to 40 years respectively. The remaining 40% were bearing up to 41 years of age and above of this age group. These age brackets of the respondents show that by and large respondents were mature enough to express their opinion/concerns about construction of proposed Sub-project and foresee its impacts.

Table 27: Age of Respondents

Sr. No.	Age	Number	Percentage
1.	21-25	3	10
2.	26-30	8	27
3.	31-35	1	3
4.	36-40	6	20
5.	41 and Above	12	40
Total		30	100



4.6.1.4 Marital Status

The table below shows that 90% of the respondents were married. The remaining 10% were unmarried.

Table 28:Marital Status

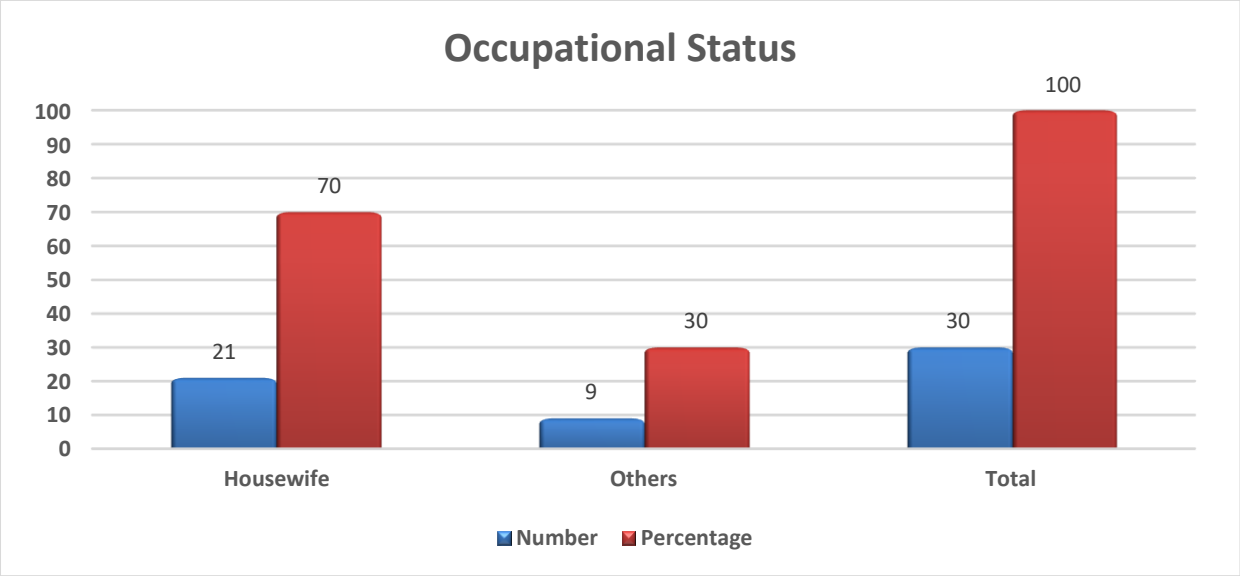
Marital Status	Number	Percentage
Married	27	90
Unmarried	03	10
Total	30	100

4.6.1.5 Occupational Status

Table below shows that about 70% of the consulted women are housewives and remain engaged on a full time basis in household chores including food preparation, cleaning / housekeeping, caring and rearing of children and taking care of old and sick members of the family. About 30% of the women were contributing in household income through both indoor and outdoor activities (some women are working as teacher). Women are also engaged in the informal rural economy through the rearing of animals.

Table 29:Occupational Status

Sr. No.	Occupation	Number	Percentage
1.	Housewife	21	70
2.	Others	09	30
Total		30	100

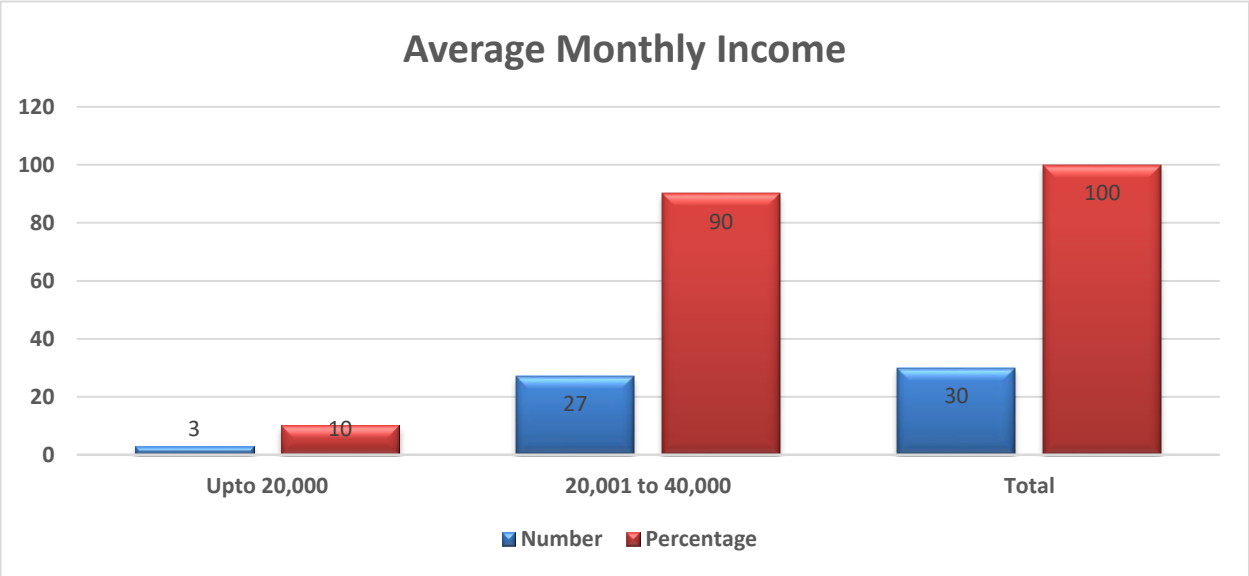


4.6.1.6 Income

From the Table below, it is clear that 10% of the respondents fall in the low-income group of up to rupees 20,000, the majority 90% from the range 20,001 to 40,000 rupees.

Table 30: Income Status

Sr. No.	Average Monthly Income	Number	Percentage
1.	Upto 20,000	03	10
2.	20,001 to 40,000	27	90
Total		203	100

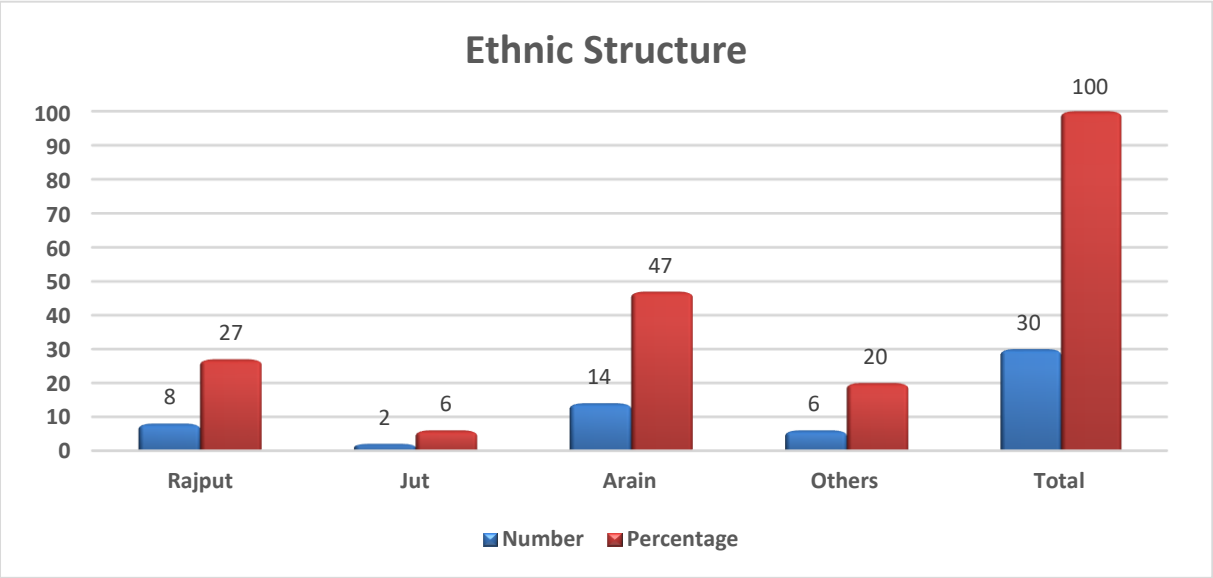


4.6.1.7 Ethnic Structure

The most common ethnic groups found is presented in Table below. The field data shows that majority of the respondents' i.e. 47% were Arain while Rajput and Jutt were 47% and 6% respectively.

Table 31:Ethnic Structure

Sr. No.	Cast	Number	Percentage
1.	Rajput	8	27
2.	Jutt	2	6
3.	Arain	14	47
4.	Others	6	20
Total		30	100

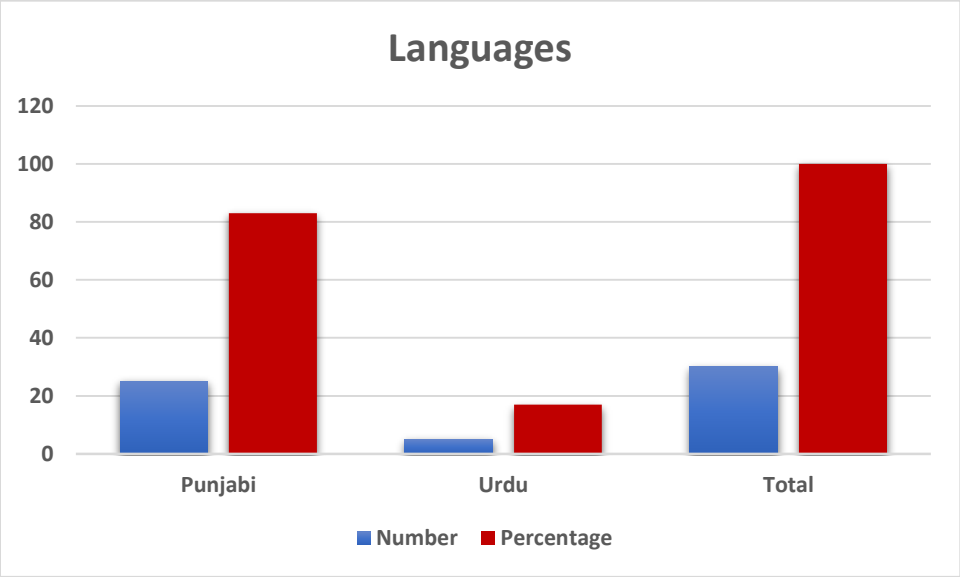


4.6.1.8 Language

Punjabi is the dominant language being spoken by 83% respondents with different dialect. It was reported that 7% of the respondents speak Urdu, as shown in Table Below and are depicted in Figure below:

Table 32: Languages

Language	Number	Percentage
Punjabi	25	83
Urdu	5	07
Total	30	100



4.6.1.9 Feedback

- During the consultation, the respondent women told us that given women's primary responsibility for cleaning, food preparation, family health, laundry, and domestic maintenance, women and men may view domestic wastewater and its disposal differently. The respondents said the sewer manholes start overflowing on the stretch whenever it rains, even after a short spell. They will again demand from the government to direct the departments concerned to resolve the issue at the earliest.
- women told us: "It was harrowing time for residents due to waterlogging on the main road during the last rain. After rain started, the sewers started overflowing within minutes due to which water accumulated on the road. It was difficult for the commuters to pass through the stretch. When vehicles used to pass through the flooded stretch, water also flow towards our buildings. During rainy days, sewers start overflowing on the road. The government should provide a relief to residents by finding a permanent solution to the problem at the earliest."
- One of the participants said that we are fed up with the stench of wastewater and mosquito-borne diseases like malaria and dengue fever.
- The consumption of contaminated ground water is causing health issues in children and women especially in pregnant women.
- In some areas pit holes are dug for household wastewater and it collects the water, the women members of family are supposed to empty the pit hole and dispose off directly in open passages/streets or nearby open fields which is an unhygienic practice

and creates unpleasant and unhealthy impacts on the areas and overall on women health.

- Proper sanitation infrastructure is not priority of the communities due to which women households are affecting badly.

5 Potential Environmental Impacts & Mitigation Measures

5.1 General

This section identifies the overall impacts of pre-construction (design), construction and operational phases of the proposed project on the physical, biological and socioeconomic environment due to Improvement of sewerage system in Jaranwala city and construction of WWTP. In addition, it also recommends the measures to mitigate or minimize the project's adverse environmental impacts.

Environmental Impact Matrices

The identification of impacts is done on the basis of literature review, site surveys and expert opinion on prevailing site conditions and sensitive receptors. The significance of the effect on the environment is estimated using an environmental impact significance matrix. This gives each environmental impact either a high, medium or low significance depending on the estimated severity and frequency of the effect on the environment.

Table 33:Environmental Impact Significance Matrices

Significance	Implications
Low	Should not have an influence on the decision to proceed with the proposed project, provided that recommended mitigation measures to mitigate impacts are implemented.
Medium	Should influence the decision to proceed with the proposed project, provided that recommended measures to mitigate impacts are implemented.
High	Should strongly influence the decision to proceed with the proposed project regardless of mitigation measures

5.2 Anticipated Impacts during Pre-Construction/Design Phase

Following is the description of impacts envisaged and the recommended mitigation measures during Pre-construction/Design Phase:
Residual Impacts of this project are negligible and mitigated at design stage. However, the residual impacts after decommissioning of project are also in consideration during planning stage.

5.2.1.1 Design & Layout Planning

Incompatible layout plan and engineering design of the project's structures can undermine the overall aesthetic beauty and ambience of the project area. Also, low utilization of the available spaces and not designing the structures taking into account, the prospective and futuristic needs can result in structures with low social acceptability and functionality. This impact will be of high significance in nature. For the mitigation of these impacts it is important that all structural, layout and engineering designing should be in strict accordance with the applicable

laws (Land acquisition Act, PEPA 2012, The Punjab restriction on employment of children ACT 2016) and engineering parameters.

Furthermore, Emergency Response Plan has been prepared for this project and is attached Annexure H.

5.2.1.2 Assessment of Impacts

The environmental and social safeguards screening checklist depicts that:

- No land requires for wastewater treatment plant and disposal station.
- No settlements to be relocated.
- Damage of agriculture land and Crops.
- Cutting of 120 trees (70 Wood Trees and 50 Fruit Trees).
- Damage of 02 (Category-B) Residential Structures and 02 Semi-pacca Construction Units.
- Damage of 04 Tubewells.
- Sub-project will be of least hindrance in the movement of households of residential units and transport during its construction phase.
- Sub-project will generate loose earth material during construction activities, which can generate construction waste and waste water problems temporarily till it will be reused or disposed of on daily basis.
- There may be noise generation and exhaust emissions during boring and material transport which will be mitigated by using new and well-tuned machinery by the The Contractor.
- Safety issues may arise during movement of vehicle which will be mitigated.
- Excavation may cause accidents particularly for children and elderly. Special attention will be given to remove irrelevant persons away from Sub-project site and install barricade and safety/ caution sign boards for the safety of local community.
- Mismanagement of construction activities / materials & equipment may impact inhabitants along the Sub-project.
- The Sub-project does not fall in any protected area, such as wildlife sanctuary, game reserve, or national park.
- There are many masjids and schools near the proposed subproject, which are the sensitive receptors but located outside the RoW of the Sub-project and movement and educational activities of students/ commuters across the Sub-project sites will not be affected. The only minor or in-significant impact on these sensitive receptors will due to dust and noise during the construction activities.

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Mitigation Measures

For the mitigation of these impacts, it is important that all structural, layout and engineering designing should be in strict accordance with the applicable laws (Land acquisition Act, PEPA 2012, The Punjab restriction on employment of children ACT 2016) and engineering parameters.
Furthermore, Emergency Response Plan has been prepared for this project and is attached Annexure H.

5.3.1.2 Topography

Cut and fill of land for the improvement of sewerage system and construction of WWTP will be required that may contribute to moderate change in the topography of the area.
Removal of topsoil and soil erosion may occur on roadside due to excavation, clearing of existing ROW and cutting and dismantling of existing pavements. The changes due to construction of the proposed project, however, will be of localized nature. This impact is medium in nature.

Mitigation Measures

Mitigation measures will include provision of embankments, designed by considering the Geotechnical investigation studies (if needed). Due consideration should be given to aesthetic improvement during the design phase.

5.3.1.3 Drainage

Improper drainage from home may cause trash pooling condition; due to which following impact of medium nature are expected to arise:

- Deterioration of the surface road and reduction of its bearing capacity;
- Public inconvenience in road usage; and

The stagnant water may serve as breeding ground for disease vector.

Mitigation Measures

Mitigation measures will include provision of appropriate drainage structures and storm water pumping station in design. Proper slopes shall be incorporated in design feature to avoid the formation of the water layer on road surfaces in rainy seasons.

5.3.1.4 Resource Conservation

The materials used in construction of proposed project would include coarse aggregates (crush), fine aggregates (sand), steel, water, asphalt, reinforcement and cement etc. Almost all the materials to be used in the construction of proposed project are non-renewable and therefore their sustainable use is necessary for the future use. Resource materials are essential in the pre-construction phase as they support design and engineering efforts, cost estimation, material selection, regulatory compliance, procurement, supply chain management, and sustainability considerations. Their proper utilization ensures a well-planned and organized start to the construction project, leading to successful project outcomes.

Fuel will be used to operate construction machinery, asphalt plant and batching plants. Wastage and unsustainable use of these resources can possess low to moderate impacts. Sustainable use of energy resources is very important not only to continue future use but it will also help to reduce air emissions. For conservation of energy, efficiency of the engines and burning processes shall be considered in planning. Overall, energy resources have a substantial impact on the pre-construction phase of a project, influencing its feasibility, design, cost, environmental footprint, and compliance with regulations. Proper assessment and planning of energy resources during this phase help ensure the efficient and sustainable development of the project.

Mitigation measures will include:

- Wastage of water should be reduced by training the workers involved in water use;
- Source of water should be carefully selected. Water use should not disturb the existing community water supplies;
- Ensure adequate insulation to reduce heat loss through batching plants; and
- Regularly monitor CO and CO2 content of the flue gases to verify that combustion systems are using practical excess air volumes.

5.4 Anticipated Impacts during Construction

This section explains how proposed project will affect different environmental aspects and its mitigation measures to manage the impact. The impacts arise during construction phase are generally low to medium in nature. Even though, the measures proposed to minimize such impacts.

The potential environmental impacts of the proposed project at site and surrounding area during construction phase of the Improvement of sewerage system and construction of WWTP involve:

- Noise and vibration due to movement of heavy construction machinery, land clearing, excavation and digging
- Fresh water consumption and wastewater from different activities
- Exhaust, particulate emissions and dust generation due to engines, generators, movement of heavy construction machinery and other construction activities
- Solid waste from construction activates and from site camp office/labors camp
- Increase traffic burden due to construction activities and heavy machinery

However, the majority of these impacts will be low and short-term during construction phase and are envisaged to abate with completion of the construction phase.

5.4.1.1 Physical Component

The main impacts of the project during construction and development activities are described below:

5.4.1.2 Soil Erosion and Land Use Changes

Soil and land may be affected during construction phase due to land clearing operations, excavations and diggings, cutting of trees if any at the proposed project site, onsite stockpiling of materials and equipment, construction of site offices, movement of heavy construction machinery, disposal of wastes and wastewater along with throwing of chemicals, oils, varnishes, coal tar, packaging materials and other compounds on to the land would be associated with impacts on soil and land.

When it comes to proposed project site, no significant impact on soil would arise. Similarly, the project construction will have apparently no impact on topography and slope stability. However, the soil quality may be affected due to vehicle and equipment maintenance and leakage from equipment and vehicles as explained above. Nevertheless, if appropriate mitigation measures are applied then the overall impact on soil during construction phase would be minor.

i. Potential Impacts

The environmental impacts to soils and lands would be medium in nature some of impacts are listed below:

- Degradation of soils and changing soil properties
- Soil may be contaminated as a result of fuel/minor oils/chemicals spillage leakage, and inappropriate waste (solid as well as liquid) disposal during the proposed project.
- Land instability
- Deterioration of soil due to movement of heavy machinery
- Development of pits and depression in borrow areas and stagnation of water on the land surface.

Impacts, related to soil erosion and degradation will be occurred during construction phase of the proposed project, are characterized above and these will be managed on site by following proposed mitigation measures.

ii. Potential Mitigation Measures

- Wherever possible, avoid excessive and simultaneous excavations to minimize generation of large volumes of soil and chances of destabilization and erosion of adjacent lands. Backfill the soil borrowing areas and level up the surfaces of the pits and depressions is recommended.
- Spills' prevention trays should be provided and used at refueling locations.
- During onsite maintenance of vehicles and equipment, tarpaulin or other impermeable material should be spread on the ground to prevent the contamination of the soil.
- Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.
- Regular inspection should be carried out to detect the leakage in construction vehicles and equipment.
- Domestic solid waste will be disposed in a manner that does not cause soil contamination and ensure provision of dustbins for solid waste at the site.
- Appropriate arrangement, including shovels, plastic bags and absorbent material, should be available near the fuel or oil storage area.
- Select campsite in consultation with site engineer and the project environmentalist and secure a connection of the toilet's wastewater from labors.

As soon as the construction phase is completed or near completion, a plantation program shall be implemented around the site. The significance of the residual impacts is therefore expected to be low because these mitigation measures are based on best management practices.

5.4.1.3 Dust During Construction Deteriorates Air Quality

Dust or the equivalent technical term 'particulate matter', is generally defined as any airborne finely divided solid or liquid material up to the size of about 100 microns (micrometers or one-millionth of a meter). During the development / construction, vehicles and machinery will be employed. These will generate some dust and smoke temporarily which will stop on completion of the construction work. During construction phase due to continuous operation of machinery and movement of heavy trucks and vehicles can generate gaseous emissions and can have a slight adverse effect on the surrounding environment. Combustion exhaust from vehicles and construction equipment during construction phase can affect ambient air quality of project area.

This will possess medium impacts on environment as it will only occur during the excavation activities. Also, these impacts are expected to be contained within the site boundaries.

i. Potential Impacts

- Particulate matter emitted during construction activities can result in deterioration of ambient air quality in the vicinity of the source and be a nuisance to the communities and construction workers.
- The main health hazards are the particles smaller than 10 microns (designated as 'PM10') as they are respire-able. Larger particles also tend to settle rapidly and often do not reach receptors. In cases where they reach the receptors, the dust is considered a nuisance as it may spoil property and affect visibility.
- Large amount of dust particles will be generated from the project site due to various activities such as movement of the heavy construction vehicles on unpaved roads, earthwork, truck dumping, hauling etc. This will be higher than the existing level of the particulate matter measured at the project site.
- Due to continuous operation of machinery and movement of heavy trucks and vehicles can generate gaseous emissions and can have a slight adverse effect on the surrounding environment.

ii. Potential Mitigation Measures

The potential negative impacts during construction stage of the project will be mitigated to an acceptable level. Following environmental protection measures will be adopted to eliminate adverse environmental impacts or to reduce them to an acceptable level within the PEQS. The proposed mitigation measures are listed below:

- Appropriate waste disposal mechanism will be followed during the construction phase. The construction waste will be disposed in a manner that does not contaminate surface or groundwater.
- The construction waste generated will be used for earth filling within the project site premises.
- The Contractor needs to make sure that their machinery and equipment are properly tuned and serviced and there is no leakage of oil from construction equipment and machineries.
- Construction labor must be trained in safety procedures for all relevant aspects of construction
- Ensure water sprinkling on daily basis before the start of the construction activities as dust suppressant. Frequency of sprinkling will be kept such that the dust remains under control, particularly when wind is blowing towards the receptors (especially when the wind blows towards the city).
- Construction materials that are susceptible to dust formation will be transported only in securely covered trucks to prevent dust emission during transportation.

- Properly cover construction material such as soil, sand and cement stockpiles for the shortest possible time to prevent wind whipping.
- Plantation will be done at site.

The effects of the dust nuisance are temporary and no long-lasting impacts are expected after the completion of the construction works. It is therefore recommended to put in place all the suggested mitigation measure in order to avoid significant impact during the construction phase of the facility.

5.4.1.4 Noise and Vibration

Noise is a by-product of -construction activity. Main sources are heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills, stone crushers, asphalt plants and other equipment. Noise generated by construction machinery is likely to affect sensitive receptors located within 50 meters of the proposed site. This noise and vibration can negatively affect the nearby public. Therefore, appropriate measures will be -adopted to minimize the repercussion of noise. Noise and vibrations will have low to high impact depends upon the receptors nearby.

i. Potential Impacts

- Noise and vibration can be a source of nuisance for workers and most importantly for local public of the area.
- Distracted attention and inability to concentrate
- Health impact in terms of Irritation and short temperedness, headache, dizziness and ringing ears.
- Physical stress on labor because they have to speak louder than normal in a noisy environment
- Physical damage to ear drum in case of noise crosses the critical threshold for that as a result partial loss of hearing and inability to hear at normal pitch and sound.

ii. Potential Mitigation Measures

All mitigation measures mentioned below should be taken in order to minimize the impacts of noise in the project area. These measures include, but are not limited to the following:

- Plan the traffic route away from the residential settlements.
- Selection of up-to-date and well-tuned machinery.
- Confining excessively noisy work to normal working hours in the day, as far as possible. Therefore, Plan to perform noisy operation at the same time period. The total noise level would not be higher than the level if the operations were performed separately.
- Providing the construction workers with suitable hearing protection like ear plugs, or earmuffs

- It is recommended to use quieted equipment, such as enclosed air compressor and air mufflers (silencer) on all engines
- Select the demolition method that produces the least noise and vibration.
- Use of low noise machinery, or machinery with noise shielding and absorption.
- Regular checkups and maintenance of the construction equipment, periodic preventive lubrication and greasing of the noise making mechanical parts.
- Use noise-abating devices wherever needed and practicable.
- Contractors should comply with submitted work schedule, keeping noisy operations away from sensitive points

Keeping in view all these measures, it is envisaged that residual noise and vibration impacts during construction activities are expected to be low.

5.4.1.5 Surface and Ground Water Quality

The improvement of the proposed sewerage system and construction of WWTP will involve various operations. This section summarizes the various activities and their potential impacts on the surface and the ground water quality.

Surface water might get contaminated due to the disposal of solid waste from different activities during the construction phase. Similarly ground water quality may also be deteriorated by dint of excavation, digging and removal of vegetation.

i. Potential Impacts

- Unauthorized and excessive abstraction of groundwater, imperfect sealing of the groundwater borehole would allow contaminated water to move down along the borehole.
- In the rainy season during construction phase, runoff results significant pollution in the surroundings. Therefore, Construction of temporary infrastructure such as drainage culverts/ducts may be required.
- Solid waste from camps if established, 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 it.
- The used engine oil and lubricants, and their storage as waste materials has the potential to create impacts if spillage occurs as oil may percolate into the surface soil layer, runoff in to the local watercourses hence adequate measures should bring in to practice in order to prevent spillage. So, there is a possibility that various materials like fuel, lubricant oil and other oily products, which are used during the construction phase may contaminate groundwater, if they are not handled properly

- Contaminated groundwater would lead to serious health consequences as it is used for drinking purposes.
- Wastewater from camps and improper disposal of garbage can contaminate surface and groundwater.
- During construction phase, impacts from the workers include waste and wastewater generated from eating areas, and sewage from temporary sanitary facilities because sewage is characterized by high levels of BOD, ammonia and E-Coli. Adverse water quality impact will be generated only if the sewage is discharged directly into the receiving waters without any prior treatment.

ii. Potential Mitigation Measures

- The surface water quality if there is a potential of contamination should be constantly monitored.
- Wastes must be collected, stored and taken to approve disposal site. Contractor camp if established should be at proper location
- Do not construct unauthorized borehole and do not make boreholes at low lying places and depressions, which attract surface runoff and allow water stagnation. Seal off the borehole with cement mortar.
- Ensure regular laboratory testing of the groundwater/ drinking water from site for timely detection of contamination during execution phase.

The majority of the identified adverse impacts on surface and ground water quality are High in nature. Implementation of the recommended mitigations will result in complete abatement of the adverse impacts on surface waters and there would not remain any residual adverse environmental impacts pertaining to this parameter. The site supervisor -will have the responsibility to ensure the compliance/implementation of the prescribed mitigations measures.

5.4.1.6 Air Quality

Air quality will be affected by fugitive dust emissions from construction machinery and vehicular traffic. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. Usage of poor-quality oils petroleum products, additives and chemicals, unplanned excavations and diggings and leaving the dugout sites open and without backfill, loose stock pile of the materials without covering, shielding or water sprinkling will affect the quality of air. Vehicular emissions such as PM_{10}, SOx, NOx and CO_2, CO and the smoke emission will get higher.

i. **Potential Impacts**

- Transportation of materials and other construction activities will create dust emissions.

- During construction, the continuous operation of machinery and movement of heavy trucks and vehicles may generate gaseous emissions and have negative impact on the surrounding environment.
- Decrease visibility due to smoke and particulate matters
- Deposition of dust and particulates on open surfaces and vehicles
- Inhalation and ingestion of the fugitive dust and consequential health problems.
- Emissions from the generators will also pose significant impact on quantity of GHG emissions.

ii. **Potential Mitigation Measures**

- All vehicles, machinery, equipment and generators which are used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions
- The quality lubricants and oil should be used
- Open burning of solid waste from the contractor's camps should be strictly banned
- Regular water sprinkling of the site should be carried out to suppress excessive dust emissions.
- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions.
- Keep the stockpile materials covered or lightly sprinkle with water in order to avoid dust emissions.
- Use protective inhalation masks and eye glasses during construction works.

The site supervisor is responsible to ensure compliance of the suggested mitigation measures. The impacts during construction phase are envisaged to be low.

5.4.1.7 Solid Waste Generation & Dumping

Solid waste may arise from different activities during construction phase such as waste generated for labor camps, food waste, construction material, waste obtained during excavation and digging etc. Moreover, different types of raw materials will be used during construction phase which in general comprise of the following:

- Cement concrete
- Plastic pipes
- Bricks, tiles,
- Cement plaster
- Steel (RCC, door/ window frames, roofing support, railings of staircase etc.)
- Rubble, sand, Stone (Marble, granite, sand stone)

- Timber/wood
- Paints/varnishes

Dumping of construction wastes/excavated material in the surrounding area of the proposed project may lead to serious implications pertaining to environment as explained below.

i. Potential Impacts

- Result in degradation of soils
- Solid waste may pose health issues or disturb the scenic beauty of the site.
- Generation of solid waste and its improper management may provide breeding place for mosquitoes, rodents and insects
- Heaps of solid waste may cause disturbance in mobility
- If not properly dispose of or covered or store separately during raining season then it will lead to leachate generation that in turn deteriorate soil and groundwater quality.
- Improper disposal of solid waste and debris can choke sewer lines may cause contamination of drinking water.

ii. Potential Mitigation Measures

- The waste/ spoils will be carefully examined and disposed of in an environmentally friendly manner by transporting it in closed container and filling at appropriate sites.
- The waste transfer vehicles shall be properly covered.
- Waste should be properly covered at the site and maximum effort shall bring in to practice to avoid contact with precipitation.
- The solid waste generated during this period being predominantly inert in nature. Hence maximum effort would be made to reuse and recycle it. The most of the solid waste material can be used for filing/ leveling of low-laying areas within the site.
- Attempts will be made to keep the waste segregated into different heaps as far as possible so that their further gradation and reuse is facilitated.
- Scattered solid waste should be properly managed in order to avoid contamination and provision of enclosed bins for general refuse at project site.
- The local body/MC or a private company may be arranged to provide appropriate number of skip containers/ trolleys on hire.

The use of the construction material basically depends on their separation and conditions of the separated material. A majority of these materials are durable and therefore, have a high potential for reuse. It would, however, be desirable to have quality standards for the recycled materials. Construction waste can be used in the following manner:

- Reuse of bricks, tiles, stone slabs, timber, piping railings etc. to the extent possible and depending upon their conditions.
- Sale/ auction of materials which cannot be used at the site due to design constraint
- Plastics, broken glass, scrap metal etc. will be stored and processed within the site premises.
- Rubble/ brick bats can be used for building activity, such as leveling, under coat of lanes where the traffic does not constitute heavy moving loads.
- Larger useless pieces can be sent for filing up low laying areas.
- Fine material such as sand, dust, etc. can be used as cover material
- The unearthed soil can be used for leveling as well as for lawn development
- The broken pieces of the flooring material can be used for leveling in the building or can be disposed of.
- The unused or remaining paints/varnishes/wood can either be reused or can be mxxdisposed of.

All attempts should be made to stick to the -above mentioned measures. The site supervisor will be responsible to ensure compliance of the suggested mitigation measures. The impacts during construction phase are envisaged to be low.

5.4.1.8 B Biological Component

5.4.1.9 Impact on Floral Species

Trees are vital source of ecosystem perform variety of functions for the improvement of environment such as reduction in air pollution, noise abatement, cooling effect on earth, supply of oxygen etc. As already explained in above sections that site is commercial in nature and have no impact on floral species However, several ornamental plants will be planted for landscaping in decommissioning phase.

A. Potential Impacts

- Cutting of trees from the project site if any
- Cutting of tress for cooking purposes from the surroundings

B. Potential Mitigation Measures

The following mitigation measures will further minimize any negative impacts on floral resources of the area:

- In the entire project area, a comprehensive plantation plan will be developed, with due consideration given to landscaping. The plantation plan should be implemented as early as practicable.

- After construction besides introducing new ornamental plants, local tree and plants species will be planted. In addition to providing a better view to the area, the proposed vegetation will help minimize the excess noise, vehicular emissions and dust pollution.
- Indigenous species of trees will be recommended to be planted. Other species suitable for site will be planted to increase scenic beauty. Besides, species having dust retention and odor control properties will be recommended for plantation.
- Slopes must be contoured and grass planted to avoid erosion.
- Use of fuel wood will not be allowed.

With the help of the mitigation measures, the residual impact of the project's construction activities is likely to be low.

5.4.1.10 Impact on Faunal Species

During the construction phase, there will be considerable human interventions in the project area which can potentially affect the faunal resources such as land clearing, earthmoving, terrain shaping, and construction activities, construction camp, dredging and filling, solid and hazardous waste, discharge of polluted or treated wastewater and fuel storage.

No environmentally sensitive area (forest, wetland, national park, wildlife sanctuary, or game reserve) is located in the vicinity of the project area. Most of the animals found are common species that are highly adaptable and are able to co-exist with people. Similarly, there is no wildlife present in the Project area. However, none of the species found to be endangered or of global significance.

A. Potential Impacts

- Water quality impacts such as increased sediment disturbance can indirectly affect habitat health
- Soil and water contamination will affect the faunal resources
- Disruption and dislocation (via noise, vibration, lights and human presence) of local birds or other wild animals
- Tree cutting from the surroundings for heating purposes may disrupt habitat of birds i.e. removal of nests during breeding seasons.

B. Potential Mitigation Measures

- The measure to prevent soil and water contamination will predict any adverse impact on the faunal resources of the area.
- Construction machinery will remain confined within their designated areas of movement.
- Well-tuned machinery will be used to avoid nuisance to wild life in the surroundings

With the help of the mitigation measures, the residual impacts of the project's construction activities are likely to be low.

5.4.1.11C Social Component

5.4.1.12 Health and Safety of Workers

Construction activities are always associated with risks, hazards include traffic, working of mechanized equipment and machineries, excavations, falling objects, confined spaces, trapped energy, tripping etc. The contractor will be made bound to provide its workers necessary personnel protective equipment (PPE) to safeguard themselves against any hazard.

A. Potential Impacts

- Hazards during transportation of waste and construction material
- Risk of injury during movement of heavy machinery, lifting of heavy objects, drilling tipping etc.
- Non observance of worksite safety instructions and non-usage of safety gadgets during construction operation can increase vulnerability to adverse health and personnel safety impacts.
- Fire, explosions and accidents from unsafe storage of hazardous, explosive inflammable and ignitable materials.
- Construction material such as sand, stones, cement may pose health risk
- Unhealthy/ unsafe work conditions if OHS rules and gears are not in placed.
- Transmission lines or electric poles pose a threat to worker/labor health.
- Generation of solid waste may pose health issues or disturb the scenic beauty of the site.

B. Potential Mitigation Measures

- Material shall be appropriately covered to prevent dispersal of sand material. Also, Protective health & safety measures should be adopted.
- Training programs for the construction crew will also be arranged to let them know about the construction hazards. Also, ensure provision of basic medical training to specified work staff and basic medical service and supplies to workers.
- All the construction work will be contained within the boundaries of the project site and unauthorized personnel will not be allowed to be in the premises of the construction activities without any authorization.
- Protection devices (ear muffs, ear plugs) should be provided to the workers doing job in the vicinity of high noise generating machines

- Provision of adequate sanitation, washing and cooking facilities
- Provision of protective clothing for laborers handling hazardous materials, e.g., helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc. Also, ensure strict use of wearing these protective clothing during work activities
- Elaboration of a contingency planning in case of major accidents
- Clear safety warning signs should be placed along strategic locations within the site. Safety and warning devices such as reflectors, lights, etc. shall be installed at designated spots. During construction, adequate signage, lightning devices, barriers, yellow tape and persons with flags must be there.
- Dustbins should be provided at project site and identification of disposal site for SW with due involvement of MC will be ensured.
- Designated staff should be hired at project site to collect SW at consecutive/ regular intervals
- Ensure the provision of protective devices PPEs, such as earplugs to all those working in a noisy area
- The equipment and construction machinery will only be operated by properly trained and experienced personnel.
- The total noise level would not be higher than the level if the operations were performed separately.
- Frequent water sprinkling at the site will be carried out at regular intervals to avoid generation of dust.
- Workers/labor at the site if established will be advised to maintain specific distance from transmission line during construction activities. Also, Construction of offices, controls rooms etc. will be proposed away from the electric poles.
- Construction area will be properly identified and the access to the area will be limited to only project related personal.
- After the completion of construction phase, proper site restoration will be carried out to eliminate any safety hazards such as any excavation will be leveled to prevent falling injury to construction crew.

Allegiance to these mitigation measures will avoid any incident. With implementation of the mitigation measures proposed above, impacts will be minimized. Therefore, the significance of the residual impacts is therefore expected to be low because these mitigation measures are based on best management practices.

5.4.1.13 Damage to Archaeological, Historical or Cultural Artifacts

There is no site of archaeological, historical, religious and cultural importance within 2km premises of the project. If later on during, drilling, excavation work, if any archaeological artifact is found, the relevant department will be informed.

5.5 Impacts during Operational Phase

During the operation phase of the proposed project, the anticipated impacts on the physical environment, biological environment, and socio-economic aspects related to the proposed project have been studied for operational stage and are discussed as follows:

5.5.1.1 A Impacts on Physical Environment

5.5.1.2 Soil Contamination

Potential Impacts

During operation phase, soil might be contaminated by dint of inappropriate waste treatment, its disposal and due to improper handling. Otherwise, no significant impacts are envisaged in this regard.

Potential Mitigation Measures

- Regular soil testing will be ensured to check the quality of soil.
- Proper handling of sludge will be ensured, design engineers will ensure the best possible design for protection of soil and surrounding environment

If these measures are properly taken by the MC, then the residual impacts will be negligible.

5.5.1.3 Surface and Ground Water Contamination

Surface water can be contaminated if wastewater enter into it whereas wastewater from sewage can also deteriorate ground water quality.

Potential Mitigation Measures

The below listed mitigation measures will be useful to control the adverse impacts of surface and ground water contamination:

- To ensure the preservation of surface water quality, the entry of wastewater into any surface water body will be strictly prohibited unless it meets the prescribed Environmental Quality Standards (PEQs). Additionally, the discharge of sewage water into the surrounding area is not allowed."
- During construction asphalt lining will be ensured to control leaching of wastewater.

After adopting all the recommended mitigation measures, the residual impacts during the operations phase of the project shall be medium to low.

5.5.1.4 Air Quality

The air emissions -from electricity generator to run machinery at disposal station.

Potential Mitigation Measures

- Plantation will be provided on the main entrance would be useful for landscaping and surroundings which will generate fresh oxygen
- Maintenance of electricity generators will be ensured timely.
- Plantation will be done along the premises of sewerage Network and WWTP. Plantation Plan is Attached as Annexure I.

Despite the above measures, there will be some residual impacts on the air quality. The significance of this impact is expected to be from low to moderate.

5.5.1.5 Odour Generation and Associated Issues

A. Potential Impacts

Impact will be low in nature

- According to the 'Wastewater Technology Fact Sheet – US EPA', odor WSP based WWTPs is usually generated due to excessive organic load causing anaerobic decomposition and due to inadequate ventilation.
- Ponding could happen due to excessive biological growth or foreign matter in or on the WSP.

B. Potential Mitigation Measures

Mitigation measures to be adopted by the MC include:

- WSP shall be inspected on a daily basis for signs of ponding, uneven flow distribution, clogging, vibration, leakage, flies and unusual odors.

To avoid odors, the operators shall;

- Reduce loading; increase BOD removal in primary settling tanks; enhance aerobic conditions in treatment units by adding chemical oxidants, pre-aerating, recycling plant effluent, or increasing air to aerated grit chambers; scrub off gases; use plastic media instead of rock.
- Increasing the recirculation rate and checking for vent obstructions shall eliminate the problem.
- Check for clogged nozzles which may not be allowing for equal distribution of flow.

To avoid Ponding, the operators shall:

- A sampling plan shall be devised by the MC that will assist in locating problems within the plant with the minimum parameters for the samples being influent flow, recirculation rates, BOD5, TSS, pH, DO, settle-able solids and suspended solids.
- The operational performance of both upstream and downstream treatment units will have a direct effect on the performance of a WSP[39].

5.5.1.6 B Social Environment

[39] https://files.dep.state.pa.us/water/bsdw/OperatorCertification/TrainingModules/ww20_Waste Stabilization Pounds_wb.pdf

When a development project is launched in a community, it helps in boosting up the socio-economic conditions by providing the people different economic opportunities. The improvement of sewerage system and construction WWTP would have a positive impact on the commercial activities of the locals. The socio-economic impacts like employment, revenue generation for MC, and improvement of municipal services are the direct benefits during this stage for the people of the sub-project area. Local people will be hired for different jobs like sewerage system maintenance, Environmental Quality parameter testing and handling of WWTP etc. These are some of the many examples. Operation of the project will also result in the decrease land values. This section will highlight positive and negative impact of the project.

5.5.1.7 Employment Generation

The employment opportunities in the sub-project area will be increased due to the development and operation of the proposed project. During development and operation of the proposed project, unskilled workers will be required as labors, sanitary workers and sweepers as well as for the skilled workers such as; environmental engineers and lab analyst to operate WWTP. In totality, the overall economic conditions of the area will be improved.

5.5.1.8 Aesthetic Impacts

Tree plantation followed by ornamental plants within or outside the premises will increase the aesthetic value and scenic beauty of the site. The Proponent will also make arrangements for protection and maintenance of these plants and trees.

5.5.1.9 Occupational Health & Safety Impacts

a) Potential Impacts

- Work at Sewage Treatment Plant is often physically demanding and may involve hazards such as open water, trenches, and slippery walkways, working at heights, energized circuits, and heavy equipment.
- There is a high potential for illnesses arising from contact with viruses, bacteria and other microorganisms in sewage. The most serious viral risk is hepatitis. The most serious bacterial risk is tetanus.
- Work may also involve entry into confined spaces, including manholes, sewers, pipelines, storage tanks, wet wells, digesters, and pump stations. Methane generated from anaerobic biodegradation of sewage can lead to fires and explosions.
- Moreover, cutting, grinding and hot work shall be done in workshop which also has significant safety risk. Unless suitable precautionary protocols in accordance with international good practices are put in place, there is a high risk of injury and accidents taking place at the WWTP during its day-to-day operations.
- Laboratory staff shall be at risk of getting injuries associated with handling of various lab chemicals and reagents.

- Sanitation workers involved in the cleaning and maintenance of interceptor can be exposed to Hydrogen Sulphide (H2S) when cleaning or maintaining the interceptor. Sanitation workers dealing with sewage may be at increased risk of becoming ill from waterborne diseases

b) Potential Mitigation Measures

- In order to ensure a safe and healthy working environment for the workers and staff of the WWTP and the sanitation workers involved cleaning and maintenance, the following measures shall be strictly enforced, implemented and monitored by the MC:
- An OHS Management System shall be established and implemented describing standard operating procedures, roles and responsibilities, training needs, emergency response procedures, and reporting and documenting needs.
- Designation of an Environment, Health and Safety (EHS) officer dedicated to the site;
- Workers shall be educated / trained for the following measures as well as they shall be equipped by the plant management accordingly:
- Avoid direct contact with sewage.
- Avoid aerosolizing sewage water or minimizing exposure time in areas where aerosolizing is occurring. Make sure ventilation systems are functioning properly when working around areas where sewage may be aerosolized.
- Thoroughly cleanse all exposed injuries with soap and water and keep them covered with a bandage (preferably waterproof) while at work. Seek medication attention immediately after suffering cuts or penetrating injuries.
- If a worker is suffering from a skin problem, they should see a physician before working with sewage.
- Avoid touching the face, mouth, hands, eyes or nose with dirty hands or other items and avoid nail biting.
- Thoroughly wash the hands and face with soap and water before eating, drinking or smoking.
- Eat/smoke in designated areas away from sewage contamination. These areas must be kept free from contamination by leaving any protective clothing and boots in a separate area, for example.

- Use appropriate protective clothing at work (coveralls) and personal protective equipment (boots, gloves, plastic face shields) and, where required wearing respiratory protective equipment.
- Remove personal protective clothing and footwear at the end of the shift and leave it at work.
- Shower and change out of work clothes before leaving work.
- Report damaged equipment.
- Report all work-related health symptoms to the supervisor / in-charge
- The plant management shall ensure organization of periodic tests for workers for disease exposure such as: Skin tests for tuberculosis and fungal infections, liver function tests for hepatitis, white blood cell (leukocyte) counts and urinalysis for Fibrinogen Degradation Product (FDP) concentration.
- Safe reach shall be ensured so that all the staff reach their work stations safely.
- All path, walkways, staircases, ladders and platforms shall be stable and made suitable for the tasks to be undertaken;
- Strict use of Personal Protective Equipment (PPE) by all personnel (especially staff working in Laboratory/chemical building and workshop) shall be ensured.
- Tool Box talks shall be performed at the start of every shift.
- Mandatory training of all employees, including sub-contractors, on Health and Safety Practices for WWTP and its auxiliary facilities shall be ensured.
- Mandatory health and medical check-ups for all sanitary workers working in cleaning of pumping stations and sewers shall be performed.
- A written program (i.e., health information, instruction and training) shall be developed for setting out the procedures, equipment, personal protective equipment, and work practices that are capable of protecting employees from the health hazards of working in WWTP and its auxiliary facilities;
- Accidental fires must be addressed immediately. Firefighting plan shall be developed and appropriate fire extinguishers shall be placed at prominent locations.
- Emergency plan (including fire management) shall be developed and implemented attached as Annexure H.

- First aid facilities required to attend workers with minor injuries / ailments shall be established at site for meeting emergency situations;
- Availability of first-aid kits and vehicles that can be used to bring any injured employee to the nearest hospital in cases of accidents shall be ensured;
- Mandatory reporting of all accidents or incident of near misses of accidents and immediate adoption of corrective measures shall be ensured.
- The MC shall provide all the necessary financial and manpower resources for the implementation and enforcement of all health and safety programs and activities throughout the operational phase;
- Regular training and orientation on safety practices will be implemented to impart knowledge of safe and efficient working environment.
- Effective and proper housekeeping shall be ensured.
- Heat levels shall be monitored and spot checks shall be done to ensure that workers' welfare is addressed especially during summer months.
- Railing shall be installed around all process tanks and pits.
- Workers working near water bodies shall be provided with life line and Personal Flotation Device (PFD) and provision / availability of rescue buoys and throw bags shall be ensured;
- Implementation of a confined spaces entry program that is consistent with applicable accepted standards shall be ensured.
- Valves to process tanks shall be locked to prevent accidental flooding during maintenance;
- Provision and use of fall protection equipment shall be ensured during work at heights;
- Work areas shall be maintained to minimize slipping and tripping hazards; Fire and explosion prevention measures shall be adopted in accordance with internationally accepted standards

5.5.1.10C Biological Environment

During operational phase of the project, there would be medium on the surrounding biological environment.

After adopting all recommended mitigation strategies, the residual impacts shall be low.

5.5.1.11 Pathogens and Vectors

a) Potential Impacts

- Workers and staff at wastewater and sludge treatment facilities where treated wastewater or sludge is applied, as well as operators of sludge collection vehicles, can be exposed to the many pathogens contained in sewage.
- Processing of sewage can generate bio-aerosols which are suspensions of particles in the air consisting partially or wholly of microorganisms, such as bacteria, viruses, molds, and fungi. These microorganisms can remain suspended in the air for long periods of time, retaining viability or infectivity.
- Workers may also be exposed to endotoxins, which are produced within a microorganism and released upon destruction of the cell and which can be carried by airborne dust particles. Vectors for sewage pathogens include insects (e.g., mosquitoes, flies), rodents (e.g. rats) and birds (e.g. gulls).

b) Mitigation Measures

The Contractor shall ensure the following:

- Comprehensive plan (Disease Vector Plan) attached as Annexure J shall be developed and implemented to manage and avoid the spread of vector borne diseases, also taking into account the seasonality of the issue;
- Minimize the sludge inventory present at the WWTP as far as possible to prevent breeding of disease vectors;
- Cover the sludge piles present at the WWTP as far as possible;
- Cover all influent drains within WWTP and inject chemicals as required to minimize/prevent breeding of disease vectors;
- Maintain good housekeeping in sewage processing and storage areas;
- Implement safety training program for workers, safe handling and personal hygiene practices to minimize exposure to pathogens and vectors;
- Use of vacuum trucks for removal of sludge instead of manual methods;
- Provision and use of suitable personal protective clothing and equipment to prevent contact with wastewater (e.g., rubber gloves, aprons, boots, etc.).

- Provision of prompt medical attention and cover any skin trauma such as cuts and abrasions to prevent infection and use protective clothing and goggles to prevent contact with spray and splashes;
- Provide areas for workers to shower and change clothes before leaving work and provide laundry service for work clothes;
- Encourage workers to wash hands frequently;
- Provide worker immunization (e.g., for Hepatitis B and tetanus) and health monitoring, including regular physical examinations;
- Reduce aerosol formation and distribution by planting trees around the aeration areas to shield the area from wind and to capture the droplets and particles;
- Reducing aeration rate, if possible, but not to the detriment of wastewater treatment efficiency;
- Avoid handling screenings by hand to prevent needle stick injuries;
- Maintain good housekeeping in sewage processing and storage areas;
- Advise individuals with asthma, diabetes, or suppressed immune systems not to work at wastewater treatment facilities, because of their greater risk of infection.

5.5.1.12 Community Health & Safety

a) Potential Impacts

If the waste left on the site and not promptly disposed of during maintenance or cleaning, the public may experience inconvenience due to exposure to unpleasant odors and harmful pathogens. Additionally, the transportation of the waste, if not handled properly, could also create problems for general traffic, further adding to the nuisance.

b) Potential Mitigation Measures

- EPA certified hazardous waste handlers shall be contracted for the safe and timely removal and transportation of removed waste for its appropriate disposal. Cleaning and maintenance shall be done at night, when the roads are quieter, with less vehicular traffic.

- Choose the site of the sewerage and waste treatment project carefully, away from sensitive locations such as residential areas, schools, and hospitals.
- Post attention/alert notices at the sub-project site to inform the community about the ongoing construction and potential hazards.

- Barricade the site to prevent unauthorized access and ensure the safety of the surrounding community.
- Use proper signage to clearly indicate areas where access is restricted.
- Develop a stakeholder engagement plan based on consultation with the community regarding the nature and potential consequences of risks.
- Implement mitigation measures for sewerage and waste treatment projects to prevent waterborne diseases, pollution, and promote public health and safety.
- Design and construct the sewerage and waste treatment system to meet environmental and public health standards with appropriate materials and technologies to prevent leaks, spills, and other hazards.
- Implement odor control measures like covering tanks, using odor control chemicals, and installing air scrubbers.
- Engage with the community throughout the project to provide information, raise concerns, and provide feedback.

6 Environmental and Social Management and Monitoring Plan

6.1 General

This chapter presents the Environmental and Social Management and Monitoring Plan (ESMMP), which describes the various actions taken by the project proponent to ensure long term environment sustainability of the proposed project. Hence, a comprehensive management plan is required that are socially acceptable and environmentally sound. The basic aim of the Environmental and Social Management and Monitoring Plan (ESMMP) is to address all the anticipated environmental issues and proposed framework for mitigation measures of pre-construction, during and operational phases of the project. Besides defining roles and responsibilities of various authorities, the ESMMP also presents a set of environmental mitigation measures, which focus on avoiding and or preventing the adverse environmental and social impacts emerge due to project activities. The ESMMP also suggests institutional setup for ensuring smooth implementation of the various mitigation measures and other recommendations. Institutional arrangements for compliance monitoring, training and capacity building are also included in the ESMMP. ESMMP also defines frequency of taking samples for monitoring of air quality, solid quality, ground water quality, noise and vibration etc.

ESMMP will ensure proper management of the identified environmental impacts, either fully prevented or alleviate to an acceptable level. It would be only possible if proper implementation of the EMP and objectives are successfully adapted by concerned departments, institutions and regulatory agencies. Therefore, there is a need to carefully coordinate with the design and construction phase of the project to assure that relevant mitigation measures are implemented at the suitable stage and resources are properly allocated to attain the desired outcome

The ESMMP is one of the outcomes of the EIA/ESIA identifies major areas which need attention during the various stages of the project implementation such as designing phase (pre-construction phase), construction phase as well as operation phase, in particular, (a) what is to be managed and monitored; (b) when and where; (c) by whom; (d) whom to report and follow up if there is an issue that may raise at any stage of the project. An important component to ponder is that monitoring of every environmental parameter continuously is not practical and necessary. Environmental monitoring functions according to the characteristics of existing environmental conditions and identifies unacceptable changes during construction period.

Based on these guiding principles, the ESMMP is prepared for the effective implementation, management of the mitigation measures and monitoring requirements, satisfies the requirement of the Pakistan Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2022 and WB policy guidelines.

6.2 Primary Objective

The ESMMP devises a mechanism to address adverse impacts that are likely to arise during pre-construction, construction, operation of the proposed facility and the post closure to enhance project benefits and to introduce good practices to be adopted at various stages of project.

The primary objectives of the ESMMP are:

- Outline mitigation measures based on the impact assessment in the EIA/ESIA and define the responsibilities of the contractors, sub-contractors and the project proponent and timing for the implementation of these measures.
- Develop a monitoring mechanism and identify parameters that can confirm the implementation of the mitigation measures.
- Facilitate the implementation of the mitigation measures identified in the EIA/ESIA.
- The development and implementation of environmental monitoring plan for the periodic reviews of the baseline environmental conditions.
- Identify training requirements at various levels.

6.3 Roles And Responsibilities

This section defines roles and responsibilities of the project proponent (for the implementation of ESMMP and identify areas where these roles and responsibilities can be shared with other stakeholders.

The project proponent will be responsible for ensuring compliance to all applicable requirements of ESMMP. The proponent will be responsible for all the activities requiring special attention as specified by the Environmental Expert. Meanwhile, the proponent will ensure that contractor conducts all activities in a manner that minimizes disturbances to the residents and the public in general. The contractor will implement the majority of environmental and social mitigation measures. The contractor will carry out field activities. The contractors are subject to certain liabilities under the environmental laws of the country and under its contract with the proponent.

The organizational roles and responsibilities are summarized below:

Role	Responsibilities
Proponent	▪ Implementation and monitoring of the ESMMP ▪ Provide all supervisory and management staff with an awareness and understanding of their responsibilities under this ESMMP.

Role	Responsibilities
	▪ Provide appropriate and adequate resources are allocated to allow for the effective implementation and maintenance of the ESMMP. ▪ Conduct periodic reviews of environmental performance are conducted. ▪ Report any major environmental incidents that may have a significant impact on the surrounding environment. ▪ Provide employees and contractors with the relevant environmental instruction in relation to the ESMMP and awareness and understanding of their obligations and duties.
Construction Contractor	▪ The Contractor will be responsible for on-field implementation of the ESMMP and environmental protection liabilities under the Punjab Environmental Protection Act (Amendment 2012). He will also be responsible for compliance of ESMMP provisions keeping in view his contract with the MC Jaranwala. The Contractor will train his crews in all aspects for implementation of the ESMMP. ▪ Be aware of and understand the contents of and the reason for implementing the elements of the ESMMP and ensure all personnel including subcontractors adhere to these requirements. ▪ Provide adequate training in the elements of the EMMP to all personnel, including contractors. ▪ Provide personnel involved in the project, including subcontractors and visitors, with the appropriate environmental training required to provide them with awareness and understanding of their responsibilities under the ESMMP as well as understanding of the environmental approvals that adhere to the strategies outlined in the ESMMP. ▪ The contractor/ sub-contractor shall carry out field activities as part of the project construction. The contractors/ sub-

Role	Responsibilities
	contractor will be responsible to implement various mitigation measures prescribed in the ESMMP of EIA/ESIA report. The contractors will also be subjected to certain obligations under the PEPA Act, and under their contracts with the concerned authority. ▪ Make sure that all environmental safeguards and precautions are in place and adhered to at all times at the site and activity. ▪ Regularly inspect and monitor all activities for adherence to proper environmental safeguards. ▪ Ensure that all equipment used is properly serviced and that all precautions are in place to prevent the likelihood of an environmental incident occurring. ▪ Report all environmental incidents to the Superintendent's Representative as soon as practicable, but within 24 hours of them.
Superintendent's Representative All employees and subcontractors	▪ Be aware and understand the contents of, and the reason for, implementing the elements of the ESMMP. ▪ Exercise environmental due diligence and achieve compliance with the ESMMP. ▪ Report all environmental incidents to the principal as soon as practicable, but within 24 hours of them occurring.

6.4 Institutional Arrangements

6.4.1.1 MC Jaranwala

Overall responsibility for Environmental Management and Monitoring will rest with the MC Jaranwala. ESM Wing will provide support to ESFPs for managing environment and social aspects of the Sub-project and implementation of the present ESMMP. The specific responsibilities of the institutions involved in the ESMMP implementation are described below:

6.4.1.2 PMDFC ESM Wing

MC will be responsible for implementation of ESMMP with the technical assistance of ESM Wing PMDFC throughout the Sub-project period. ESM Wing would also support community participation, consultations and other social activities from the Sub-project identification to completion stage.

6.4.1.3 The Contractor

The The Contractor will be responsible for on-field implementation of the ESMMP and environmental protection liabilities under the Punjab Environmental Protection Act (Amendment 2012) and World Bank's Environmental and Social Safeguard Policies. He will also be responsible for compliance of ESMMP provisions keeping in view his contract with the MC. The The Contractor will train his crews in all aspects for implementation of the ESMMP.

The ESMMP will be an integral part of the contract document. The bid would include a detailed environmental mitigation budget as part of the engineering costs of the respective works. The Contractor will also be responsible for implementation of social and environmental guidelines for The Contractors prepared by PMDFC ESM Wing during execution of work. The Contractor will engage environmental and social officers to fulfill the above requirements.

6.5 Reports

The The Contractor will submit weekly compliance monitoring checklist and PMDFC ESM Wing will submit quarterly and annual monitoring reports as well as a final report of the Sub-project based on safeguard implementation status. The monitoring reports will also include process and outcome of consultations with the Sub-project Affected Persons if any. The distribution of periodic reports is given in Table 14.

Table 34:Reports

Distribution of Periodic Reports Report	Prepared by	Reviewed by	Distribution
Weekly	The Contractor	PMDFC DPO ESM	PMDFC ESM team
Quarterly	MC with the support of PMDFC DPO ESM	PMDFC SPO ESM	The World Bank
Annual	MC with the support of PMDFC DPO ESM	PMDFC SPO ESM	The World Bank
Final	MC with the support of PMDFC DPO ESM	PMDFC SPO ESM	The World Bank

6.6 Inclusion of ESMMP and ESHS Conditions in the Bidding Documents

The present ESMMP will be included in the bidding/ contract documents and their implementation will be a contractual binding for the The Contractors. In addition, the The Contractor's guidelines prepared by PMDFC/ safeguards procedures will also be made part of contractual agreement.

In order to make Contractors fully aware and responsible for ensuring ESHS compliance, following conditions in particular and all other relevant conditions in line with 'WB – Procurement of Works & User's Guide – Updated January 2017, will be made part of the bidding documents:

- The Contractor shall obtain (at its cost) an Environmental, Social, Safety and Health (ESHS) Performance Security for compliance with the Contractor's ESHS obligations.
- The Contractor shall be required to declare any civil work contracts that have been suspended or terminated and/or performance security called by an employer for reasons

related to the non-compliance of any environmental, or social, or health or safety requirements or safeguard or related to sexual exploitation and abuse and gender-based violence in the past five years.

- The Contractor shall submit comprehensive and concise Environmental, Social, Health and Safety Management Strategies and Implementation Plans (ESHS-MSIP) which includes but not limited to; Mobilization strategy, Strategy for obtaining consents/permits, Traffic management plan, Waste management plan, workers camp management plan etc. and a Strategy for marking and respecting work site boundaries etc.
- The Contractor shall recruit qualified and experienced Environment, Health, Safety and Social Staff with relevant educational background and experience for each site to manage E&S aspects of the project.
- The Contractor will be contractually bound to disclose the "Recruitment Policy" and follow it. Contractor will hire at least 60% people who live within close proximity to the Project Area.
- ESIA shall be made part of the bidding documents.
- Provision related to SEA/SH/GBV will be incorporated in the bidding document.
- The Contractor shall be required to ensure compliance of 'Code of Conduct' signed by each of its employees / workers. The issues to be addressed in the Code of Conduct shall include the following:

  i) Compliance with applicable laws, rules, and regulations of the jurisdiction

  ii) Compliance with applicable health and safety requirements (including wearing prescribed personal protective equipment, preventing avoidable accidents and a duty to report conditions or practices that pose a safety hazard or threaten the environment)

  iii) The use of illegal substances

  iv) Non-Discrimination (for example on the basis of family status, ethnicity, race, gender, religion, language, marital status, birth, age, disability, or political conviction)

  v) Interactions with community members (for example to convey an attitude of respect and non-discrimination)

  vi) Sexual harassment (for example to prohibit use of language or behaviour, in particular towards women or children, that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate)

  vii) Violence or exploitation (for example the prohibition of the exchange of money, employment, goods, or services for sex, including sexual favours or other forms of humiliating, degrading or exploitative behaviour)

  viii) Protection of children (including prohibitions against abuse, defilement, or otherwise unacceptable behaviour with children, limiting interactions with children, and ensuring their safety in project areas)

  ix) Sanitation requirements (for example, to ensure workers use specified sanitary facilities provided by their employer and not open areas)

x) Avoidance of conflicts of interest (such that benefits, contracts, or employment, or any sort of preferential treatment or favours, are not provided to any person with whom there is a financial, family, or personal connection)

xi) Respecting reasonable work instructions (including regarding environmental and social norms)

xii) Protection and proper use of property (for example, to prohibit theft, carelessness or waste)

xiii) Duty to report violations of this Code

xiv) Non retaliation against workers who report violations of the Code, if that report is made in good faith.

6.6.1.1 E&S Monitoring and Mitigation Plans

The mitigation and monitoring plans are the key element of the ESIA study to be prepared on the basis of impact and risk assessment described in Chapter 6. The plans describe the potentially negative impacts and risks during pre-construction, construction and operation, lists mitigation and prevention measures to address the negative impacts, risks, and assigns responsibilities for implementation, prevention and monitoring and inspecting of these measures.

The E&S Mitigation and monitoring Plans have been prepared following the ESS pattern and are provided as Tables 15 to 19 The Contractor will make sure that they present the implementation status of mitigation and preventive measures identified in these Tables in every monthly report, with quantifiable information.

Table 35:Environmental & Social Management & Monitoring Plan Package 01: Sewerage System

A-Design Stage	Design Responsibilit	Implementation Responsibility
1. Design Aspects		
The following Design Considerations have been integrated with the design of rehabilitation of existing sewerage system enabling to it environmentally and socially sustainable. **1.** Wastewater Treatment • Safe and sustainable wastewater collection, transport, and treatment systems to ensure human and environmental well-being by providing missing links of sewerage supply lines, identification of the lines where desilting will be sufficient rather to replace the system and provision of manholes covers and replacement of pumping machinery from dry wells • The sewerage system that conveys the wastewater discharge of the current population will be connected to infrastructure that performs storage and treatment functions, comprising a disposal station, a WWTP-WSP, and floating wetland up to the minimum acceptable levels to be discharged to a surface water body as per PEQSs and or re-used as per WHO and USEPA Guidelines. • The importance of design criteria is that it allows the identification of problems associated with poor management and improves it through a comprehensive management model that provides solutions based on technical and sustainable criteria, being the innovative part that opens the opportunity for studies to be carried out by professionals; allowing to strengthen learning. **2.** Better Municipal services and sustainable water application after treatment. Major purpose is to improve quality of wastewater by eliminating pollutants, toxicants and many such to make. wastewater usable for other purposes and preservation of water quality of natural water resources.	Design Consultants	MC Jaranwala
2.Permits, NOCs, Clearances		

Necessary consents, permits, and clearances shall be obtained before the start of civil works Permissions and clearances are required mainly from the government agencies including i.e. Punjab Environmental Protection Agency (EPA) or from other Government entity in case of temporary obstruction in public utilities e,g. WAPDA in case of shifting of transmission lines.	PMDFC and MC	MC Jaranwala
3.Land Acquisition and Resettlement Issues		
• This component of subproject will be executed at MC owned ROW and existing systems • The contractor's temporary facilities will preferably be established on government owned land. Otherwise, such lands/budlings will be obtained on a rental or lease basis. • It will be ensured that no project works are carried out where AED activities have been or are being carried out	MC Jaranwala	MC Jaranwala
4.Preparation of Stakeholder Engagement Plan		
Stakeholder engagement plan with a realistic timeframe covering preliminary, construction and operation phases has been prepared and approved (prior to project appraisal) and implemented effectively ensuring engagement of stakeholders throughout the project cycle.	Design Consultant/ PMDFC	MC Jaranwala
5. Preparation of Labour Management Procedures		
EHS SOPS for Labour workers/Including women workers have been prepared and approved (prior to project appraisal) and will be implemented effectively throughout the project period by making them part of contractors' term of reference and bid documents.	ESFPS	

B-Pre-Construction Phase	Location/Project Phase	Institutional Responsibility	
		Implementation	Supervision
1. Contractors Terms of Reference • The MC Jaranwala shall ensure to make EIA/ESIA Report approved from Punjab EPA and ESMMP of EIA/ESIA shall be made part of contractor terms of reference and part of the bid documents. • This ESMMP will be used by the contractor to be guided on the structure and control of potential environmental and social issues that are required to be managed to avoid or mitigated adverse consequences. • This ESMMP will address all of the issues addressed here, but not limited to, and will consists of different sub-plans that will cover health and safety, traffic management, worker camp management, material sourcing, waste disposal.	Contract Award to completion phase	MC Jaranwala	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants
2. Grievance Redress Mechanism • Grievance Redress Mechanism has been developed under PCP • MC Jaranwala with the technical assistance of PMDFC team shall share project details to public, relevant stakeholders and to receive complaints • Display contact details of ESFPs and E&S Supervision consultants for public to lodge their complaints/concerns to the contractor at the entrance and main points of the site • Provide sign boards for pedestrians to inform nature and duration of construction works • Provide alternative access road for residents via Peradeniya • Develop and establish contractor's own procedure for receiving, documenting and addressing complaints from the affected public and nearby communities that is fully in line with and guided by the project's GRM • Ensure to keep a copy of the ESMMP at all times at the project supervision office on site.	Throughout the cycle of project	MC Jaranwala Contractor	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants

C- Construction phase							
Proposed sub project activity	**Anticipated Environment and Social Issues**	**Magnitude of Impacts**	**Proposed Mitigation Measures**	**Mitigation Implementation Responsibility**	**Monitoring Indicators**	**Monitoring Frequency**	**Monitoring Responsibility**
Establishment of Labor Camp	• Availability of Land • Security • Environment, Health and Safety of Labor at Campsite • Community Concerns regarding privacy of women and GBV[40]	Medium	• At current, land/road proposed for construction and improvement of existing Sewerage system is open and vacant from any legal/illegal occupants. There are no trees of important flora and fauna observed at the site. • Currently MC owned land at proposed sewerage site is available for construction of labor camp at the current site. • Contractor will prepare Occupational Health and Safety Plan and get approval from MC before the execution of work • Contractor will be instructed (will be included in his term of reference and in the form of EHS SOPs) strictly implement the PMDFC SOPs for EHS of labor/ construction workers	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports • Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office • E&S Consultants of Supervision Consultants team

[40] Gender Based Violence

	• Sustainable Use of Environmental Resources		• Contractor will be instructed to prefer the local labor to be engaged. Anyhow, for labor site management, following mitigation measures will be provided: I. Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to construction labor if they will be hired from outstation. II. Good housekeeping will be ensured inside campsite III. Labor will be provided with hygienically good quality food. IV. During winter hot water will be provided for bathing and likewise as per the weather condition. **Labor Training and Code of Conduct-** • The contractor shall develop a labor code of conduct indicating specific labor management procedures applicable to different categories of workers including short time and full-time workers. The labor code of conduct shall be consistent with and part of the overall EHS SOPs for Labor developed by the PMDFC. • The labour Code of Conduct shall be translated into Urdu language upon clearance from the MOI of MC Jaranwala and DPO-ESM of regional office of PMDFC. The code of conduct must be made available to all staff and displayed in the work site in local languages • Labor awareness programs to educate the laborers about the code of conduct, general conduct, the Environmental and Social Management and				

			Monitoring Plan, Public and Occupational Health and Safety Plan and sustainable use of local environmental resources etc. should be conducted throughout the contract period as per the Labor management plan and ESH plan approved by the MOI and DPO-ESM. • The contractor shall give priority to selecting labor from project influenced areas so as to minimize the need for erecting labor camps and minimizing labor influx. • Frequent supervision of laborers' activities, labor welfare needs, and action to ensure hygienic conditions in the work sites/ camps • Avoid social conflicts among contactor's labor force and the surrounding community or tension and prevalence of gender- based violence through the implementation of LMP. • Conduct awareness program on Gender Based Violence (GBV), good hygienic practices and dangers of sexually transmitted diseases such as HIV/AIDS and sensitize them to avoid interference and consider the privacy of local community women and vulnerable groups. • Introduce a code of conduct for labor teams to prevent alcohol and drug abuse, violence, sexual abuse etc. • Continue consultation and interaction with host community • Prepare an inventory (including names/ National ID numbers/addresses etc.) of entire labor force employed by contractor, and share with the Resident				

			Supervision Consultants. This inventory shall be updated at each recruitment or resignation of labors.				
Site Preparation	• Accessibility of local communities and Work Site Management • Health and Safety of local communities • Traffic Management	Medium to High	• All public access to the site via adequate fencing and signage which prohibit public access completely, in order to avoid risk to the public • The site entrance will include adequate signage indicating the details of the proposed subproject, implementing agencies etc. as well as safety signage to keep public away. • A fence shall be erected to cover the entire perimeter of the facility using cost effective fence materials consisting of chain link fence fabric, concrete post, etc. as specified in the Technical Specifications in order to ensure, animals and public are unable to access the site. • To avoid land disturbance and movement, the fence shall generally follow the contour of the ground. • Grading shall be performed where necessary to provide a neat appearance • The contractor should provide a site-specific proposed site layout plan that identifies various zones within the construction site for designated use such as material and equipment storage areas, construction vehicle parking areas, vehicle/equipment maintenance areas, labor camps (if any onsite), temporary spoil storage areas etc. which shall be approved by the MC	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

			• Parking, repairing vehicles, machinery and equipment shall be stationed only within the work site and/or in any other designated areas by the MC • The contractor should provide instruction and advice to drivers and operators to park vehicles and store equipment at the designated area **Traffic Safety and Management Plan-** I. The contractor will prepare a **Traffic management plan** in consultation with the city traffic committee approved by the MC and duly disclosed to the public in a timely manner II. Carryout a road safety assessment in order to establish traffic control and safety measures such as road humps, fixing of signage etc. prior to commencement of construction III. Based on the initial road safety analysis a monitoring and management plan shall be prepared and submitted to the MC by contractor and Road Management Plan to be placed at the prominent places IV. In order to ease traffic within the city, transport of construction material and machinery will be done prior to 6.00 am and after 8.00 pm V. During school traffic hour's transportation of construction materials and heavy machinery shall not be done. VI. Provide information and boards at each strategic location indicating basic info – times of closure, diversion routes etc.				

			I. Special consideration shall be given in the preparation of the traffic management plan ensuring the safety of pedestrians and workers at night. II. Personnel used for traffic control by the contractor shall be properly trained, provided with proper gear including communication equipment, luminous jackets for night use. All signs, barricades, pavement markings used for traffic management should be to the standards and approved by the City Traffic Police **Road Safety Monitoring Plan** shall be implemented throughout the construction period. • Monitoring incidents and accidents and monthly reporting shall be ensured. • Appropriate safety improvement measures shall be implemented avoiding incidents due to movement of construction vehicles based on the periodic review of reports. **Environment, Health and Safety of Labor and Communities and Implementation of ESMMP** I. The contractor will employ a qualified Health and Safety Specialist in his team for a period of 06 months. He/she will submit to the engineer a comprehensive Health and Safety Plan for the site which will be based on an assessment of OSH/EHS ad public safety risks in relation to various types of construction activity and which covers the entire construction period.				

			II. The H&S specialist will oversee its implementation regularly assessing the risk of various hazards and adopting mitigation measures. III. He shall ensure the all-reasonable precautions will be taken to prevent danger of the workers and the public from accidents such as fire, explosions, blasts, falling to excavated pits, chemical sprays, unsafe power supply lines etc. IV. The Contractor shall comply with requirements for the safety of the workmen as per the international labor organization (ILO) convention No. 62 and EHS SOPs of PMDFC to the extent that those are applicable to this contract. **V.** The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, boots, etc., to the workers and staff. **Community Safety Management Plan**- I. All debris, waste generation from construction activity, labor camps etc. will be disposed only at locations approved by the MC for such purpose II. The debris and spoil shall be disposed in such a manner that; (i) waterways and drainage paths are not blocked				

			(ii) the disposed material should not be washed away by runoff and (iii) should not be a nuisance to the public. (iv) The contractor shall do what is necessary in the minimum to ensure the disposal sites are made safe after disposal of the waste (level the waste, ensure drainage and safety) (v)The contractor shall as much as possible dispose waste on daily basis (or as necessary given the waste quantities generated and onsite stockpiling space) without allowing to stockpile onsite, at identified locations for debris disposal, recommended by the MC. (vi) During transportation, dispose materials should be covered with tarpaulin				
Excavation and Construction Activities	• Dust/Air and noise	High	• All sedimentation and pollution control works and maintenance thereof are deemed, as incidental to the earthwork. Works to minimize cleared areas and exposed soils at a given time. • Barricades such as humps shall be erected around excavated areas for culverts, silt traps, foundations, sewerage pipes as some work in • The contractor shall effectively manage the dust generating activities such as handling and transporting sand, rubble, bitumen, and cement during periods of high winds or during more stable conditions with winds directed towards adjacent residences and other facilities. • The Contractor shall erect a dust/noise barrier has around the site. • All vehicles delivering materials shall be covered to avoid spillage and dust emission. • The Contractor should avoid, where possible and take suitable action to prevent dirt and mud being	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultant of Supervision Consultans team

			carried to the roadway (particularly following wet weather). • The contractor should enforce vehicle speed limits to minimize dust generation. • The Contractor shall employ a water truck to sprinkle water for dust suppression on all exposed areas as required (note: the use of waste water / waste oil for dust suppression is prohibited) • All existing roads used by vehicles of the contractor, or any of his sub-contractor or supplies of materials or plant and similar roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres. • Clearance shall be affected immediately by manual sweeping and removal of debris and ensure sprinkled water using appropriate equipment • Dust emissions should be controlled by wet spraying of construction sites and roads which are used for transportation of Construction materials at regular intervals. • Tarpaulin covering is mandatory on trucks /lorries which are used for transporting materials. • All stockpiles including temporary storage of debris and construction materials should be covered using tarpaulin covering. • Noise and Dust barriers with minimum height of 4m should be erected around entire working sites to control dust emission to the ambient air. Selection of the suitable material. • Contractor shall take appropriate action to ensure that construction works do not result in damage to the adjacent properties due to vibration. • Contractor shall pay due consideration on vibration impacts of construction on adjoining structures. In				

			the event vibration levels are found to be exceeding national standards, he shall modify the method of construction until compliance with stipulated national vibration standards is met. • Vehicles should be maintained in good condition regularly so that noise and emission generating from wear and tear will be minimal • Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the DPO-ESM to keep noise and air emissions from these at a minimum				
	• Soil and Vegetation Cover Loss		• Construction vehicle, machinery and equipment shall be used and stationed only in the areas of work and in any other area designated/ approved by the MC Jaranwala. • Ad-hoc and scattered parking and placement of machinery should be avoided to minimize harm to roadside ground cover. • The contractor shall include in the construction site layout plan indicating various areas identified for designated use including parking areas. • Contractor should provide necessary instructions to drivers/operators and other construction workers not to destroy ground vegetation cover unnecessarily. • Designated vehicle parks and maintenance yards must be informed to labor force. • Top soil of productive areas where it has to be removed for the purpose of this project shall be stripped to a specified depth of 150mm and stored in stockpiles of height not exceeding 2m, if directed by the MC. If the contractor is in any doubt on whether to conserve the topsoil or not for any given area he/she shall obtain the direction from the MC in writing				

			• Removed top soil could be used as a productive soil when replanting/establishing vegetation under landscaping plans Stockpiled topsoil must be returned to cover the areas including cut slopes where the topsoil has been removed due to project activities. • Vehicle/machinery and equipment servicing and maintenance work shall be carried out only in designated locations/ service stations approved by the MC. • Waste oil, lubricants and other petroleum products and untreated wastewater shall not be discharged on ground so that to avoid soil pollution. Clean up measures shall be taken against pollution of soil by spillage of petroleum/oil products from storage tanks and containers • Sites used for vehicle and plant service and maintenance shall be restored back to its initial status. Site restoration will be considered as incidental to work				
	• Water and Soil Contamination		• The contractor shall clean up any area including water-bodies affected/contaminated (if any) as directed by the MC at his own cost. • The contractor shall indicate on a site layout plan the drainage network and strategic locations in which soil erosion control devices will be installed. The contractor shall, to the extent possible, schedule/stage these sections will have to be stopped during heavy rains due to heavy erosion. • Work that lead to heavy erosion shall be avoided during the raining season. If such activities need to be continued during rainy season prior approval must be obtained from the MC by submitting a proposal on actions that will be undertaken by the contractor to prevent erosion.				

	• Damage to archeological sites		• Chance Find Procedure will be adopted in case any such discovery of archeological property, the contractor shall take reasonable precaution to prevent his workmen or any other persons from removing/damaging any such article and shall immediately inform the MC and immediately stop construction activities. (Chance Find Procedures are attached as **Annexure C**)				
	• Management of Hazardous Waste		• Contractor prior to the commencement of work shall provide list of harmful, hazardous and risky chemicals/ material that will be used in the project work to the MC. • Contractor shall also provide the list of places where such chemicals/materials or their containers or other harmful Asbestos Containing Materials (ACM) shall not be used for any temporary and permanent work on the SEWERAGE site.				
	• Disturbance to Flora and Fauna and vegetation cover		• All construction works shall be carried out in a manner that the destruction to flora and their habitats is minimized. • At current, no trees are found at the proposed site of sewerage but if all such cases of tree removal contractor shall take prior approval from the MC and DPO-ESM prior to removal with a justification as to why the removal is unavoidable and plantation will be carried out with 1:10 removal ratio				
	• Wastage of Water		• Arrange adequate supply of water for the project purpose throughout the construction period in consultation with the MC Jaranwala . • The contractor should discuss the daily requirement for potable and non-potable water and confirm with the MC Jaranwala that the demand can be met through their supply connection.				

			• Do not extract water from surface water bodies or water sources without the permission from MC & relevant authority. Obtain permission for extracting ground water, if needed, prior to the commencing of the project, from the relevant authority • The contractor will minimize wastage of water in the construction process/operations by reusing water as much as possible, utilizing only the required amount of water for the construction works etc. • The contractor shall maintain a record of usage of water for various purposes and sources tapped. • The contractor will adopt measures that are technically and financially feasible that avoid or minimize water usage throughout the construction period.				
	• Traffic Jams and Congestion and road accidents		• The construction materials intended for temporarily storage should be properly stockpiled in most appropriate areas in the Site to avoid disturbance to site mobility, traffic and stored away from drainage paths • Efficient use of all construction material in order to reduce waste generation. • All use of chemicals and hazardous materials will be subject to national and international regulations and requirements. Their use will be minimized and their release will be controlled				
Construction Material Storage, Handling and Use	Spillage Odor	Low	• Contractor shall take all precautions such as storing all chemicals used for construction works in properly closed containers with good ventilations to prevent odor and offensive smell emanating from chemicals and processes applied in construction works or from labor camps.	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervisio

			• In a situation when/where odor or offensive smell does occur, contractor shall take immediate action to rectify the situation • Contractor is responsible for any compensation involved with any health issue arisen out of bad odor and offensive smells				n Consultants team
Construction Machinery/ Equipment Use	• Emissions from Construction Vehicles, Equipment and Machinery • Noise from Vehicles, Plants and Equipment • Health and Safety of Labor /Workers	Low	• The emission standards promulgated under the Punjab Environmental Quality Standards (PEQs) shall be strictly adhered to all vehicles, equipment and machinery used for construction shall be regularly serviced and well maintained to ensure that emission levels comply with the relevant standards. • The contractor shall maintain the average noise levels within the construction site during the day time to 65 dB and night time to 55 dB Punjab Environmental Quality Standards (PEQs). • Noise barriers (cum dust) with minimum height of 4m shall be installed around the site as shown in the following figures and the construction noise levels outside the noise barriers should be maintained below 75dB during day time. • Within the site, the contractor shall measure noise levels on a monthly basis, or as per requirement, and report to the DPO-ESM through the contractor's monthly progress reports. Where, exceedances are noted, that can adversely affect construction workers, the contractor shall propose methods to control noise levels. • All machinery and equipment should be well maintained and fitted with noise reduction devices in accordance with manufacturer's instructions. • All vehicles and equipment used in construction shall be fitted with exhaust silences. • During routine servicing operations, the effectiveness of exhaust silencers shall be checked	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

			and if found to be defective shall be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of sound emission. Non-compliant plant shall be removed from site • Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the Engineer, to keep noise from these at a minimum. • Workers in vicinity of strong noise, and workers working with or in crushing, compaction, batching or concrete mixing operations shall be provided with PPEs				
Construcion activties	Impacts on sensitive receptors (schools, Mosques, colleges, Hospitals, Maddrassa, graveyard and shrines) • High noise • Air pollution • Traffic congestion • Access & Mobility • Safety Concerns	high	• Implementing noise barriers and using quieter equipment to reduce noise pollution. • Controlling dust and air pollution through water spraying and dust suppression measures. • Scheduling construction activities during less sensitive times, such as avoiding school hours or reducing noisy activities during the evenings. • Creating safe pedestrian pathways and ensuring smooth traffic flow. • Engaging with the local community to inform them about the construction plans and potential disruptions. • Labor/workers will be sensitized to avoid any interference with the local communities who may be visiting the graveyard • Vehicle/machinery movement shall be strictly avoided from the passage of graveyard and	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly •	• DPO-ESM • of PMDFC Regional Office E&S Consultants of Supervision Consultants team

			alternate movement route (which is available) shall be used. • Sewerage lines will be ensured to be laid 100m away from the graveyard and MC will ensure it by the contractor and same is ensured in the design of the subproject. • Contractor will be instructed to avoid construction activities during religious practices days at shrine. • An effective GRM shall be in-placed to immediately resolve any complaint from the local communities.				
D- OPERATION PHASE							
Proposed sub project activity	**Anticipated Environment and Social Issues**	**Magnitude of Impacts**	**Proposed Mitigation Measures**	**Mitigation Implementation Responsibility**	**Monitoring Indicators**	**Monitoring Frequency**	**Monitoring Responsibility**
Seepage / salinity	Weaken the structure strength and in watering and salinity condition.		• Runoff from the Site shall be controlled to ensure that adjacent areas are not affected and disturbance to the public is to minimum. • Anti-percolation material layer will be installed under the sewerage lines that no seepage into the soil occur.	MC Jaranwala	• Site Visits • Monitoring Reports • Implementation of GRM	•Site visit	MC Jaranwala

	Unhygienic condition, public health risks		• Sewerage disposal connections to the periphery wastewater system shall be maintained properly with routine maintenance of plumbing/pumps diligently carried out. • Trees shall be managed properly that includes watering, fertilizing, weeding, pest controlling, pruning and training of trees timely. • MCJ shall take necessary actions to prevent the breeding of mosquitoes where stagnation of water in any areas along the sewerage system.				
Emergency Leakage and burst of Sewerage Lines	Nuisance for the local inhabitants Odor and vector breeding hazards Mixing of sewerage water with drinking water		• MC shall ensure to adopt the emergency plans to deal such leakages • Current subproject is designed to be sustainable till at-least 20 years • MCs shall adopt Integrated Development Asset Management Plans (IDAMPs) • Record maintenance of emergency hazards and preparedness Emergency response plan is attached as Annexure H.	MC Jaranwala	• Site Visits • Implementation of GRM	Site visit	MC Jaranwala
Waste water disposal without treatment	Environmental hazard Ecological Hazard Non-compliance of PEQSs Hazardous impacts on agricultural		• Improved sewerage network shall be connected to the proposed disposal station and will be further transmitted to WWTP where its BOD, temperature, flow and other parameters will be monitored at entry point (influent) to the last exit (effluent) after treatment through anaerobic ponds, facultative ponds and through bioremediation by introducing floating wetlands.	MC Jaranwala	• Site Visits • Lab Facility working and maintenance of record/data • Implementation of GRM	Site visit	MC Jaranwala

	crops if used for irrigation		• Sludge dry beds will be used to prepare the compost for further selling to the local farmers which will be a source of revenue generation for the MC. • After disinfection and chlorination and helminths and pathogens removal, treated water will be reused for irrigation purposes and during monsoon or no irrigation usage seasons, treated water shall be pumped through watercourse to the nearest canal which is 10 m away from the WWTP. • For discharge of treated water into surface water body, PEQSs[41] shall be strictly followed (**Attached as Annexure B**) • As Pakistan has no Guidelines/Standards for treated water re-use, so WHO, FAO and USEPA Guidelines and Standards **(attached as Annexure K)** shall be used to ensure the environmental and ecological safety				

[41] . As per PEQSs, Biochemical Oxygen Demand (BOD_5) at 20^0 C for inland water discharge is 80

1: Package 01 Sewerage (Estimated Budget for ESSMP)			
Item	**Quantity**	**Tentative Cost/Item-PKR. /-**	**Total Cost**
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	8	300	2400
Safety Hard Helmets	8	3,000	24000
Safety Shoes	8	3,000	24000
Hand Gloves	8	1,000	8000
Ear Plugs	8	500	4000
Reflective Safety Vest	8	1,000	8000
Safety Goggles	8	500	4000
B-Community Health and Safety			0
First Aid Box Complete	1	5,000	5000
Safety Signs	2	15,000	30000
Safety Cones	8	1,000	8000
Safety Tapes	8	1,500	12000
Portable Delineator with chain	3	2,200	6600
Emergency Portable Lights	2	3,000	6000
Solid Waste Collection Drums with Cover	1	12,000	12000
Fire Fighting Equipment Purchase and refilling	1	5,000	5000
Hiring of Environmental Manager (for 03 months)	3	50,000	150000
Labor Campsite Management	1	100,000	100000
Water Sprinkling	1	50,000	50000
Ambient Air Quality-Before, during, and after construction	3	85,000	255000
Noise Quality-Before, during, and after construction	3	1000	3000
Water Quality-Before, during, and after construction	3	22,000	66000
Total (PKR)-A+B			**783,000**

Table 36: ESMMP of Package 02: Construction of Disposal Station and Forcemain

A-Design Stage	Design Responsibilit	Implementation Responsibility
1. Design Aspects		
The following Design Considerations have been integrated with the design of rehabilitation of existing sewerage system enabling to it environmentally and socially sustainable. **1.** Wastewater Treatment • Safe and sustainable wastewater collection, transport, and treatment systems to ensure human and environmental well-being by providing missing links of sewerage supply lines, identification of the lines where desilting will be sufficient rather to replace the system and provision of manholes covers and replacement of pumping machinery from dry wells • The sewerage system that conveys the wastewater discharge of the current population is connected to infrastructure that performs storage and treatment functions, comprising a disposal station, a WWTP-WSP, and floating wetland up to the minimum acceptable levels to be discharged to a surface water body as per PEQSs and or re-used as per WHO and USEPA Guidelines. • The importance of design criteria is that it allows the identification of problems associated with poor management and improves it through a comprehensive management model that provides solutions based on technical and sustainable criteria, being the innovative part that opens the opportunity for studies to be carried out by professionals; allowing to strengthen learning. **2.** Better Municipal services and sustainable water application after treatment. Major purpose is to improve quality of wastewater by eliminating pollutants, toxicants and many such to make. wastewater usable for other purposes and preservation of water quality of natural water resources.	Design Consultants	MC Jaranwala
2.Permits, NOCs, Clearances		

Necessary consents, permits, and clearances shall be obtained before the start of civil works Permissions and clearances are required mainly from the government agencies including i.e. Punjab Environmental Protection Agency (EPA) or from other Government entity in case of temporary obstruction in public utilities e,g. WAPDA in case of shifting of transmission lines. Anyhow, this component of project will be executed at MC Jaranwala owned Government land where existing system is	PMDFC and MC	MC Jaranwala
3.Land Acquisition and Resettlement Issues		
• This component of subproject will be executed at MC owned ROW and existing systems • The contractor's temporary facilities will preferably be established on government owned land. Otherwise, such lands/budlings will be obtained on a rental or lease basis. • It will be ensured that no project works are carried out where AED activities have been or are being carried out	MC Jaranwala	MC Jaranwala
4.Preparation of Stakeholder Engagement Plan		
Stakeholder engagement plan with a realistic timeframe covering preliminary, construction and operation phases has been prepared and approved (prior to project appraisal) and implemented effectively ensuring engagement of stakeholders throughout the project cycle.	Design Consultant/ PMDFC	MC Jaranwala
5. Preparation of Labour Management Procedures		
EHS SOPS for Labour workers/Including women workers have been prepared and approved (prior to project appraisal) and will be implemented effectively throughout the project period by making them part of contractors term of reference and bid documents.	ESFPS	

B-Pre-Construction Phase	Location/Project Phase	Institutional Responsibility	
		Implementation	Supervision
3. Contractors Terms of Reference • The MC Jaranwala shall ensure to make EIA/ESIA Report approved from Punjab EPA and ESMMP of EIA/ESIA shall be made part of contractor terms of reference and part of the bid documents. • This ESMMP will be used by the contractor to be guided on the structure and control of potential environmental and social issues that are required to be managed to avoid or mitigated adverse consequences. • This ESMMP will address all of the issues addressed here, but not limited to, and will consists of different sub-plans that will cover health and safety, traffic management, worker camp management, material sourcing, waste disposal.	Contract Award to completion phase	MC Jaranwala	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants
4. Grievance Redress Mechanism • Grievance Redress Mechanism has been developed under PCP • MC Jaranwala with the technical assistance of PMDFC team shall share project details to public, relevant stakeholders and to receive complaints • Display contact details of ESFPs and E&S Supervision consultants for public to lodge their complaints/concerns to the contractor at the entrance and main points of the site • Provide sign boards for pedestrians to inform nature and duration of construction works • Provide alternative access road for residents via Peradeniya • Develop and establish contractor's own procedure for receiving, documenting and addressing complaints from the affected public and nearby communities that is fully in line with and guided by the project's GRM • Ensure to keep a copy of the ESMMP at all times at the project supervision office on site.	Throughout the cycle of project	MC Jaranwala Contractor	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants

C- Construction Phase							
Proposed sub project activity	**Anticipated Environment and Social Issues**	**Magnitude of Impacts**	**Proposed Mitigation Measures**	**Mitigation Implementation Responsibility**	**Monitoring Indicators**	**Monitoring Frequency**	**Monitoring Responsibility**
Establishment of Labor Camp	• Availability of Land • Security • Environment, Health and Safety of Labor at Campsite • Community Concerns regarding privacy of women and GBV[42] • Sustainable Use of Environmental Resources	Med.	• At current, land proposed for construction of disposal station is open and vacant from any legal/illegal occupants. There are no trees of important flora and fauna observed at the site. This vacant space is owned by MCJ and notified as commercial area at the entry of the main city where urban area is a few meters away. • Currently MC owned land at proposed site is available for construction of labor camp at the current site • Contractor will prepare Occupational Health and Safety Plan and get approval from MC before the execution of work • Contractor will be instructed (will be included in his term of reference and in the form of EHS SOPs) strictly implement the PMDFC SOPs for EHS of labor/ construction workers	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports • Implementation of GRM	• Daily site visit during construction phase • Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office • E&S Consultants of Supervision Consultants team

[42] Gender Based Violence

			• Contractor will be instructed to prefer the local labor to be engaged. Anyhow, for labor site management, following mitigation measures will be provided: V. Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to construction labor if they will be hired from outstation. VI. Good housekeeping will be ensured inside campsite VII. Labor will be provided with hygienically good quality food. VIII. During winter hot water will be provided for bathing and likewise as per the weather condition. **Labor Training and Code of Conduct-** • The contractor shall develop a labor code of conduct indicating specific labor management procedures applicable to different categories of workers including short time and full-time workers. The labor code of conduct shall be consistent with and part of the overall EHS SOPs for Labor developed by the PMDFC. • The labour Code of Conduct shall be translated into Urdu language upon clearance from the MOI of MC Jaranwala and DPO-ESM of regional office of PMDFC. The code of conduct must be made available to all staff and displayed in the work site in local languages • Labor awareness programs to educate the laborers about the code of conduct, general conduct, the				

			Environmental and Social Management and Monitoring Plan, Public and Occupational Health and Safety Plan and sustainable use of local environmental resources etc. should be conducted throughout the contract period as per the Labor management plan and ESH plan approved by the MOI and DPO-ESM. • The contractor shall give priority to selecting labor from project influenced areas so as to minimize the need for erecting labor camps and minimizing labor influx. • Frequent supervision of laborers' activities, labor welfare needs, and action to ensure hygienic conditions in the work sites/ camps • Avoid social conflicts among contactor's labor force and the surrounding community or tension and prevalence of gender- based violence through the implementation of LMP. • Conduct awareness program on Gender Based Violence (GBV), good hygienic practices and dangers of sexually transmitted diseases such as HIV/AIDS and sensitize them to avoid interference and consider the privacy of local community women and vulnerable groups. • Introduce a code of conduct for labor teams to prevent alcohol and drug abuse, violence, sexual abuse etc. • Continue consultation and interaction with host community				

			• Prepare an inventory (including names/ National ID numbers/addresses etc.) of entire labor force employed by contractor, and share with the Resident Supervision Consultants. This inventory shall be updated at each recruitment or resignation of labors.				
Site Preparation	• Accessibility of local communities and Work Site Management • Health and Safety of local communities • Traffic Management	Medium to High	• All public access to the site via adequate fencing and signage which prohibit public access completely, in order to avoid risk to the public • The site entrance will include adequate signage indicating the details of the proposed subproject, implementing agencies etc. as well as safety signage to keep public away. • A fence shall be erected to cover the entire perimeter of the facility using cost effective fence materials consisting of chain link fence fabric, concrete post, etc. as specified in the Technical Specifications in order to ensure, animals and public are unable to access the site. • To avoid land disturbance and movement, the fence shall generally follow the contour of the ground. • Grading shall be performed where necessary to provide a neat appearance • The contractor should provide a site-specific proposed site layout plan that identifies various zones within the construction site for designated use such as material and equipment storage areas, construction vehicle parking areas, vehicle/equipment maintenance areas, labor camps	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

			(if any onsite), temporary spoil storage areas etc. which shall be approved by the MC • Parking, repairing vehicles, machinery and equipment shall be stationed only within the work site and/or in any other designated areas by the MC • The contractor should provide instruction and advice to drivers and operators to park vehicles and store equipment at the designated area **Traffic Safety and Management Plan-** VII. The contractor will prepare a **Traffic management plan** in consultation with the city traffic committee approved by the MC and duly disclosed to the public in a timely manner VIII. Carryout a road safety assessment in order to establish traffic control and safety measures such as road humps, fixing of signage etc. prior to commencement of construction IX. Based on the initial road safety analysis a monitoring and management plan shall be prepared and submitted to the MC by contractor and Road Management Plan to be placed at the prominent places X. In order to ease traffic within the city, transport of construction material and machinery will be done prior to 6.00 am and after 8.00 pm XI. During school traffic hour's transportation of construction materials and heavy machinery shall not be done.				

			XII. Provide information and boards at each strategic location indicating basic info – times of closure, diversion routes etc III. Special consideration shall be given in the preparation of the traffic management plan ensuring the safety of pedestrians and workers at night. IV. Personnel used for traffic control by the contractor shall be properly trained, provided with proper gear including communication equipment, luminous jackets for night use. All signs, barricades, pavement markings used for traffic management should be to the standards and approved by the City Traffic Police **Road Safety Monitoring Plan** shall be implemented throughout the construction period. • Monitoring incidents and accidents and monthly reporting shall be ensured. • Appropriate safety improvement measures shall be implemented avoiding incidents due to movement of construction vehicles based on the periodic review of reports. **Environment, Health and Safety of Labor and Communities and Implementation of ESMMP** VI. The contractor will employ a qualified Health and Safety Specialist in his team for a period of 06 months. He/she will submit to the engineer a comprehensive Health and Safety Plan for the site which will be based on an				

			assessment of OSH/EHS and public safety risks in relation to various types of construction activity and which covers the entire construction period. VII. The H&S specialist will oversee its implementation regularly assessing the risk of various hazards and adopting mitigation measures. VIII. He shall ensure the all reasonable precautions will be taken to prevent danger of the workers and the public from accidents such as fire, explosions, blasts, falling to excavated pits, chemical sprays, unsafe power supply lines etc. IX. The Contractor shall comply with requirements for the safety of the workmen as per the international labor organization (ILO) convention No. 62 and EHS SOPs of PMDFC to the extent that those are applicable to this contract. **X.** The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, boots, etc., to the workers and staff. **Community Safety Management Plan**- I. All debris, waste generation from construction activity, labor camps etc. will be disposed only at locations approved by the MC for such purpose				

			II. The debris and spoil shall be disposed in such a manner that; (i) waterways and drainage paths are not blocked (ii) the disposed material should not be washed away by runoff and (iii) should not be a nuisance to the public. (iv) The contractor shall do what is necessary in the minimum to ensure the disposal sites are made safe after disposal of the waste (level the waste, ensure drainage and safety) (v)The contractor shall as much as possible dispose waste on daily basis (or as necessary given the waste quantities generated and onsite stockpiling space) without allowing to stockpile onsite, at identified locations for debris disposal, recommended by the MC. (vi) During transportation, dispose materials should be covered with tarpaulin				
Excavation and Construction Activities	• Dust/Air and noise	High	• All sedimentation and pollution control works and maintenance thereof are deemed, as incidental to the earthwork. Works to minimize cleared areas and exposed soils at a given time. • Barricades such as humps shall be erected around excavated areas for culverts, silt traps, foundations, sewerage pipes as some work in • The contractor shall effectively manage the dust generating activities such as handling and transporting sand, rubble, bitumen, and cement during periods of high winds or during more stable conditions with winds directed towards adjacent residences and other facilities.	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultant of Supervision Consultants team

			• The Contractor shall erect a dust/noise barrier has around the site. • All vehicles delivering materials shall be covered to avoid spillage and dust emission. • The Contractor should avoid, where possible and take suitable action to prevent dirt and mud being carried to the roadway (particularly following wet weather). • The contractor should enforce vehicle speed limits to minimize dust generation. • The Contractor shall employ a water truck to sprinkle water for dust suppression on all exposed areas as required (note: the use of waste water / waste oil for dust suppression is prohibited) • All existing roads used by vehicles of the contractor, or any of his sub-contractor or supplies of materials or plant and similar roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres. • Clearance shall be affected immediately by manual sweeping and removal of debris and ensure sprinkled water using appropriate equipment • Dust emissions should be controlled by wet spraying of construction sites and roads which are used for transportation of Construction materials at regular intervals. • Tarpaulin covering is mandatory on trucks /lorries which are used for transporting materials. • All stockpiles including temporary storage of debris and construction materials should be covered using tarpaulin covering. • Noise and Dust barriers with minimum height of 4m should be erected around entire working sites to				

			control dust emission to the ambient air. Selection of the suitable material. • Contractor shall take appropriate action to ensure that construction works do not result in damage to the adjacent properties due to vibration. • Contractor shall pay due consideration on vibration impacts of construction on adjoining structures. In the event vibration levels are found to be exceeding national standards, he shall modify the method of construction until compliance with stipulated national vibration standards is met. • Vehicles should be maintained in good condition regularly so that noise and emission generating from wear and tear will be minimal • Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the DPO-ESM to keep noise and air emissions from these at a minimum				
	• Soil and Vegetation Cover Loss		• Construction vehicle, machinery and equipment shall be used and stationed only in the areas of work and in any other area designated/ approved by the MC Jaranwala . • Ad-hoc and scattered parking and placement of machinery should be avoided to minimize harm to roadside ground cover. • The contractor shall include in the construction site layout plan indicating various areas identified for designated use including parking areas. • Contractor should provide necessary instructions to drivers/operators and other construction workers not to destroy ground vegetation cover unnecessarily. • Designated vehicle parks and maintenance yards must be informed to labor force.				

			• Top soil of productive areas where it has to be removed for the purpose of this project shall be stripped to a specified depth of 150mm and stored in stockpiles of height not exceeding 2m, if directed by the MC. If the contractor is in any doubt on whether to conserve the topsoil or not for any given area he/she shall obtain the direction from the MC in writing • Removed top soil could be used as a productive soil when replanting/establishing vegetation under landscaping plans Stockpiled topsoil must be returned to cover the areas including cut slopes where the topsoil has been removed due to project activities. • Vehicle/machinery and equipment servicing and maintenance work shall be carried out only in designated locations/ service stations approved by the MC. • Waste oil, lubricants and other petroleum products and untreated wastewater shall not be discharged on ground so that to avoid soil pollution. Clean up measures shall be taken against pollution of soil by spillage of petroleum/oil products from storage tanks and containers • Sites used for vehicle and plant service and maintenance shall be restored back to its initial status. Site restoration will be considered as incidental to work				
	• Water and Soil Contamination		• The contractor shall clean up any area including water-bodies affected/contaminated (if any) as directed by the MC at his own cost. • The contractor shall indicate on a site layout plan the drainage network and strategic locations in which soil erosion control devices will be installed. The contractor shall, to the extent possible,				

			schedule/stage these sections will have to be stopped during heavy rains due to heavy erosion. • Work that lead to heavy erosion shall be avoided during the raining season. If such activities need to be continued during rainy season prior approval must be obtained from the MC by submitting a proposal on actions that will be undertaken by the contractor to prevent erosion.				
	• Damage to archeological sites		• Chance Find Procedure will be adopted in case any such discovery of archeological property, the contractor shall take reasonable precaution to prevent his workmen or any other persons from removing/damaging any such article and shall immediately inform the MC and immediately stop construction activities. (Chance Find Procedures are attached as **Annexure C**)				
	• Management of Hazardous Waste		• Contractor prior to the commencement of work shall provide list of harmful, hazardous and risky chemicals/ material that will be used in the project work to the MC. • Contractor shall also provide the list of places where such chemicals/materials or their containers or other harmful Asbestos Containing Materials (ACM) shall not be used for any temporary and permanent work on the SEWERAGE site.				
	• Disturbance to Flora and Fauna and vegetation cover		• All construction works shall be carried out in a manner that the destruction to flora and their habitats is minimized. • At current, no trees are found at the proposed site of sewerage but if all such cases of tree removal contractor shall take prior approval from the MC and DPO-ESM prior to removal with a justification as to				

			why the removal is unavoidable and plantation will be carried out with 1:10 removal ratio				
	• Wastage of Water		• Arrange adequate supply of water for the project purpose throughout the construction period in consultation with the MC Jaranwala . • The contractor should discuss the daily requirement for potable and non-potable water and confirm with the MC Jaranwala that the demand can be met through their supply connection. • Do not extract water from surface water bodies or water sources without the permission from MC & relevant authority. Obtain permission for extracting ground water, if needed, prior to the commencing of the project, from the relevant authority • The contractor will minimize wastage of water in the construction process/operations by reusing water as much as possible, utilizing only the required amount of water for the construction works etc. • The contractor shall maintain a record of usage of water for various purposes and sources tapped. • The contractor will adopt measures that are technically and financially feasible that avoid or minimize water usage throughout the construction period.				
	• Traffic Jams and Congestion and Road accidents		• The construction materials intended for temporarily storage should be properly stockpiled in most appropriate areas in the Site to avoid disturbance to site mobility, traffic and stored away from drainage paths • Efficient use of all construction material in order to reduce waste generation. • All use of chemicals and hazardous materials will be subject to national and international regulations				

			and requirements. Their use will be minimized and their release will be controlled				
Construction Material Storage, Handling and Use	Spillage Odor	Low	• Contractor shall take all precautions such as storing all chemicals used for construction works in properly closed containers with good ventilations to prevent odor and offensive smell emanating from chemicals and processes applied in construction works or from labor camps. • In a situation when/where odor or offensive smell does occur, contractor shall take immediate action to rectify the situation • Contractor is responsible for any compensation involved with any health issue arisen out of bad odor and offensive smells	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team
Construction Machinery/ Equipment Use	• Emissions from Construction Vehicles, Equipment and Machinery • Noise from Vehicles, Plants and Equipment • Health and Safety of Labor /Workers	Low	• The emission standards promulgated under the Punjab Environmental Quality Standards (PEQs) shall be strictly adhered to all vehicles, equipment and machinery used for construction shall be regularly serviced and well maintained to ensure that emission levels comply with the relevant standards. • The contractor shall maintain the average noise levels within the construction site during the day time to 65 dB and night time to 55 dB Punjab Environmental Quality Standards (PEQs). • Noise barriers (cum dust) with minimum height of 4m shall be installed around the site as shown in the following figures and the construction noise levels outside the noise barriers should be maintained below 75dB during day time. • Within the site, the contractor shall measure noise levels on a monthly basis, or as per requirement, and report to the DPO-ESM through the contractor's monthly progress reports. Where, exceedances are noted, that can adversely affect	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

			construction workers, the contractor shall propose methods to control noise levels. • All machinery and equipment should be well maintained and fitted with noise reduction devices in accordance with manufacturer's instructions. • All vehicles and equipment used in construction shall be fitted with exhaust silences. • During routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found to be defective shall be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of sound emission. Non-compliant plant shall be removed from site • Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the Engineer, to keep noise from these at a minimum. • Workers in vicinity of strong noise, and workers working with or in crushing, compaction, batching or concrete mixing operations shall be provided with PPEs				
Electrical Works – Wiring, switch, boards, lighting etc.	• Injuries/Incidents due to unsafe electric installations. • Short circuits due to quality compromised		• The labor should be provided with safety shoes, gloves, Safety goggle as per nature of job of worker. • Quality of electric installations should not be compromised. • Wiring should be underground. • Fire retardant plastic wires should be used. • Fire extinguishers should be installed at appropriate places.	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

	electric equipment /installations. • Fire accidents due to electric installations						
Impact on sensitive receptors	• 12 mosques, 02 shrines, 2 sschools, 1 training institute • High noise • Air pollution • Traffic congestion • Access & Mobility	Low	• Disposal site will be 500meter apart from the sensitive receptor and it will be ensured by contractor that no physical impact occur on sensitive receptor during construction activity. • Labor/workers will be sensitized to avoid any interference with the local communities who may be visiting the graveyard • Vehicle/machinery movement shall be strictly avoided from the passage of graveyard and alternate movement route (which is available) shall be used. • Sewerage lines will be ensured to be laid 100m away from the graveyard and MC will ensure it by the contractor and same is ensured in the design of the subproject. • Contractor will be instructed to avoid construction activities during religious practices days at shrine.	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

			• An effective GRM shall be in-placed to immediately resolve any complaint from the local communities. • Implementing noise barriers and using quieter equipment to reduce noise pollution. • Controlling dust and air pollution through water spraying and dust suppression measures. • Scheduling construction activities during less sensitive times, such as avoiding school hours or reducing noisy activities during the evenings. • Creating safe pedestrian pathways and ensuring smooth traffic flow. • Engaging with the local community to inform them about the construction plans and potential disruptions.				
D. OPERATION PHASE							
Proposed sub project activity	**Anticipated Environment and Social Issues**	**Magnitude of Impacts**	**Proposed Mitigation Measures**	**Mitigation Implementation Responsibility**	**Monitoring Indicators**	**Monitoring Frequency**	**Monitoring Responsibility**
Seepage / salinity	Weaken the structure strength		• Runoff from the Site shall be controlled to ensure that adjacent areas are not affected and disturbance to the public is to minimum.	MC Jaranwala	• Site Visits • Monitoring Reports • Implementation of GRM	• Site visit	MC Jaranwala

	,produce watering and salinity condition.		• PPEs i.e. Masks & Ear plugs will be provided to workers • Ensure proper design, construction and operation of the structure and system to minimize seepage. • Anti-percolation material layer will be installed under the disposal station and open drain that no seepage into the soil occur				
Waste water storage and disposal	Odor		• Emission from disposal station during its decommissioning and connection to centralized sewerage system and when wastewater move through the open drain. • The Contractor shall ensure covering and sealing off all water collection tanks and septic tanks at the end of construction works. • At disposal Station worker will be provided with PPEs.				
	Nuisance		• Heavy noise from generators to pump Wastewater from sewerage system to disposal station which opens up in an open drain which take wastewater to WWTP will be mitigated by installing Silencer and anti-vibrant mouns to reduce structural damage of disposal station. Noise will be monitored routinely. • Use of machineries & equipment having less noise. • Provision for personal protective equipment (PPE's), ear muffs/ear plugs to workers.				
	Emission of fumes		• Ensure Workers use appropriate clothing. Lay concrete/Asphalt during dry periods				

	Unhygienic condition, public health risks		• Sewerage disposal connections to the periphery wastewater system shall be maintained properly with routine maintenance of plumbing/pumps diligently carried out. • Trees shall be managed properly that includes watering, fertilizing, weeding, pest controlling, pruning and training of trees timely. • MCJ shall take necessary actions to prevent the breeding of mosquitoes where stagnation of water in any areas along the sewerage system.				

2.a Disposal (Estimated Budget for ESSMP)			
Item	**Quantity**	**Tentative Cost/Item-PKR./-**	**Total Cost**
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	10	300	3000
Safety Hard Helmets	10	3,000	30000
Safety Shoes	10	3,000	30000
Hand Gloves	10	1,000	10000
Ear Plugs	10	500	5000
Reflective Safety Vest	10	1,000	10000
Safety Goggles	10	500	5000
B-Community Health and Safety			0
First Aid Box Complete	1	10,000	10000
Safety Signs	3	15,000	45000
Safety Cones	8	1,000	8000
Safety Tapes	8	1,500	12000
Portable Delineator with chain	4	2,000	8000
Emergency Portable Lights	2	3,000	6000
Solid Waste Collection Drums with Cover	2	12,000	24000
Fire Fighting Equipment Purchase and refilling	1	10,000	10000
Hiring of Environmental Manager (for 03 months)	3	50,000	150000
Labor Campsite Management	1	100,000	100000
Water Sprinkling	1	50,000	50000
Ambient Air Quality-Before, during, and after construction	3	85,000	255000
Noise Quality-Before, during, and after construction	3	1000	3000
Water Quality-Before, during, and after construction	3	22,000	66000
Total (PKR)-A+B			**840,000**

2b. Force main (Estimated Budget of ESMMP)			
Item	**Quantity**	**Tentative Cost/Item-PKR./-**	**Total Cost**
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	10	300	3000
Safety Hard Helmets	8	3,000	24000
Safety Shoes	8	3,000	24000
Hand Gloves	8	1,000	8000
Ear Plugs	8	500	4000
Reflective Safety Vest	8	1,000	8000
Safety Goggles	8	500	4000
B-Community Health and Safety			0
First Aid Box Complete	1	5,000	5000
Safety Signs	2	15,000	30000
Safety Cones	5	1,000	5000
Safety Tapes	5	1,500	7500
Portable Delineator with chain	3	2,200	6600
Solid Waste Collection Drums with Cover	1	12,000	12000
Fire Fighting Equipment Purchase and refilling	1	10,000	10000
Labor Camp Management	1	100,000	100000
Hiring of EHS Expert	2	50,000	100000
Ambient Air Quality-Before, during, and after construction	3	85,000	255000
Noise Quality-Before, during, and after construction	3	1000	3000
Water Quality-Before, during, and after construction	3	22,000	66000
Total (PKR)-A+B			**675100**

Table 37: ESMMP of Package 3: Rehabilitation of drains Disposal Chak 128 and P/F RPC manhole Cover

Execution Phase								
Proposed Sub-project activities	**Potential Env/Soc Impacts**	**Magnitude of Impact**			**Mitigation Measures**	**Monitoring Indicators**	**Monitoring Frequency**	**Responsibility**
		Low	Medium	High				
Labor Camp (if established by Contractor)	○ Health impacts due to absence of housing and sanitation facilities in labor camp. ○ Security of labor ○ Unhygienic conditions				• Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to labor. However local labor will be hired as skilled labor from outstation is not the requirement of this project In case of construction of camp site, following measures will be adopted by the contractor: • Good housekeeping will be ensured inside campsite • Labor will be provided with quality food. • Better heating & cooling facilities will be provided by the Contractor as per season accordingly.	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

					• Better accommodation will be ensured by the Contractor. • Its better to accommodate labor in Containers Camps/houses with all amenities. • Contractor will submit Campsite Management Plan and approve from Construction Supervision Consultant before the execution of work.			
Pumping Machinery Replacement	○ Electric shocks ○ Fall and slip damage in the dry well				• It will be ensured to switch off all the electric connections before entering the laborer/worker into the well • Use of PPEs will be ensured	Visual/ Pictures	• During work/ activity	• ESFPs • Construction Supervision Consultant • DPO ESSs •
Site Safety Issues	○ Accidents				Contractor will ensure site safety using safety cautions (night vision), boards, flagmen, cordon tapes etc. for smooth flow of traffic during the construction phase of the Sub-Project.	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly	• ESFPs • Construction Supervision Consultant • DPO ESSs

							• Once during the construction phase	
Occupational Health & Safety	○ Injuries to workers/LTI				• Contractor will follow HSE SOPs for all activities on the site. • Workers will be trained and guided to follow SOPs and will be provided with necessary PPEs (Safety Helmets, Safety Shoes, Gloves, Chemical Masks etc.) wherever required. • First aid will be provided onsite • Careful monitoring will also be carried out.	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs
Damage to Public Infrastructure/utilities	○ Accidents/Incidents/Injuries ○ Structural loss ○ Social Conflicts				• Contractor will ensure no damage to public utilities or structures. • Contractor will provide compensation in case of any damage may occur to the private property	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during	• ESFPs • Construction Supervision Consultant • DPO ESSs

							the construction phase	
Sexual Harassment-Labor Influx-Child Labor	○ Social Conflicts				• Contractor will give behavioral training to the workforce. • Contractor will hire local labor • Child labor will not be allowed for any activity	Visual/ Pictures/Reported/Complains by public during visit	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs
CoViD-19 SOPs implementation	○ Spread of Corona among the labor				• Contractor will provide face masks to the labor on daily basis to reduce Corona impact. • Contractor will follow CoViD-19 guidelines during construction works	Visual/ Pictures	• Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

3. Desilting of Drains& Sewer (Estimated Budget of ESMMP)			
Item	**Quantity**	**Tentative Cost/Item-PKR./-**	**Total Cost**
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	15	300	4500
Safety Hard Helmets	5	3,000	15000
Safety Shoes	5	3,000	15000
Hand Gloves	5	1,000	5000
Ear Plugs	5	500	2500
Reflective Safety Vest	5	1,000	5000
Safety Goggles	5	500	2500
B-Community Health and Safety			0
Trapline to cover silt during transportation	1	20,000	20000
First Aid Box Complete	1	5,000	5000
Safety Signs	2	15,000	30000
Safety Cones	5	1,000	5000
Safety Tapes	5	1,500	7500
Portable Delineator with chain	2	2,200	4400
Solid Waste Collection Drums with Cover	2	12,000	24000
Fire Fighting Equipment Purchase and refilling	1	10,000	10000
Total (PKR)-A+B			**155,400**

3(b)- Providing & Fixing of Manhole Covers (Estimated Budget of ESMMP)			
Item	**Quantity**	**Tentative Cost/Item-PKR./-**	**Total Cost**
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	5	300	1500
Safety Hard Helmets	5	3,000	15000
Safety Shoes	5	3,000	15000
Hand Gloves	5	1,000	5000
Ear Plugs	5	500	2500
Reflective Safety Vest	5	1,000	5000
Safety Goggles	5	500	2500
Total (PKR)			**46,500**

Table 38: ESMMP of Package 04: Construction of WWTP

A-Design Stage	Design Responsibility	Implementation Responsibility
1. Design Aspects		
The following Design Considerations have been integrated with the design of rehabilitation of existing sewerage system enabling to it environmentally and socially sustainable. **1.** Wastewater Treatment • Safe and sustainable wastewater collection, transport, and treatment systems to ensure human and environmental well-being by providing missing links of sewerage supply lines, identification of the lines where desilting will be sufficient rather to replace the system and provision of manholes covers and replacement of pumping machinery from dry wells • The sewerage system that conveys the wastewater discharge of the current population is connected to infrastructure that performs storage and treatment functions, comprising a disposal station, a WWTP-WSP, and floating wetland up to the minimum acceptable levels to be discharged to a surface water body as per PEQSs and or re-used as per WHO and USEPA Guidelines. • Emergency Response Plan has been prepared for this project and is attached Annexure H. • The importance of design criteria is that it allows the identification of problems associated with poor management and improves it through a comprehensive management model that provides solutions based on technical and sustainable criteria, being the innovative part that opens the opportunity for studies to be carried out by professionals; allowing to strengthen learning. **2.** Better Municipal services and sustainable water application after treatment. Major purpose is to improve quality of wastewater by eliminating pollutants, toxicants and many such to make . wastewater usable for other purposes and preservation of water quality of natural water resources.	Design Consultants	MC Jaranwala

2.Permits, NOCs, Clearances		
Necessary consents, permits, and clearances shall be obtained before the start of civil works Permissions and clearances are required mainly from the government agencies including i.e. Punjab Environmental Protection Agency (EPA) or from other Government entity in case of temporary obstruction in public utilities e,g. WAPDA in case of shifting of transmission lines. Anyhow, this component of project will be executed at MC Jaranwala owned Government land where existing system is	PMDFC and MC	MC Jaranwala
3.Land Acquisition and Resettlement Issues		
• Farmers Dera • Crops (Sugarcane, Wheat, Vegetable (Polls Shed/Tunnel technology) etc.) • Guava Farms • Citrus (Lemon) Farm • Trees • Tube Wells (4) • The compensation will be ensured by MC Jaranwala thorugh Abbrebvaited Ressttlement Action Plan (ARAP) before start of execution.	MC Jaranwala	MC Jaranwala
4.Preparation of Stakeholder Engagement Plan		
Stakeholder engagement plan with a realistic timeframe covering preliminary, construction and operation phases has been prepared and approved (prior to project appraisal) and implemented effectively ensuring engagement of stakeholders throughout the project cycle.	Design Consultant/ PMDFC	MC Jaranwala

5. Preparation of Labour Management Procedures		
EHS SOPS for Labour workers/Including women workers have been prepared and approved (prior to project appraisal) and will be implemented effectively throughout the project period by making them part of contractors term of reference and bid documents.	ESFPS	

B-Pre-Construction Phase	Location/Project Phase	Institutional Responsibility	
		Implementation	Supervision
5. Contractors Terms of Reference • The MC Jaranwala shall ensure to make EIA/ESIA Report approved from Punjab EPA and ESMMP of EIA/ESIA shall be made part of contractor terms of reference and part of the bid documents. • This ESMMP will be used by the contractor to be guided on the structure and control of potential environmental and social issues that are required to be managed to avoid or mitigated adverse consequences. • This ESMMP will address all of the issues addressed here, but not limited to, and will consists of different sub-plans that will cover health and safety, traffic management, worker camp management, material sourcing, waste disposal.	Contract Award to completion phase	MC Jaranwala	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants

6. Grievance Redress Mechanism • Grievance Redress Mechanism has been developed under PCP • MC Jaranwala with the technical assistance of PMDFC team shall share project details to public, relevant stakeholders and to receive complaints • Display contact details of ESFPs and E&S Supervision consultants for public to lodge their complaints/concerns to the contractor at the entrance and main points of the site • Provide sign boards for pedestrians to inform nature and duration of construction works • Provide alternative access road for residents via Peradeniya • Develop and establish contractor's own procedure for receiving, documenting and addressing complaints from the affected public and nearby communities that is fully in line with and guided by the project's GRM • Ensure to keep a copy of the ESMMP at all times at the project supervision office on site.	Throughout the cycle of project	MC Jaranwala Contractor	Regional Office PMDFC ESM Team PMDFC E&S Supervision Consultants

C-Environmental and Social Issues Associated with Site at Construction Phase

Project Stag /Affected Aspects	Project Activity	Potential Impacts	Impact Significance	Proposed Mitigation measures	Responsibility for Mitigation Implement-ation	Monitoring Indicators	Monitoring Frequency	Monitoring Responsibility
Excavation and Construction Activities	Soil stripping and limited cutting, filling and levelling activities to	Surface runoff from the construction site may contain eroded earth,	Med.	▪ Construction vehicle, machinery and equipment shall be used and stationed only in the areas of work and in any other area designated/ approved by the MC Jaranwala. ▪ Ad-hoc and scattered parking and placement of machinery should be avoided to minimize harm to roadside ground cover.	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence	•Daily site visit during construction phase	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision

	make the site topography suitable for setting up of the WWTP. The removal of vegetation cover and top soil can increase the potential for soil erosion during a short period of time till the site is levelled and then stabilized with fill materials like gravel, and sand.	sand, aggregate, spilled oil, lubricant, paint residues etc., however the potential to reach drainage channel near and affecting the water quality.		▪ The contractor shall include in the construction site layout plan indicating various areas identified for designated use including parking areas. ▪ Contractor should provide necessary instructions to drivers/operators and other construction workers not to destroy ground vegetation cover unnecessarily. ▪ Designated vehicle parks and maintenance yards must be informed to labor force. ▪ As construction of WWTP and Sewer lines structures required width according to design parameters. Excavation would be with the consideration of all available monitoring and analysis of water table level on the site to prevent the contamination of ground water and soil there. If the contractor is in any doubt on whether to conserve the topsoil or not for any given area he/she shall obtain the direction from the MC in writing. ▪ Removed top soil could be used as a productive soil when replanting/establishing vegetation under landscaping plans Stockpiled topsoil must be returned to cover the areas including cut slopes where the topsoil has been removed due to project activities. ▪ Vehicle/machinery and equipment servicing and maintenance work shall be carried out only in designated locations/ service stations approved by the MC.		• Monitoring Reports Implementation of GRM	•Fortnightly/ Weekly	Consultants team

				▪ Waste oil, lubricants and other petroleum products and untreated wastewater shall not be discharged on ground so that to avoid soil pollution. Clean up measures shall be taken against pollution of soil spillage petroleum/oil products from storage tanks and containers ▪ Sites used for vehicle and plant service and maintenance shall be restored back to its initial status. Site restoration will be considered as incidental to work ▪ Contractor prior to the commencement of work shall provide list of harmful, hazardous and risky chemicals/material that will be used in the project work to the MC. ▪ Contractor shall also provide the list of places where such chemicals/materials or their containers or other harmful Asbestos Containing Materials (ACM) shall not be used for any temporary and permanent work on the WWTP site. ▪ The contractor shall clean up any area including water-bodies affected/contaminated (if any) as directed by the MC at his own cost. ▪ The contractor shall indicate on a site layout plan the drainage network and strategic locations in which soil erosion control devices will be installed. The contractor shall, to the extent possible, schedule/stage these sections will have to be stopped during heavy rains due to heavy erosion. ▪ Work that lead to heavy erosion shall be avoided during the raining season. If such activities need to				

				be continued during rainy season prior approval must be obtained from the MC by submitting a proposal on actions that will be undertaken by the contractor to prevent erosion. ▪ Chance Find Procedure will be adopted in case any such discovery of archeological property, the contractor shall take reasonable precaution to prevent his workmen or another person's from removing/damaging any such article and shall immediately inform the MC and immediately stop construction activities. All sedimentation and pollution control work and maintenance there of a redeemed, as incidental to the earthwork. Works to minimize cleared areas and exposed soils at a given time. ▪ Barricades such as humps shall be erected around excavated areas for culverts, silt traps, foundations, as some work in ▪ The contractor shall effectively manage the dust generating activities such as handling and transporting sand, rubble, bitumen, and cement during periods of high winds or during more stable conditions with winds directed towards adjacent residences and other facilities. ▪ The Contractor shall erect a dust/noise barrier has around the site. ▪ All vehicles delivering materials shall be covered to avoid spillage and dust emission. ▪ The Contractor should avoid, where possible and take suitable action to prevent dirt and mud being				

				carried to the roadway (particularly following wet weather). ▪ The contractor should enforce vehicle speed limits to minimize dust generation. ▪ The Contractor shall employ a water truck to sprinkle water for dust suppression on all exposed areas as required (note: the use of wastewater / waste oil for dust suppression is prohibited) ▪ All existing roads used by vehicles aftercontraction, or any of his sub-contractor or supplies of materials or plant and similar roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres. ▪ Clearance shall be affected immediately by manual sweeping and removal of debris and ensure sprinkled water using appropriate equipment. ▪ Dust emissions should be controlled by wet spraying of construction sites and roads which aroused for transportation of Construction materials at regular intervals. ▪ Tarpaulin coverings mandatory on trucks /lorries which are used for transporting materials. ▪ All stockpiles including temporary storage of debris and construction materials should be covered using tarpaulin covering. ▪ Noise and Dust barriers with minimum height of 4m should be erected around entire working sites				

				to control dust emission to the ambient air. Selection of the suitable material. ▪ Contractor shall take appropriate action to ensure that construction works do not resulting damage to the adjacent properties due to vibration. ▪ Contractor shall pay due consideration on vibration impacts of construction on adjoining structures. In the event vibration levels are found to be exceeding national standards, he shall modify the method of construction until compliance with stipulated national vibration standards is met. ▪ Vehicles should be maintained in good condition regularly so that noise and emission generating from wear and tear will be minimal. ▪ The construction materials intended for temporarily storage should be properly stockpiled in most appropriate areas in the Site to avoid disturbance to site mobility, traffic and stored away from drainage paths. ▪ Efficient use of all construction material in order to reduce waste generation. ▪ All use of chemicals and hazardous materials will be subject to national and international regulations and requirements. Their use will be minimized and their release will be controlled. ▪ Arrange adequate supply of water for the project purpose throughout the construction period in consultation with the MC Jaranwala. ▪ The contractor should discuss the daily requirement for potable and non-potable water				

				and confirm with the MC Jaranwala that the demand can be met through their supply connection. ▪ Do not extract water from surface water bodies or water sources without the permission from MC & relevant authority. Obtain permission for extracting groundwater, if needed, prior to the commencing of the project, from the relevant authority. ▪ Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the DPO-ESM to keep noise and air emissions from these at minimum. ▪ The contractor will minimize wastage of water in the construction process/operations by reusing water as much as possible, utilizing only the required amount of water for the construction works etc. ▪ The contractor shall maintain a record of usage of water for various purposes and sources tapped. ▪ The contractor will adopt measures that are technically and financially feasible that avoid or minimize water usage throughout the construction period. ▪ All construction works shall be carried out in a manner that the destruction to flora and their habitats is minimized.				

Visual and Aesthetics	Grading and cleaning of land for demolition activity Emptying of existing structures Demolition of existing structures Storage and disposal of demolition waste Storage and disposal of sludge/silt from On-Site storage of excavated and construction materials; On-Site storage of construction waste; Off-Site	Loss of topsoil producing an offensive odor and visual impact The disposal of MSW in open area around the site can create odor nuisance.	Low	▪ Stacking of demolition waste, soil heaps and sludge/silt to be done away from settlements with provision of covers so that odor and fugitive emissions are restricted. ▪ All the construction activities will be restricted within the designated site. ▪ On completion of work, all temporary structures, surplus materials and wastes will be completely removed from the site and disposed of at a designated facility. ▪ Provision of storage facility for construction materials within the site designated by MC. ▪ Provision of temporary storage of wastes and collection will also be made at the site Sections excavated for pipeline route will be barricaded with tin sheets. ▪ Stacking of sections of pipeline to be done away from settlements with provision of wedges to ensure that rolling or movement of pipeline do not pose risks to passers-by. ▪ All the construction activities will be restricted within the designated site. ▪ On completion of work, all temporary structures, surplus materials and wastes will be completely removed from the site and disposed of at a designated facility. ▪ Construction and municipal solid waste temporarily stored at the site will be transported to the designated disposal facility at regular intervals.	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

	disposal of construction waste; Earth work along the sewer pipeline route; De-silting of sewer pipelines; On-Site storage and Off- Site disposal of silt/sludge from sewer pipeline; and Renovation work at linked facilities.							
Soil Quality	Site clearing and preparation Fueling and operation of heavy machinery	Soil compaction Soil contamination through spills and leaks	Medium to High	▪ Demarcation of routes for movement of heavy vehicles. ▪ Stripping and placing soils when dry, and not when wet. ▪ Preparation of guidelines and procedures for immediate clean-up actions following any spillages of oil, fuel or chemicals.	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S

	transport vehicles Storage and handling of chemicals Storage, handling and disposal of construction waste Generation of sanitary effluent	Soil contamination through spills and leaks		▪ Storage areas for oil, fuel and chemicals to be surrounded by bunds or other containment devices to prevent any spilled oil, fuel or chemicals from contaminating soils, water or groundwater. ▪ Use of spill or drip trays to contain spills and leaks, and use of spill control kits to clean small spills and leaks. ▪ Installation of oil/water separators to treat surface run-off from bounded areas prior to discharge to the storm water system. ▪ Designated storage area with proper area arrangements. ▪ Design processes to prevent/ minimize quantities of wastes generated and hazards associated with the waste generated. ▪ Implement a construction materials inventory management system to minimize over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period. ▪ Segregate hazardous and non-hazardous waste and provide appropriate containers for the waste types generated (e.g. enclosed bins for putrescible materials to avoid attracting pests and vermin and to minimize odor nuisance). ▪ Store wastes in closed containers away from direct sunlight, wind and rain. ▪ Ensure storage area has an impermeable floor and containment, of capacity to accommodate 110% of the volume of the largest waste container.		• Monitoring Reports Implementation of GRM		Consultants of Supervision Consultants team

				▪ Dispose of waste by authorized vendor. ▪ The waste management plan (including C&D waste as well as Liquid waste) also should contain aspects of adequate storage, disposal, transportation route, training and record keeping for different categories of waste i.e. hazardous waste, non-hazardous waste, solid waste, e-waste, bio-medical waste, municipal solid waste and chemical waste. ▪ Adequate sanitary facilities, i.e. toilets and showers, will be provided for the construction workforce. ▪ Septic tank and soak pit will be provided to treat domestic waste water.				
Surface Water Quality	Erosion from excavation, levelling, filling and other activities Fueling and operation of heavy machinery and transport vehicles	Increased sediment content of surface water Contamination of surface water Contamination of surface water Contamination of surface water by sanitary effluent	Medium	▪ Provision of channels, earth bunds or sand bag barriers on site to direct storm water to silt ▪ Protection of stockpiles by plastic sheeting to ensure that they are suitably secured against the wind at the end of each working day if rain is forecasted; ▪ Appropriate surface drainage will be designed and provided where necessary; ▪ Drainage systems, erosion control and silt removal facilities will be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit will be removed regularly; ▪ Any temporarily diverted drainage will be reinstated to its original condition when the	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

	Storage and handling of chemicals Generation of sanitary effluent from on-site labor accommodation.	generated from on-site labor accommodation.		construction work has finished or when the temporary diversion is no longer required; Temporary and permanent drainage pipes and culverts will be provided to facilitate runoff discharge. These will be designed for the controlled release of storm flows. ▪ Vehicle servicing areas, vehicle wash bays and lubrication bays will, as far as practical, be located within roofed and cemented areas. The drainage in these covered areas will be connected to sewers via an oil/water interceptor; Any oil leakage or spillage will be contained and cleaned up immediately. Waste oil will be collected and stored for recycling or disposal; Any surplus wastewater from the concrete batching plant will be treated to comply with discharge standards before it is discharged to final destination; ▪ Designated storage area with proper boundary				
Ground Water	•Fueling and operation of heavy machinery and transport vehicles •Wastewater standing in	Contamination of Ground water	High	▪ Proper SOP has to be followed during such kind of activity ▪ Appropriate sub-surface geotechnical and/or hydro-geological explorations should be undertaken to establish the suitability of proposed materials to meet anticipated conditions. ▪ Groundwater information below the lagoon site including water quality, water levels, direction of flow and gradient may be required	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implemen	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

	ponds for treatment			for establishing lining requirements and monitor well requirements and locations if these are required. ▪ ponds should be relatively impermeable in accordance with the needs for functional treatment and protection of surrounding land and ground water. ▪ It is recommended that field and/or laboratory tests be carried out to establish the hydraulic conductivities of soils at the WWTP site and any proposed soil lining materials. ▪ At least one hydraulic conductivity test per 2 hectares of WWTP area should be carried out. For in-situ materials or soil liners an on-site permeability of 10 times the laboratory value should be used to calculate seepage tosses. ▪ Adequate provisions for monitoring and for seepage control measures such as cutoffs, subsurface drainage interceptors, etc. should be considered. ▪ Pre-filling the pond(s) or other techniques should be considered in order to protect the liner, prevent weed growth and to protect against desiccation of the seal material. ▪ Highest quality geomembrane will be used to protect ground water resources and ecological environment having advantages of: ○ 1.Low cost ○ 2.good anti-seepage ability ○ 3.High strength		tation of GRM		

				○ 4.Good ductility ○ 5.Good chemical stability ○ 6.good resistance to ultraviolet light aging, and ○ 7.resistance to rodent and microbial attack To ensure the ideal installation and construction quality, the base layer will be further inspected to ensure that the surface of the base layer is flat and smooth, and there is no debris that may damage the geomembrane, such as rocks, tree roots, and sharp objects. There should be no right-angle rigid structure at the bending part of the geomembrane, and it should be made into an arc shape				
Air Quality	Operation of heavy machinery and transport vehicles C&D waste management and Sludge Handling	Exhaust Emissions Dust	Medium	▪ Minimize movement of construction vehicles and enforce a speed limit around the construction site; ▪ Regularly maintain all diesel-powered equipment and reduce idling time to avoid emissions of NOx, PM10 and SO2; ▪ Where available use low Sulphur diesel (LSD) in HGVs and diesel-powered equipment in collaboration with best management practices; Implement best practice procedures to control vehicle / equipment air emissions (such as turning off equipment when not in use); and Vehicle / equipment exhausts observed to be emitting significant black smoke from their exhausts should be serviced/ replaced.	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

				▪ As far as possible, locate the concrete batching plant away from sensitive receptors; Implementation of a periodic watering and sprinkling regime in particular during the dry season, at least two times during the day; Minimize the height from which fill materials are unloaded during site backfilling as far as possible. Where possible, this should be below the height of the hoarding around the Project site boundary; ▪ During construction, the approach road will be regularly maintained to keep it clean, free from mud and slurry. The approach road will be properly shaped and compacted by rolling to an even and uniform surface to receive pavement. Totally enclose any skips for material transport with impervious sheeting; and ▪ No waste will be burnt on or around the Project site.				
Noise	Heavy machinery operations for construction works	Increase in ambient noise levels	Low to medium	▪ Normal working hours of the contractor will be in day light hours from Monday to Sunday. If work needs to be undertaken outside these hours, it should be limited to activities that do not lead to exceedance of the noise criteria at nearby sensitive receptors; ▪ Regular maintenance of equipment including lubricating moving parts, tightening loose parts and replacing worn out components should be conducted;	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implemen	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

				▪ Low noise equipment should be used as far as practicable; ▪ The number of equipment operating simultaneously should be reduced as far as practicable; ▪ Equipment known to emit noise strongly in one direction should be orientated so that the noise is directed away from nearby sensitive receptors settlement as far as practicable; ▪ Acoustic enclosure should be erected around DG sets and other stationary noise generating equipment; ▪ There would be proper monitoring to avoid any discomfort.		tation of GRM		
Occupational Health and Safety	General construction activities	Health and safety of construction workforce	Moderate	▪ Personal Protective Equipment (PPE) shall be worn at all times on the Site. ▪ If labor will be working in the hazard prone areas, then the contractor needs to ensure proper outfit and PPEs. ▪ Before starting work all the appropriate safety equipment and the first-aid kit will be assembled and checked as being in working order; ▪ All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded; ▪ All scaffolding will be erected and inspected in conformity with the Factories Act and the	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

				appropriate records maintained by the Contractor; ▪ Safety hoops or cages will be provided for ladders with a height in excess of two meters; When there is a risk of drowning lifejackets shall be provided and it shall be ensured that personnel wear adequate buoyancy equipment or harness and safety lines, and that rescue personnel are present when work is proceeding; The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress.				
Desilted Material	○ Traffic/pedestrians hindrance Smell		Moderate	○ Desilted material needs to be disposed off within 24 hours at MC designated site ○ To avoid mobility of the local community, alternate routes will be provided in the main roads while local community will be informed well before time about this activity		Visual/ • Pictures	Daily site visit during construction phase Fortnightly/Weekly •Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs •

Community Health and Safety	Influx of construction workers Road transportation	Increased prevalence of disease Traffic safety	Low	▪ Barriers will be provided to prevent ingress of persons into the construction site and also to protect the public from exposure to hazards associated with the construction activities; Screening, surveillance and treatment of workers, through the provision of medical facilities and, where required, immunization programmed; Undertaking health awareness and education initiatives among workers; ▪ Avoiding collection of stagnant water; ▪ Road safety awareness building for residents living along the transportation route.	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team
Loss of Income of Existing Workers	Prior to construction of the WWTP.	The existing workers engaged under the contracting agencies at the WSP and associated facilities, may be laid off during the new phase.	Low to medium	▪ If retrenchment is necessary, to reduce the adverse impacts of retrenchment on the workers, a Retrenchment Plan should be developed, meeting PMDFC requirements. ▪ The client should comply with all legal and contractual requirements related to notification of public authorities, and provision of information to, and consultation with workers and their organizations. ▪ The client should ensure that all workers receive notice of dismissal and severance payments mandated by law and collective agreements in a timely manner. ▪ All outstanding payments and social security benefits and benefits should be paid: (a)on or before termination of the working relationship				

				to the workers, (b)where appropriate, for the benefit of the workers, or (c)Payment will be made in accordance with a timeline agreed through a collective agreement. (d)Where payments are made for the benefit of workers, workers will be provided with evidence of such payments. ▪ The Retrenchment Plan is required to be prepared prior to the closure of the contract of the workers, which has to be conducted in consultation with the affected parties and the Concessionaire.				
Access Disruption	Repair and laying of new sewer line.	Access disruption for both residential, commercial and business operation during excavation work for laying of new rising mains, replacement and construction work.	Low to medium	▪ Inform all the stakeholders well in advance) at least 15 days (before the start of the construction work to enable shop owners to stock up and remain unaffected if goods vehicles are unable to reach them during construction; ▪ Providing provision of wooden planks to ensure pedestrian access, signage with project details and contact details for grievance redress; and proper traffic management ▪ Providing assistance to mobile vendors if any present during construction, to shift nearby locations if any; ▪ The contractor should provide proper barricading and signage or notices to indicate the ongoing work. In case by-lanes towards	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

				the residential areas/shops are located from the replacement stretches, contractor to provide proper barricading and temporary alternate route for people to access their houses/shops ▪ Alternative access route to be provided for the community to access their residential places and in case of any medical emergency.				
Structure Loss	Construction Phase	Loss of structures includes 2 Farmers Dera Crops (Sugarcane, Wheat, Vegetable (Polls Shed/Tunnel technology) etc.) 120 Trees Guava Farms Fields Citrus (Lemon) Farm 4 Tube Wells	Moderate	▪ ARAP has been developed and will be ensures by MC before execution of Project	MC Jaranwala	Public Consultation	Visit during Award Compensation	ESM team PMDFC

Gender Empowerment including Employment of Women	Civil construction during the construction phase of the project.	The civil construction work to be taken place at the WWTP can provide employment opportunities for women residing in the project area.	Low	▪ Ensure the implementation of the Gender Action Plan (GAP) for the project, which has been developed as a stand-alone document. ▪ Ensure equitable distribution of employment opportunities between men and women through encouraging contractors to employ local workers including women for labor-based work. ▪ Ensure availability of gender sensitive facilities such as toilets, resting areas, crèches for children, and a policy against sexual harassment. ▪ Women should be encouraged to participate in public meetings, discussions and consultations especially with regard to their entitlements. ▪ Women should be made aware of the Grievance Redressal Mechanism (GRM) and the Grievance Redressal Committee should also comprise 50% of women members.	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team
Intra-state Migrant Workers & Laboure's	Inflow of Migrant laborer's & workers expected during construction phase of the project	Availability of Land Security Environment, Health and Safety of Labor at Campsite Community Concerns	Moderate	▪ Contractor will prepare Occupational Health and Safety Plan and get approval from MC before the execution of work ▪ Contractor will be instructed (will be included in his term of reference and in the form of EHS SOPs) strictly implement the PMDFC SOPs for EHS of labor/construction workers ▪ Contractor will be instructed to prefer the local labor to be engaged. Anyhow, for labor site	MC Jaranwala Contractor	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implemen	•Daily site visit during construction phase •Fortnightly/ Weekly	• DPO-ESM of PMDFC Regional Office E&S Consultants of Supervision Consultants team

		regarding privacy of women and GBV[43] Sustainable Use of Environmental Resources		management, following mitigation measures will be provided: IX. Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to construction labor if they will be hired from outstation. X. Good housekeeping will be ensured inside campsite XI. Labor will be provided with hygienically good quality food. XII. During winter hot water will be provided for bathing and likewise as per the weather condition. **Labor Training and Code of Conduct-** ▪ The contractor shall develop a laborlore conduct management procedure applicable to different categories of workers including short time and full-time workers. The labor code of conduct shall be consistent with and part of the overall EHS SOPs for Labor developed by the PMDFC. ▪ The labor Code of Conduct shall be translated into Urdu language upon clearance from the MOI of MC Jaranwala and DPO-ESM of regional office of PMDFC. Theodor conduct must be made available to all staff and displayed in the work site in local languages		tation of GRM		

[43] Gender Based Violence

				▪ Labor awareness programs to educate the laborers about the code of conduct ,general conduct, the Environmental and Social Management and Monitoring Plan, Public and Occupational Health and Safety Planned sustainable use of local environmental resources etc. should be conducted throughout the contract period as per the Labor management plan and ESH plan approved by the MOI and DPO-ESM. ▪ The contractor shall give priority selecting labor from project influenced areas so as to minimize the need for erecting labor camps and minimizing labor influx. ▪ Frequent supervision laborer's' activities, labor welfare needs, and action to ensure hygienic conditions in the work sites/ camps ▪ Avoid social conflicts among contactor's labor force and the surrounding community or tension and prevalence of gender- based violence through the implementation offlap. ▪ Conduct awareness program on Gender Based Violence (GBV), good hygienic practices and dangers of sexually transmitted diseases such as HIV/AIDS and sensitize them to avoid interference and consider the privacy of local community women and vulnerable groups.				

				▪ Introduce code of conduct collaborates to prevent alcohol and drug abuse, violence, sexual abuse etc. ▪ Regular consultation and interaction with host community ▪ Prepare an inventory (including names/ National ID numbers/addressees.) of entire labor force employed by contractor, and share with the Resident Supervision Consultants. This inventory shall be updated at each recruitment or resignation of labors.				
D-Environmental & Social issues related Operational phase								
Visual and Aesthetics	Physical presence of the WWTP Illumination from the WWTP facility. Operation and Storage of Sludge increasing the Odor	Visual and Odor	Minor to moderate	▪ Appropriate shading of lights to prevent scattering ▪ Tree plantation and odor Monitoring ▪ Scum that builds up on the pond surface should be regularly removed. ▪ Floating wetlands will introduce that will stop eutrophication and algal growth within the body of our WWTP. ▪ Floating wetland will also help to minimize odor and the flies in ponds. ▪ The anaerobic pond must be de-sludged approximately once every 2 to 5 years, when the accumulated solids reach one third of the pond volume.	MC Jaranwala	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Visits after regular interval	MC Jaranwala

	Price fall in property rates			▪ Proper implementation of flies especially (psychoda) and other breeding habitat control strategies at site ▪ Proposed site for WWTP is already away from the urban area and nearby lands are being used for crops cultivation while downstream is facing severe water shortages which will be recovered after availability of treated water to be used for irrigation purposes which will enhance the productivity.				
Surface and ground water quality	Wastewater seepage into ground water	Impact on soil and ground water and environment Occupational health and safety hazard Impact on Ground water quality	Moderate to high	• In order to monitor WWTP performance, continuous evaluation and monitoring of discharge parameters will be undertaken at the outlet and inlet point of WWTP. • To avoid ground water contamination, highest quality smooth surface HDPE geomembrane will be used to protect ground water resources and ecological environment having advantages of: ○ Low cost ○ good anti-seepage ability ○ High strength ○ Good ductility ○ Good chemical stability ○ good resistance to ultraviolet light aging, and ○ resistance to rodent and microbial attack To ensure the ideal installation and construction quality, the base layer will be further inspected to ensure that the surface of the base layer is flat and	MC Jaranwala	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	• Visits after regular interval	MC Jaranwala

				smooth, and there is no debris that may damage the geomembrane, such as rocks, tree roots, and sharp objects. There should be no right-angle rigid structure at the bending part of the geomembrane, and it should be made into an arc shape.				
Air Quality	Stack emissions Emission of H2S Methane gases from Anaerobic ponds	Impact on ambient air quality GHG emissions	Low to Medium (Negative)	▪ Comply with the Emission guidelines In PEQs. ▪ Monitor ambient air quality in and around the Project site as per the Environment Monitoring Program formulated for the Project which will comply with National Regulatory requirements.	MC Jaranwala	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Visits after regular interval	MC Jaranwala
Noise	Plant operations	Impact on health of workers and staff	Low (Negative)	▪ Noise monitoring along with health check-up on aregular interval ▪ All noise generating units would be acousticallyenclosed; ▪ Use of rubber padding underneath high noiseand vibration generating machines; ▪ Personnel working onsite in high noise generating areas will use ear plugs /ear muffs;	MC Jaranwala	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	•Visits after regular interval	MC Jaranwala
Community Health and	Plant operations	Impact on communit	Low	▪ Comply with the Community health and safety guidelines EHS Guidelines by World	MC Jaranwala	• Site Visits	•Visits after	MC Jaranwala

Safety and other issues		y assets such as water due to water intake and cooking water discharge Increased vehicular traffic in the region Exposure to site accidents and incidents Traffic Movement in newly constructed site approach road	to Medium	Bank. ▪ Formulate and implement an On-site Emergency Management Plan (attached as Annexure H) in consultation and collaboration with local government authorities to streamline the emergency management response and strategy. ▪ Institute and operate a Community Grievance Redress System in line with PMDFC performance that pertains to Community Health, Safety and Security aspects; ▪ If required, Project Security personnel will be engaged and trained in line with the recommendations of IFC Performance Standard ▪ Awareness campaign among the community residing adjacent to the road Maintaining healthy relationship with community through BCC (Behavioral Change campaigns) ▪ 100 meters of Buffer zone is provided to avoid any odor and noise related issues at community level and massive plantation will be ensured in the buffer zone (List of plant species is provided in the annexure I)		• Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	regular interval	
Occupational Health	Project Operation Phase	Risk of accident and fatality to	Med.	▪ On job training for the workers shall be carried out; ▪ Work permit system shall be followed;	MC Jaranwala	• Site Visits • Visual Inspectio	•Visits after	MC Jaranwala

and Safety		worker		▪ PPEs to be provided and use of PPEs shall beencouraged; ▪ SOPs to be developed for operation and maintenance of the project site.		n and pictorial evidence • Monitoring Reports Implementation of GRM	regular interval	
Monitoring of overall performance of WWTP	Project operation phase	Lab analysis of all parameters All inlet and outlets flow data management Data management of the reuse of treated water by community people		▪ A specialized lab will always onboard for the analysis of treated water parameters and to ensure its availability to reuse or mixing with water channel will be safe ▪ There will be the hiring of a skilled team for the management of WWTP throughout the sub-project working span. ▪ Management of all related data of WWTP plant working efficiency, flow rate and characteristics of inlet and flow rate and characteristic of outlets, species of plants used for the floating wetland purpose will be assured. ▪ There will be proper maintenance of all machinery and equipment's used during the operation phase. ▪ Regular analysis report of the structure of WWTP will be made to assure that compatibility of structure and to avoid any accident like seepage or any other contact of highly contaminated water present in ponds with other resources.	MC Jaranwala	• Site Visits • Visual Inspection and pictorial evidence • Monitoring Reports Implementation of GRM	O& M Manuals	MC Jaranwala

		around						
Re-use and discharge of Treated water into surface water body	Project Operation Phase	Ecological and health hazards		▪ WWTP facility shall ensure BOD, temperature, flow and other parameters monitoring at entry point (influent) to the last exit (effluent) after treatment through anaerobic ponds, facultative ponds and through bioremediation by introducing floating wetlands. ▪ Sludge dry beds will be used to prepare the compost for further selling to the local farmers which will be a source of revenue generation for the MC. ▪ After disinfection and chlorination and helminths and pathogens removal, treated water will be reused for irrigation purposes and during monsoon or no irrigation usage seasons, treated water shall be pumped through watercourse to the nearest canal which is 10 meter away from the WWTP. ▪ For discharge of treated water into surface water body, PEQSs[44] shall be strictly followed (Attached as Annexure B)	MC Jaranwala	Monitoring Reports Effectiveness of GRM Well-established reporting and documentation mechanism	Visits after regular interval	• MC Jaranwala

[44] . As per PEQSs, Biochemical Oxygen Demand (BOD_5) at 20^0 C for inland water discharge is 80

				▪ As Pakistan has no Guidelines/Standards for treated water re-use, so WHO, FAO and USEPA Guidelines and Standards (attached as Annexure K) shall be used to ensure the environmental and ecological safety				
Security	At operation phase	Vandalism Theft Encroachment		• Boundary Wall will be provided around the WWTP • Security cameras will be installed • Guards and watchmen will be deputed • Admin block is included in the WWTP auxiliary facilities • Buffer zone of 100m will be maintained	MC Jaranwala	Best administration practices	Throughout the operation	MC Jaranwala
Energy Efficiency	At operation phase	Over-exploitation of energy resources		Solar energy system is introduced for energy efficiency and safe use of energy	MC Jaranwala	Energy Audits O&M Manuals	Annual	MC Jaranwala

4. WWTP (Estimated Budget of ESMMP)			
Item	**Quantity**	**Tentative Cost/Item-PKR./-**	**Total Cost**
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	50	300	15000
Safety Hard Helmets	30	3,000	90000
Safety Shoes	30	3,000	90000
Hand Gloves	30	1,000	30000
Ear Plugs	30	500	15000
Reflective Safety Vest	30	1,000	30000
Safety Goggles	30	500	15000
B-Community Health and Safety			0
First Aid Box Complete	4	10,000	40000
Infrared Thermometer (Benetech GM-2200 or equivalent)	1	40,000	40000
Safety Signs	20	15,000	300000
Safety Cones	19	1,000	19000
Safety Tapes	20	1,500	30000
Portable Delineator with chain	20	2,200	44000
Emergency Portable Lights	20	3,000	60000
Solid Waste Collection Drums with Cover	20	12,000	240000
Fire Fighting Equipment Purchase and refilling	3	10,000	30000
Hiring of Environmental Manager (for 02 years)	24	50,000	1200000
Pole Hanging Waste Bins	8	12,000	96000
Labor Campsite Management	1	770,000	770000
Water Sprinkling	1	300,000	300000
Social and Behavior Change Campaign and Labor Awareness/Training	1	250,000	250000
C- Environment Quality Testing during Construction Phase			0
Ambient Air Quality-Before, during, and after construction	12	85000	1020000
Noise Quality-Before, during, and after construction	12	1000	12000
Water Quality-Before, during, and after construction	12	22000	264000
D -Monitoring cost			0
Water Quality Analysis Lab Establishment at site to ensure treated water quality as per WHO/PEQSs	Estimated Cost has been incorporated in the BOQ of Civil works of WWTP		0
Total (PKR)-A+B+C			**5,000,000**

Table 39: ESMMP of Package 05: Supply of Liquid waste Machinery

Sr no	Parameters	Impacts	Safety guidelines
1	**Solid waste Machinery and Equipment's Maintenance**	**Environmental** ▪ Emissions **Social** ▪ Parking problems ▪ Technical issues ▪ Rusting **Health** ▪ Respiratory ailments by exposure of emissions	▪ Before starting the machinery, inspect it for any damages, leaks, or malfunctions. Make sure that all safety guards and devices are in place and working correctly. ▪ Wear appropriate personal protective equipment (PPE) at all times, including safety glasses, hard hats, safety shoes, gloves, and respiratory protection if required. ▪ Regularly inspect and maintain the machinery, following the manufacturer's recommendations for lubrication, cleaning, and servicing. ▪ There should be proper parking sheds for the parking of WM. ▪ Keep the parking area clean and free of debris. Do not allow waste or materials to accumulate around the machinery, as they can cause tripping hazards or interfere with its operation. ▪ Best quality of fuel should be used in SWM machinery to avoid carbon emissions. ▪ Vehicles should be well tuned and annual fitness certificate should be obtained from the respective authority. ▪ Regular maintenance and washing of vehicles. ▪ Parking area should be maintained. ▪ Regular use of oils/ lubricants and paints to avoid rusting of SWM.
2	**Waste Generation & Collection**	**Environmental** ▪ Missing data of daily waste generation can lead to problem in choosing appropriate method for collection and further processing. ▪ Illegal / open site dumping ▪ Mixing of waste	▪ Maintaining catalog of waste collected (weight and location) and disposed (weight and location) for each solid waste collection machine on daily basis. ▪ Create public awareness by pasting solid waste management public messages on the machines. Following messages can be placed on the machines: ▪ Best management technique for solid waste management is to reduce waste

		▪ No data about composition and types of waste being collected **Social** ▪ Smell ▪ Mobility issues ▪ Social conflicts **Health** ▪ Different diseases by exposure of waste like pneumonia, tetanus and skin allergies etc.	▪ Segregation and recycling of solid waste at source is a good solid waste management practice ▪ Reusing the waste material to the extent possible ▪ Processing food waste through home composting or community composting ▪ Sell recyclable solid waste to solid waste hawkers ▪ Wrapping securely sanitary napkins/pads, tampons, infant and adult diapers, condoms, and menstrual cups before putting in domestic bin meant for non-bio-degradable waste. ▪ Throwing waste on the street, open spaces, drain or water bodies is a bad practice. ▪ Machine operators should be made responsible for the following best practices while operating solid waste machines in the filed: ▪ Segregation of waste at generation point. Segregate and store the waste generated & mandate citizens to store segregated wastes at source in separate domestic or trade bins and hand over these wastes separately to designated waste collectors for recycling, processing and disposal of solid waste. ▪ Organize door to door collection of segregated bio-degradable or wet and non- bio-degradable or dry solid wastes on a daily basis at pre informed timings from all residential and non- residential premises. ▪ Bio-degradable wastes from fruits and vegetable markets, meat and fish markets, horticulture waste from parks and gardens, shall be collected separately. ▪ Disposal of construction waste at daily basis to allocated disposal site. ▪ No solid waste collection and disposal machinery should be involved in open site dumping and illegal disposal. MCs should install tagging/tracking system on each machine.

			▪ Proper monitoring by MC teams of solid waste machinery maintenance, operations, and performance in the field to avoid violation of rules. ▪ Machine operators should be made aware about the practices of handling of waste at generation point and about health hazards and diseases caused with exposure of waste. ▪ Provide separate bins with labeled instructions on recreational areas. ▪ Collect and store chemicals in closed containers that will not leak. ▪ Collect and store liquids separately from solids. ▪ Broken Glass Equipment (broken beakers, pipets, etc. that are waste) should be promptly swept up and disposed of in rigid containers. When the container is full tape it shut. ▪ Waste collection vehicles and equipment should be cleaned regularly to prevent the spread of disease-causing microorganisms. ▪ Waste collection workers should undergo regular health screening to identify any potential health risks, such as exposure to harmful chemicals or infectious diseases. ▪ It is essential to engage the community in waste management practices to promote a sense of ownership and responsibility for waste generation and collection. This includes community-based awareness campaigns, education programs, and the provision of resources such as recycling bins and composting facilities. ▪ Waste generation and collection practices should be inclusive and accessible to all members of the community, regardless of their income level. This includes the provision of resources such as recycling bins and composting facilities to under-resourced communities. ▪

3	**Waste Transportation & Disposal**	**Environmental** ▪ Spreading of waste in open streets ▪ Spillage ▪ Soil pollution ▪ Water pollution **Health** ▪ Injury ▪ Infection ▪ Over load of work **Social** ▪ Odor ▪ Mobility issues ▪ roads blockage	▪ Quality fuel should be used to avoid carbon emissions from vehicles transporting waste. ▪ Vehicles should be well tuned ▪ Skilled and trained labor should be used for waste transportation and disposal purpose. ▪ Vehicles used for transportation of wastes shall be covered and shall have a facility to prevent waste spillage and leachate dropping from the vehicles on the ground enroute to the processing or disposal facility. ▪ Waste shall not be visible to public, nor exposed to open environment preventing their scattering ▪ Use tarpaulin sheets to cover the containers and waste trolleys properly. ▪ Waste depots shall have covered containers for separate storage of bio-degradable or wet waste and non-bio-degradable or dry waste collected from the doorstep ▪ Use appropriate leak-proof material with mechanical stability ▪ Label all containers to identify the waste, describe the possible hazard, and the remedial measures / first-aid required in caseof accidental spills ▪ Secondary storage vehicles or containers shall synchronize with transportation system to avoid multiple handling of waste ▪ Secondary storage of waste in open spaces on the roadsides or open plots or in cylindrical concrete bins or open masonry bins shall be dispensed ▪ Telephone number of the contact person / controlling agency in case of emergency etc. through labeling; ▪ Select Collector/transport who has technical competence and relevant skills and other requirements. ▪ Packaging material shall be such that there will be no significant chemical or galvanic action among any of the materialin the package.

			▪ All material shall be so packaged and sealed those spillages of hazardous wastes / substances are prevented during transportation due to jerks and vibrations caused by uneven road surface. ▪ The work environment must be further evaluated and tested on a continuous basis in terms of hazardous conditions. ▪ Provide proper PPEs to all workers to be used during waste collection and handling. ▪ Manpower needs and schedules should be reevaluated and altered in an effort to avoid excessive overtime. ▪ Don't Schedule collection and transportation between office/school going and coming hour. ▪ Inform inhibitors about collection schedule. ▪ Select proper waste disposal sites to consider environmental and social impacts, such as proximity to residential areas, water bodies, and wildlife habitats. ▪ Implement innovative waste management technologies and practices such as smart waste management systems, waste-to-energy technologies, and other innovative solutions to improve the efficiency and sustainability of waste generation and collection. ▪ Promoting public education and awareness about the importance of proper waste transportation and disposal practices can help increase community engagement and ownership in the waste management process. ▪ Comply with national and Punjab regulations and laws to protect public health and the environment.

5: Supply of Liquid Waste Machinery (Estimated Budget of ESMMP)			
Item	**Quantity**	**Tentative Cost/Item-PKR./-**	**Total Cost**
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	5	300	1500
Safety Hard Helmets	5	3,000	15000
Safety Shoes	5	3,000	15000
Hand Gloves	5	1,000	5000
Ear Plugs	5	500	2500
Reflective Safety Vest	5	1,000	5000
Safety Goggles	5	500	2500
Total (PKR)			**46,500**

Table 40: ESMMP of Package 06: Desilting of sewerage lines

Execution Phase								
Proposed Sub-project activities	**Potential Env/Soc Impacts**	**Magnitude of Impact**			**Mitigation Measures**	**Monitoring Indicators**	**Monitoring Frequency**	**Responsibility**
		Low	Medium	High				
Labor Camp (if established by Contractor)	○ Health impacts due to absence of housing and sanitation facilities in labor camp. ○ Security of labor ○ Unhygienic conditions				• Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to labor. However local labor will be hired as skilled labor from outstation is not the requirement of this project In case of construction of camp site, following measures will be adopted by the contractor: • Good housekeeping will be ensured inside campsite • Labor will be provided with quality food. • Better heating & cooling facilities will be provided by the Contractor as per season accordingly.	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

					• Better accommodation will be ensured by the Contractor. • Its better to accommodate labor in Containers Camps/houses with all amenities. • Contractor will submit Campsite Management Plan and approve from Construction Supervision Consultant before the execution of work.			
Desilting	○ Traffic/pedestrians hindrance ○ Smell/odor ○ Vector borne diseases sites in case of silt piles				• Desilted material will be disposed off within 24 hours at MC designated site • Silt will be removed through sucker bucket machines and to avoid mobility of the local community, alternate routes will be provided in the main roads while local community will be informed well before time about this activity • In case of sensitive receptors i.e., schools/ colleges and Mosques sites, desilting activity will be scheduled as per the timings of institutions and prayers. • Safe transportation of silt material will be ensured from the de-siltation site to disposal site by covering with the	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

					trapline and using PPEs by the workers handling the overall activity To know the change in air and water quality due to silt material, contractor will ensure to carry out the air and water quality testing before and after the activity from de-siltation site and disposal site respectively			
Site Safety Issues	○ Accidents				Contractor will ensure site safety using safety cautions (night vision), boards, flagmen, cordon tapes etc. for smooth flow of traffic during the construction phase of the Sub-Project.	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs
Occupational Health & Safety	○ Injuries to workers/LTI				• Contractor will follow HSE SOPs for all activities on the site. • Workers will be trained and guided to follow SOPs and will be provided with necessary PPEs (Safety Helmets, Safety	Visual/ Pictures	• Daily site visit during construction phase	• ESFPs • Construction Supervision Consultant

					Shoes, Gloves, Chemical Masks etc.) wherever required. • First aid will be provided onsite • Careful monitoring will also be carried out.		• Fortnightly/Weekly • Once during the construction phase	• DPO ESSs
Damage to Public Infrastructure/utilities	○ Accidents/Incidents/Injuries ○ Structural loss ○ Social Conflicts				• Contractor will ensure no damage to public utilities or structures. • Contractor will provide compensation in case of any damage may occur to the private property	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs
Sexual Harassment-Labor Influx-Child Labor	○ Social Conflicts				• Contractor will give behavioral training to the workforce. • Contractor will hire local labor • Child labor will not be allowed for any activity	Visual/ Pictures/Reported/Complains by public during visit	• Daily site visit during construction phase	• ESFPs • Construction Supervision Consultant

							• Fortnightly/Weekly • Once during the construction phase	• DPO ESSs
CoViD-19 SOPs implementation	○ Spread of Corona among the labor				• Contractor will provide face masks to the labor on daily basis to reduce Corona impact. • Contractor will follow CoViD-19 guidelines during construction works	Visual/ Pictures	• Once during the construction phase	• ESFPs • Construction Supervision Consultant • DPO ESSs

06: ESMMP Cost of package 06 Desilting of Sewerage lines

Item	Quantity	Tentative Cost/Item-PKR./-	Total Cost
A-PPEs for Health and Safety of Labor/Workers			
Face Masks (3 PLY) - box	5	200	1000
Safety Hard Helmets	4	3,000	12000
Safety Shoes	4	3,000	12000
Hand Gloves	4	1,000	4000
Ear Plugs	4	500	2000
Reflective Safety Vest	4	1,000	4000
Safety Goggles	4	500	2000
B-Community Health and Safety			0
Trapline to cover silt during transportation	1	15,000	15000
First Aid Box Complete	1	2,000	2000
Safety Signs	1	10,000	10000
Safety Cones	4	1,000	4000
Safety Tapes	1	1,200	1200
Solid Waste Collection Drums with Cover	1	8,000	8000
			77200

6.7 Monitoring & Reporting Mechanism of ESIA

6.7.1 Monitoring Plan Development:

A monitoring plan is developed, outlining the methods, frequency, and responsibilities for monitoring the identified indicators. The plan should specify who will conduct the monitoring, what data will be collected, how it will be analyzed, and how often monitoring reports will be produced.

- **Ongoing Monitoring**: The project activities and their impacts are regularly monitored according to the established plan. This may involve field visits, data collection, sample analysis, stakeholder consultations, and other monitoring techniques. Monitoring helps track changes, identify emerging issues, and evaluate the effectiveness of mitigation measures.

- **Data Analysis:** The collected monitoring data is analyzed to assess the project's actual environmental and social performance against the predicted impacts outlined in the ESIA report. This analysis helps identify any discrepancies, areas of concern, or unexpected impacts.

- **Reporting:** Regular monitoring reports are prepared and submitted to the relevant stakeholders, including the project proponent, regulatory authorities, affected communities, and other interested parties. The reports should present the monitoring findings in a clear and understandable manner and provide an objective assessment of the project's performance.

- **Mitigation and Corrective Actions**: If the monitoring reports identify significant adverse impacts or non-compliance with environmental and social standards, appropriate mitigation and corrective actions should be proposed and implemented. These actions aim to reduce or eliminate the negative impacts and improve the project's environmental and social performance.

- **Stakeholder Engagement**: Throughout the monitoring and reporting process, it is essential to engage with stakeholders, including affected communities, NGOs, regulatory agencies, and other interested parties. Stakeholder engagement helps ensure transparency, gather feedback and concerns, and foster collaboration in addressing environmental and social issues.

To ensure the successful implementation of an ESMP, monitoring and supervision are considered effective tools. The level of monitoring and supervision must be appropriate. These measures are mean to reduce the risks and impacts and ensure compliances with the sub-project requirements and the procedures for documentation, reporting, and feedback on the outcomes of corrective and preventive action.

Physical, biological, and socio-cultural parameters will be monitored to determine the compliance level with National, World Bank standards and compliance with this ESMP. Monitoring will be divided into Compliance monitoring and Effect monitoring.

Compliance monitoring represents the majority of the monitoring during the sub-project operational and handing over (defect notification). supervision consultant

along with ESM will be responsible for day to day monitoring of the contractor's compliance with this ESMP and will monitor the implementation of the mitigation measures.

supervision consultant will complete monitoring within the sub-project area using contract specific monitoring checklists and will engage a full-time environmental representative to be present on-site for daily monitoring who will report directly to the Resident Engineer from supervision consultant, and who will coordinate with the project management unit.

Effects Monitoring will be carried out by M&EC of various environmental and social parameters quarterly to evaluate the performance of this ESMP. The following parameters are to be monitored:

- Monitoring of Noise levels at fixed locations during the construction phase
- Availability of water at the downstream end of the channel system;
- Monitoring of ambient air quality during the construction phase;
- Health and safety of Contractors personnel.
- Monitoring for waste management and sanitary waste disposal.
- Monitoring labor management in the project area such as the process of hiring skilled and unskilled labor from the local community or other areas, no any labor rights are affected, camps are located 500 meters away from community trespass area and have an adequate boundary, contractor's training plan is implemented accordingly, no GBV or sexual exploitations are taken place, rights of women and children or any vulnerable groups are not affected.
- Monitoring of overall GRM mechanism developed in the project such as their functional committees, a database of grievances received from the communities in soft and recorded in hard in database register in writing or verbally and follow-ups status.

6.7.2 Monitoring Mechanism

Before the execution of work, in the contractor's environmental and social management plan, each Contractor will include details of its proposed social, health, safety, and environmental implementation procedures, to ensure the construction sites are operating satisfactorily and that problems are being dealt with swiftly.

- The format of a monthly report which reviews the Contractor's compliance with the environmental and social requirements of this ESMP and their own plan.
- A formalized mechanism to audit the effectiveness of the own plan (i.e. Contractor Environmental Social Management Plan.

Details of the records to be kept demonstrating compliance with safeguards.

- Monitoring checklists for day to day monitoring with safeguards.
  A plan for day-to-day monitoring of the site and identification of staff responsible for this.
- Proposed actions to be taken to correct non-compliances noted by the supervision consultant.
- Internal reporting channels for non-compliances.

6.7.2 Aims of Monitoring

Main objectives of the Monitoring Plans are

- Evaluate the performance of the ESMP and to bring about improvements.
- To provide a means where impacts that were uncertain at the time of preparation of ESMP or unforeseen could be identified and steps are taken to adopt appropriate corrective measures.
- Record the inputs provided by various participants in the environmental and social management process, (i.e., client, consultants, contractors)
- To check whether mitigation measures are adequate, effective, and adopted in the field.
- To comply with legal and community obligations, including safety on construction sites.

6.7.3 Noncompliance and Corrective Measures

The Contractor will be notified of any violations with this ESMP, as well as any corrective actions required. The payment of the mobilization bill item will not be paid to the contractor until the following conditions have been met.

- Preparation and submission of Health and Safety Plan to the supervision consultant in coordination with ESM for review and approval.
- Provision of contractor's staff camps.
- Preparation and submission of the contractor's Environmental and Social Management Plan to the supervision consultant in coordination with ESM for review and approval.
- The contractor will submit the curriculum vitae of its ESMP staff to the supervision consultant in coordination with ESM for review and approval. The availability of the Contractor's ESMP staff will be made full time on site.

Where the contractor fails to comply with his management plans, (i.e., CESMP or Health and Safety Plan) and, therefore fails to comply with this ESMP, payments will be deducted from the relevant bill item each month. The percentage deduction from these bill items will be based on the percentage compliance as measured through monthly monitoring checklists.

The following stages will be performed, relating to the increasing severity of ESMP non-compliances.

Stage 1 Supervision Consultant discusses the problem with ESM and Contractor to work out mitigations together and record the facts and the decision implemented.

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

Stage 3: ESM / supervision consultant will order the Contractor to suspend part, or all, of the works. The suspension will be enforced until the offending party, procedure, or equipment is corrected and/or remedial measures put in place if required. No extension of time will be granted for such delays and all costs will be borne by the Contractor.

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

6.7.4 Communication, Reporting, and Documentation

Meetings

A preliminary meeting will be held with the aim of setting out the format for the regular meetings. This meeting will be held before the commencement of the works, following the contract award. The meeting will be attended by ESM /PIU, supervision consultant, and the contractor.

In addition to the meetings above, SUPERVISION CONSULTANT (Environmental Engineer) will monitor or check the compliance status of contractor commitment on social, environmental, health, and safety-related issues. The day-to-day progress will be provided by the supervision consultant to ESM.

Communications

Most communications between supervision consultant and the contractor will be verbal on site. Where such verbal communication proves to be ineffective for an issue, the environmental team of supervision consultant will issue a formal instruction to the contractor under the civil works contract. Such instructions will also be copied to ESM, as the *Employer*.

Reporting Frequency

The Contractor and supervision consultant will produce monthly reports detailing the compliance level and non-compliance with this ESMMP. The distribution list of reports is given in the below table.

Table 40:Distribution of Periodic Reports

S. N	Report	Prepared by	Frequency	Reviewed by	Distribution

1.	Monthly supervision consultant Compliance Report	supervision consultant	Monthly	ESM	Contractor
2.	Monthly Contractor's ES Mitigation and Management	Contractor's Environmental Coordinator/Officer	Monthly	ES supervision consultant	ESM & supervision consultant

Pictorial Record

A photographic record of the sub-project locations shall be kept and taken at key locations in a walkthrough survey by the contractor, Supervision Consultant and ESM. The photographic record shall be incorporated into the monthly reports. The pictorial record shall include time, the title of the photograph, and the date.

Monthly Environmental Health and Safety Checklists

The completed monitoring checklists shall be attached to the monthly reports. The format of the monthly monitoring checklist is provided in Appendix E.

Complaints Register

The contractor will maintain social complaints register at all camps and worksites to document all complaints received from the local communities. The register will also record the measures taken to mitigate the reported concerns. The final report will be communicated to the ESM . All complaints/issues of the community will be reported in the monthly progress report for the following month along with the status of the last mont

7 Information Disclosure, Consultation and Participation

7.1 Introduction

This Section outlines the consultation and participation activities that have been undertaken as part of the impact of sub-project. Early and ongoing consultation, disclosure and meaningful stakeholder meetings is a key requirement of developing a sub-project. The logic behind the consultation is to get feedback from the stakeholders and address their concerns about the sub-project. The consultation process consists of initiating dialogues among all the stakeholders. The process covers, starting from awareness campaign to the identification, inclusion and participation of Sub-project affected communities. Stakeholders including institutions and concerned communities are generally able to understand the implications of the Sub-project activities.

The present report has been prepared by consulting local communities and concerned government departments/ organizations to ensure that their views and concerns about the sub-project have been taken into account in the study.The consultation process involves initiating dialogues among all stakeholders, encompassing activities such as raising awareness through campaigns and ensuring the identification, inclusion, and participation of those affected by the project

The present report has been prepared by consulting with local communities and concerned government departments/ organizations to ensure that their views and concerns about the sub-project have been taken into account in the study.

7.2 Consultant's Perspective

The present multi-sectorial and multi-dimensional strategy for the sub-project rests on the consultation process including participation, inclusion, ownership and equity of genuine development of national resources on a sustainable basis has been designed keeping in view the following essentials;

a) Social acceptability,
b) Technical appropriateness,
c) Financial viability,
d) Environmental friendliness,
e) Pro-poverty reduction,
f) Gender positive and
g) Long-term sustainability prospects.

7.3 Consultation Requirements

7.3.1 Overview

This sub-section provides an overview of the international consultation, disclosure and stakeholder engagement requirements of the national, provincial and World Bank Guidelines for consultation.

7.3.2 National and Provincial Consultation Requirements

The Government of Pakistan (GOP) and Government of Punjab places great importance on involving institutional and community stakeholders for determining the impacts associated with the sub-project implementation. In order to understand sub-project affected stakeholder's perceptions regarding impacts and mitigations of the projet and participation of stakeholders has been taken as integral part of the study. An attempt has been made to consult with a full range of stakeholders to obtain their views on sub-project interventions and impacts thereon.

7.4 Specific Objectives of Consultation Process

The consultation process provides a meaningful understanding of local social issues for the environmental and social impact analyses. The consultation process helps to minimize adverse environmental and social impacts, reduces the expected conflicts, minimizes the risk of Sub-project delays and enables to make the Sub-project more economical and socially acceptable. Moreover, public consultations create a sense of ownership among the stakeholders regarding the Sub-project and ensure the transparency in Sub-project activities. The consultative process for the "ESIA" has included not only the institutional stakeholders, but also the local community of the area. Meetings with institutional stakeholders like government departments, and line agencies has been organized and conducted to discuss Sub-project interventions and potential impacts on the local communities and environment. Public consultations have been carried out with the stakeholders keeping in view the overall objective of evolving their participation. The public consultation aimed to achieve following specific objectives.

- Information disclosure to create awareness among various stakeholders about Sub-project development objectives and proposed interventions
- To start interaction process with stakeholders
- To elaborate environmental and social impacts to the stakeholders
- To establish communication and an evolving mechanism for the resolution of social and environmental issues at local and Sub-project level
- To involve Sub-project stakeholders in an inclusive manner at every stage of Sub-project implementation
- To receive feedback from all types of stakeholders on adopting mitigation and enhancement measures for environmental and social impacts

7.5 Identification of Stakeholders

Stakeholders include all those who can affect and are being affected by policies, decisions or actions while implementing any development project. Stakeholders can be individuals, group(s) of people, organizations and institutions. During consultation meetings stakeholders reveal their concerns, apprehensions and demands regarding the adverse project impacts mitigation and enhancement of project benefits to the stakeholders. Stakeholders can be broadly divided into primary and secondary stakeholders.

7.5.1 Primary Stakeholders

The primary stakeholders are the intended beneficiaries or communities expected to be affected directly by the project interventions. In this case, people living within Tehsil Jaranwala are considered as Primary Stakeholders. Primary stakeholders identified and consulted include local leaders/ influential, community members (men and women), local representatives, imams, teachers, union council and village council members.

7.5.2 Secondary Stakeholders

This category of stakeholders pertains to those who may not be directly affected but have interests that could contribute to the initiation, implementation at some stage, or affect decision making on Project aspects. The Secondary Stakeholder include, federal/provincial government departments and organizations dealing with education, health, irrigation, agriculture, forest, wildlife, fisheries, and transport etc. Stakeholder consultations meetings were conducted in two stages:

7.6 Public Consultation

Consultations mainly in form of “Focus Group Discussions” (FGD) with Primary Stakeholders in those communities which is near to the Sub-project at public places. It was important to provide meaningful input for the public into the decision-making process through consultation. Representatives of the communities, potential vulnerable groups such as women and youth has been consulted to understand their specific issues and concerns. The findings and recommendations have been discussed and disclosed in an open and transparent manner with the communities in order to solicit their comments and suggestions on the sub-project interventions.

Participants were first briefed about the Sub-project objectives and major interventions associated with the sub-project implementation. Afterward, people were asked to express their views regarding the proposed Sub-project. In general participants appreciated the sub-project but Chak No. 352 GB which is near to the WWTP the farmers showed their concerns about the construction of WWTP and offered comments & suggestions to enhance the expected environmental and social benefits and to mitigate the adverse impacts. The community perception of the sub-project is very good but most of the people wish to implement the sub-project in a sustainable and safety manner. The number of participants involved in each locality and major issues raised by communities during meetings are provided in (Table 42).

Table 41: Consultation with Stakeholders

Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
The community of city accept Chak No. 352 JB reported no objection for the proposed sub-project and willing to cooperate during the entire period. However, they requested that measures should be apply in order to avoid any inconvenience to the affected community.	• To avoid any safety related incidences and ensure well-being of the local residents, a comprehensive livelihood restoration plan and social development plans have been developed to avoid any inconvenience to the affected community.
The community perceived that the proposed project will improve the sewerage system in the area and hopeful the issues of wastewater will be resolved. They expressed cooperation for the project during construction period.	Definitely, the proposed sub-project will enhance the quality of life for the entire city and hopefully will resolve the wastewater issues in the Jaranwala city through successful implementation of this proposed sub-project.
The community, however raised their concern that in the earlier construction work have causes damage to public utilities such as the drinking water pipelines. Therefore, they urge that during replacement work, measure should be taken to avoid damage to public utilities.	• During the project implementation stage, measures will be taken to avoid damage to public utilities. .
The rehabilitation of the sewerage system will be beneficial for the entire area and also beneficial for social and a significant environmental enhancement is also expected.	• This sub-project team committed to providing local residents for effective, comfortable and healthy environment through the rehabilitation work. The measures for accessibility issues, traffic management, women privacy has been considered.
What are the objectives of this project?	• To provide a socially, environmentally and economically sustainable solution for disposal of sewerage and wastewater; and • To ensure efficiency for quick and safe disposal of sewage / wastewater by lying of Trunk Sewerage System.

Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
Participant of Chak 352 JB worried about the land which will used for WWTP and they requested the ES team that this land is the only source of their livelihood.	• The land is owned by the Government of the Punjab and now will be used for the development of WWTP of the entire city which is now the necessary need of the city development. There is a comprehensive livelihood restoration plan and social development plans have been developed to avoid any inconvenience to the affected community.
The community requested for advance notice prior to construction.	• Definitely, the contractor will inform the local community before the start of the construction activities.
Participants told us that the project will have positive impacts towards the health, environment, women & children.	• According to the experts, a sewage system is vital to improving health but is often not implemented due to a lack of resources, infrastructure, available technology, and space. But implementation of this project will improve the health for local community.
What are the construction impacts?	• The contractor will put in place measures to minimize effects and provide regular information to local residents on construction activities and their impacts.
Equal and fair job opportunities for local residents.	• The contractor will be contractually bound to disclose the "Recruitment Policy" that specifically includes a requirement to prioritise local employment for unskilled and semi-skilled positions that become available.
HSE awareness should be provided to the local public being directly affected by the construction activities.	• It should be the implemented during the construction activities to save local community spatially women, old people and children.
People were also concerned that the workers and laborers will be brought by the Contractor from outside the project area and an opportunity of	• The contractor will be contractually bound to disclose the "Recruitment Policy" that specifically includes a requirement to

Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
employment generated locally shall be availed by the people from other areas.	prioritise local employment for unskilled and semi-skilled positions that become available.
The participants requested for information before the commencement of project activities.	• Definitely, the contractor will inform the locals in every stage of the project implementation activity.
One of the participants said that the safety of the public at all stages of the construction will be ensured.	• During the project implementation stage, measures will be prepared that will include GRM and institutional arrangement.
It was also mentioned that the relevant Government personnel must ensure the Contractor staff is cooperative with the general public and maintain the right attitude and try to facilitate them instead of being confrontational.	• The local community were told of the grievance mechanism with the community members in case of any grievances. • During the project implementation stage, measures will be prepared that will include GRM and institutional arrangements.
People were of the strong apprehension that upon completion of the project, the local crossings available on the road may be disturbed and they will be put to trouble by way of long distances for crossing or otherwise.	• The Contractor will take proper safety measures (placing warning tapes around excavations) to avoid people, especially children, accidentally falling into excavations and during all the construction activities. Contractor is bond to restore the condition after completion of work.

Sr. No.	Settlement	Tehsil	District	Number of Participants
1.	Chak No. 352 J.B	Jaranwala	Faisalabad	19
2.	Anwarabd			16
3.	Mohalla Eid Gah			08
4.	Ahmed Park			05
5.	Saifia Park			10
6.	Mahmood Colony (Gali No.4)			07
7.	Mahmood Colony (Gali No.6)			10
8.	Ismail Abad			15
9.	Aftab Town			07
10.	Gular Mor			08
11.	Sheruana Pull			10

Sr. No.	Settlement	Tehsil	District	Number of Participants
12.	Dab Colony			10
13.	Kumharan Wali Pulli			06
14.	Lari Adda			07
15.	Ameen Park			06
16.	Nankana Mor			07
17.	Islam Pura Gali No.4			09
18.	240 Mor			06
19.	Basti Eisa Nagri			14
20.	Bihari Colony			15
21.	Abu Zar Colony			13
22.	Chak No. 128 GB			09
23.	Bashir Colony			10
24.	Islam Pura			18
25.	Chamra Mandi			07
26.	Usmania Park and Abdullah Park			16
27.	Gillani Mohalla			17
28.	Bheek Colony			11
29.	Bilal Gunj and Farooq Park			10
30.	Mehmood Colony (Gender Consultation)			09
31.	Mohalla Sadat Park (Gender Consultation)			08
32.	Manto Park (Gender Consultation)			06
33.	Awan Town (Gender Consultation)			07

Pictorial View of Public Consultation

7.7 Institutional Consultation

The consultant environmental and social team visited various organizations and offices located in the tehsil and district level for information disclosure and to get feedback. Institutional stakeholder consultations were more formal as they involved government personnel and non-governmental organization, who were consulted. They were briefed on the ESIA process, the proposed Sub-project, proposed interventions and the potential negative and positive impact of the Sub-project on the area's environment.

The public sector representatives of the different line departments expressed their complete support towards the sub-project development and mentioned the intent to ensure the sub-project was completed at the earliest to the highest quality standards. In addition, these officials expressed the commitment to ensuring the support and would adhere to all environmental and social compliance standards with no leniency in this regard to be expected from the relevant Government line departments. The digest of comment and suggestions received is given as under, whereas, complete list of offices visited, official consulted and feedback received is provided in (Table-23).

Table 42: Feedback and Concerns

Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
• The Assistant Commissioner of Jaranwala City told to the ES team that the status of the land which will be used for WWTP and he told us that the lease period of this land is expired and now land is ready for the development purpose.	• The support of AC is impressive and it will helpful the successful implementation of the sub-project.
• If the land is required for the project, then what about the compensation?	• Most of the alignment is along the main road which is the property of government. Minor acquisition may be required from private property. • Due consideration should be given to minimum or no land acquisition. • Land should be acquired according to World Bank Safegaurd Policies. • Compensation should be given as per World Bank Safegaurd Policies.

Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
• What are the mitigation measures for emission control?	• All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition, properly tuned and maintained in order to minimize the exhaust emissions; • Proper maintenance and repair of power generators and construction machinery is needed to minimize the hazardous emissions;
• The proposed project is essential for the improvement of public health and socio-economic development, particularly in Jaranwala city with a high incidence of water-related diseases, which affect particularly children. • This actually is not new as drinking water and waste have already been recognised as key health issues in Jaranwala city and the proposed project will effectively change the present scenario. • Traditionally in this proposed project, improvements in Sewerage system have been promoted as essential public health measures to improve the population's health status and reduce the burden of disease.	• The proposed Sewerage Networks Rehabilitation project is aimed towards the introduction of a sustainable sewerage infrastructure that will be able to fulfil the city needs for the next many decades. The project will result in the drastic improvement of sewage collection and conveyance system to cater the existing and future drainage needs and will help towards the development of infrastructure, business and routine life in these regions especially the project area which is very much populated. Locals will be benefited by this, as this will contribute to their livelihoods.
• What are the benefits of the project on the local population?	• With the improvement in sewerage system, improvement in health, hygiene and sanitation will also be observed.
• What are the objectives of the project?	• The proposed project will provide a socially, environmentally and economically sustainable solution for disposal of sewerage and wastewater. The Project intends to ensure efficiency in

Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
	safe and quick disposal of sewage/wastewater.
• Where are the project activities to be implemented during the construction?	• Project activities will be implemented within and outside the existing residential and commercial areas. In order to avoid restricting the mobility of the local stakeholders, construction vehicles will remain confined within their designated areas of movement;
• What are the solution of traffic problem during the construction?	• All necessary measures will be taken to ensure the safety of traffic during construction, including barricades (including signs, pavement markings, flags, and lights). All such barricades will be set up to facilitate the local traffic.
• It is recommended that as per world standards the water supply line and sewerage line should be on specific distance as they could not be mixed when these become damaged.	• The proposed Sewerage Networks Rehabilitation project is aimed towards the introduction of a sustainable sewerage infrastructure that will be able to fulfil the city needs for the next many decades. The project will result in the drastic improvement of sewage collection and conveyance system to cater the existing and future drainage needs.
• What is the procedure to address grivances?	• The most of the concerns raised by stakeholders have been incorporated into the project's environmental and social assessment and EMP. In addition, a Grievance Redress Mechanism/Complaint Handling Mechanism will be developed at the implementation level by forming Grievance Redress Committee which will receive and resolve complaints of the project affected persons and other stakeholders of the project area.

Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
• Cutting of trees should be avoided at the maximum level	• Incorporate technical design measures to minimize removal of these trees, as far as possible
• Efforts should be made to transplant the trees according to the available facilities.	• A tree plantation plan to compensate for the anticipated loss of vegetation during the construction activities, and to help abate pollution caused by emissions, dust, and noise during the operation;
• There is no sensitive area near the project interventions.	• Comment has been incorporated in the ESIA report
• Overall, the Projects interventions will have positive impacts on environmental and social conditions, including the positive impacts on environmental, aesthetics and hygienic conditions of the Jaranwala city.	• Yes, improvement of the Sewerage system will create a healthy lifestyle in the entire city.
• The official of Wildlife department desire to receive regular updates on the project development.	• Definitely, the consultation process will be on going process and World Bank's disclosure policy will be adopted.
• 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.	• The labourers with different transmittable diseases should be restricted within the construction site; • Efforts will be made to create awareness about road safety among the drivers operating construction vehicles; • Timely public notification on planned construction works; • Close consultation with local communities (residential areas along the project alignment) to identify optimal solutions for diversions to maintain community integrity & social links;

Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
	• Provision of proper safety signage, particularly at sensitive/accident-prone spots; • The communicable disease of most concern during construction phase, like sexually-transmitted disease (STDs) such as HIV/AIDS, should be prevented by successful initiative typically involving health awareness; education initiatives; training heath workers in disease treatment; immunization program and providing health service;
• Minimize the effects of noise, dust, vibration, traffic and lightening associated with construction activities on the communities living near the project area that can cause disturbances and emotional stress	• Construction machinery will be placed in an adequate location away from the sensitive areas to minimize the impacts related to the noise;
• Solid waste produced due to construction activities should be disposed of properly	• Solid waste generated during construction and at camp sites will be disposed of safely at the waste disposal sites approved by the relevant Government authority;
• Sprinkling of water should be regular in the morning, noon and evening on the daily basis.	• It is the liability of the contractor to save local environment.
• Utilities disturbed at the site should be restored as early as possible.	• The utilities to be shifted due to the construction of proposed project will be relocated on priority basis to minimize the impact on the stakeholders;

Table 43: Consultation with Institutional Stakeholders

Sr. No	Department/ Organization	Name	Designation	Contact No.
1.	Tehsil Adminstratiion	Shukat Masih Sandhu	Assistant Commissioner	041-4312913
		Rai Abdul Rauf	Patwari	0301-7011050
2.	MC, Jaranwala	Mian Ashfaq Ali	Chief Officer	0301-7193071
		Sadam Hussain	M.O.I	0341-4495441
		Muhammad Rafi	S.D.O	0300-6531729
3.	Environment Protection Department	Imtiaz Ahmed	Deputy Director	042-9200111
		Khalid Mehmood	Inspector (Jaranwala)	0300-6606654
		Mazhar Fareed	Inspector	0300-9656701
4.	Forest Department	Ansir Rasool	D.F.O	041-9220454
		Dr. Aqeela Mubin	Director (Research)	041- 9330723
5	Wildlife Department	Amir Khan Niazi	D.D	0333-6835763
6.	Irrigation Department	Muhammad Ahsan	EXEN	0321-4323777
7.	Drainage Department	Tasawar Ayub	EXEN	0325-4166103
8.	Agriculture Department	Muhammad Asad	Agriculture Officer	0309-5581057
		Muhammad Pervaiz	Agri. Inspector	0301-7271477
9.	OFWM	Muhammad Maqsood	Assistant Director	0300-7840228
10.	Drainage Sub Division	Muzamil Hussain	A.S.D.C	03037675077
11.	PHE	Tasadaq Abbas	Sub- Engineer	0300-5624627
		Basharat Ali	Civil Surveyer	0300-6571625

Pictorial View of Institutional Consultation

Information Discloser and Consultation with AC Jaranwala

Information Discloser and Consultation with CO of MC Jaranwala

Information Discloser and Consultation with officials of EPD

Information Discloser and Consultation with MOI of MC Jaranwala

Information Discloser and Consultation with EXEN Drainage Department

Information Discloser and Consultation with Manager Borala Division PIDA

Information Discloser and Consultation with Official of OFWM

Information Discloser and Consultation Director, Forest Reseach Institute

Information Discloser and Consultation with Official of Wildlife Department

Information Discloser and Consultation with EXEN Irrigation Department

Information Discloser and Consultation with official of PHE Department

Information Discloser and Consultation with SDO (MC) Jaranwala

Information Discloser and Consultation with official of Agriculture Department

7.8 Women Stakeholders Consultation

Gender issues are gaining importance in development Sub-projects because female members of the community are generally neglected while designing, assessing and implementing such Sub-projects. Females are generally more vulnerable than male members of the society. This Sub-project is also no exception to it. Conducting women consultations in the Sub-project area was a challenging task. However, the process has been carried out by holding consultation sessions with women of local communities randomly. A participatory and consultative approach has been employed for information gathering and data collection.

Female participants were first briefed about the Sub-project objectives and interventions and then were requested to give their views. Women's main concerns were generally related to the existing hardships they are facing and suggestions, as under:

- One of the participants said that we are fed up with the stench of wastewater and mosquito-borne diseases like malaria and dengue fever.
- The consumption of contaminated ground water is causing health issues in children and women especially in pregnant women.
- In some areas pit holes are dug for household waste water and it collects the water, the women members of family are supposed to empty the pit hole and dispose off directly in open passages/streets or nearby open fields which is an unhygienic practice and creates unpleasant and unhealthy impacts on the areas and overll on women health.
- Women are suppressed and not consulted during decision making.
- Proper sanitation infrastructure is not priority of the communities due to which women households are affecting badly.

- Women are not allowed to leave the house without permission of head of family, most of women are not aware of hygienic practices and products.

Pictorial View of Women Consultation

7.9 Capacity Building

A comprehensive program will be followed to strengthen the technical and institutional capacities of the executing agency (MC Jaranwala), contractors, and laborers.

Table 44:Training / Awareness and Sensitization Plan

Sr. No	Components	Audience	Level	Modality	Frequency	Responsibility	
1	ESMF Site Specific requirements and E&S Management and Mitigation Plan	MO-1 MO-PMC and field staff	Training	Briefing Presentations Mock Activities	Before execution of sub-project and time to time instructions	PMDFC team	ESM

2	ESMP Implementation and Monitoring Plan	MO-1 MO-P MC staff field	Training	Briefing Presentations Mock Activities		
		Contractor	Awareness and sensitization	Briefing	At the time of Contract signing and before execution	DPO-ESM ESFPs
		Labor	Awareness and sensitization	Briefing	Before execution and time to time during execution	DPO-ESM ESFPs
3	EHS SOPs for Labor/Workers (including women workers)	Contractor	Awareness and sensitization	Briefingand Illustrations	Before execution and time to time during execution	DPO-ESM ESFPs
		Labor/workers	Awareness and sensitization on SOPs Training on Use of PPEs	Presentations Illustrations Mock Activities Resource material	Before execution and time to time during execution	DPO-ESM ESFPs
4	GRM	Contractor	Awareness and sensitization	Briefing	Before execution and time to time during execution	DPO-ESM ESFPs
5	GRM, Environmental Pollution, Social issues	Local communities	Awareness Sensitization	Public consultation Awareness Messages Traffic Signage Temporary cardon of the	Throughout the cycle of execution of sub-project	MC DPO-ESM

				construction area		

8 Grievance Redressal Mechanism

To receive and facilitate the resolution of affected people concerns, compliments, and grievance about the sub-project's environmental and social performance an Environmental Grievance Redress Mechanism (GRM) has been established. The GRM will address affected people's concerns and complaints proactively and promptly, using an understandable and transparent process that is gender responsive, culturally appropriate and readily accessible to all segments of the affected people at no costs and without retribution.

The GRM will be accessible to diverse members of the communities, including women, senior citizens, and people with disabilities, laborers/workers, and other vulnerable groups. The subproject GRM will follow the PCP's overall program GRM.

8.1 Principles

A GRM is established to address any complaints or grievances arising during the implementation period of the projects. People of the project area may perceive risks to themselves or their property or their legal rights or have concerns about the possible adverse environmental and social impact that a project may have. Any concerns or grievances will be addressed quickly and transparently, and without retribution to the Affected Persons (Aps) or community members or complainant. The primary principle of GRM is that all complaints or grievances are resolved as quickly as possible in a fair and transparent manner.

8.2 GRM

Grievance Redress Mechanism (GRM) is to provide a robust system of procedures and processes that provides for transparent and rapid resolution of concerns and complaints identified at the local level. In case of any complaint, E&S expert of supervision consultant team will act as focal person of GRC who may be contacted at site and his contact details will be provided at project site.

8.2.1 1st Tire of GRC

GRC has been notified under the umbrella of the Punjab Cities Program (PCP) comprising of the following members and TORs.

Chief Officer MC JaranwalaChairperson
Municipal Officer (Infrastructure Development)Convener
Municipal Officer (Planning)Member
Municipal Officer (Regulation)Member

TORs of GRC- MC Jaranwala are as followed:

- The ESFPs with the support of DPO-ESM will play an instrumental role in steering the GRC functions both at the city and regional levels.

- CO MC Jaranwala will be responsible to share monthly recorded grievances data with regional GRC.
- The contractor will have observer status on the committee.
- If unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the 3rd Tire of GRC before going to Government's judicial remedies.

8.2.2 2nd Tire of GRC at Administration/PMDFC Level

A Grievance Redress Committee (GRC- PMDFC/LG&CDD) will be responsible to oversee the overall functions of the GRM at a strategic level including monthly reviews. It will be headed by the DS/AS LG &CDD.

- The committee will be responsible to oversee the overall functions of the GRM at a strategic level including monthly reviews.
- The committee will maintain an electronic database at the PMDFC that will provide a summary of complaints received and mitigations.
- The committee will also provide an analysis of the grievances at each sub-project location using a pre-designed M&E template that will give insight into the type of complaints received and a qualitative and quantitative review of grievance redressal.
- The committee will also be responsible for uploading the actions and results for each grievance for each Sub-project location on a periodic basis to the PMDFC/PCP website.

8.3 Types of Grievances

The following are some of the environmental and social issues could be subject for grievance from the affected people.

Environmental Issues	Social Issues	EHS Issues
• Noise Pollution • Air Pollution • Fugitive Dust • Water Pollution • Solid Waste Management • House Keeping • Cutting of Trees • Borrow Areas Management • Protection of Wildlife • Campsite Management	• Accidental Insurance for labor • Non-Provision of PPEs to labor as per nature of their jobs • Loss of any public infrastructure • Protection of sensitive receptors • Compensation for any economic losses • Traffic Management • Labor grievance redressal • Gender discrimination • Security Arrangements • Impacts on livelihood • Irregular Traffic Movement	• First Aid • Fire Safety • Workplace Safety • Tools Box Talks • Provision of PPEs • Work at Height Safety • Excavation Safety • Heavy Machinery Issues

	• Obstruction in access • Intensive schedule of construction activities • Child Labor • Unsafe conditions for the community (Community Health and Safety, CHS)	

9 Conclusion and Recommendations

This section presents conclusion of the ESIA study of the proposed sub-project. The overall objective of this ESIA is to carry out an environmental and social 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.

9.1 Conclusion

The present report presents the EIA/ESIA of Improvement of Sewerage System in Jaranwala City and Construction of WWTP. During the preparation of EIA /ESIA report for the proposed developmental project, it is observed and established that the negative environmental and social impacts are temporary and moderate to high in nature. No depletion, deterioration or exploitation of local natural resources is expected to be caused by the proposed project activities. It is accordingly recommended that the Environmental Approval for the project may be issued by the Punjab Environmental Protection Agency, subjected to the payment of requisite scrutiny fee by the proponent of the project. The project does not pose any serious negative environmental impacts. Adequate mitigation measures have been proposed in the ESMMP of this report to address the negative environmental and social impacts that may emerge at execution or operation phase.

In addition, the improvement of sewerage system in Jaranwala city and construction of WWTP would be beneficial for the community in multiple ways. This project is unique and need of the hour to improve air quality, traffic congestion and safety issues of the public of MC Jaranwala. It will generate revenue for MC Jaranwala.

9.2 Recommendations

The EIA/ESIA report as well as the public consultation results are finally evaluated to recommend the following:

- Adherence to the ESMMP as proposed in this report is mandatory by making it the part of bid documents and contractors' terms of reference.
- During the construction phase of this project, all the required PPEs should be provided to the workers.
- All the safety precautions for the EHS of labor/workers including women labor and communities should be followed as proposed in the ESMMP of this report and EHS SOPs developed by PMDFC.
- Proper safety signage and information sign boards must be placed at prominent places.
- Adequate training of workers must be done to deal with the emergency situations.

Annexure A: Environmental & Social Screening Checklist

1

Instructions: Environmental and Social Focal Persons (ESFPs)45 nominated by the MCs for PCP environmental and social management, will use this checklist in field for environmental and social screening and categorization of each and every sub-project proposed to be executed under the Program. Deputy Program Officers-Environmental and Social Management deputed by PMDFC in regional offices will technically assist and support the ESFPs/MCs in filling in of this Checklist It is to be attached with the main document46 of sub-projects at planning stage and will be duly signed by the relevant ESFP and endorsed by the respective DPO-ESM This checklist focuses on environmental issues and social concerns. To ensure that social dimensions are adequately considered, Involuntary Resettlement Screening Checklist will also be used (iii) The purpose of this E&S Screening Checklists is to identify potential "Negative" impacts of environmental and social attributes or to enhance the existing environmental & social benefits. Use the "remarks" section to discuss any anticipated mitigation measures.	
Name of ESFP:	**Muhammad Saddam MOI (I&S)**
Name of MC:	**Jaranwala**
Sub-Project Sector:	**Sewerage**
Sub-Project Title:	**Sewerage System** **a)** Laying of Trunk RCC sewers (18- 60 inch) of (Eidgah to kalma chowk along Faisalabad Road and shero aana pull to committee chowk), and De silting of Sewer Lines, Jaranwala **b)** Rehabilitation and Laying of Trunk and sub main RCC sewers (9- 36 inch) of (Chack 128, Rasheed Park, Altaf Park, Usmania Park, Mahmood colony, Islam pura, Grid Station, shah Jamal Park, Ahmad Park, Sreet no 1,1,3 Bilaal Park, Chamra Mandi, shahid Town, Gillani Mohallah, Bheek Colony,) of Zone II, Jaranwala
Sub- Project Categorization:	**E-1 ✓** **S-1** **E-2** **S-2✓** **E-3** **S-3**
Date of Screening:	**09-06-2023**

[45] In all MCs, ESFPs are notified by Local government; MO (I&S) are focal persons for environmental sector and MO(P) are focal persons for social sectors.

[46] It is meant as PC-I and/or engineering estimates of sub-project

Anticipated Project Activities	➢ Marking of the Alignment: The centerline of the sewer will be marked with a theodolite and invert tap. It would be marked either by reference line or with the help of sight rail. The position of the manhole will also be marked. ➢ After marking the centerline of the sewer, the excavation up to 07 feet deep and 5 feet wide trench will be done. The excavation would be carried out either by manual labor or by machines like power shovels, track excavators etc. ➢ Timbering of the Trench: When the depth of excavation is more than 2 m, timber bracing or sheet piling will be provided on both sides of the trench so that it may not collapse. The extent of timbering required will depend upon the type of soil and the depth of excavation. ➢ Preparation of Sub-grade: For soft soil, the bed of the sewer will be prepared by plain concrete (1:3:6). The thickness of concrete would vary from 15 to 20 cm. The bedding layer will not require in case of hard soil. ➢ Laying and Joining of Pipes: Laying of (18 to 60 inches) High Density Poly Ethylene (HDPE) pipes. After joining, both sides of the pipe will be finished with concrete. ➢ Testing of Straightness of Alignment and Obstruction. ➢ Back Filling: Lastly, the trenches will be filled up with the excavated earth in layers about 15 cm thick. Each layer will be properly watered and rammed
Estimated Cost of Subprojects	PKR 2484.700million
Completion Time/Duration	1 year

CHECKLIST

Screening Questions	Yes	No	Remarks
A. Project Siting **Is the Sub-Project area adjacent to or within any of the following?**			
Environmentally sensitive areas?			
Legally protected Area		✓	No legally protected area lies within 200 meters jurisdiction of Sub-Project.
Any surface water body (river, canal, stream, lake, wetland) within 200 meters of the proposed sub project		✓	No water body observed within 200 meters in the Sub-Project area
Estuarine		✓	Not observed in sub project area
Special area for protecting biodiversity		✓	Not observed in sub project area
Buffer zone of protected area		✓	Not observed in sub project area
Mangroves Forest		✓	Not observed in sub project area
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	Mostly are urban area around these lines.
Socially sensitive /important areas/communities/ people?			
Physical Cultural Resources (PCRs) and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, Gordwarah, Temple, Fort, archeological/historical site) within 100 m of the proposed subproject	✓		12 Mosque, one shrine observed within 100 meters of the Sub-Project interventions but have no direct/indirect significant environmental & social impacts. There would be hindrance in the mobility of people during Sewerage construction phase. However, this will be a temporary impact and would be managed by proper controlling the traffic. No other significant adverse impacts on sensitive receptors are foreseen
Sensitive receptors (Schools, colleges, Shrine, Mosque, Church, hospitals and clinics) within 100 meters of the proposed sub project	✓		23 school, 7 collages, and 02 madrassa ,01 Govt Hospital and 15 are Private exist within 10 m of the subproject interventions There would be hindrance in the mobility of people

Screening Questions	Yes	No	Remarks
			d2ring Sewerage construction phase. However, this will be a temporary impact and would be managed by proper controlling the traffic. No other significant adverse impacts on sensitive receptors are foreseen
Any graveyard of local community (Muslims or Christians)	✓		02 Graveyard exist within 10 m of the subproject interventions along Faisalabad Road. There would be hindrance in the mobility of people during Sewerage construction phase. However, this will be a temporary impact and would be managed by proper controlling the traffic. No other significant adverse impacts on sensitive receptors are foreseen
Any demographic or socio-economic aspects of the subproject area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities, people in old age, socially isolated segments47 of the society and women or children)?		✓	No negative impact observed on vulnerable groups (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities) Sub-Project area
Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	No infrastructure will be dismantling due to construction activities.
B. Potential Environmental Impacts Will the Sub-Project cause…			
1. Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	The proposed project site doesn't have any environmentally sensitive or protected areas.
2. Cutting of trees?		✓	No Cutting of trees involved during construction phase
3. Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	No significant adverse impacts on environment.

[47] Due to caste, creed, religion or gender e.g. transgender

Screening Questions	Yes	No	Remarks
4. Generation of wastewater during construction or operation?		✓	Construction activities on minor level so waste water generation activities on lower level
5. Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of wastewater?		✓	No such impact anticipated as no wastewater will be generated during construction activities.
6. Alteration of surface water hydrology of waterways resulting in increased sediment in streams/rivers or due to increased soil erosion at construction site?		✓	No such impact foreseen, as work activities are limited level and away from the surface water bodies so no other significant adverse impacts on sensitive receptors are foreseen during construction Phase.
7. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction.		✓	No construction labor camps envisaged and a rental house is used as a labor camp. Due to limited scope of work under Sub-Project and un-skilled local labor will be engaged for the construction activities. Chemical storage activities monitor regularly.
8. Over pumping of ground water, leading to salinization and ground subsidence?		✓	No over pumping/pumping involved in scope of construction activities.
9. Serious contamination of soil due to construction works?		✓	Construction materials should be storage properly, no leakage or leaching Process involve so contamination of soil not observed
10. Aggravation of solid waste problems in the area?		✓	No aggravation of solid waste problems in the area is anticipated. The waste construction material will be collected and disposed at designated place on daily basis
11. Generation of hazardous waste?		✓	Bitumen containing solid waste will be generated during dismantling of existing road at some point during laying of sewerage line that will be disposed properly at designated place.
12. Increased air pollution due to sub-project construction and operation?		✓	The subproject interventions are on small scale that will not significantly increase air pollution

Screening Questions	Yes	No	Remarks
13. Noise and vibration due to sub-project construction or operation?	✓		Noise and vibration will be generated during excavation and pipe laying activities but the level is expected to be low. However, the noise will be monitored on regularly during construction by the contractor
14. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?		✓	No Temporary breeding habitats creates during Construction activities for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid
15. Use of chemicals during construction?		✓	No chemicals will be used during construction activities
C: Potential Social Impacts Will the Sub-Project cause…			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?		✓	No impairment/damage to any PCR envisioned as per scope of construction activities
2. Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	Not observed in sub project area
3. Disproportionate impacts on the poor, women and children and or other vulnerable groups 48 (mentioned above)?		✓	There will be no Impact on the poor women, children and or other vulnerable groups
4. Temporary impediments in movements of people/transport and animals?	✓		There would be hindrance in the mobility of people during construction phase. However, this will be a temporary impact and would be managed by proper controlling the traffic. The Contractor in this context will ensure housekeeping.

[48] Women, Children, Women headed households, People in old age, people having disabilities, socially isolated community groups and or people living below the poverty line

Screening Questions	Yes	No	Remarks
5. Large population influx during sub-project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	Due to Limited Scope of work activities, Local unskilled labor will be preferred by the Contractor
6. Social conflicts if workers from other areas are hired.	✓		Contractor will Hire local worker for unskilled construction activities
7. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		Contractor will follow EHS SOPs to avoid physical hazards which are part of PC-I.
8. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel, and other chemicals during construction and operation?	✓		There would be some safety issues during martial transportation, during construction phase. The SOPs for health and safety have been included in the PC-I that have to be followed by the contractors
9. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation, and decommissioning.	✓		There would be safety issues in Construction phase, During storage of fuel and other chemicals and transport. The SOPs for health and safety have been included in the PC-I that have to be followed by the contractors
10. Any impact on sensitive receptors (mentioned above)		✓	Not observed in sub project area
11. Any impact of negative nature on already existing infrastructure including public amenities		✓	Not observed in sub project area

Trunk Sewer Line area along Road, Jaranwala

A W

THE EDUCATORS
A Project of Beaconhouse
AL WASAY CAMPUS

AL-FALAH
SCHOOL
AL-FALAH EDUCATIONAL GROUP

NATIONAL COLLEGE
Jaranwala Campus

INFORMATICS
JARANWALA CAMPUS

Collages and Schools along the route of trunk sewer, Jaranwala

Hospitals along the route of trunk sewer, Jaranwala

Public Consultation along the route of trunk sewer Area, Jaranwala

Public Consultation and pictoral view of chack 128/GB, Jaranwala

NUR PUBLIC GRAMMAR
GIRLS HIGH SCHOOL
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INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of City/MC/LG: Jaranwala

Sub-Project Sector: Sewerage

Sub-Project Title: Sewerage System

Sub- Project Categorization: E-1 & S-2

Date of Screening: 09-06-2023

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		Already Road exists and pipe line laying along the road. land owned by Govt so no land acquired for this sub project
If yes, then describe the type of land being acquired from the categories below:		✓		No Land acquired for this sub project
Has any AED been conducted at the proposed location by the government1? Yes/No		✓		Not observed in sub project area and confirm by MC Staff also
Land (Quantify and describe types of land being acquired in "remarks column".		✓		No Land acquired for this sub project
Government and LG owned land free of occupation (agriculture or settlement)		✓		Already land owned by govt so no land acquired for this sub project
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		No Land acquired for this sub project. No government or state-owned land will be affected due to the implementation of the project
Private land		✓		Construction activities will be limited along roads, no additional private land will be required/ affect
Residential		✓		No residential structure or land will be affected due to the rehabilitation of sewerage lines
Commercial		✓		No Land acquired for this sub project
Agricultural		✓		No Land acquired for this sub project
Communal		✓		No Land acquired for this sub project
Others (specify in "remarks").		✓		Already land owned by govt so no land acquired for this sub project
Name of owner/owners and type of ownership document if available.		✓		Already land owned by govt so no land acquired for this sub project
If land is being acquired, describe any structures constructed on it		✓		No Land acquired for this sub project

SECTION 1	Yes	No	Expected	Remarks
Land-based assets:		✓		No Land acquired for this sub project
Residential structures		✓		No Land acquired for this sub project
Commercial structures (specify in "remarks")		✓		No Land acquired for this sub project
Community structures (specify in "remarks")		✓		No Land acquired for this sub project
Agriculture structures (specify in "remarks")		✓		
Public utilities (specify in "remarks")	✓			Already land owned by govt so no land acquired for this sub project. Ramps are away from ROW.
Others (specify in "remarks")		✓		No Land acquired for this sub project
If agricultural land is being acquired, specify the following:		✓		No Land acquired for this sub project
Agriculture related impacts		✓		No Land acquired for this sub project
Crops and vegetables (specify types and cropping area in "remarks).		✓		No Land acquired for this sub project
Trees (specify number and types in "remarks").		✓		No Land acquired for this sub project
Others (specify in "remarks").		✓		No Land acquired for this sub project
Affected Persons (APs)		✓		No Persons Affected during this Project
Will any people be displaced from the land when acquired? Yes/No		✓		No Land acquired for this sub project
Number of Aps		✓		No Persons Affected during this Project
Males		✓		No Persons Affected during this Project
Females		✓		No Persons Affected during this Project
Titled landowners		✓		No Land acquired for this sub project
Tenants and sharecroppers		✓		No Land acquired for this sub project
Leaseholders		✓		No Land acquired for this sub project
Agriculture wage laborers		✓		Not involved in this project
Encroachers and squatters (specify in remarks column)		✓		No Land acquired for this sub project
Vulnerable APs (e.g. women headed households, minors and aged, orphans, disabled persons, and those below the poverty line). Specify the number and vulnerability in "remarks".		✓		No Land acquired for this sub project no one effected during this this intervention
Others (specify in "remarks")		✓		Not involved in this project

Prepared By:	Endorsed By:	Reviewed By:
Name: Ihsan ul Haq Farooqi	**Name: Muhammad Saddam**- MOI	**Name:** Hassan Ali
Designation: Senior Sociologist	**Designation:** Municipal Officer Infrastructure (MOI)	**Designation:** Deputy Program Officer ESM
Organization: MM Pakistan	**Organization:** MC Jaranwala	**Organization:** PMDFC
Signature:	**Signature**	**Signature:**
Date: 09-06-2023	**Date: 09**-06-2023	**Date: 09**-06-2023

Environmental & Social Screening Checklist

2

Instructions:
Environmental and Social Focal Persons (ESFPs)49 nominated by the MCs for PCP environmental and social management, will use this checklist in field for environmental and social screening and categorization of each and every sub-project proposed to be executed under the Program.
Deputy Program Officers-Environmental and Social Management deputed by PMDFC in regional offices will technically assist and support the ESFPs/MCs in filling in of this Checklist
It is to be attached with the main document50 of sub-projects at planning stage and will be duly signed by the relevant ESFP and endorsed by the respective DPO-ESM
This checklist focuses on environmental issues and social concerns. To ensure that social dimensions are adequately considered, Involuntary Resettlement Screening Checklist will also be used
(iii) The purpose of this E&S Screening Checklists is to identify potential "Negative" impacts of environmental and social attributes or to enhance the existing environmental & social benefits. Use the "remarks" section to discuss any anticipated mitigation measures.

Name of ESFP:	**Muhammad Saddam MOI (I&S)**
Name of MC:	**Jaranwala**
Sub-Project Sector:	**Sewerage**
Sub-Project Title:	**Disposal Station & Forcemain**
Sub- Project Categorization:	**E-1 ✓ S-1** **E-2 S-2✓** **E-3 S-3**
Date of Screening:	**09-06-2023**
Anticipated Project Activities	➢ Marking of the Alignment: The centerline of the sewer will be marked with a theodolite and invert tap. It would be marked either by reference line or with the help of sight rail. The position of the manhole will also be marked. ➢ After marking the centerline of the sewer, the excavation up to 07 feet deep and 5 feet wide trench will be done. The excavation would be carried out either by manual labor or by machines like power shovels, track excavators etc. ➢ Timbering of the Trench: When the depth of excavation is more than 2 m, timber bracing or sheet piling will be provided on both sides of the trench so that it may not collapse. The extent of timbering required will depend upon the type of soil and the depth of excavation. ➢ Preparation of Sub-grade: For soft soil, the bed of the sewer will be prepared by plain concrete (1:3:6). The thickness of concrete would vary from 15 to 20 cm. The bedding layer will not require in case of hard soil. ➢ Laying and Joining of Pipes: Laying of (18 to 60 inches) High Density Poly Ethylene (HDPE) pipes. After joining, both sides of the pipe will be finished with concrete. ➢ Testing of Straightness of Alignment and Obstruction. ➢ Back Filling: Lastly, the trenches will be filled up with the excavated earth in layers about 15 cm thick. Each layer will be properly watered and rammed
Estimated E&S Cost of Subprojects	PKR 2484.700million

[49] In all MCs, ESFPs are notified by Local government; MO (I&S) are focal persons for environmental sector and MO(P) are focal persons for social sectors.

[50] It is meant as PC-I and/or engineering estimates of sub-project

Completion Time/Duration	1 year

CHECKLIST

Screening Questions	Yes	No	Remarks
A. Project Siting **Is the Sub-Project area adjacent to or within any of the following?**			
Environmentally sensitive areas?			
Legally protected Area		✓	No legally protected area lies within 200 meters jurisdiction of Sub-Project.
Any surface water body (river, canal, stream, lake, wetland) within 200 meters of the proposed sub project		✓	No water body observed within 200 meters in the Sub-Project area
Estuarine		✓	Not observed in sub project area
Special area for protecting biodiversity		✓	Not observed in sub project area
Buffer zone of protected area		✓	Not observed in sub project area
Mangroves Forest		✓	Not observed in sub project area
Man-made forest /game reserve, orchid /crops or any other area of environmental importance	✓		Mostly are agricultural area around these lines present on both sides
Socially sensitive /important areas/communities/ people?			
Physical Cultural Resources (PCRs) and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, Gordwarah, Temple, Fort, archeological/historical site) within 100 m of the proposed subproject	✓		10 Mosque, one shrine observed within 100 meters of the Sub-Project interventions but have no direct/indirect significant environmental & social impacts. There would be hindrance in the mobility of people during Sewerage construction phase. However, this will be a temporary impact and would be managed by proper controlling the traffic. No other significant adverse impacts on sensitive receptors are foreseen
Sensitive receptors (Schools, colleges, Shrine, Mosque, Church, hospitals and clinics) within 100 meters of the proposed sub project	✓		01 Vocational institute, 2 Schools, 01 Masjid ,01 madrassa exist within 100 m of the subproject interventions There would be hindrance in the mobility of people during Sewerage construction phase. However, this will be a temporary impact and would be managed by proper controlling the traffic. No other significant adverse impacts on sensitive receptors are foreseen
Any graveyard of local community (Muslims or Christians)	✓		One Graveyard exist within 10 m of the subproject interventions along Jaranwala Road. but have no direct/indirect significant environmental & social impacts
Any demographic or socio-economic aspects of the subproject area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities, people in old age,		✓	No negative impact observed on vulnerable groups (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities) Sub-Project area

Screening Questions	Yes	No	Remarks
socially isolated segments51 of the society and women or children)?			
Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	No infrastructure will be dismantling due to construction activities.
B. Potential Environmental Impacts Will the Sub-Project cause…			
1. Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	The proposed project site doesn't have any environmentally sensitive or protected areas.
2. Cutting of trees?		✓	No Cutting of trees involved during construction phase
3. Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	No significant adverse impacts on environment.
4. Generation of wastewater during construction or operation?		✓	Construction activities on minor level so waste water generation activities on lower level
5. Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of wastewater?		✓	No such impact anticipated as no wastewater will be generated during construction activities.
6. Alteration of surface water hydrology of waterways resulting in increased sediment in streams/rivers or due to increased soil erosion at construction site?		✓	No such impact foreseen, as work activities are limited level and away from the surface water bodies so no other significant adverse impacts on sensitive receptors are foreseen during construction Phase.
7. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction.		✓	No construction labor camps envisaged and a rental house is used as a labor camp. Due to limited scope of work under Sub-Project and un-skilled local labor will be engaged for the construction activities. Chemical storage activities monitor regularly.
8. Over pumping of ground water, leading to salinization and ground subsidence?		✓	No over pumping/pumping involved in scope of construction activities.
9. Serious contamination of soil due to construction works?		✓	Construction materials should be storage properly, no leakage or leaching Process involve so contamination of soil not observed
10. Aggravation of solid waste problems in the area?		✓	No aggravation of solid waste problems in the area is anticipated. The waste construction material will be collected and disposed at designated place on daily basis
11. Generation of hazardous waste?		✓	Bitumen containing solid waste will be generated during dismantling of existing road at some point during laying of sewerage line that will be disposed properly at designated place.
12. Increased air pollution due to sub-project construction and operation?		✓	The subproject interventions are on small scale that will not significantly increase air pollution
13. Noise and vibration due to sub-project construction or operation?	✓		Noise and vibration will be generated during excavation and pipe laying activities but the level is expected to be low. However, the noise will be monitored on regularly during construction by the contractor

[51] Due to caste, creed, religion or gender e.g. transgender

Screening Questions	Yes	No	Remarks
14. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?		✓	No Temporary breeding habitats creates during Construction activities for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid
15. Use of chemicals during construction?		✓	No chemicals will be used during construction activities
C: Potential Social Impacts Will the Sub-Project cause…			
2. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?		✓	No impairment/damage to any PCR envisioned as per scope of construction activities
2. Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	Not observed in sub project area
3. Disproportionate impacts on the poor, women and children and or other vulnerable groups 52(mentioned above)?		✓	There will be no Impact on the poor women, children and or other vulnerable groups
4. Temporary impediments in movements of people/transport and animals?	✓		There would be hindrance in the mobility of people during construction phase. However, this will be a temporary impact and would be managed by proper controlling the traffic. The Contractor in this context will ensure housekeeping.
5. Large population influx during sub-project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	Due to Limited Scope of work activities, Local unskilled labor will be preferred by the Contractor
6. Social conflicts if workers from other areas are hired.	✓		Contractor will Hire local worker for unskilled construction activities
7. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		Contractor will follow EHS SOPs to avoid physical hazards which are part of PC-I.
8. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel, and other chemicals during construction and operation?	✓		There would be some safety issues during martial transportation, during construction phase. The SOPs for health and safety have been included in the PC-I that have to be followed by the contractors
9. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation, and decommissioning.	✓		There would be safety issues in Construction phase, During storage of fuel and other chemicals and transport. The SOPs for health and safety have been included in the PC-I that have to be followed by the contractors
10. Any impact on sensitive receptors (mentioned above)		✓	Not observed in sub project area

[52] Women, Children, Women headed households, People in old age, people having disabilities, socially isolated community groups and or people living below the poverty line

Screening Questions	Yes	No	Remarks
11. Any impact of negative nature on already existing infrastructure including public amenities		✓	Not observed in sub project area

INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of City/MC/LG: Jaranwala

Sub-Project Sector: Sewerage

Sub-Project Title: Disposal Station & Forcemain

Sub- Project Categorization: E-1 & S-2

Date of Screening: 23-5-2023

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		Already Road exists and pipe line laying along the road. land owned by Govt so no land acquired for this sub project
If yes, then describe the type of land being acquired from the categories below:		✓		No Land acquired for this sub project
Has any AED been conducted at the proposed location by the government1? Yes/No		✓		Not observed in sub project area and confirm by MC Staff also
Land (Quantify and describe types of land being acquired in "remarks column".		✓		No Land acquired for this sub project
Government and LG owned land free of occupation (agriculture or settlement)		✓		Already land owned by govt so no land acquired for this sub project
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		No Land acquired for this sub project. No government or state-owned land will be affected due to the implementation of the project
Private land		✓		Construction activities will be limited on streets, no additional private land will be required/ affect
Residential		✓		No residential structure or land will be affected due to the rehabilitation of sewerage lines
Commercial		✓		No Land acquired for this sub project
Agricultural		✓		No Land acquired for this sub project
Communal		✓		No Land acquired for this sub project
Others (specify in "remarks").		✓		Already land owned by govt so no land acquired for this sub project
Name of owner/owners and type of ownership document if available.		✓		Already land owned by govt so no land acquired for this sub project
If land is being acquired, describe any structures constructed on it		✓		No Land acquired for this sub project

SECTION 1	Yes	No	Expected	Remarks
Land-based assets:		✓		No Land acquired for this sub project
Residential structures		✓		No Land acquired for this sub project
Commercial structures (specify in "remarks")		✓		No Land acquired for this sub project
Community structures (specify in "remarks")		✓		No Land acquired for this sub project
Agriculture structures (specify in "remarks")		✓		
Public utilities (specify in "remarks")	✓			Already land owned by govt so no land acquired for this sub project. Ramps are away from ROW.
Others (specify in "remarks")		✓		No Land acquired for this sub project
If agricultural land is being acquired, specify the following:		✓		No Land acquired for this sub project
Agriculture related impacts		✓		No Land acquired for this sub project
Crops and vegetables (specify types and cropping area in "remarks).		✓		No Land acquired for this sub project
Trees (specify number and types in "remarks").		✓		No Land acquired for this sub project
Others (specify in "remarks").		✓		No Land acquired for this sub project
Affected Persons (APs)		✓		No Persons Affected during this Project
Will any people be displaced from the land when acquired? Yes/No		✓		No Land acquired for this sub project
Number of APs		✓		No Persons Affected during this Project
Males		✓		No Persons Affected during this Project
Females		✓		No Persons Affected during this Project
Titled landowners		✓		No Land acquired for this sub project
Tenants and sharecroppers		✓		No Land acquired for this sub project
Leaseholders		✓		No Land acquired for this sub project
Agriculture wage laborers		✓		Not involved in this project
Encroachers and squatters (specify in remarks column)		✓		No Land acquired for this sub project
Vulnerable APs (e.g. women headed households, minors and aged, orphans, disabled persons, and those below the poverty line). Specify the number and vulnerability in "remarks".		✓		No Land acquired for this sub project no one effected during this this intervention
Others (specify in "remarks")		✓		Not involved in this project

Public Consultation and pictoral view of Force Main Route from 240 morr disposal to

Prepared By:	Endorsed By:	Reviewed By:
Name: Ihsan ul Haq Farooqi Designation: Senior Sociologist Organization: MM Pakistan Signature: Date: 23-5-23	Name: Muhammad Saddam- MOI Designation: Municipal Officer Infrastructure (MOI) Organization: MC Jaranwala Signature Date: 23-5-23	Name: Hassan Ali Designation: Deputy Program Officer ESM Organization: PMDFC Signature: Date: 23-5-23

Environmental & Social Screening Checklist

3

Instructions: Environmental and Social Focal Persons (ESFPs)[53] nominated by the MCs for PCP environmental and social management, will use this checklist in field for environmental and social screening and categorization of each and every sub-project proposed to be executed under the Program. Deputy Program Officers-Environmental and Social Management deputed by PMDFC in regional offices will technically assist and support the ESFPs/MCs in filling in of this Checklist It is to be attached with the main document[54] of sub-projects at planning stage and will be duly signed by the relevant ESFP and endorsed by the respective DPO-ESM This checklist focuses on environmental issues and social concerns. To ensure that social dimensions are adequately considered, Involuntary Resettlement Screening Checklist will also be used (iii) The purpose of this E&S Screening Checklists is to identify potential "Negative" impacts of environmental and social attributes or to enhance the existing environmental & social benefits. Use the "remarks" section to discuss any anticipated mitigation measures.	
Name of ESFP:	Muhammad Saddam(I&S)
Name of MC:	Jaranwala
Sub-Project Sector:	Sewerage
Sub-Project Title:	Rehabilitation of Drain Disposal Chak 128 and P/F RPC manhole Cover
Sub- Project Categorization:	**E-1** ✓ **S-1** **E-2** **S-2**✓ **E-3** **S-3**
Date of Screening:	23-5-23
Anticipated Project Activities	➢ Construction of Civil works for the new disposal station. ➢ Construction of collection chamber. ➢ Installation of inflow and outflow pipes. ➢ Construction of embanked facultative sewage disposal ponds. ➢ Transport and installation of pumping machinery.
Estimated E&S Cost of Subprojects	PKR 2484.700million
Completion Time/Duration	6 Month
Estimated Labor for Subproject	15

[53] In all MCs, ESFPs are notified by Local government; MO (I&S) are focal persons for environmental sector and MO(P) are focal persons for social sectors.

[54] It is meant as PC-I and/or engineering estimates of sub-project

CHECKLIST

Screening Questions	Yes	No	Remarks
A. Project Siting **Is the Sub-Project area adjacent to or within any of the following?**			
Environmentally sensitive areas?			
Legally protected Area		✓	No legally protected area lies within 1000 meters jurisdiction of Sub-Project.
Any surface water body (river, canal, stream, lake, wetland) within 250 meters of the proposed sub project		✓	surface water body (river, canal, stream, lake, wetland) within 250 meters of the proposed sub project Sub-Project area
Estuarine		✓	Not observed in sub project area
Special area for protecting biodiversity		✓	Not observed in sub project area
Buffer zone of protected area		✓	Not observed in sub project area
Mangroves Forest		✓	Not observed in sub project area
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	Not observed in sub project area
Socially sensitive /important areas/communities/ people?			
Physical Cultural Resources (PCRs) and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, Gordwarah, Temple, Fort, archeological/historical site) within 100 m of the proposed subproject	✓		1 Mosque and 01 Shrine observed 200 meter area of this sub project, There would be hindrance in the mobility of people during road construction phase. However, this will be a temporary impact and would be managed by proper controlling the traffic. No other significant adverse impacts on sensitive receptors are foreseen
Sensitive receptors (Schools, colleges, Shrine, Mosque, Church, hospitals and clinics) within 100 meters of the proposed sub project		✓	Not observed in sub project area
Any graveyard of local community (Muslims or Christians)		✓	01 graveyard observed under 200 meter of sub project alignment.
Any demographic or socio-economic aspects of the subproject area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities, people in old age, socially isolated segments55 of the society and women or children)?		✓	No negative impact observed on vulnerable groups (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities) sub project area
Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	No existing infrastructure (including public amenities) present which may be required to dismantle.

[55] Due to caste, creed, religion or gender e.g. transgender

Screening Questions	Yes	No	Remarks
B. Potential Environmental Impacts Will the Sub-Project cause…			
1. Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	Not observed in sub project area
2. Cutting of trees?		✓	No Cutting of trees involved during construction phase
3. Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	No significant adverse impacts on environment.
4. Generation of wastewater during construction or operation?		✓	All construction activities are on minor level so wastewater generation during construction are limited. In operation, it's a collection point for sewerage and then disposed of to WWTP.
5. Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of wastewater?		✓	No such impact anticipated as wastewater will be generated at Minor Level during construction activities
6. Alteration of surface water hydrology of waterways resulting in increased sediment in streams/rivers or due to increased soil erosion at construction site?		✓	No such impact foreseen, as work activities are limited level and within the boundary so no wastewater will be generated during construction activities.
7. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction.		✓	No construction labor camps envisaged due to limited scope of work under Sub-Project and un-skilled local labor will be engaged for the construction activities.
8. Over pumping of ground water, leading to salinization and ground subsidence?		✓	No over pumping/pumping involved in scope of construction activities.
9. Serious contamination of soil due to construction works.		✓	Land is already a dumping site for sugar mill so Keep in mind the soil condition before construction of disposal station structure. Construction materials should be storage properly, no leakage or leaching Process involve so contamination of soil not observed
10. Aggravation of solid waste problems in the area?		✓	No aggravation of solid waste problems in the area is anticipated. The waste construction material will be collected and disposed at designated place on daily basis
11. Generation of hazardous waste?		✓	No hazardous waste material generated during project activities

12. Increased air pollution due to sub-project construction and operation?		✓	The subproject interventions are on small scale and construction activities are within the boundary that will not significantly increase air pollution.in operation phase ,smell problem increase because it's a sewerage water collection place.
13. Noise and vibration due to sub-project construction or operation?	✓		Noise and vibration will be generated during excavation and pipe laying activities but the level is expected to be low. However, the noise will be monitored on regularly during construction by the contractor
14. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?		✓	During construction, Creation of temporary breeding habitats for diseases not anticipated but in the operation phase this problem is exceed because sewerage water collection ponds are breeding habitats for mosquitoes and other harmful insects.
15. Use of chemicals during construction?		✓	No chemicals will be used during construction activities
C: Potential Social Impacts Will the Sub-Project cause…			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?		✓	Not observed in sub project area
2. Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	Not observed in sub project area
3. Disproportionate impacts on the poor, women and children and or other vulnerable groups 56(mentioned above)?		✓	There will be no Impact on the poor women, children and or other vulnerable groups
4. Temporary impediments in movements of people/transport and animals?		✓	No such impact foreseen as work activities are limited level and within the boundary
5. Large population influx during sub-project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems).		✓	Not observed in sub project area

[56] Women, Children, Women headed households, People in old age, people having disabilities, socially isolated community groups and or people living below the poverty line

6. Social conflicts if workers from other areas are hired.		✓	Contractor will Hire local worker for unskilled construction activities
7. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation.		✓	There would be some safety issues during martial transportation, and other construction activities.
8. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel, and other chemicals during construction and operation?	✓		There would be some safety issues during martial transportation, road compaction during construction phase. The SOPs for health and safety have been included in the PC-I that have to be followed by the contractors
9. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation, and decommissioning.	✓		There would be safety issues in Construction phase, During storage of fuel and other chemicals and transport. The SOPs for health and safety have been included in the PC-I that have to be followed by the contractors
10. Any impact on sensitive receptors (mentioned above)		✓	Not observed in sub project area
11. Any impact of negative nature on already existing infrastructure including public amenities		✓	Not observed in sub project area

Pictorial view Public Consultation at New Sewerage Disposal Site at 240 Morr , Jaranwala

Prepared By:	Endorsed By:	Reviewed By:
Name: Muhammad Imran	Name: Muhammad Saddam	Name: Hassan Ali
Designation: Environment Specialist	Designation: Municipal Officer Infrastructure (MOI)	Designation: Deputy Program Officer ESM
Organization: MM Pakistan	Organization: MC Jaranwala	Organization: PMDFC
Signature:	Signature	Signature:
Date: 23-5-23	Date: 23-5-23	Date: 23-5-23

INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of City/MC/LG: Jaranwala

Sub-Project Sector: Park

Sub-Project Title: Rehabilitation of Drain Disposal Chak 128 and P/F RPC manhole cover

Sub- Project Categorization: E-1 & S-2

Date of Screening: 23-5-23

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
If yes, then describe the type of land being acquired from the categories below:		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
Has any AED been conducted at the proposed location by the government1? Yes/No		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
Land (Quantify and describe types of land being acquired in "remarks column".		✓		land owned by MC so no land acquired for this sub project
Government and LG owned land free of occupation (agriculture or settlement)		✓		Land owned by District Govt so no land acquired for this sub project for construction of disposal station.
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		Yes, Govt Land exist at that area for construction of disposal station
Private land		✓		No private Land acquired for this project
Residential		✓		Already disposal is present in residential area.
Commercial		✓		Not a commercial area
Agricultural		✓		No agricultural Land acquired for this project
Communal		✓		It's not a communal land required for this sub project
Others (specify in "remarks").		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
Name of owner/owners and type of ownership document if available.		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
If land is being acquired, describe any structures constructed on it		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
Land-based assets:		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
Residential structures		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
Commercial structures (specify in "remarks")		✓		No Commercial structures occurred at that land.
Community structures (specify in "remarks")		✓		No Community structures occurred on that land

Agriculture structures (specify in "remarks")		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
Public utilities (specify in "remarks")	✓			No Public utility structures occurred on land.
Others (specify in "remarks")		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
If agricultural land is being acquired, specify the following:		✓		Already a Disposal occurred and land owned by MC so no land acquired for this sub project
Agriculture related impacts		✓		No agricultural related adverse impact observed.
Crops and vegetables (specify types and cropping area in "remarks).		✓		The project land is not used for agricultural purposes presently.
Trees (specify number and types in "remarks").		✓		No Tree cutting involved during this project.
Others (specify in "remarks").		✓		No Land acquired for this sub project
Affected Persons (APs)		✓		Land acquisition is not Required so no Person affected.
Will any people be displaced from the land when acquired? Yes/No		✓		land acquisition is not Required so no Person affected
Number of Aps		✓		land acquisition is not Required so no Person affected
Males		✓		No person affected during this project
Females		✓		No person affected during this project
Titled landowners		✓		Land is owned by MC of Jaranwala
Tenants and sharecroppers		✓		Tenants and sharecroppers are not observed at that area.
Leaseholders		✓		Land is cleared and no leaseholder observed during site visit
Agriculture wage laborers		✓		Its not an agricultural Land so this problem are not observed at that area
Encroachers and squatters (specify in remarks column)		✓		No Encroachers and squatters present at land that required for this sub project
Vulnerable APs (e.g. women headed households, minors and aged, orphans, disabled persons, and those below the poverty line). Specify the number and vulnerability in "remarks".		✓		No Vulnerable APs (e.g. women headed households, minors and aged, orphans, disabled persons, and those below the poverty line) present at land that acquired for this sub project
Others (specify in "remarks")		✓		Not involved in this project

Prepared By:	Endorsed By:	Reviewed By:
Name: Ihsan ul Haq Farooqi	Name: Muhammad Saddam	Name: Hassan Ali
Designation: Senior Sociologist	Designation: Municipal Officer Infrastructure (MOI)	Designation: Deputy Program Officer ESM
Organization: MM Pakistan	Organization: MC Jaranwala	Organization: PMDFC
Signature:	Signature	Signature:
Date: 23-5-23	Date: 23-5-23	Date: 23-5-23

Environmental & Social Screening Checklist

4

Instructions: Environmental and Social Focal Persons (ESFPs) nominated by the MCs for PCP environmental and social management, will use this checklist in field for environmental and social screening and categorization of each and every sub-project proposed to be executed under the Program. Deputy Program Officers-Environmental and Social Management deputed by PMDFC in regional offices will technically assist and support the ESFPs/MCs in filling in of this Checklist It is to be attached with the main document[57] of sub-projects at planning stage and will be duly signed by the relevant ESFP and endorsed by the respective DPO-ESM This checklist focuses on environmental issues and social concerns. To ensure that social dimensions are adequately considered, Involuntary Resettlement Screening Checklist will also be used (iii) The purpose of this E&S Screening Checklists is to identify potential "Negative" impacts of environmental and social attributes or to enhance the existing environmental & social benefits. Use the "remarks" section to discuss any anticipated mitigation measures.	
Name of ESFP:	Muhammad Saddam (MOI)
Name of MC:	Jaranwala
Sub-Project Sector:	Sewerage
Sub-Project Title:	**Construction of Wastewater Treatment Plant**
Sub- Project Categorization:	**E-1 ✓** **S-1** **E-2** **S-2✓** **E-3** **S-3**
Date of Screening:	23-5-23
Anticipated Project Activities	Construction of Sewage Waste Water Stabilization Ponds ➢ Excavation and backfilling involved, the excavation would be carried out either by manual labor or by machines like power shovels, track excavators. Transport excavated material to fix disposal sites. ➢ Pipe Laying Activities. ➢ Construction of Inlet and outlet Drains structure. ➢ Construction of Boundary wall. ➢ Construction of Retaining ponds Beds. ➢ Electric Installations. ➢ Back Filling: Lastly, the trenches will be filled up with the excavated earth in layers about 15 cm thick. Each layer will be properly watered and rammed. ➢ Staff Quarters+ Security Guard Room.

[57] It is meant as PC-I and/or engineering estimates of sub-project

Estimated of Subprojects	PKR 2484.700million
Completion Time/Duration	1 year
Estimated Labor for Subproject	20-30

CHECKLIST

Screening Questions	Yes	No	Remarks
A.Project Siting Is the Sub-Project area adjacent to or within any of the following? **Environmentally sensitive areas?**			
Cultural heritage site		✓	No cultural heritage site observed within 250 meters of periphery of Sub-Project.
Legally protected Area (core zone or buffer zone)		✓	No legally protected area exists within 250 meters of radius of sub-Project.
Any surface water body (river, canal, stream, lake, wetland) within 250 meters of proposed project?			A Buralla Canal is situated at the east bank of the selected place for Waste Water Treatment Plant within 50 meters approx.
Mangrove Forest		✓	No mangrove forest observed.
Estuarine		✓	No estuarine exists in Sub-Project proposed scope of work.
Special area for protecting biodiversity		✓	No protected area or buffer zone lies within peripheral zone of sub-Project.
Buffer zone of protected area		✓	
Man-made forest /game reserve, orchid/crops or any other area of environmental importance	✓		Farms/orchidaceous plants of Guava and Citrus are observed within vicinity of Sub-project.
Socially sensitive/Important areas/communities/people?			
PCRs and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, Gordwarah, Temple, Fort, archeological/historical site) within 100 m of the proposed subproject	✓		Muslim Graveyard is located approximately 500 meters away for the selected place which will have no direct impact as per scope of work.
Sensitive receptors (Schools, colleges, hospitals and clinics) within 100 meters of the proposed sub project	✓		School and Union Council Office located approximately 500 meters away from the selected place.
Any graveyard of local community (Muslims or Christians)	✓		Muslim Graveyard is located approximately 500 meters away for the selected place.

Screening Questions	Yes	No	Remarks
Any demographic or socio-economic aspects of the sub-project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities, people in old age, socially isolated segments of the society and women or children)?	✓		Socio-economic status of local community based of agriculture practices. They use to grow wheat, sugarcane, vegetables and fruit farms in vicinity of Sub-Project. Sub-Project area is fertile and main source of livelihood for local peoples. There are illegal cultivations on state land. These will be paid compensation as per Entitlement Matrix of ESMF of PCP.
Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?	✓		The following are situated within premises of proposed WWTP site which may be dismantled and will be compensated through ARAP, RAP. It will be decided after demarcation of land for WWTP. i- Farmers Dera ii- Crops (Sugarcane, Wheat, Vegetable (Polls Shed/Tunnel technology) etc.) iii- Guava Farms iv- Citrus (Lemon) Farm v- Trees vi- Tube Wells (Approximately 4-5)
B. Potential Environmental Impacts Will the Sub-Project cause…			
Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	The proposed project site doesn't have any environmentally sensitive or protected areas.
Cutting of trees?	✓		127 no. of trees, (medium and mature) farms/orchards (Guava, Citrus) may be required to be cutted as per scope of work under Sub-Project. However, WWTP needs to be designed in such a way that cutting of trees either avoided OR minimized. Massive plantation in the buffer zone of 100m is proposed and made part of EIA/ESIA
Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	No disruption to any habitat/ecosystem due to any Sub-Project activities.

Screening Questions	Yes	No	Remarks
Generation of wastewater during construction or operation?	✓		During construction, wastewater will be generated from contractor's camp etc., The generated wastewater will require proper disposal and mitigation measures will be provided in the ESMMP of EIA/ESIA During operational phase, significant adverse impacts on environment and surrounding settlements of the sub-project area will occur i.e. odor and breeding site for the mosquitos. Accordingly, mitigation measures will be proposed in the ESMMP of the EIA/ESIA. The municipal wastewater will be drained into the Wastewater Treatment Plant (WWTP) through a sewerage conveyance system. The treated wastewater will essentially comply the the PEQSs. WWTP will be exclusively designed for the municipal wastewater and wastewater from all the localities will be discharged into the WWTP. There will be no chance of mixing industrial wastewater and storm water with the municipal wastewater before treatment.
Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of waste water?	✓		Treated wastewater will be disposed of into nearby Buralla Canal which will ultimately clean polluted water with Stabilization Ponds and Floating Wetlands treatment facility under Sub-Project.
Alteration of surface water hydrology of waterways resulting in increased sediment in streams/rivers or due to increased soil erosion at construction site?	✓		In construction phase, sedimentation could not affect the nearest water body (Buralla Canal) due to level difference. In operation phase, There will be discharge of treated water into nearby canal which may increase sediment load and also susceptible to erosion of embankments of canal. There is dire need to address this aspect during designing of WWTP.

Screening Questions	Yes	No	Remarks
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	✓		Campsite establishment envisaged. Contactor will be instructed to rent a house with already established sewerage system OR submit plan for sewerage treatment for camp to Engineer In-charge. For construction of labor camp, SOPs will be followed and mitigation measures will be provided in the ESSMP of EIA/ESIA Report Chemical storage facilities will be regularly monitor.
Over pumping of ground water, leading to salinization and ground subsidence?		✓	No over pumping involved during construction works.
Serious contamination of soil due to construction works?	✓		Construction materials will be stored properly. Mitigation will be provided in the ESMMP of EIA/ESIA.
Aggravation of solid waste problems in the area?	✓		Stockpiling of dismantled material may temporarily disturb local communities. No aggravation of solid waste problems in the area is anticipated. The waste construction material will be collected and disposed at designated place on daily basis. For solid waste of labor camp, mitigation measures shall be provided in the ESMMP od EIA Report
Generation of solid waste/hazardous waste?			Hazardous waste generated during construction activities in terms of oils, rubber lining, sealants will be managed with precautions and mitigation measures will be provided in the ESMMP of EIA/ESIA An Environmental Quality Testing laboratory will be managed by the MC at site to ensure effective monitoring of treated wastewater to ensure that treated wastewater is in compliance with the PEQSs and WHO Guidelines to be reused for the agricultural activities

Screening Questions	Yes	No	Remarks
Increased air pollution due to sub-project construction and operation?	✓		Impact will be assessed before the execution of Sub-Project. Due to heavy traffic movement; there will be generation of $PM_{2.5}$ and ambient air will also be assessed during construction & post-construction. The sub-project construction and operational phases will result in air pollution. Air pollution control measures during construction and operational phases will be included in the design of the sub-project and these will be described in detail in EIA/ESIA and ESMMP
Noise and vibration due to sub-project construction or operation?	✓		Due to flow of heavy-duty vehicles and private vehicles plus rikshaws; noise and vibration impact is substantial. Noise and vibration will be generated during construction and operational phases. Mitigations will be included in the design of the sub-project. EIA /ESIA and ESMMP will cover noise and vibration aspects, impacts and mitigations in detail.
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?	✓		In the proposed wastewater treatment technology, waste stabilization ponds will be used and further bio-remediation (floating wetlands) will be introduced in which minimal chances of mosquito breeding are anticipated. During operation phase; such factors may cause significant impact which needs immediate remedial measures.
Use of chemicals during construction?	✓		Multiple chemicals will be used during construction and operational phases. Chemical management system for the safe use of chemicals will be made part of the EIA/ESIA and ESMMP.
C: Potential Social Impacts Will the Sub-Project cause…			
1.Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?		✓	No any PCRs situated nearby the selected place of WWTP

Screening Questions	Yes	No	Remarks
2. Displacement or involuntary resettlement of people? (Physical displacement and/or economic displacement)	✓		The following agriculturally based entrepreneurships categories will be affected: i- Proprietors of Farm/Orchards ii- Proprietor of Trees (If cutting is involved) iii- Landlords of the Crops (Wheat, Sugarcane, Vegetables etc.) iv- Farmers Dera Jat v- Removal of Tube Wells
3. Disproportionate impacts on the poor, women and children and or other vulnerable groups [58](mentioned above)?		✓	No such disproportionate impacts on poor, women, children and or vulnerable groups but some daily wagers agriculture-based laborer's livelihood depends on said farms may be affected which will be compensated as per their entitlements.
4. Temporary impediments in movements of people/transport and animals?		✓	No significant movement of people/transport and animals observed because Sub-Project is proposed on agriculture fields in Peri-Urban area of Jaranwala City near Buralla Canal.
5. Large population influx during sub-project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	No such impact envisaged.
6. Social conflicts if workers from other areas are hired?	✓		Local level labor engagement in the construction work may reduce and mitigated the issue
7. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		To planning/ designing the Occupational Safety Health measures to mitigated the risks during the WWTP construction period
8. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	✓		To planning/ designing the Occupational Safety Health measures to mitigated the risks during the WWTP construction period

[58] Women, Children, Women headed households, People in old age, people having disabilities, socially isolated community groups and or people living below the poverty line

Screening Questions	Yes	No	Remarks
9. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	✓		
10. Any impact of negative nature on already existing infrastructure including public amenities	✓		Damage to any public amenity will be compensated as per Entitlement Matrix.

Prepared By:	Endorsed By:	Reviewed By:
Name: Muhammad Imran **Designation:** Environment Specialist **Organization:** MM Pakistan **Signature:** **Date:** 23-5-23	**Name:** Muhammad Saddam **Designation:** Municipal Officer Infrastructure (MO1) **Organization:** MC Jaranwala **Signature** **Date:** 23-5-23	**Name:** Hassan Ali **Designation:** Deputy Program Officer ESM **Organization:** PMDFC **Signature:** **Date:** 23-5-23

INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of Enumerator/ESFP: MO Planning

Name of City/MC/LG: MC Jaranwala

Sub-Project Sector: Sewerage

Sub-Project Title: Construction of Wastewater Treatment Plant

Sub- Project Categorization:

S-1 ☐ **S-2** ■ **S-3** ☐

Date of Screening: 23-5-23

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No	✓			A state land is selected for the construction of Sub-Project. There will be inter-departmental transfer of state land required.
If yes, then describe the type of land being acquired from the categories below:	✓			No Land acquired for this sub project
Has any AED been conducted at the proposed location by the government1? Yes/No		✓		No AED conducted on proposed area.
Land (Quantify and describe types of land being acquired in "remarks column".	✓			Approximately 108 Acre of state land available and land requirement will be decided after WWTP design and sewerage network assessment.
Government and LG owned land free of occupation (agriculture or settlement)		✓		Government department (Revenue) owns the land but there are crops, farms (Citrus & Guava), Dera Jat, trees, tube wells lie within premises of Sub-Project.
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		Government department (Revenue) owns the land but there are crops, farms (Citrus & Guava), Dera Jat, trees, tube wells lie within premises of Sub-Project.
Private land		✓		No private land acquired for this project
Residential		✓		No Residential land acquired for this project
Commercial		✓		No Commercial land acquired for this project
Agricultural	✓			Agricultural Land and owned by Government department (Revenue) owns the land but there are crops, farms (Citrus & Guava), 2 Dera Jat, 120 trees, 4 tube wells lies within premises of Sub-Project.

SECTION 1	Yes	No	Expected	Remarks
Communal				No Land acquired for this sub project
Others (specify in "remarks").		✓		No Land acquired for this sub project
Name of owner/owners and type of ownership document if available.		✓		Land is selected but not but demarcation is in process.
If land is being acquired, describe any structures constructed on it				
Land-based assets:	✓			Crops, Fruit Farms, Vegetables, 2 Dear Jat, 4 Tube wells observed within premises of proposed land.
Residential structures Commercial structures (specify in "remarks") Community structures (specify in "remarks") Agriculture structures (specify in "remarks") Public utilities (specify in "remarks") Others (specify in "remarks")	✓			The following are situated within premises of proposed WWTP site which may be dismantled and will be compensated through, ARAP. It will be decided after demarcation of land for WWTP. vii- 2 Farmers Dera viii- Crops (Sugarcane, Wheat, Vegetable (Polls Shed/Tunnel technology) etc.) ix- 120 Trees x- Guava Farms Fields xi- Citrus (Lemon) Farm xii- Tube Wells (Approximately 4-5)
If agricultural land is being acquired, specify the following:				
Agriculture related impacts	✓			Loss of agriculture land Loss in agriculture Productivity
Crops and vegetables (specify types and cropping area in "remarks).				Wheat, Sugar Cane, Tunnel Farming, Fodder observed.
Trees (specify number and types in "remarks").	✓			120 (small &medium) trees observed inside jurisdiction of proposed land which may be cutted. No. of trees to be cutted will be decided after WWTP design. (Mature & younger trees) Trees and types are (sheesham, backain, Keekar, shreen, Peepal,popular)
Others (specify in "remarks").				
Affected Persons (APs)	✓			16 Affected Persons (APs) selected and ARAP Activities are in progress
Will any people be displaced from the land when acquired? Yes/No	✓			ARAP Activities are in progress
Number of APs	✓			14Affected Persons (APs) selected and ARAP Activities are in progress

SECTION 1	Yes	No	Expected	Remarks
Males				ARAP Activities are in progress
Females				ARAP Activities are in progress
Titled land owners				ARAP Activities are in progress
Tenants and sharecroppers	✓			Tenants and sharecroppers are affected so ARAP Activities are in progress
Leaseholders	✓			Leaseholders are present and ARAP Activities are in progress
Agriculture wage laborers	✓			Agriculture wage laborers are affected by this land acquisition process so we need Livelihood restoration Plan required for this project.
Encroachers and squatters (specify in remarks column)		✓		No Encroachers and squatters are present
Vulnerable APs (e.g. women headed households, minors and aged, orphans, disabled persons and those below the poverty line). Specify the number and vulnerability in "remarks".	✓			Negative impact observed on vulnerable groups like women labor and people in old age
Others (specify in "remarks")		✓		
How will people be affected?				

Prepared By:	Endorsed By:	Reviewed By:
Name: Ihsan ul Haq Farooqi **Designation:** Senior Sociologist **Organization:** MM Pakistan **Signature:** **Date:** 23-5-23	**Name:** Muhammad Saddam **Designation:** Municipal Officer Planning (MOP) **Organization:** MC Jaranwala **Signature** **Date:** 23-5-23	**Name:** Muhammad Hassan Ai **Designation:** Deputy Program Officer ESM **Organization:** PMDFC **Signature:** **Date**23-5-23

Site Visit and Public Consultation and pictoral view of WWTP Site, Jaranwala

Environmental & Social Screening Checklist

5

Instructions:

Environmental and Social Focal Persons (ESFPs)59 nominated by the MCs for PCP environmental and social management, will use this checklist in field for environmental and social screening and categorization of each and every sub-project proposed to be executed under the Program.

Deputy Program Officers-Environmental and Social Management deputed by PMDFC in regional offices will technically assist and support the ESFPs/MCs in filling in of this Checklist

It is to be attached with the main document60 of sub-projects at planning stage and will be duly signed by the relevant ESFP and endorsed by the respective DPO-ESM

This checklist focuses on environmental issues and social concerns. To ensure that social dimensions are adequately considered, Involuntary Resettlement Screening Checklist will also be used

(iii) The purpose of this E&S Screening Checklists is to identify potential "Negative" impacts of environmental and social attributes or to enhance the existing environmental & social benefits. Use the "remarks" section to discuss any anticipated mitigation measures.

Name of ESFP:	**Muhammad Saddam (I&S)**	
Name of MC:	**Jaranwala**	
Sub-Project Sector:	**Sewerage**	
Sub-Project Title:	**Desilting of Sewerage lines**	
Sub- Project Categorization:	**E-1 ✓** **E-2** **E-3**	**S-1** **S-2✓** **S-3**
Date of Screening:	23-5-23	
Anticipated Project Activities	Desilting of sewerage lines	
Estimated Cost of Subprojects	PKR 2484.700million	
Completion Time/Duration	1 year	

59 In all MCs, ESFPs are notified by Local government; MO (I&S) are focal persons for environmental sector and MO(P) are focal persons for social sectors.

60 It is meant as PC-I and/or engineering estimates of sub-project

Screening Questions	Yes	No	Remarks
A.Project Siting Is the Sub-Project area adjacent to or within any of the following:			
Environmentally sensitive areas?		✓	
Legally protected Area		✓	No legally protected area lies within 500 meters jurisdiction of Sub-Project.
Any surface water body (river, canal, stream, lake, wetland) within 250 meter of the proposed sub project		✓	Not observed
Estuarine		✓	Not observed in Sub-Project area
Special area for protecting biodiversity		✓	No Wild life park or other biodiversity areas observed during site E & S investigation.
Buffer zone of protected area		✓	No buffer zone for fauna and flora exists surrounding the project area
Mangroves Forest		✓	There is no existence of any mangrove in the project area.
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	Area of environmental importance such as orchid /crops is not observed within the project interventions.
Socially sensitive /important areas/communities/ people?			
PCRs and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, *Gordwarah*, Temple, Fort, archeological/historical site) within 100 m of the proposed subproject		✓	No PCRs exists within 100 meters of periphery of Sub-Project which will be negatively impacted due to any work activities.
Sensitive receptors (Schools, colleges, hospitals and clinics) within 100 meter of the proposed sub project		✓	No such receptors observed within 100 meters of location of Sub-Project that are outside of construction limits.
Any graveyard of local community (Muslims or Christians)		✓	No graveyard observed.
Any demographic or socio-economic aspects of the sub-project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities, people in old age,		✓	It's a small-scale project regarding desilting of existing drains and replacement of sewer lines machinery from disposal stations. Hence, no demographically or socio-economically vulnerable aspects of the sub-project were observed.

socially isolated segments of the society and women or children)?			
Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	No public infrastructure will be damaged/dismantled due to any Sub-Project interventions.
B. Potential Environmental Impacts Will the Sub-Project cause…			
Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	The proposed project site doesn't have any environmentally sensitive or protected areas.
Cutting of trees?		✓	No cutting of trees required as per scope of work under Sub-Project.
Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	No disruption to any habitat/ecosystem due to any Sub-Project activities.
Generation of wastewater during construction or operation?	✓		Wastewater may be generated from the labor camp for which mitigation measures are provided in the ESMMP
Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of waste water?	✓		Mitigation measures will be ensured as provided in the ESMMP of ESIA report
Alteration of surface water hydrology of waterways resulting in increased sediment in streams/rivers or due to increased soil erosion at construction site?		✓	No Sub-Project activities will trigger such negative impact.
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	✓		Local labor will be engaged by the contractor as no skilled labor is the requirement for this activity. Anyhow, Labor Camp Management is provided in the ESMMP of EIA/ESIA report which will be strictly followed.
Over pumping of ground water, leading to salinization and ground subsidence?		✓	No over pumping/pumping involved in scope of desilting activities. In case of labor camp requirements of water for sanitation, water management plan is provided in the ESMMP
Serious contamination of soil due to construction works?	✓		When desilting is performed in existing sewerage lines desilted

			material is contagious and lead to soil contamination which will be mitigated by proper handling of the desilted material and will be disposed off at dumping site assigned by MC Jaranwala
Aggravation of solid waste problems in the area?	✓		The Municipal Solid waste and mud excavated from the existing drains will be disposed at proper disposal sites on daily basis. Stockpiling of desilt material may produce smell and nuisance for the commuters and to avoid this, silt material shall be disposed off within 24 hours from the disposal site(which is 8 km from the de-siltation areas) and an activated GRM will be established at site to get complaints from the communities. For handling of solid waste produced from the labor camps, mitigation measures provided in the ESMMP will be followed.
Generation of hazardous waste?			When desilting is performed in existing sewer lines, desilted material may be contagious and hazardous for health of workers and community However, EHS SOPs will be strictly followed during the overall activity and the desilted material will be disposed off at dumping site assigned by MC Jaranwala.
Increased air pollution due to sub-project construction and operation?	✓		Frequent monitoring of air quality particularly odor will support to review the effectiveness of the mitigation measures. Limit the air emissions within PEQS.
Noise and vibration due to sub-project construction or operation?	✓		All noise-making equipment will be installed with acoustic enclosures. Timings of noise construction activities will be regulated near sensitive receptors. Further regular monitoring of noise levels will be adopted and continuous monitoring is proposed during the construction stage as a migratory measure.
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?	✓		The stagnant water and desilted material in desilting areas may create temporary breeding habitat for mosquitoes and resulting in mosquitos borne diseases issue. Handling and dispose off in 24 hours of waste will avoid the creation of breeding habitats. Use of anti-mosquito spray will be ensured by contractor
Use of chemicals during construction?		✓	No chemicals will be used during this subproject activities
C: Potential Social Impacts Will the Sub-Project cause…			
Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?		✓	No impairment/damage to any PCR envisioned as per scope of construction activities

Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	No displacement/resettlement of people involved in Sub-Project scope.
Disproportionate impacts on the poor, women and children and or other vulnerable groups (mentioned above)?		✓	There will be no direct/indirect negative impact on the poor, women, children and or other vulnerable groups. However, at current accessibility of the local residents is vulnerable due to chocked sewer lines and it aggravates during rainy season which will get better after desilting of main sewer lines
Temporary impediments in movements of people/transport and animals?	✓		There would be temporary hindrances in movements of local people/transport during the desilting process. However, movement will be restricted for a few hours only, and the residents/people will be informed before the construction activities in confined areas and streets while alternate route will be provided in the main roads
Large population influx during sub-project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	Local unskilled labor will be preferred by the Contractor due to limited work activities. It's a small-scale project and therefore, there will be no large population influx among the locals. However, during desiltation activities, separate sanitary facilities and water will be adequately supplied to the labor force by the contractor to avoid and conflict with the local community on the use of their water resources.
Social conflicts if workers from other areas are hired?		✓	No such impact foreseen as work activities are limited up to desilting of existing sewers.
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		Workers will be provided requisite PPEs to minimize such exposure and associated harmful occupational health effects. Also, regular monitoring will be conducted by the MCs focal persons and supervision consultants and regional office team of PMDFC Implementation through PMDFC EHS SOPs will be ensured.
Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	✓		Safe transportation management of silt from sewer lines to disposal site will reduce the risks to community health and safety.

Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	✓		Regular monitoring will be scheduled for compliance of Occupational Health & Safety SOPs.
Any impact on sensitive receptors (mentioned above)		✓	No significant direct/ indirect impact foreseen
Any impact of negative nature on already existing infrastructure including public amenities		✓	No damages to any public amenity is envisaged for the project interventions.

Prepared By: **Name:** Saddam Hussain **Designation:** Municipal Officer Infrastructure (MOI) **Organization:** MC Jaranwala **Signature** **Date:** 23-5-23	**Endorsed By:** **Name: Hassan Ali** **Designation:** Deputy Program Officer ESM **Organization:** PMDFC **Signature:** **Date:** 23-5-23

INVOLUNTARY RESETTLEMENT SCREENING

CHECKLIST

Name of City/MC/LG: Jaranwala

Sub-Project Sector: Sewerage System

Sub-Project Title: Desilting of Sewerage lines

Sub- Project Categorization: S-2

Date of Screening: 23-05-2023

Involuntary Resettlement Checklist				
SECTION 1	**Yes**	**No**	**Expected**	**Remarks**
Does the project require land acquisition? Yes/No		✓		Land owned by MC so no land acquired for this sub project
If yes, then describe the type of land being acquired from the categories below:		✓		No Land acquired for this sub project
Has any AED been conducted at the proposed location by the government[61]?		✓		Ramps are not involved. No AED been conducted at the proposed location by the Government[1]
Land (Quantify and describe types of land being acquired in "remarks column".		✓		No Land acquired for this sub project
Government and LG owned land free of occupation (agriculture or settlement)		✓		Land is owned by Govt.
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		No Land acquired for this sub project
Private land		✓		No Land acquired for this sub project
Residential		✓		No Land acquired for this sub project
Commercial		✓		No Land acquired for this sub project
Agricultural		✓		No Land acquired for this sub project

[61] The sub-projects have to avoid all such lands where any government led AED has been conducted since 2018 and such land will be considered as ineligible expenditure.

Involuntary Resettlement Checklist				
SECTION 1	**Yes**	**No**	**Expected**	**Remarks**
Communal		✓		No Land acquired for this sub project
Others (specify in "remarks").		✓		land owned by govt so no land acquired for this sub project
Name of owner/owners and type of ownership document if available.		✓		Already existing sewerage drainage and land is owned by govt.
If land is being acquired, describe any structures constructed on it		✓		No Land acquired for this sub project
Land-based assets:		✓		No Land acquired for this sub project
Residential structures		✓		No Land acquired for this sub project
Commercial structures (specify in "remarks")		✓		No Land acquired for this sub project
Community structures (specify in "remarks")		✓		No Land acquired for this sub project
Agriculture structures (specify in "remarks")		✓		No
Public utilities (specify in "remarks")		✓		land owned by govt so no land acquired for this sub project. No Ramps are ROW.
Others (specify in "remarks")		✓		No Land acquired for this sub project
If agricultural land is being acquired, specify the following:		✓		No Land acquired for this sub project
Agriculture related impacts		✓		No Agriculture related impacts foreseen for this sub project
Crops and vegetables (specify types and cropping area in "remarks).		✓		Not anticipated during this sub project
Trees (specify number and types in "remarks").		✓		No tree cutting involved during this sub project
Others (specify in "remarks").		✓		No Land acquired for this sub project
Affected Persons (APs)		✓		No Persons Affected during this Project
Will any people be displaced from the land when acquired? Yes/No		✓		No Land acquired for this sub project
Number of APs		✓		No Persons Affected during this Project
Males		✓		No Persons Affected during this Project

Involuntary Resettlement Checklist				
SECTION 1	**Yes**	**No**	**Expected**	**Remarks**
Females		✓		No Persons Affected during this Project
Titled land owners		✓		No Land acquired for this sub project
Tenants and sharecroppers		✓		No Land acquired for this sub project
Leaseholders		✓		No Land acquired for this sub project
Agriculture wage laborers		✓		Not involved in this project
Encroachers and squatters (specify in remarks column)		✓		No Land acquired for this sub project
Vulnerable APs (e.g. women headed households, minors and aged, orphans, disabled persons and those below the poverty line). Specify the number and vulnerability in "remarks".		✓		No Land acquired for this sub project no one effected during this this intervention
Others (specify in "remarks")		✓		Not involved in this project
How will people be affected?		✓		There would be Temporary hindrances in movements of people/transport during the desilting phase. However, GRM will be established at site to ensure the best management and silt material will be disposed off in 24 hours to the disposal site

Prepared By:	Endorsed By:	Reviewed By:
Name: Ihsan ul Haq Farooqi **Designation:** Senior Sociologist **Organization:** MM Pakistan **Signature:** **Date:** 23-5-23	**Name:** Muhammad Saddam **Designation:** Municipal Officer Planning (MOP) **Organization:** MC Jaranwala **Signature** **Date:** 23-5-23	**Name:** Hassan Ali **Designation:** Deputy Program Officer ESM **Organization:** PMDFC **Signature:** **Date**23-5-23

Environmental & Social Screening Checklist

Instructions:

Environmental and Social Focal Persons (ESFPs)62 nominated by the MCs for PCP environmental and social management, will use this checklist in field for environmental and social screening and categorization of each and every sub-project proposed to be executed under the Program.

Deputy Program Officers-Environmental and Social Management deputed by PMDFC in regional offices will technically assist and support the ESFPs/MCs in filling in of this Checklist

It is to be attached with the main document63 of sub-projects at planning stage and will be duly signed by the relevant ESFP and endorsed by the respective DPO-ESM

This checklist focuses on environmental issues and social concerns. To ensure that social dimensions are adequately considered, Involuntary Resettlement Screening Checklist will also be used

(iii) The purpose of this E&S Screening Checklists is to identify potential "Negative" impacts of environmental and social attributes or to enhance the existing environmental & social benefits. Use the "remarks" section to discuss any anticipated mitigation measures.

Name of ESFP:	**Muhammad Saddam (I&S)**
Name of MC:	**Jaranwala**
Sub-Project Sector:	**Sewerage**
Sub-Project Title:	Improvement of Sewerage System in Jaranwala and Construction of Waste Water Treatment Plant (WWTP)
Sub- Project Categorization:	**E-1** S-1 E-2 **S-2** E-3 S-3
Date of Screening:	23-5-23
Anticipated Project Activities	Desilting of Drains,
Estimated Cost of Subprojects	PKR 2484.700 million
Completion Time/Duration	1 year

Screening Questions	Yes	No	Remarks

62 In all MCs, ESFPs are notified by Local government; MO (I&S) are focal persons for environmental sector and MO(P) are focal persons for social sectors.

63 It is meant as PC-I and/or engineering estimates of sub-project

A.Project Siting Is the Sub-Project area adjacent to or within any of the following:			
Environmentally sensitive areas?		✓	
Legally protected Area		✓	No legally protected area lies within 500 meters jurisdiction of Sub-Project.
Any surface water body (river, canal, stream, lake, wetland) within 250 meter of the proposed sub project		✓	Not observed
Estuarine		✓	Not observed in Sub-Project area
Special area for protecting biodiversity		✓	No Wild life park or other biodiversity areas observed during site E & S investigation.
Buffer zone of protected area		✓	No buffer zone for fauna and flora exists surrounding the project area
Mangroves Forest		✓	There is no existence of any mangrove in the project area.
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	Area of environmental importance such as orchid /crops is not observed within the project interventions.
Socially sensitive /important areas/communities/ people?			
PCRs and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, *Gordwarah*, Temple, Fort, archeological/historical site) within 100 m of the proposed subproject		✓	No PCRs exists within 100 meters of periphery of Sub-Project which will be negatively impacted due to any work activities.
Sensitive receptors (Schools, colleges, hospitals and clinics) within 100 meter of the proposed sub project		✓	No such receptors observed within 100 meters of location of Sub-Project that are outside of construction limits.
Any graveyard of local community (Muslims or Christians)		✓	No graveyard observed.
Any demographic or socio-economic aspects of the sub-project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities, people in old age, socially isolated segments of the society and women or children)?		✓	It's a small-scale project regarding desilting of existing drains and replacement of sewer lines machinery from disposal stations. Hence, no demographically or socio-economically vulnerable aspects of the sub-project were observed.

Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	No public infrastructure will be damaged/dismantled due to any Sub-Project interventions.
B. Potential Environmental Impacts Will the Sub-Project cause…			
Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	The proposed project site doesn't have any environmentally sensitive or protected areas.
Cutting of trees?		✓	No cutting of trees required as per scope of work under Sub-Project.
Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	No disruption to any habitat/ecosystem due to any Sub-Project activities.
Generation of wastewater during construction or operation?	✓		Wastewater may be generated from the labor camp for which mitigation measures are provided in the ESMMP
Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of waste water?	✓		Mitigation measures will be ensured as provided in the ESMMP .
Alteration of surface water hydrology of waterways resulting in increased sediment in streams/rivers or due to increased soil erosion at construction site?		✓	No Sub-Project activities will trigger such negative impact.
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	✓		Local labor will be engaged by the contractor as no skilled labor is the requirement for this activity.
Over pumping of ground water, leading to salinization and ground subsidence?		✓	No over pumping/pumping involved in scope of desilting activities. In case of labor camp requirements of water for sanitation, water management plan is provided in the ESMMP
Serious contamination of soil due to construction works?	✓		When desilting is performed in existing sewerage lines desilted material is contagious and lead to soil contamination which will be mitigated by proper handling of the desilted material and will be disposed off at dumping site assigned by MC Jaranwala

Aggravation of solid waste problems in the area?	✓		The Municipal Solid waste and mud excavated from the existing drains will be disposed at proper disposal sites on daily basis. Stockpiling of desilt material may produce smell and nuisance for the commuters and to avoid this, silt material shall be disposed off within 24 hours from the disposal site(which is 8 km from the de-siltation areas) and an activated GRM will be established at site to get complaints from the communities. For handling of solid waste produced from the labor camps, mitigation measures provided in the ESMMP will be followed.
Generation of hazardous waste?	✓		When desilting is performed in existing sewer lines, desilted material may be contagious and hazardous for health of workers and community However, EHS SOPs will be strictly followed during the overall activity and the desilted material will be disposed off at dumping site assigned by MC Jaranwala.
Increased air pollution due to sub-project construction and operation?	✓		Frequent monitoring of air quality particularly odor will support to review the effectiveness of the mitigation measures. Limit the air emissions within PEQS.
Noise and vibration due to sub-project construction or operation?	✓		All noise-making equipment will be installed with acoustic enclosures. Timings of noise construction activities will be regulated near sensitive receptors. Further regular monitoring of noise levels will be adopted and continuous monitoring is proposed during the construction stage as a migratory measure.
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?	✓		The stagnant water and desilted material in desilting areas may create temporary breeding habitat for mosquitoes and resulting in mosquitos borne diseases issue. Handling and dispose off in 24 hours of waste will avoid the creation of breeding habitats. Use of anti-mosquito spray will be ensured by contractor
Use of chemicals during construction?		✓	No chemicals will be used during this subproject activities
C: Potential Social Impacts Will the Sub-Project cause…			
Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?		✓	No impairment/damage to any PCR envisioned as per scope of construction activities
Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement)		✓	No displacement/resettlement of people involved in Sub-Project scope.

(If "Yes", please also fill Involuntary Resettlement Screening Checklist)			
Disproportionate impacts on the poor, women and children and or other vulnerable groups (mentioned above)?		✓	There will be no direct/indirect negative impact on the poor, women, children and or other vulnerable groups. However, at current accessibility of the local residents is vulnerable due to chocked sewer lines and it aggravates during rainy season which will get better after desilting of main sewer lines
Temporary impediments in movements of people/transport and animals?	✓		There would be temporary hindrances in movements of local people/transport during the desilting process. However, movement will be restricted for a few hours only, and the residents/people will be informed before the construction activities in confined areas and streets while alternate route will be provided in the main roads
Large population influx during sub-project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	Local unskilled labor will be preferred by the Contractor due to limited work activities. It's a small-scale project and therefore, there will be no large population influx among the locals. However, during desiltation activities, separate sanitary facilities and water will be adequately supplied to the labor force by the contractor to avoid and conflict with the local community on the use of their water resources.
Social conflicts if workers from other areas are hired?		✓	No such impact foreseen as work activities are limited up to desilting of existing sewers.
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		Workers will be provided requisite PPEs to minimize such exposure and associated harmful occupational health effects. Also, regular monitoring will be conducted by the MCs focal persons and supervision consultants and regional office team of PMDFC Implementation through PMDFC EHS SOPs will be ensured.
Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	✓		Safe transportation management of silt from sewer lines to disposal site will reduce the risks to community health and safety.
Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where	✓		Regular monitoring will be scheduled for compliance of Occupational Health & Safety SOPs.

their failure could result in injury to the community throughout project construction, operation and decommissioning?			
Any impact on sensitive receptors (mentioned above)		✓	No significant direct/ indirect impact foreseen
Any impact of negative nature on already existing infrastructure including public amenities		✓	No damages to any public amenity is envisaged for the project interventions.

Prepared By:	Endorsed By:	Reviewed By:
Name: Muhammad Imran	**Name:** Saddam Hussain	**Name:** Hassan Ali
Designation: Environmental Specialist	**Designation:** Municipal Officer Infrastructure (MOI)	**Designation:** Deputy Program Officer ESM
Organization: MMP	**Organization:** MC Jaranwala	**Organization:** PMDFC
Signature	**Signature**	**Signature:**
Date: 23-5-23	**Date:** 23-5-23	**Date:** 23-5-23

Tentative Layout Plan

Annexure B: Punjab Environmental Quality Standards (PEQS) 2016

Punjab Environmental Quality Standards for Ambient Air

Pollutant	Time-weighted average	Concentration in Ambient Air	Method of measurement
Sulfur Dioxide (SO_2)	Annual Average*	80 µg/m^3	Ultraviolet Fluorescence method
	24 hours**	120 µg/m^3	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m^3	Gas Phase Chemiluminescence
	24 hours**	40 µg/m^3	
Oxides of Nitrogen as (NO_2)	Annual Average*	40 µg/m^3	Gas Phase Chemiluminescence
	24 hours**	80 µg/m^3	
Ozone (O3)	1 hour	130 µg/m^3	Non dispersive UV absorption method
Suspended Particulate Matter (SPM)	Annual Average*	360 µg/m^3	High Volume Sampling, (Average flow rate not less than 1.1 m^3/min).
	24 hours**	500 µg/m^3	
Respirable Particulate Matter PM_{10}	Annual Average*	120 µg/m^3	Preferably B-Ray Absorption method
	24 hours**	150 µg/m^3	
Respirable Particulate Matter $PM_{2.5}$	Annual Average*	15 µg/m^3	Preferably B-Ray Absorption method
	24 hours**	35 µg/m^3	
	1 hour	15 µg/m^3	
Lead (Pb)	Annual Average*	1 µg/m^3	ASS Method after sampling using EPM

Pollutant	Time-weighted average	Concentration in Ambient Air	Method of measurement
	24 hours**	1.5 µg/m^3	2000 or equivalent Filter paper
Carbon Monoxide (CO)	8 hours**	5 mg/m^3	Non-Dispersive Infra-Red (NDIR) method
	1 hour	1.5 mg/m^3	

Note:

*Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

** 24 hourly / 8 hourly values should be met 98% of the year. 2% of the time, it may exceed but not on two consecutive days.

Punjab Environmental Quality Standards for Water Quality

Punjab Environmental Quality Standards for Drinking Water

Properties / Parameters	Standard Values	WHO Standards	Remarks
All water intended for drinking (E. Coli or Thermo-tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water entering the distribution system (E. Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water in the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.	Most Asian countries also follow WHO standards
Colour	≤ 15 TCU	≤ 15 TCU	
Taste	Non Objectionable / Acceptable	Non Objectionable / Acceptable	
Odour	Non	Non	

Properties / Parameters	Standard Values	WHO Standards	Remarks
	Objectionable / Acceptable	Objectionable / Acceptable	
Turbidity	<5 NTU	<5 NTU	
Total hardness as $CaCO_3$	< 5000 mg/l	--	
TDS	< 1000	< 1000	
pH	6.5 – 8.5	6.5 – 8.5	
Essential Inorganic	**mg/Liter**	**mg/Liter**	
Aluminum (Al) mg/l	≤ 0.2	0.2	
Antimony (Sb)	≤ 0.0005 (P)	0.02	
Arsenic (As)	≤ 0.05 (P)	0.01	Standard for Pakistan similar to most Asian developing countries
Barium (Ba)	0.7	0.7	
Boron (B)	0.3	0.3	
Cadmium (Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing countries
Chloride (Cl)	< 250	250	
Chromium (Cr)	< 0.05	0.05	
Copper (Cu)	2	2	
Toxic Inorganic	**Mg/l**	**Mg/l**	
Cyanide (CN)	< 0.05	0.07	Standard for Pakistan similar to most Asian developing countries
Fluoride (F)*	≤ 1.5	1.5	
Lead (Pb)	≤ 0.05	0.01	Standard for Pakistan similar to most Asian developing countries

Properties / Parameters	Standard Values	WHO Standards	Remarks
Manganese (Mn)	≤ 0.5	0.5	
Mercury (Hg)	≤ 0.001	0.001	
Nickel (Ni)	≤ 0.02	0.02	
Nitrate (NO_3)*	≤ 50	50	
Nitrite (NO_2)*	≤ 3 (P)	3	
Selenium (Se)	0.01 (P)	0.01	
Residual chlorine	0.2 – 0.5 at consumer end 0.5 – 1.5 at source		
Zinc (Zn)	5.0	3	Standard for Pakistan similar to most Asian developing countries
Organic			
Pesticides mg/l			PSQCA No. 4639-2004, Page No. 4 Table No. 3 Serial No. 20-58 may be consulted **
Phenolic compounds (as Phenols) mg/l			
Poly-nuclear aromatic hydrocarbons (as PAHs) g/l		0.01 (By GC/MS method)	
Alpha Emitters bq/L or pCi	0.1	0.1	
Beta emitters	1	1	

Note:

*Indicates priority health related inorganic constituents, which need regular monitoring.

** .PSQCA: Pakistan Standards Quality Control Authority.

Punjab Environmental Quality Standards for Noise

No.	Category of Area / Zone	Effective from 1st July, 2010		Effective from 1st July, 2013	
		Limits in dB(A) Leq*			
		Day Time	Night Time	Day Time	Night Time
1.	Residential Area (A)	65	50	55	45
2.	Commercial Area (B)	70	60	65	55
3.	Industrial Area (C)	80	75	75	65
4.	Silence Zone (D)	55	45	50	45

Note:

1. Day time hours; 6:00 am to 10:00 Pm
2. Night time hours; 10:00 pm to 6:00 am.
3. Silence Zone: Zones which are declared as such by the Competent Authority and are comprising not less than 100 meters around, educational institutions and courts.
4. Mixed categories of area may be declared as one of the four above mentioned categories by the competent authority.
5. dB(A) Leq: Time weighted average of the level of sound in decibel on scale A which is relatable to human hearing.

Punjab Environmental Quality Standards for Industrial Gaseous Emissions

No.	Parameter	Source of Emission	Standard
1.	Smoke	Smoke opacity not exceed.	40% or 2 Ringlemann Scale or equivalent smoke number
2.	Particulate matter	(a) Boiler and furnaces:	
		(i) Oil fired	300
		(ii) Coal fired	500
		(iii) Cement Kilns	300
		(b) Grinding, crushing, clinker cooler and related processes, metallurgical processes, converters, blast furnaces and cupolas.	500
3.	Hydrogen Chloride (HCl)	Any	400
4.	Chlorine (Cl^2)	Any	150
5.	Hydrogen Fluoride (HF)	Any	150
6.	Hydrogen Sulphide (H_2S)	Any	10
7.	Sulphur Oxides (2x3)	Sulfuric acid / Sulfonic acid plants	5000
		Other plants except power plants operating on oil and coal	1700
8.	Carbon Monoxide (CO)	Any	800
9.	Lead (Pb)	Any	50
10.	Mercury (Hg)	Any	10
11.	Cadmium (Cd)	Any	20
12.	Arsenic (Ar)	Any	20
13.	Copper (Cu)	Any	50

No.	Parameter	Source of Emission	Standard
14.	Antimony (Sb)	Any	20
15.	Zinc (Zn)	Any	200
16.	Oxides of Nitrogen	Nitric acid manufacturing unit	3000
		Other plants except power plants operating on oil or coal:	
		Gas fired	400
		Oil fired	600
		Coal fired	1200

Explanations:

1. Based on the assumption that the size of the particulate is 10 micron or more.
2. Based on 1 percent sulfur content in fuel oil. Higher content of sulfur will cause standards to be pro-rated.
3. In respect of emissions of sulfur dioxide and nitrogen oxides, the power plants operating on oil and coal as fuel shall in addition to the Punjab Environmental Quality Standards (PEQS) specified above, comply with the following standards:

A. Sulfur Dioxide

Sulfur Dioxide Background levels Microgram per cubic meter (ug/m^3) Standards				
Background Air Quality (SO_2 Basis)	Annual Average	Max, 24 hours Interval	Criterion 1 Max. SO_2 Emission (Tons per Day per plant)	Criterion II. Max. Allowable ground level increment to ambient (ug/m^3) One Year Average
Unpolluted Moderated Polluted*	< 50	< 200	500	50
Low	50	200	500	50
High	100	400	100	10
Very Polluted**	> 100	> 400	100	10

* For intermediate values between 50 and 100 ug/m^3 linear interpolations should be used.

** No Projects with Sulfur dioxide emissions will be recommended.

B. Nitrogen Oxide

Ambient air concentrations of Nitrogen Oxides, expressed as NOx should not exceed the following:

Annual Arithmetic Mean 100 ug/m^3 (0.05 ppm)

Emission levels for stationary source discharges before mixing with the atmosphere, should be maintained as follows:

For Fuel fired steam generators, as Nano-gram per joule (10^{-9} g/J) of heat input:

Liquid fossil fuel130

Solid fossil fuel300

Lignite fossil fuel260

Note:Dilution of gaseous emission to bring them to the NEQS limiting value is not permissible through excess air mixing blowing before emitting into the environment.

Punjab Environmental Quality Standards for Municipal and Liquid Industrial Effluents

No.	Parameter	Into Inland Waters	Into Sewage Treatment
1	2	3	4
1.	Temperature or Temperate increase *	≤ 3^0 C	≤ 3^0 C
2.	pH value (H*)	6-9	6-9
3.	Biochemical Oxygen Demand (BOD_5) at 20^0 C (1)	80	250
4.	Chemical Oxygen Demand (COD)	150	400
5.	Total suspended solids (TSS)	200	400
6.	Total dissolved solids (TDS)	3500	3500
7.	Grease and Oil	10	10
8.	Phenolic compounds (as phenol)	0.1	0.3
9.	Chloide (as Cl^-)	1000	1000
10.	Fluoride (as F^-)	10	10
11.	Cyanide (as CN^-) total	1.0	1.0
12.	An-ionic detergents (as MBAs) (2)	20	20
13.	Sulfate (SO_4^{2-})	600	1000
14.	Sulfide (S^{2-})	1.0	1.0
15.	Ammonia (NH_3)	40	40
16.	Pesticides (3)	0.15	0.15
17.	Cadmium (Cd) (4)	0.1	0.1
18.	Chromium (Trivalent and hexavalent) (4) (1)	1.0	1.0

No.	Parameter	Into Inland Waters	Into Sewage Treatment
19.	Copper (Cu) (4)	1.0	1.0
20.	Lead (Pb) (4)	0.5	0.5
21.	Mercury (Hg) (4)	0.01	0.01
22.	Selenium (Se) (4)	0.5	0.5
23.	Nickel (Ni) (4)	1.0	1.0
24.	Silver (Ag) (4)	1.0	1.0
25.	Total Toxic metals	2.0	2.0
26.	Zinc (Zn)	5.0	5.0
27.	Arsenic (As) (4)	1.0	1.0
28.	Barium (Ba) (4)	1.5	1.5
29.	Iron (Fe)	8.0	8.0
30.	Manganese (Mn)	1.5	1.5
31.	Boron (B) (4)	6.0	6.0
32.	Chlorine (Cl_2)	1.0	1.0

Explanations:

1. Assuming minimum dilution 1:10 on discharge, lower ration would attract progressively stringent standards to be determined by the Provincial Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of water for dilution of this effluent.
2. Methylene Blue Active Substances; assuming surfactant as biodegradable.
3. Pesticides include herbicides, fungicides and insecticides.
4. Subject to total toxic metals, discharge should not exceed level given at S.N 25.
5. Applicable only when and where sewage treatment is operational and BOD_5=80 mg/l is achieved by the sewage treatment system.

No.	Parameter	Into Inland Waters	Into Sewage Treatment
The effluent should not result in temperature increase of more than 30^0 C at the edge of the zone where initial mixing and dilution take place in the receiving body. In case zone is not defined, use 100 meters from the point of discharge. ** The value for industry is 200 mg/l			

Note:
(1). Dilution of liquid effluents to meet to the PEQS limiting value is not permissible through fresh water mixing with the effluent before discharging in the environment.
(2). The concentration of pollutants in water being used will be subtracted from the effluent for calculating the PEQS limits

Annexure C: Chance Find Procedure

Chance Find procedures which will be used during this Project are as follows:

- Stop the construction activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the Ministry in charge of Department of Archaeology take over;
- Notify the supervisory Engineer who in turn will notify the responsible local authorities and the Ministry immediately (within 24 hours or less);
- Responsible local authorities and the Ministry in charge of Department of Archaeology would oversee protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archaeologists of the Department of Archaeology and Museums (within 72 hours). The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values;
- Decisions on how to handle the finding shall be taken by the responsible authorities and the Ministry in charge of Department of Archaeology. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;
- Implementation for the authority decision concerning the management of the finding shall be communicated in writing by the Ministry in charge of Department of Archaeology; and
- Construction work could resume only after permission is given from the responsible local authorities and the Ministry in charge of Department of Archaeology concerning safeguard of the heritage.
- These procedures will be referred to as standard provisions in construction contracts, when applicable. During project supervision, the Site Engineer will monitor the above regulations relating to the treatment of any chance find encountered are observed.

Annexure D: Wastewater Analsysis

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accreditated Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc.#: PGG/IMS/FF/063 | Rev. Date: 27-Jan-22 | Rev. # 01

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref #: PGG/LAB/2023-3829/WW

Date: 10-Jul-23

Name of Client	**Punjab Municipal Development Fund Company (PMDFC)**
Project Site	Jaranwala

Sample Description:

Nature of sample	Wastewater
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location	N 31.325637° E 73.421527°
Sample source	Nala, Lahore Road (Lakar Mandi)
Sample Code	WW-1320
Sample Type	Composite
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Compliance
Remarks: All Parameters are in compliance with PEQS Limit.	

- Analysis was conducted at the request of the proponent for his own use.
- Report cannot be used to comply with any complaint, EPO or other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. 46-M, Gulberg-III, Lahore Pakistan

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Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref #: PGG/LAB/2023-3829/WW **Date:** 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	19.6	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	7.670 at 19.6⁰C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 ⁰C) ^	mg/L	80	1	78	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	128	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	90	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	1890	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	230	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	1.3	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.826	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	165	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	10.4	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0293	APHA-3111 B

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Ref #: PGG/LAB/2023-3834/WW **Date:** 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1335	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	1.7212	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.1319	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	-	-
31.	Sodium^	mg/L	-	0.0100	143.0950	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

PEQS: Punjab Environmental Quality Standards ^PNAC Accredited
BDL: Below Detection Limit LDL: Lowest Detection Limit

PNAC Pakistan National Accreditation Council LAB 180 17025

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Ref #: PGG/LAB/2023-3834/WW

Date: 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	19.2	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	7.740 at 19.2⁰C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 ⁰C) ^	mg/L	80	1	118*	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	184*	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	240*	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	2060	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	275	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	1.9	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.914	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	190	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	18.6	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001	APHA-3111 B

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TEST REPORT

Ref #: PGG/LAB/2023-3834/WW **Date:** 10-Jul-23

Name of Client	**Punjab Municipal Development Fund Company (PMDFC)**
Project Site	Jaranwala

Sample Description:

Nature of sample	Waste Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location	N 31.322338° E 73.42429°
Sample source	Disposal, 240 Mor
Sample Type	Composite
Sample Code	WW-1325
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

- Analysis was conducted at the request of the proponent for his own use.
- Report cannot be used to comply with any complaint, EPO or other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

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Ref #: PGG/LAB/2023-3833/WW **Date:** 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1334	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	2.0281	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.1091	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	-	-
31.	Sodium^	mg/L	-	0.0100	125.4713	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

PEQS: Punjab Environmental Quality Standards ^PNAC Accredited
BDL: Below Detection Limit LDL: Lowest Detection Limit

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Ref #: PGG/LAB/2023-3833/WW **Date:** 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	18.9	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	7.606 at 18.9°C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 °C) ^	mg/L	80	1	86*	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	144	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	100	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	1680	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	190	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	2.0	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.884	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	185	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	14.6	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001	APHA-3111 B

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TEST REPORT

Ref #: PGG/LAB/2023-3833/WW **Date:** 10-Jul-23

Name of Client	**Punjab Municipal Development Fund Company (PMDFC)**
Project Site	Jaranwala

Sample Description:

Nature of sample	Waste water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location	N 31.324178° E 73.415563°
Sample source	Nala, Faisalabad Road
Sample Type	Composite
Sample Code	WW-1324
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

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- Report cannot be used to comply with any complaint, EPO or other court case.
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- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. 46-M, Gulberg-III, Lahore Pakistan

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Ref #: PGG/LAB/2023-3832/WW **Date:** 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1264	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	1.2005	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.3902	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	-	-
31.	Sodium^	mg/L	-	0.0100	122.9358	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

PEQS: Punjab Environmental Quality Standards ^PNAC Accredited
BDL: Below Detection Limit LDL: Lowest Detection Limit

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Ref #: PGG/LAB/2023-3832/WW

Date: 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	19.5	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	7.428 at 19.5°C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 °C) ^	mg/L	80	1	18	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	32	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	20	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	1340	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	115	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	1.1	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.649	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	122	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	0.9	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001	APHA-3111 B

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TEST REPORT

Ref #: PGG/LAB/2023-3832/WW **Date:** 10-Jul-23

Name of Client	**Punjab Municipal Development Fund Company (PMDFC)**
Project Site	Jaranwala

Sample Description:

Nature of sample	Waste water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location	31.347981° E 73.421431°
Sample source	Discharge, Housing Colony
Sample Code	WW-1323
Sample Type	Composite
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Compliance
Remarks: All Parameters are in compliance with PEQS Limit.	

- Analysis was conducted at the request of the proponent for his own use.
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- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Enviro-Engineering (Pvt) Ltd. Gulberg-III, Lahore. Lahore Pakistan

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Ref #: PGG/LAB/2023-3831/WW **Date:** 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1783	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	2.8808	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.1117	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	-	-
31.	Sodium^	mg/L	-	0.0100	125.0380	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

PEQS: Punjab Environmental Quality Standards **^PNAC Accredited**
BDL: Below Detection Limit **LDL: Lowest Detection Limit**

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Ref #: PGG/LAB/2023-3831/WW **Date:** 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	19.5	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	7.867 at 19.5°C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 °C) ^	mg/L	80	1	128*	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	208*	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	150	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	1680	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	110	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	1.4	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.859	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	177	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	16.4	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001	APHA-3111 B

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TEST REPORT

Ref #: PGG/LAB/2023-3831/WW **Date:** 10-Jul-23

Name of Client	**Punjab Municipal Development Fund Company (PMDFC)**
Project Site	Jaranwala

Sample Description:

Nature of sample	Waste Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location	N 31.346196° E 73.423021°
Sample source	Colony Disposal, Khurrianwala Road
Sample Code	WW-1322
Sample Type	Composite
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

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Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. Gulberg-III Lahore Pakistan

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Ref #: PGG/LAB/2023-3829/WW **Date:** 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1424	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	4.0196	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.1487	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	0.0293	-
31.	Sodium^	mg/L	-	0.0100	132.4802	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

PEQS: Punjab Environmental Quality Standards ^PNAC Accredited
BDL: Below Detection Limit LDL: Lowest Detection Limit

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Annexure E: Air Quality Analysis

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

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TEST REPORT

Ref. #: PGG/LAB/2023-3853/AA

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Ambient Air
Monitoring By:	Pak Green Laboratories
Monitoring Site:	Jaranwala
Monitoring Location:	WWTP-1
Monitoring Coordinates:	N 31° 18' 54.36"E 73° 27' 18.81"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	AQMS
Monitoring Duration:	24 hours
Monitoring Date:	23-Jun-23 to 24-Jun-23

Results:

Sr. No.	Time	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$	O_3	SPM
		mg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
1.	11:00 AM	1.072	4.12	28.10	24.45				
2.	12:00 PM	0.961	6.63	31.95	30.99				
3.	1:00 PM	0.925	5.42	30.13	31.39				
4.	2:00 PM	0.973	7.27	22.82	32.29				
5.	3:00 PM	0.994	8.23	16.73	26.82				
6.	4:00 PM	1.175	5.86	38.67	22.90				
7.	5:00 PM	1.070	9.08	62.01	16.55				
8.	6:00 PM	0.926	11.12	73.46	31.39				
9.	7:00 PM	0.902	10.59	23.23	42.92				
10.	8:00 PM	0.956	10.82	30.33	38.92				
11.	9:00 PM	0.885	9.69	63.97	36.91				
12.	10:00 PM	0.930	12.07	50.19	35.48				
13.	11:00 PM	0.960	11.09	33.95	33.36	173.5*	83.6*	98.5	581.9*
14.	12:00 AM	0.914	9.87	28.06	31.53				
15.	1:00 AM	0.955	9.34	24.00	31.22				
16.	2:00 AM	0.858	9.40	19.94	29.78				
17.	3:00 AM	1.005	8.54	38.86	29.08				
18.	4:00 AM	0.995	7.65	37.84	28.45				
19.	5:00 AM	0.930	5.34	35.81	27.89				
20.	6:00 AM	0.963	7.28	33.17	27.67				
21.	7:00 AM	0.948	4.78	32.97	26.54				
22.	8:00 AM	1.172	6.62	32.77	26.79				
23.	9:00 AM	1.079	4.13	30.53	30.32				
24.	10:00 AM	0.980	5.34	26.27	37.59				
Average (24 Hours)		0.980	7.93	35.24	30.47				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours

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Ref. #: PGG/LAB/2023-3853/AA

Date: 10-Jul-23

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Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3854/AA

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Ambient Air
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	WWTP-2
Monitoring Coordinates:	N 31° 18' 43.22"E 73° 26' 57.57"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	AQMS
Monitoring Duration:	24 hours
Monitoring Date:	24-Jun-23 to 25-Jun-23

Results:

Sr. No.	Time	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$	O_3	SPM
		mg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
1.	11:00 AM	1.229	5.54	15.91	31.97				
2.	12:00 PM	1.253	8.71	37.66	29.44				
3.	1:00 PM	1.290	6.86	35.63	26.62				
4.	2:00 PM	1.266	5.94	32.79	28.87				
5.	11:00 AM	1.327	6.73	37.25	31.41				
6.	4:00 PM	1.217	8.58	38.06	33.10				
7.	5:00 PM	1.253	9.63	41.11	26.05				
8.	6:00 PM	1.340	8.44	34.00	29.15				
9.	7:00 PM	1.364	6.99	33.19	30.85				
10.	8:00 PM	1.389	7.65	36.44	27.46				
11.	9:00 PM	1.241	8.31	37.25	26.90				
12.	10:00 PM	1.204	5.94	31.57	31.69				
13.	11:00 PM	1.376	7.39	29.94	25.77	165.3*	70.1*	92.4	578.5*
14.	12:00 AM	1.278	6.46	41.72	26.62				
15.	1:00 AM	1.217	5.94	45.37	28.59				
16.	2:00 AM	1.266	8.97	38.47	25.21				
17.	3:00 AM	1.290	11.22	45.78	28.03				
18.	4:00 AM	1.253	8.18	47.20	29.72				
19.	5:00 AM	1.413	12.14	42.12	32.26				
20.	6:00 AM	1.389	11.35	41.11	26.90				
21.	7:00 AM	1.229	10.69	38.88	28.31				
22.	8:00 AM	1.315	9.76	36.64	27.74				
23.	9:00 AM	1.278	8.05	37.66	26.33				
24.	10:00 AM	1.364	7.78	41.31	26.62				
Average (24 Hours)		1.293	8.22	37.38	28.57				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours

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Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3855/AA

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Ambient Air
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	Lahore Road Jaranwala
Monitoring Coordinates:	N 31° 19' 24.12"E 73° 26' 7.24"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	AQMS
Monitoring Duration:	24 hours
Monitoring Date:	25-Jun-23 to 26-Jun-23

Results:

Sr. No.	Time	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$	O_3	SPM
		mg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
1.	11:00 AM	1.241	5.93	26.33	31.56				
2.	12:00 PM	1.253	6.11	27.75	34.10				
3.	1:00 PM	1.303	9.28	36.88	27.90				
4.	2:00 PM	1.352	9.54	39.73	32.41				
5.	11:00 AM	1.278	7.56	32.42	31.28				
6.	4:00 PM	1.266	8.22	34.85	29.87				
7.	5:00 PM	1.352	7.96	33.64	27.62				
8.	6:00 PM	1.413	9.15	37.90	27.05				
9.	7:00 PM	1.217	10.20	39.93	27.90				
10.	8:00 PM	1.253	9.01	32.82	33.26				
11.	9:00 PM	1.303	8.22	35.87	27.33				
12.	10:00 PM	1.364	9.94	38.51	29.87				
13.	11:00 PM	1.340	11.65	41.96	27.62	172.4*	77.5*	102.2	592.3*
14.	12:00 AM	1.241	12.84	42.57	30.72				
15.	1:00 AM	1.204	9.01	32.82	28.74				
16.	2:00 AM	1.253	10.33	32.21	29.03				
17.	3:00 AM	1.290	9.28	34.04	27.90				
18.	4:00 AM	1.413	8.88	36.48	30.44				
19.	5:00 AM	1.352	6.51	28.15	27.05				
20.	6:00 AM	1.229	7.56	32.42	27.62				
21.	7:00 AM	1.266	7.83	34.04	29.03				
22.	8:00 AM	1.303	6.37	28.76	27.62				
23.	9:00 AM	1.376	6.64	26.12	26.49				
24.	10:00 AM	1.364	5.54	26.73	27.62				
Average (24 Hours)		1.301	8.48	33.87	29.17				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours

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Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3856/AA

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Ambient Air
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	Nankana Mor
Monitoring Coordinates:	N 31° 20' 25.03" E 73° 25' 26.93"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	AQMS
Monitoring Duration:	24 hours
Monitoring Date:	26-Jun-23 to 27-Jun-23

Results:

Sr. No.	Time	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$	O_3	SPM
		mg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
1.	11:00 AM	1.278	14.82	39.57	23.90				
2.	12:00 PM	1.315	9.94	37.34	32.92				
3.	1:00 PM	1.253	8.22	31.86	32.08				
4.	2:00 PM	1.413	14.56	39.37	43.36				
5.	11:00 AM	1.364	10.60	20.90	27.28				
6.	4:00 PM	1.266	8.62	31.45	30.67				
7.	5:00 PM	1.499	14.03	39.98	32.36				
8.	6:00 PM	1.463	6.51	25.77	28.13				
9.	7:00 PM	1.241	9.01	37.14	35.18				
10.	8:00 PM	1.229	16.14	39.77	45.89				
11.	9:00 PM	1.192	9.54	36.32	26.15				
12.	10:00 PM	1.376	9.01	35.31	23.62				
13.	11:00 PM	1.487	10.60	37.74	22.49	169.6*	72.8*	105.6	546.2*
14.	12:00 AM	1.315	7.69	29.83	23.05				
15.	1:00 AM	1.364	14.82	39.77	25.03				
16.	2:00 AM	1.389	8.22	35.92	22.77				
17.	3:00 AM	1.241	7.03	28.20	23.62				
18.	4:00 AM	1.315	8.22	31.25	21.64				
19.	5:00 AM	1.253	11.79	39.77	22.21				
20.	6:00 AM	1.229	13.50	44.44	23.90				
21.	7:00 AM	1.253	9.28	33.68	32.36				
22.	8:00 AM	1.352	8.22	32.26	24.46				
23.	9:00 AM	1.413	7.83	31.05	23.33				
24.	10:00 AM	1.389	6.60	29.62	22.77				
Average (24 Hours)		1.329	10.20	34.51	27.88				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours

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Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3857/AA

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Ambient Air
Monitoring By:	Pak Green Laboratories
Monitoring Site:	Jaranwala
Monitoring Location:	Faisalabad Road
Monitoring Coordinates:	N 31° 19' 22.67" E 73° 24' 7.04"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	AQMS
Monitoring Duration:	24 hours
Monitoring Date:	27-Jun-23 to 28-Jun-23

Results:

Sr. No.	Time	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$	O_3	SPM
		mg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
1.	11:00 AM	1.854	8.25	33.53	28.43				
2.	12:00 PM	1.743	10.76	37.38	34.97				
3.	1:00 PM	1.707	9.55	35.56	35.37				
4.	2:00 PM	1.755	11.40	28.25	36.27				
5.	3:00 PM	1.776	12.36	22.16	30.80				
6.	4:00 PM	1.957	9.99	44.10	26.88				
7.	5:00 PM	1.852	13.21	67.44	20.53				
8.	6:00 PM	1.708	15.25	78.89	35.37				
9.	7:00 PM	1.684	14.72	28.66	46.90				
10.	8:00 PM	1.738	14.95	35.76	42.90				
11.	9:00 PM	1.667	13.82	69.40	40.89				
12.	10:00 PM	1.712	16.20	55.62	39.46				
13.	11:00 PM	1.742	15.22	39.38	37.34	178.7*	69.3*	90.7	562.1*
14.	12:00 AM	1.696	14.00	33.49	35.51				
15.	1:00 AM	1.737	13.47	29.43	35.20				
16.	2:00 AM	1.640	13.53	25.37	33.76				
17.	3:00 AM	1.787	12.67	44.29	33.06				
18.	4:00 AM	1.777	11.78	43.27	32.43				
19.	5:00 AM	1.712	9.47	41.24	31.87				
20.	6:00 AM	1.745	11.41	38.60	31.65				
21.	7:00 AM	1.730	8.91	38.40	30.52				
22.	8:00 AM	1.954	10.75	38.20	30.77				
23.	9:00 AM	1.861	8.26	35.96	34.30				
24.	10:00 AM	1.762	8.90	31.70	41.57				
Average (24 Hours)		1.762	12.03	40.67	34.45				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours

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Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3858/AA

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Ambient Air
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	City Center
Monitoring Coordinates:	N 31° 20' 4.24"E 73° 25' 10.29"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	AQMS
Monitoring Duration:	24 hours
Monitoring Date:	28-Jun-23 to 29-Jun-23

Results:

Sr. No.	Time	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$	O_3	SPM
		mg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
1.	11:00 AM	2.011	9.67	21.34	35.14				
2.	12:00 PM	2.035	12.84	43.09	32.61				
3.	1:00 PM	2.072	10.99	41.06	29.79				
4.	2:00 PM	2.048	10.07	38.22	32.04				
5.	11:00 AM	2.109	10.86	42.68	34.58				
6.	4:00 PM	1.999	12.71	43.49	36.27				
7.	5:00 PM	2.035	13.76	46.54	29.22				
8.	6:00 PM	2.122	12.57	39.43	32.32				
9.	7:00 PM	2.146	11.12	38.62	34.02				
10.	8:00 PM	2.171	11.78	41.87	30.63				
11.	9:00 PM	2.023	12.44	42.68	30.07				
12.	10:00 PM	1.986	10.07	37.00	34.86				
13.	11:00 PM	2.158	11.52	35.37	29.75	182*	81.9*	94.3	610.4*
14.	12:00 AM	2.060	10.59	47.15	30.60				
15.	1:00 AM	1.999	10.07	50.80	32.57				
16.	2:00 AM	2.048	13.10	43.90	29.19				
17.	3:00 AM	2.072	15.35	51.21	32.01				
18.	4:00 AM	2.035	12.31	52.63	33.70				
19.	5:00 AM	2.195	16.27	47.55	36.24				
20.	6:00 AM	2.171	15.48	46.54	30.88				
21.	7:00 AM	2.011	14.82	44.31	32.29				
22.	8:00 AM	2.097	13.89	42.07	31.72				
23.	9:00 AM	2.060	12.18	43.09	30.31				
24.	10:00 AM	2.146	11.34	46.74	30.60				
Average (24 Hours)		2.075	12.33	42.81	32.14				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours

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Date: 10-Jul-23

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PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accreditated Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc.#: PGG/IMS/FF/063 | Rev. Date: 27-Jan-22 | Rev. # 01

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2023-3859/AA

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Ambient Air
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	Syed Wala Road
Monitoring Coordinates:	N 31° 19' 17.71"E 73° 25' 35.13"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	AQMS
Monitoring Duration:	24 hours
Monitoring Date:	29-Jun-23 to 30-Jun-23

Results:

Sr. No.	Time	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$	O_3	SPM
		mg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
1.	11:00 AM	0.959	3.06	22.90	28.39				
2.	12:00 PM	0.971	3.24	24.32	30.93				
3.	1:00 PM	1.021	6.41	33.45	24.73				
4.	2:00 PM	1.070	6.67	36.30	29.24				
5.	11:00 AM	0.996	4.69	28.99	28.11				
6.	4:00 PM	0.984	5.35	31.42	26.70				
7.	5:00 PM	1.070	5.09	30.21	24.45				
8.	6:00 PM	1.131	6.28	34.47	23.88				
9.	7:00 PM	0.935	7.33	36.50	24.73				
10.	8:00 PM	0.971	6.14	29.39	30.09				
11.	9:00 PM	1.021	5.35	32.44	24.16				
12.	10:00 PM	1.082	7.07	35.08	26.70				
13.	11:00 PM	1.058	8.78	38.53	24.45	160.2*	59.5*	99.2	543.5*
14.	12:00 AM	0.959	9.97	39.14	27.55				
15.	1:00 AM	0.922	6.14	29.39	25.57				
16.	2:00 AM	0.971	7.46	28.78	25.86				
17.	3:00 AM	1.008	6.41	30.61	24.73				
18.	4:00 AM	1.131	6.01	33.05	27.27				
19.	5:00 AM	1.070	3.64	24.72	23.88				
20.	6:00 AM	0.947	4.69	28.99	24.45				
21.	7:00 AM	0.984	4.96	30.61	25.86				
22.	8:00 AM	1.021	3.50	25.33	24.45				
23.	9:00 AM	1.094	3.77	22.69	23.32				
24.	10:00 AM	1.082	2.67	23.30	24.45				
Average (24 Hours)		1.019	5.61	30.44	26.00				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours

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Ref. #: PGG/LAB/2023-3859/AA

Date: 10-Jul-23

PEQS: Punjab Environmental Quality Standards
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Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3860/AA

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Ambient Air
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	Khurrianwala Road
Monitoring Coordinates:	N 31° 21' 23.62"E 73° 25' 9.75"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	AQMS
Monitoring Duration:	24 hours
Monitoring Date:	30-Jun-23 to 01-Jul-23

Results:

Sr. No.	Time	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$	O_3	SPM
		mg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
1.	11:00 AM	2.160	19.69	46.00	32.07				
2.	12:00 PM	1.597	14.81	43.77	41.09				
3.	1:00 PM	1.535	13.09	38.29	40.25				
4.	2:00 PM	1.695	19.43	45.80	51.53				
5.	11:00 AM	1.646	15.47	27.33	35.45				
6.	4:00 PM	1.548	13.49	37.88	38.84				
7.	5:00 PM	1.781	18.90	46.41	40.53				
8.	6:00 PM	1.745	11.38	32.20	36.30				
9.	7:00 PM	1.523	13.88	43.57	43.35				
10.	8:00 PM	1.511	21.01	46.20	54.06				
11.	9:00 PM	1.474	14.41	42.75	34.32				
12.	10:00 PM	1.658	13.88	41.74	31.79				
13.	11:00 PM	1.769	15.47	44.17	30.66	175.3*	67.6*	89.4	585.6*
14.	12:00 AM	1.597	12.56	36.26	31.22				
15.	1:00 AM	1.646	19.69	46.20	33.20				
16.	2:00 AM	1.671	13.09	42.35	30.94				
17.	3:00 AM	1.523	11.90	34.63	31.79				
18.	4:00 AM	1.597	13.09	37.68	29.81				
19.	5:00 AM	1.535	16.66	46.20	30.38				
20.	6:00 AM	1.511	18.37	50.87	32.07				
21.	7:00 AM	1.535	14.15	40.11	40.53				
22.	8:00 AM	1.634	13.09	38.69	32.63				
23.	9:00 AM	1.695	12.70	37.48	31.50				
24.	10:00 AM	1.671	11.47	36.05	30.94				
Average (24 Hours)		1.636	15.07	40.94	36.05				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours

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Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3861/AA

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Ambient Air
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	Nankana sahib Road
Monitoring Coordinates:	N 31° 20' 26.61"E 73° 25' 48.51"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	AQMS
Monitoring Duration:	24 hours
Monitoring Date:	01-Jul-23 to 02-Jul-23

Results:

Sr. No.	Time	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$	O_3	SPM
		mg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
1.	11:00 AM	1.429	4.80	46.60	38.13				
2.	12:00 PM	1.453	7.97	46.52	35.60				
3.	1:00 PM	1.490	6.12	44.49	32.78				
4.	2:00 PM	1.466	5.20	41.65	35.03				
5.	11:00 AM	1.527	5.99	46.11	37.57				
6.	4:00 PM	1.417	7.84	46.92	39.26				
7.	5:00 PM	1.453	8.89	49.97	32.21				
8.	6:00 PM	1.540	7.70	42.86	35.31				
9.	7:00 PM	1.564	6.25	42.05	37.01				
10.	8:00 PM	1.589	6.91	45.30	33.62				
11.	9:00 PM	1.441	7.57	46.11	33.06				
12.	10:00 PM	1.404	5.20	40.43	37.85				
13.	11:00 PM	1.576	6.65	38.80	32.74	162.5*	54.2*	98	554.3*
14.	12:00 AM	1.478	5.72	50.58	33.59				
15.	1:00 AM	1.417	5.20	54.23	35.56				
16.	2:00 AM	1.466	8.23	47.33	32.18				
17.	3:00 AM	1.490	10.48	54.64	35.00				
18.	4:00 AM	1.453	7.44	56.06	36.69				
19.	5:00 AM	1.613	11.40	50.98	39.23				
20.	6:00 AM	1.589	10.61	49.97	33.87				
21.	7:00 AM	1.429	9.95	47.74	35.28				
22.	8:00 AM	1.515	9.02	45.50	34.71				
23.	9:00 AM	1.478	7.31	46.52	33.30				
24.	10:00 AM	1.564	6.47	50.17	33.59				
Average (24 Hours)		1.493	7.46	47.15	35.13				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours

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Field Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. Gulberg-III, Lahore

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TEST REPORT

Ref. #: PGG/LAB/2023-3862/NL

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Noise Level
Monitoring By:	Pak Green Laboratories
Monitoring Site:	Jaranwala
Monitoring Location:	WWTP-1
Monitoring Coordinates:	N 31° 18' 54.36"E 73° 27' 18.81"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	LAND TEK SL 5868P
Monitoring Duration:	24 hours
Monitoring Date:	23-Jun-23 to 24-Jun-23

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	60.9
2.	8:00 AM	57.6
3.	9:00 AM	64.5
4.	10:00 AM	58.4
5.	11:00 AM	63.3
6.	12:00 PM	56.2
7.	1:00 PM	56.1
8.	2:00 PM	59.8
9.	3:00 PM	62.4
10.	4:00 PM	55.8
11.	5:00 PM	58.2
12.	6:00 PM	63.1
13.	7:00 PM	64.8
14.	8:00 PM	57.6
15.	9:00 PM	59.9
	Average	59.9

Sr. No.	Night Time	Equivalent Noise dB (A)
16.	10: 00 PM	61.8
17.	11:00 PM	53.3
18.	12:00 AM	52.1
19.	1:00 AM	53.8
20.	2:00 AM	55
21.	3:00 AM	50.6
22.	4:00 AM	55.1
23.	5:00 AM	50.4
24.	6:00 AM	48.1
	Average	53.4

.....End of Report.....

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Ref. #: PGG/LAB/2023-3862/NL

Date: 10-Jul-23

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (C)	dB (A) Leq	55	45
2.	Industrial Area (C)	dB (A) Leq	75	65
3.	Commercial Area (C)	dB (A) Leq	65	55

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- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge

Environ-Engineering (Pvt) Ltd. Gulberg-III, Lahore Pakistan

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TEST REPORT

Ref. #: PGG/LAB/2023-3863/NL

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Noise Level
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	WWTP-2
Monitoring Coordinates:	N 31° 18' 43.22"E 73° 26' 57.57"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	LAND TEK SL 5868P
Monitoring Duration:	24 hours
Monitoring Date:	24-Jun-23 to 25-Jun-23

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	59.7
2.	8:00 AM	56.4
3.	9:00 AM	63.3
4.	10:00 AM	57.2
5.	11:00 AM	62.1
6.	12:00 PM	59.0
7.	1:00 PM	61.1
8.	2:00 PM	61.6
9.	3:00 PM	59.2
10.	4:00 PM	62.6
11.	5:00 PM	61.5
12.	6:00 PM	61.9
13.	7:00 PM	64.2
14.	8:00 PM	61.8
15.	9:00 PM	58.7
Average		60.7

Sr. No.	Night Time	Equivalent Noise dB (A)
16.	10: 00 PM	60.1
17.	11:00 PM	54.5
18.	12:00 AM	53.3
19.	1:00 AM	51
20.	2:00 AM	52.1
21.	3:00 AM	53.8
22.	4:00 AM	49.4
23.	5:00 AM	54.6
24.	6:00 AM	48.2
Average		53.0

.....End of Report.....

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PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (C)	dB (A) Leq	55	45
2.	Industrial Area (C)	dB (A) Leq	75	65
3.	Commercial Area (C)	dB (A) Leq	65	55

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- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. 46-M, Gulberg-III, Lahore Pakistan

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TEST REPORT

Ref. #: PGG/LAB/2023-3864/NL

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Noise Level
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	Lahore Road Jaranwala
Monitoring Coordinates:	N 31° 19' 24.12"E 73° 26' 7.24"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	LAND TEK SL 5868P
Monitoring Duration:	24 hours
Monitoring Date:	25-Jun-23 to 26-Jun-23

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	60.9
2.	8:00 AM	57.6
3.	9:00 AM	64.5
4.	10:00 AM	58.4
5.	11:00 AM	63.8
6.	12:00 PM	60.2
7.	1:00 PM	62.3
8.	2:00 PM	62.1
9.	3:00 PM	64.4
10.	4:00 PM	61.8
11.	5:00 PM	62.7
12.	6:00 PM	65.1
13.	7:00 PM	61.4
14.	8:00 PM	63.0
15.	9:00 PM	59.9
Average		61.9

Sr. No.	Night Time	Equivalent Noise dB (A)
1.	10: 00 PM	58.5
2.	11:00 PM	54.2
3.	12:00 AM	53
4.	1:00 AM	50.7
5.	2:00 AM	51.8
6.	3:00 AM	53.5
7.	4:00 AM	49.1
8.	5:00 AM	54.8
9.	6:00 AM	50.9
Average		52.9

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Date: 10-Jul-23

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (C)	dB (A) Leq	55	45
2.	Industrial Area (C)	dB (A) Leq	75	65
3.	Commercial Area (C)	dB (A) Leq	65	55

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Field Analyst	Chief Analyst	Laboratory Incharge

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Ref. #: PGG/LAB/2023-3865/NL

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Noise Level
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	Nankana Mor
Monitoring Coordinates:	N 31° 20' 25.03" E 73° 25' 26.93"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	LAND TEK SL 5868P
Monitoring Duration:	24 hours
Monitoring Date:	26-Jun-23 to 27-Jun-23

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	63.7
2.	8:00 AM	60.4
3.	9:00 AM	62.3
4.	10:00 AM	56.2
5.	11:00 AM	62.6
6.	12:00 PM	58.0
7.	1:00 PM	60.1
8.	2:00 PM	60.8
9.	3:00 PM	62.2
10.	4:00 PM	59.6
11.	5:00 PM	58.5
12.	6:00 PM	62.9
13.	7:00 PM	59.2
14.	8:00 PM	60.8
15.	9:00 PM	58.1
Average		60.4

Sr. No.	Night Time	Equivalent Noise dB (A)
1.	10: 00 PM	60.3
2.	11:00 PM	51.6
3.	12:00 AM	50.4
4.	1:00 AM	48.1
5.	2:00 AM	49.2
6.	3:00 AM	50.9
7.	4:00 AM	46.5
8.	5:00 AM	46.8
9.	6:00 AM	48.3
Average		50.2

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EPA Certified

Ref. #: PGG/LAB/2023-3865/NL

Date: 10-Jul-23

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
4.	Residential Area (C)	dB (A) Leq	55	45
5.	Industrial Area (C)	dB (A) Leq	75	65
6.	Commercial Area (C)	dB (A) Leq	65	55

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- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3866/NL

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Noise Level
Monitoring By:	Pak Green Laboratories
Monitoring Site:	Jaranwala
Monitoring Location:	Faisalabad Road
Monitoring Coordinates:	N 31° 19' 22.67" E 73° 24' 7.04"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	LAND TEK SL 5868P
Monitoring Duration:	24 hours
Monitoring Date:	27-Jun-23 to 28-Jun-23

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	61.9
2.	8:00 AM	58.6
3.	9:00 AM	65.5
4.	10:00 AM	59.4
5.	11:00 AM	64.3
6.	12:00 PM	57.2
7.	1:00 PM	57.1
8.	2:00 PM	60.8
9.	3:00 PM	63.4
10.	4:00 PM	56.8
11.	5:00 PM	59.2
12.	6:00 PM	64.1
13.	7:00 PM	65.8
14.	8:00 PM	58.6
15.	9:00 PM	62.3
Average		61.0

Sr. No.	Night Time	Equivalent Noise dB (A)
16.	10: 00 PM	62.4
17.	11:00 PM	53.9
18.	12:00 AM	52.7
19.	1:00 AM	54.4
20.	2:00 AM	55.6
21.	3:00 AM	51.2
22.	4:00 AM	55.7
23.	5:00 AM	51
24.	6:00 AM	48.7
Average		54.0

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Date: 10-Jul-23

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (C)	dB (A) Leq	55	45
2.	Industrial Area (C)	dB (A) Leq	75	65
3.	Commercial Area (C)	dB (A) Leq	65	55

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Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3867/NL

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Noise Level
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	City Center
Monitoring Coordinates:	N 31° 20' 4.24"E 73° 25' 10.29"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	LAND TEK SL 5868P
Monitoring Duration:	24 hours
Monitoring Date:	28-Jun-23 to 29-Jun-23

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	59.2
2.	8:00 AM	55.9
3.	9:00 AM	62.8
4.	10:00 AM	69.2
5.	11:00 AM	61.6
6.	12:00 PM	68.3
7.	1:00 PM	60.6
8.	2:00 PM	65.8
9.	3:00 PM	58.7
10.	4:00 PM	62.1
11.	5:00 PM	61.0
12.	6:00 PM	61.4
13.	7:00 PM	63.7
14.	8:00 PM	61.3
15.	9:00 PM	62.6
Average		**62.3**

Sr. No.	Night Time	Equivalent Noise dB (A)
16.	10: 00 PM	52.1
17.	11:00 PM	54.4
18.	12:00 AM	53.2
19.	1:00 AM	50.9
20.	2:00 AM	52
21.	3:00 AM	53.7
22.	4:00 AM	49.3
23.	5:00 AM	54.5
24.	6:00 AM	49.1
Average		**52.1**

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Ref. #: PGG/LAB/2023-3867/NL

Date: 10-Jul-23

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (C)	dB (A) Leq	55	45
2.	Industrial Area (C)	dB (A) Leq	75	65
3.	Commercial Area (C)	dB (A) Leq	65	55

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Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3868/NL

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Noise Level
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	Syed Wala Road
Monitoring Coordinates:	N 31° 19' 17.71"E 73° 25' 35.13"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	LAND TEK SL 5868P
Monitoring Duration:	24 hours
Monitoring Date:	29-Jun-23 to 30-Jun-23

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	60.4
2.	8:00 AM	57.1
3.	9:00 AM	64.0
4.	10:00 AM	57.9
5.	11:00 AM	63.3
6.	12:00 PM	59.7
7.	1:00 PM	61.8
8.	2:00 PM	61.6
9.	3:00 PM	63.9
10.	4:00 PM	61.3
11.	5:00 PM	62.2
12.	6:00 PM	64.6
13.	7:00 PM	60.9
14.	8:00 PM	62.5
15.	9:00 PM	59.4
	Average	61.4

Sr. No.	Night Time	Equivalent Noise dB (A)
16.	10: 00 PM	55.4
17.	11:00 PM	51.1
18.	12:00 AM	49.9
19.	1:00 AM	47.6
20.	2:00 AM	48.7
21.	3:00 AM	50.4
22.	4:00 AM	46
23.	5:00 AM	51.7
24.	6:00 AM	47.8
	Average	49.8

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Ref. #: PGG/LAB/2023-3868/NL

Date: 10-Jul-23

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (C)	dB (A) Leq	55	45
2.	Industrial Area (C)	dB (A) Leq	75	65
3.	Commercial Area (C)	dB (A) Leq	65	55

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TEST REPORT

Ref. #: PGG/LAB/2023-3869/NL

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Noise Level
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	Khurrianwala Road
Monitoring Coordinates:	N 31° 21' 23.62"E 73° 25' 9.75"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	LAND TEK SL 5868P
Monitoring Duration:	24 hours
Monitoring Date:	30-Jun-23 to 01-Jul-23

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	66.4
2.	8:00 AM	63.1
3.	9:00 AM	65.0
4.	10:00 AM	58.9
5.	11:00 AM	65.3
6.	12:00 PM	60.7
7.	1:00 PM	62.8
8.	2:00 PM	63.5
9.	3:00 PM	64.9
10.	4:00 PM	62.3
11.	5:00 PM	61.2
12.	6:00 PM	65.6
13.	7:00 PM	61.9
14.	8:00 PM	63.5
15.	9:00 PM	60.8
Average		63.1

Sr. No.	Night Time	Equivalent Noise dB (A)
16.	10: 00 PM	60.3
17.	11:00 PM	52.5
18.	12:00 AM	51.3
19.	1:00 AM	49
20.	2:00 AM	50.1
21.	3:00 AM	51.8
22.	4:00 AM	47.4
23.	5:00 AM	47.7
24.	6:00 AM	48.3
Average		50.9

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Date: 10-Jul-23

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (C)	dB (A) Leq	55	45
2.	Industrial Area (C)	dB (A) Leq	75	65
3.	Commercial Area (C)	dB (A) Leq	65	55

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Field Analyst	Chief Analyst	Laboratory Incharge

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TEST REPORT

Ref. #: PGG/LAB/2023-3870/NL

Date: 10-Jul-23

Name of Client:	PMDFC
Nature of Monitoring:	Noise Level
Monitoring By:	Pak Green Laboratories
Site Location:	Jaranwala
Monitoring Location:	Nankana sahib Road
Monitoring Coordinates:	N 31° 20' 26.61"E 73° 25' 48.51"
Name of Sampling Person:	Mr. Adil
Monitoring Instrument:	LAND TEK SL 5868P
Monitoring Duration:	24 hours
Monitoring Date:	01-Jul-23 to 02-Jul-23

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	67.6
2.	8:00 AM	64.3
3.	9:00 AM	66.2
4.	10:00 AM	60.1
5.	11:00 AM	66.5
6.	12:00 PM	61.9
7.	1:00 PM	64.0
8.	2:00 PM	64.7
9.	3:00 PM	66.1
10.	4:00 PM	63.5
11.	5:00 PM	62.4
12.	6:00 PM	66.8
13.	7:00 PM	63.1
14.	8:00 PM	64.7
15.	9:00 PM	62.0
Average		64.3

Sr. No.	Night Time	Equivalent Noise dB (A)
16.	10: 00 PM	59.5
17.	11:00 PM	53
18.	12:00 AM	51.8
19.	1:00 AM	49.5
20.	2:00 AM	50.6
21.	3:00 AM	52.3
22.	4:00 AM	47.9
23.	5:00 AM	48.2
24.	6:00 AM	49.7
Average		51.4

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Ref. #: PGG/LAB/2023-3870/NL

Date: 10-Jul-23

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (C)	dB (A) Leq	55	45
2.	Industrial Area (C)	dB (A) Leq	75	65
3.	Commercial Area (C)	dB (A) Leq	65	55

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Field Analyst	Chief Analyst	Laboratory Incharge

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Annexure G: Water Analysis

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TEST REPORT

Ref #: PGG/LAB/2023-3835/SW

Date: 10-Jul-23

Name of Client	**Punjab Municipal Development Fund Company (PMDFC)**
Project Site	Jaranwala

Sample Description:

Nature of sample	Surface Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Coordinates	N 31.137207° E 73.258962°
Sample source	Tandlianwala distributary
Sample Code	SW-1326
Sample Type	Grab
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Non-Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

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- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

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Ref #: PGG/LAB/2023-3835/SW

Date: 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	19.5	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	7.892 at 19.5°C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 °C) ^	mg/L	80	1	1	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	08	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	44	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	230	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	05	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	0.4	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.309	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	35	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	0.1	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001	APHA-3111 B

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PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.
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Doc.#: PGG/IMS/FF/063 Rev. Date: 27-Jan-22 Rev. # 01
EPA Certified
Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref #: PGG/LAB/2023-3835/SW **Date:** 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1296	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	13.4829*	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.2096	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	-	-
31.	Sodium^	mg/L	-	0.0100	18.5374	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

PEQS: Punjab Environmental Quality Standards ^PNAC Accredited
BDL: Below Detection Limit LDL: Lowest Detection Limit

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TEST REPORT

Ref #: PGG/LAB/2023-3836/SW **Date:** 10-Jul-23

Name of Client	**Punjab Municipal Development Fund Company (PMDFC)**
Project Site	Jaranwala

Sample Description:

Nature of sample	Surface water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Coordinates	N 31.306619° E 73.4539°
Sample source	Discharge Point of WWTP Effluent
Sample Code	SW-1327
Sample Type	Grab
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Non-Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Enviro-Engineering (Pvt) Ltd. Gulberg-III, Lahore Lahore Pakistan

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Date: 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	19.9	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	7.880 at 19.9°C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 °C) ^	mg/L	80	1	03	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	14	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	40	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	155	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	05	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	0.2	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.211	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	22	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	0.2	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001	APHA-3111 B

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Ref #: PGG/LAB/2023-3836/SW **Date:** 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1200	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	11.0841*	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.2015	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	-	-
31.	Sodium^	mg/L	-	0.0100	18.3964	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

PEQS: Punjab Environmental Quality Standards ^PNAC Accredited
BDL: Below Detection Limit LDL: Lowest Detection Limit

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TEST REPORT

Ref #: PGG/LAB/2023-3837/SW

Date: 10-Jul-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jaranwala

Sample Description:

Nature of sample	Surface water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Coordinates	N 31.322716° E 73.456768°
Sample source	Upstream Sample Ahead WWTP Site
Sample Code	SW-1328
Sample Type	Grab
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Non-Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

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Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

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Ref #: PGG/LAB/2023-3837/SW

Date: 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	19.7	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	8.055 at 19.7°C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 °C) ^	mg/L	80	1	04	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	16	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	30	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	150	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	05	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	0.1	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.198	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	09	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	0.3	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001	APHA-3111 B

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Ref #: PGG/LAB/2023-3837/SW **Date:** 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1265	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	11.8583*	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.2024	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	-	-
31.	Sodium^	mg/L	-	0.0100	59.6572	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

PEQS: Punjab Environmental Quality Standards **^PNAC Accredited**

BDL: Below Detection Limit **LDL: Lowest Detection Limit**

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TEST REPORT

Ref #: PGG/LAB/2023-3838/SW **Date:** 10-Jul-23

Name of Client	**Punjab Municipal Development Fund Company (PMDFC)**
Project Site	Jaranwala

Sample Description:

Nature of sample	Surface Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Coordinates	N 31.356265° E 73.419217°
Sample source	Canal, Khurrianwala
Sample Code	SW-1329
Sample Type	Grab
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Non-Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

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Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

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Ref #: PGG/LAB/2023-3838/SW

Date: 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	19.8	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	8.152 at 19.8°C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 °C) ^	mg/L	80	1	1	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	08	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	24	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	140	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	05	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	0.2	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.186	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	20	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	0.4	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001	APHA-3111 B

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Ref #: PGG/LAB/2023-3838/SW **Date:** 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0213	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1309	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	19.6256*	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.2513	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	-	-
31.	Sodium^	mg/L	-	0.0100	16.1251	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

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BDL: Below Detection Limit LDL: Lowest Detection Limit

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TEST REPORT

Ref #: PGG/LAB/2023-3839/SW **Date:** 10-Jul-23

Name of Client	**Punjab Municipal Development Fund Company (PMDFC)**
Project Site	Jaranwala

Sample Description:

Nature of sample	Surface Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Coordinates	N 31.208875° E 73.34366°
Sample source	Distributary Point, 374 Chak GB
Sample Type	Grab
Sample Code	SW-1330
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Non-Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

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Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. Gulberg-III, Lahore Pakistan

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Doc.#: PGG/IMS/FF/063 | Rev. Date: 27-Jan-22 | Rev. # 01

EPA Certified

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref #: PGG/LAB/2023-3839/SW

Date: 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	19.8	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	8.205 at 19.8°C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 °C) ^	mg/L	80	1	1	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	04	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	30	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	155	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	05	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	0.2	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.199	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	22	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	0.1	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001	APHA-3111 B

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Date: 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.0010	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1296	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	18.9213*	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.2533	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	-	-
31.	Sodium^	mg/L	-	0.0100	17.0471	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

PEQS: Punjab Environmental Quality Standards ^PNAC Accredited
BDL: Below Detection Limit LDL: Lowest Detection Limit

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TEST REPORT

Ref #: PGG/LAB/2023-3840/SW **Date:** 10-Jul-23

Name of Client	**Punjab Municipal Development Fund Company (PMDFC)**
Project Site	Jaranwala

Sample Description:

Nature of sample	Surface water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Coordinates	N 31.141996° E 73.315753°
Sample source	Naurang Distributary
Sample Type	Grab
Sample Code	SW-1331
Date of sampling	24-Jun-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Non-Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

- Analysis was conducted at the request of the proponent for his own use.
- Report cannot be used to comply with any complaint, EPO or other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
QURAT-UL-AIN	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

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Date: 10-Jul-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	19.1	APHA-2550 B
2.	pH^	-	6.5-8.5	0.001	8.344 at 19.1°C	APHA-4500-H^+ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD_5 at 20 °C) ^	mg/L	80	1	1	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^	mg/L	150	0.4	06	APHA-5220 B
5.	Total Suspended Solids (TSS) ^	mg/L	200	1	40	APHA-2540 D
6.	Total Dissolved Solids (TDS) ^	mg/L	3500	10	160	APHA-2540 C
7.	Greases & Oil	mg/L	10	0.1	0.1	APHA-5520 B
8.	Phenolic Compound (As Phenol)	mg/L	0.1	0.0005	0.0005	APHA-5530 D
9.	Chloride (as Cl^{1-}) ^	mg/L	<250	0.1	05	APHA-4500-Cl B
10.	Fluoride (F^{1-})	mg/L	10	0.1	0.3	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.201	APHA 5540 C
12.	Sulphate (SO_4^{2-}) ^	mg/L	600	1	25	APHA-4500-SO_4 C
13.	Sulphide (S^{2-})	mg/L	1.0	0.1	0.1	APHA-4500-S^{2-} F
14.	Ammonia (NH_3) ^	mg/L	40	0.1	0.2	APHA-4500NH_3 C
15.	Cadmium (Cd)^	mg/L	0.1	0.0010	0.0010	APHA-3111 B
16.	Chromium^ (Trivalent & Hexavalent)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
17.	Copper (Cu)^	mg/L	1.0	0.0001	0.0001	APHA-3111 B

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Ref #: PGG/LAB/2023-3840/SW **Date:** 10-Jul-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
18.	Lead (Pb)^	mg/L	0.5	0.0010	0.2614	APHA-3111 B
19.	Mercury (Hg)	mg/L	0.01	0.0001	0.0001	APHA-3112 B
20.	Selenium (Se)	mg/L	0.5	0.0001	0.0001	APHA-3111 B
21.	Nickel (Ni)	mg/L	1.0	0.0010	0.0010	APHA-3111 B
22.	Silver (Ag)	mg/L	1.0	0.0100	0.0100	APHA-3111 B
23.	Zinc (Zn)^	mg/L	5.0	0.0001	0.1395	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0001	APHA-3114 B
25.	Barium (Ba)	mg/L	1.5	0.0500	0.0500	APHA-3111 D
26.	Iron (Fe)^	mg/L	8.0	0.0010	16.8399*	APHA-3111 B
27.	Manganese (Mn)^	mg/L	1.5	0.0010	0.2354	APHA-3111 B
28.	Boron (B)	mg/L	6.0	0.0100	0.0100	APHA-3111 D
29.	Chlorine (Cl_2)	mg/L	1.0	0.01	0.01	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	0.2614	-
31.	Sodium^	mg/L	-	0.0100	32.5311	APHA-3111 B
32.	Cyanide (as CN^{1-}) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

.....End of Report.....

PEQS: Punjab Environmental Quality Standards ^PNAC Accredited
BDL: Below Detection Limit LDL: Lowest Detection Limit

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1. 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.

2. 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 specifications at projected times and places in an emergency situation that exceeds the capability or routine responsibility of anyone 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 procedure stores pond 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 improvement sare needed.

3. Planning

i. 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, equipment's 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

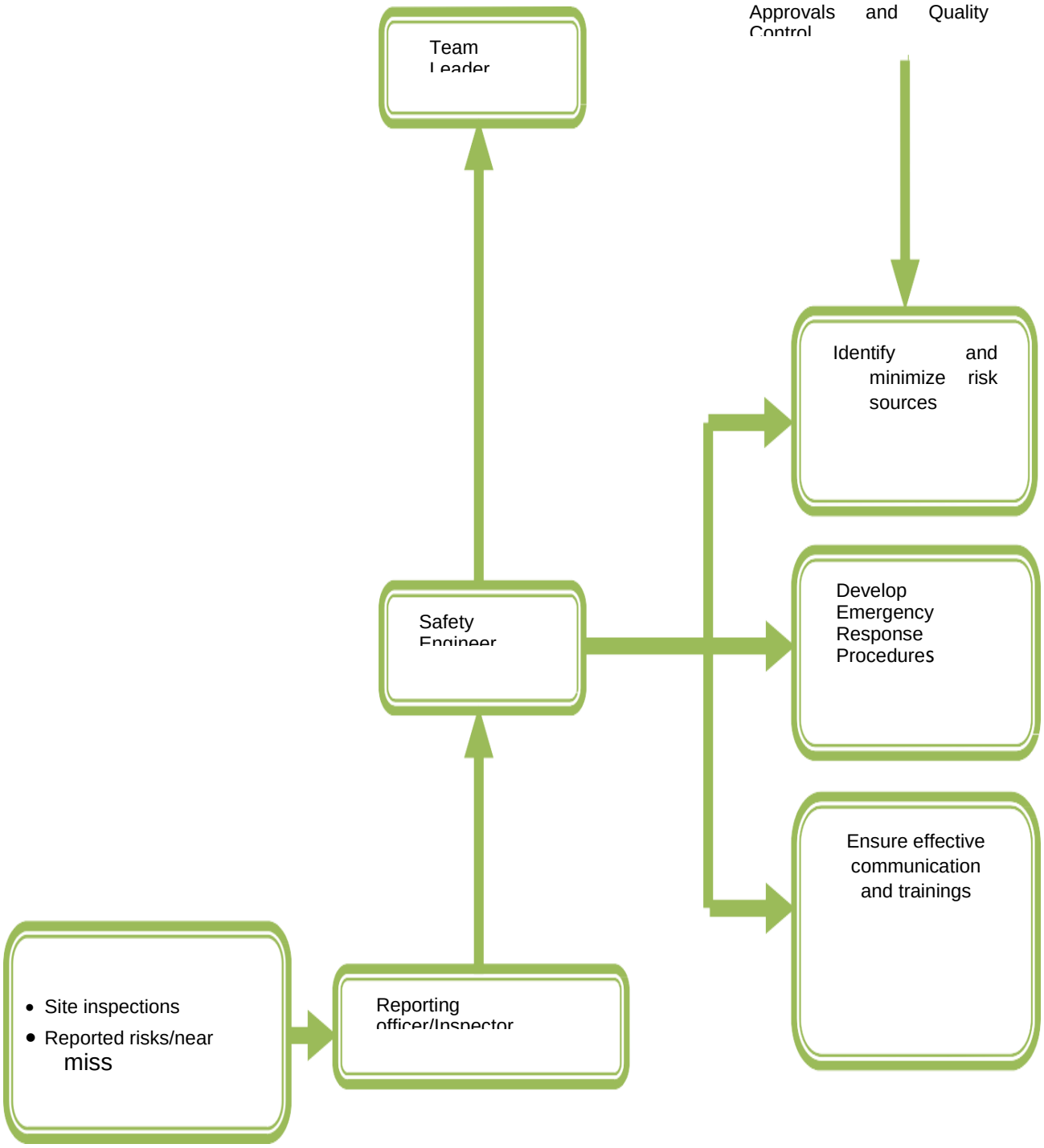
- Regular in sections of the site, to identify potential risks associated with equipment's, materials and work practices;

- 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 there by 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:


Approvals and Quality Control
Team Leader
Identify and minimize risk sources
Safety Engineer
Develop Emergency Response Procedures
Ensure effective communication and trainings
Site inspections
Reported risks/near miss
Reporting officer/Inspector

ii. Hazard Identification

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 sewerage projects are as follows:

- Equipment Failure
- Power Outages
- Chemical Spills or Releases
- Flooding
- Inflow and Infiltration
- Biological Upsets
- Security Threats

In an Emergency Response Plan (ERP), hazard identification and risk assessment are crucial components for effectively managing potential hazards. These processes help identify, evaluate, and prioritize hazards based on their probability and magnitude. The vulnerability of assets at risk is also assessed, followed by an impact analysis. Here's a description of the hazard identification and risk assessment tool commonly used in ERP:
Hazard Identification: Hazard identification involves the systematic identification and recognition of potential hazards that may pose a threat to people, property, or the environment. This process typically includes a thorough examination of the facility or area under consideration, analysis of historical data, consultation with subject matter experts, and reference to relevant regulations and standards. The goal is to identify all potential hazards that may be encountered during normal operations or in emergency situations.
Risk Assessment: Risk assessment is the process of evaluating the identified hazards to determine their potential impact and the likelihood of their occurrence. This assessment usually involves two key aspects: probability and magnitude.
Probability: The probability assessment assesses the likelihood of a hazard occurring, considering factors such as historical data, expert judgment, and statistical analysis. It helps in understanding the likelihood of the hazard's initiation or occurrence, ranging from low to high probability.
Magnitude: The magnitude assessment evaluates the potential consequences or severity of a hazard if it were to occur. This assessment considers the potential impact on human health, the environment, property, and any other relevant factors. Magnitude is often categorized on a scale from minor to catastrophic, helping prioritize hazards based on their potential severity.
Vulnerability Assessment: In addition to hazard identification and risk assessment, vulnerability assessment focuses on evaluating the susceptibility or vulnerability of assets at risk. It involves analyzing the characteristics and resilience of the assets and their ability to withstand the impact of potential hazards. This assessment helps identify assets that are more vulnerable and require additional protective measures or mitigation strategies.
Impact Analysis: The impact analysis combines the results of hazard identification, risk assessment, and vulnerability assessment to determine the potential consequences of a hazard event. This analysis provides a comprehensive understanding of the potential effects on people, infrastructure, the environment, and other critical factors. It helps prioritize response actions, allocate resources effectively, and develop appropriate mitigation strategies.
By employing a robust hazard identification and risk assessment tool, organizations can better understand and prepare for potential hazards, enabling them to develop comprehensive emergency response plans that address the identified risks and vulnerabilities

iii. 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 in section and maintenance of construction machinery and the structural integrity;
- Review of work schedules based on weather updates; and
- Security controls based on political situations.

4. Emergency Preparedness

The ERT shall be prepared withal necessary resources and the personnel's shall be trained regularly

i. Resources

Finance and administration

The financial resources shall be reserved for dealing with any emergencies arising onsite during construction and operation. Responsibilities of the person managing there sources in case of emergencies shall be clearly defined and the required resources shall be adequate and updated regularly.

Equipment

All the necessary equipment needed in an event of emergencies shall be made available, as a minimum, the equipment needed include;

- Personal Protective Equipment
- Alarms/Warnings
- Fire extinguishers
- Crowd control, flashlights, signs, barricades
- First Aid Facility
- Detection instruments, e.g. personal alarmkits, 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	Islamabad(051)
1	Ehdi Services	251191
2	Ambulance	115
3	Emergency Police	15
4	Bomb Disposal	9222362
5	Rescue	1122
6	Fire Brigade Center	16
7	Hospital Civil(casualties)	556311

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 bed one to prepare, the personnel to deal with emergencies.

5. 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 stake holders

i. 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:

1. 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, shutdown equipment or utilities, and take other necessary measures as required depending upon the type of emergency

2. Provide first aid if required or in doing so.

3. Designate people to emergency duties. e.g.: assign personnel to guide emergency services on arrival.

4. Head count People/personnel to identify any missing persons.

5. People/personnel shall be directed to safe location.

6. Arrange diversions for the traffic to reduce disturbance to the flow of traffic, if and as far as possible.

7. Preserve the accident scene until experts mark it safe; only disturb what is essential to maintain life or relieve human suffering and prevent immediate or further losses.

ii. Communication:

Emergency service providers:

The emergency service providers 'need 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, on going 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.

iii. 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;
- Rein statement of disrupted services;
- Road and bridge repairs;

Updation of safety arrangements and Emergency

Annexure I: Plantation Plan

Table 45: Tree Plantation plan for Buffer zone

Sr#	Scientific Name of Pollutant Absorbent Plants[64]	Other name	Family	Details[65]
1.	Acacia modesta Wall	Phulahi	Mimosaceae	A deciduous, thorny moderate-size tree, 3 to 9 m tall. A moderate intolerant, drought resistant tree that grows on a variety of soils, including dry shallow soils, It prefers a semi-arid, sub-humid climate within a temperature range of -5 to 40 °C
2.	Acacia nilotica (Linn.)Delile.	Desi Kikar		An evergreen, thorny, moderate-size tree, 6 to 13 m tall. An intolerant, drought resistant tree that grows on a variety of textured soils. It will tolerate saline, sodic sites if adequate soil moisture is available. Also Having ability to fix nitrogen makes it good farm forestry tree. It prefers Subtropical/ tropical environment
3.	Albizia lebbeck (Linn.) Benth.	Siris		A fast-growing deciduous tree 12 to 30 m tall. A moderately intolerant, tree that grows on a variety of moist sites t prefers a sub-humid, cool, warm, subtropical and tropical climate with a temperature range of 4 to 40 °C The wood is very strong, resilient. The flowers are yellow or greenish white appear in April and May.

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65 https://fwf.punjab.gov.pk/system/files/Forest%20and%20Environmental%20Species.pdf

4.	Morus nigra Linn.	Tut siah	Moraceae	A medium size, deciduous tree, 9 to 15 m tall. It is monecious. Reproduced both from seed and by vegetative means. The berries are white to pinkish to purple to red to black. Fruiting period is between March and Jun
5.	Ficus religiosa Linn.	Peepal		A large deciduous tree that is leafless for a short period during hot seasons. t grows well within a temperature range of 0 to 40 °C in a semi-arid, warm, subtropical climate. The growth rate of this tree is fast. Height growth of 1 m/yr has been reported. T
6.	Melia azedarach Linn.	Bakiain	Meliaceae	A medium to small size, 97 deciduous tree, 6 to 12 m tall. The wood is light, moderately hard, resilient. Flowers are small, lilac colored and fragrant appears between March and May
7.	Azadirachta indica (Linn.) A. Juss.	Neem		A medium to large, usually evergreen tree, 12 to 25 meter tall. It grows on soils which vary from rich loams to nutrient deficient sites which are not saline or waterlogged and where the water table is above 18 m. The wood is heavy, hard and resilient. Flowers are small, white and with the fragrance of honey, appear between March and April.

8.	Pongamia pinnata (Linn.) Merrill	Sukhechain	Fabaceae	A medium size glabrous evergreen tree with a short bole and spreading crown up to 18 m high.

Annexure J: Disease Vector Preventive Plan

To develop a disease preventive plan for a wastewater treatment plant (WWTP), it's essential to focus on minimizing the risk of microbial and chemical exposures for both workers and the surrounding environment. Here's a comprehensive plan to help prevent the spread of diseases in a WWTP:

Employee Training and Hygiene:

Conduct regular training sessions on personal hygiene practices, including handwashing techniques, proper use of personal protective equipment (PPE), and respiratory hygiene.

Promote a culture of hygiene and awareness among employees by displaying posters, distributing educational materials, and organizing workshops.

Encourage sick employees to stay home and establish a sick leave policy that supports responsible behavior.

Personal Protective Equipment (PPE):

Assess the potential hazards in different work areas and provide appropriate PPE to employees, such as gloves, goggles, face shields, respirators, and protective clothing.

Train employees on the correct use, maintenance, and disposal of PPE.

Regularly inspect and replace damaged or worn-out PPE to ensure effectiveness.

Vaccination Programs:

Encourage and facilitate vaccination programs for employees, particularly for diseases that may pose a risk in the WWTP environment (e.g., hepatitis A and B, tetanus, etc.).

Collaborate with local healthcare authorities to provide vaccinations or support vaccination campaigns.

Waste Management:

Establish proper waste management procedures, including the segregation, containment, and disposal of hazardous waste.

Implement measures to prevent accidental exposure to waste materials and ensure compliance with relevant regulations.

Cleaning and Disinfection:

Develop a regular cleaning and disinfection schedule for work areas, equipment, and frequently touched surfaces.

Use appropriate disinfectants recommended for wastewater treatment facilities.

Train employees on proper cleaning procedures and provide them with necessary cleaning supplies.

Monitoring and Testing:

Implement a regular monitoring program to assess microbial and chemical contamination levels in the WWTP.

Monitor employees' health by conducting periodic medical check-ups and screenings.

Collaborate with local health authorities to track any disease outbreaks or emerging health concerns in the area.

Emergency Response Plan:

Develop an emergency response plan to address potential incidents, including disease outbreaks, chemical spills, or accidents.

Train employees on emergency procedures and conduct regular drills to ensure preparedness.

Collaboration and Communication:

Foster communication and collaboration between the WWTP management, employees, and local health authorities.

Establish a reporting system for incidents, near misses, or potential health risks.

Communicate preventive measures, updates, and educational materials to employees and relevant stakeholders.

Remember to regularly review and update the preventive plan based on emerging risks, new guidelines, and technological advancements. Consulting with local health and environmental agencies can provide valuable insights and support in developing an effective disease prevention plan for a WWTP.

Annexure K: Effluent quality guidelines by WHO (1989) Technical Report on 'Health Guidelines for the Use of Wastewater in Agriculture and Aquaculture'

RECOMMENDED MICROBIOLOGICAL QUALITY GUIDELINES FOR WASTEWATER USE IN AGRICULTURE

Category	Reuse condition	Exposed group	Intestinal nematodes[b] (arithmetic mean no. of eggs per litre[c]	Faecal coliforms (geometric mean no. per 100 ml[c])	Wastewater treatment expected to achieve the required microbiological quality
A	Irrigation of crops likely to be eaten uncooked, sports fields, public parksd[d]	Workers, consumers, public	□ 1	□ 1000[d]	A series of stabilization ponds designed to achieve the microbiological quality indicated, or equivalent treatment
B	Irrigation of cereal crops, industrial crops, fodder crops, pasture and trees[e]	Workers	□ 1	No standard recommended	Retention in stabilization ponds for 8-10 days or equivalent helminth and faecal coliform removal
C	Localized irrigation of crops in category B if exposure of workers and the public does not occur	None	Not applicable	Not applicable	Pretreatment as required by the irrigation technology, but not less than primary sedimentation

[a] In specific cases, local epidemiological, socio-cultural and environmental factors should be taken into account, and the guidelines modified accordingly.

[b] *Ascaris* and *Trichuris* species and hookworms.

[c] During the irrigation period.

[d] A more stringent guideline (<200 faecal coliforms per 100 ml) is appropriate for public lawns, such as hotel lawns, with which the public may come into direct contact.

[e] In the case of fruit trees, irrigation should cease two weeks before fruit is picked, and no fruit should be picked off the ground. Sprinkler irrigation should not be used.

Source: WHO (1989)

Water quality guidelines for maximum crop production by FAO 1985:

Traditionally, irrigation water is grouped into various quality classes in order to guide the user to the potential advantages as well as problems associated with its use and to achieve optimum crop production. Thus, the classification of water for irrigation will always be general in nature and applicable under average use conditions. The effect of sodium ions in irrigation water in reducing infiltration rate and soil permeability is dependent on the sodium ion concentration relative to the concentration of calcium and magnesium ions (as indicated by SAR) and the total salt concentration, as shown in the guidelines.

GUIDELINES FOR INTERPRETATION OF WATER QUALITY FOR IRRIGATION

	Units	Degree of restriction on use		
		None	Slight to moderate	Severe
Salinity				
Ec_w[1]	dS/m	< 0.7	0.7 - 3.0	> 3.0
Or				
TDS	mg/l	< 450	450 - 2000	> 2000
Infiltration				
SAR[2] = 0 - 3 and EC_w		> 0.7	0.7 - 0.2	< 0.2
3 -6		> 1.2	1.2 - 0.3	< 0.3
6-12		> 1.9	1.9 - 0.5	< 0.5
12-20		> 2.9	2.9 - 1.3	< 1.3
20-40		> 5.0	5.0 - 2.9	< 2.9
Specific ion toxicity				
Sodium (Na)				
Surface irrigation	SAR	< 3	3 - 9	> 9
Sprinkler irrigation	me/l	< 3	> 3	
Chloride (Cl)				
Surface irrigation	me/l	< 4	4 - 10	> 10
Sprinkler irrigation	m^3/l	< 3	> 3	
Boron (B)	mg/l	< 0.7	0.7 - 3.0	> 3.0
Miscellaneous effects				
Nitrogen (NO_3-N)[3]	mg/l	< 5	5 - 30	> 30
Bicarbonate (HCO_3)	me/l	< 1.5	1.5 - 8.5	> 8.5
pH	Normal range 6.5-8			

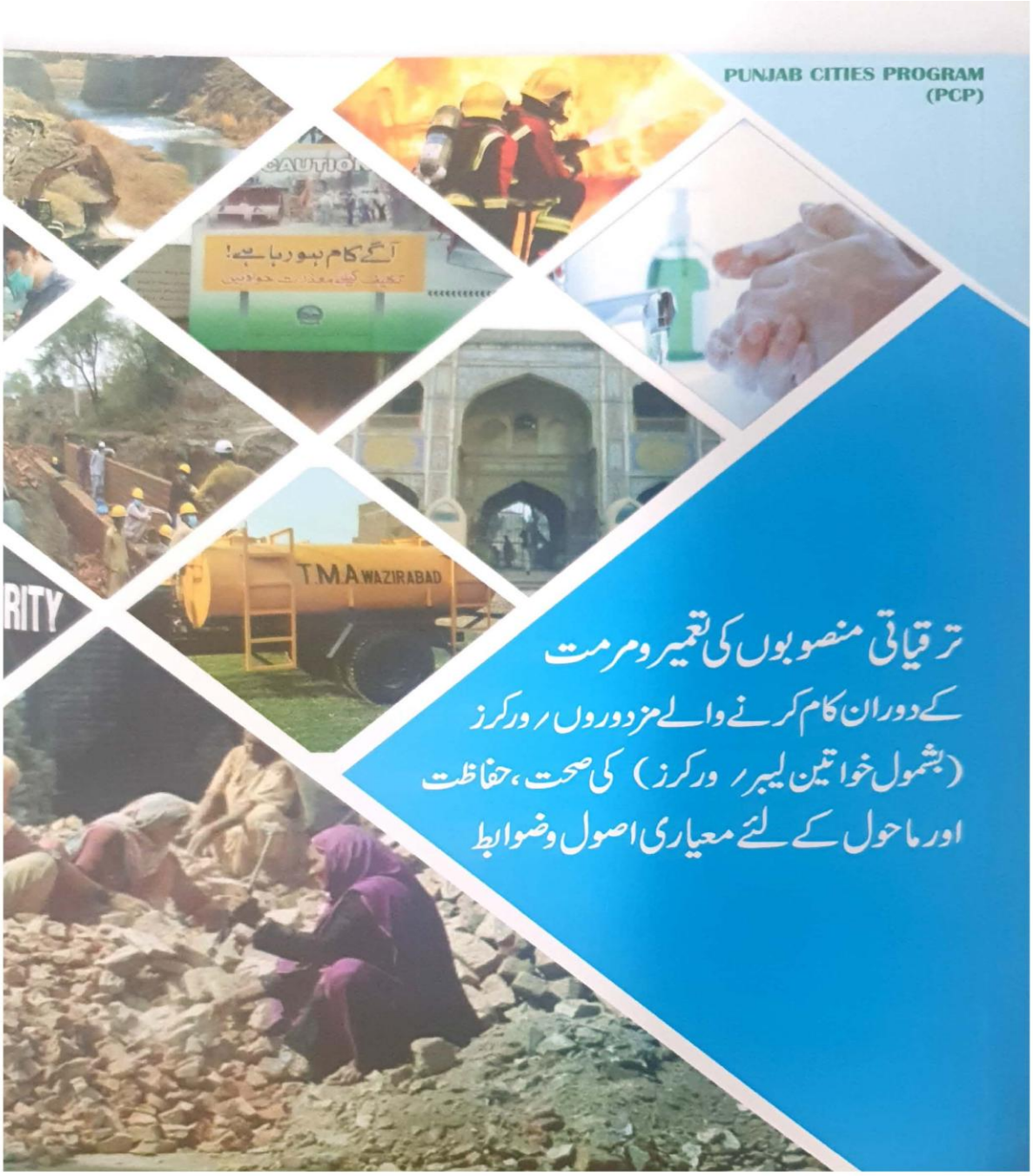
[1] EC_w means electrical conductivity in deciSiemens per metre at 25°C
[2] SAR means sodium adsorption ratio
[3] NO_3-N means nitrate nitrogen reported in terms of elemental nitrogen

Source: FAO(1985

US EPA (2012) suggested regulatory guidelines for irrigation wastewater reuse

Reuse Category	Treatment	Water Quality	Monitoring	Setback Distances
Unrestricted Urban Reuse	Secondary + Filtration + Disinfection	pH 6.0–9.0 BOD_5 10 mg/L Turbidity 2 NTU Fecal coliform 0/100 mL Cl_2 residual 1.0 mg/L (min)	pH weekly BOD_5 weekly Turbidity continuous Fecal coliform daily Cl_2 residual continuous	15 m from potable water supply wells
Restricted Urban Reuse	Secondary + Disinfection	pH 6.0–9.0 BOD_5 30 mg/L TSS 30 mg/L Fecal coliform 200/100 mL Cl_2 residual 1.0 mg/L (min)	pH weekly BOD_5 weekly TSS daily Fecal coliform daily Cl_2 residual continuous	90 m from potable water supply wells 30 m to public access areas
Agriculture Food Crops	Secondary + Filtration + Disinfection	pH 6.0–9.0 BOD_5 30 mg/L TSS 30 mg/L Fecal coliform 0/100 mL Cl_2 residual 1.0 mg/L (min)	pH weekly BOD_5 weekly Turbidity continuous Fecal coliform daily Cl_2 residual continuous	15 m from potable water supply wells
Agriculture Processed Food Crops Non-Food Crops	Secondary + Disinfection	pH 6.0–9.0 BOD_5 30 mg/L TSS 30 mg/L Fecal coliform 200/100 mL Cl_2 residual 1.0 mg/L (min)	pH weekly BOD_5 weekly TSS daily Fecal coliform daily Cl_2 residual continuous	90 m from potable water supply wells 30 m to public access areas

Annexure L: EHS SOPS for Labors/Workers (Including Women Labor/worker) for Construction of Development Project, (URDU)



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حق اشاعت

جملہ حقوق محفوظ ہیں۔

اس اشاعت کا کوئی بھی حصہ پی ایم ڈی ایف سی (PMDFC) کی پیشگی اجازت کے بغیر کسی بھی شکل میں الیکٹرانکس، مکینیکل، فوٹو کاپی، ریکارڈنگ یا کسی اور طرح سے دوبارہ بنایا یا منتقل نہیں کیا جا سکتا۔

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پیش لفظ

لوکل گورنمنٹ اینڈ کمیونٹی ڈویلپمنٹ ڈیپارٹمنٹ اور پنجاب میونسپل ڈویلپمنٹ فنڈ کمپنی (PMDFC) نے ورلڈ بینک کے اشتراک سے پنجاب سیٹیز پروگرام (PCP) کا کامیابی سے اجرا کر دیا ہے. اس منصوبے کے تحت صوبہ پنجاب کے 16 چھوٹے شہروں (MCs) بشمول بہاولنگر، بوریوالا، خانیوال، کوٹ ادو، وہاڑی، گوجرہ، جھنگ، کمالیہ، اوکاڑا، ڈسکہ، حافظ آباد، جہلم، کاموکی، مر[illegible] ترقیاتی کاموں پر کامیابی سے کام جاری ہے۔ ان ترقیاتی منصوبوں میں ویسٹ مینجمنٹ، پانی کی فراہمی، نکاسی آ[illegible] مرمت، کمیونٹی پارکس کی بحالی اور قدرتی آفات کی روک تھام کے منصوبہ جات شامل ہیں۔

پنجاب سیٹیز پروگرام (PCP) کے منصوبہ جات کی تکمیل کے دوران سماجی اور ماحولیاتی مسائل کی جانچ پڑتال اور اس کے حل کے لئے انوائرنمنٹل اینڈ سوشل سیف گارڈز (ESSs) ٹیم نے انوائرنمنٹل اینڈ سوشل مینجمنٹ فریم ورک (ESMF) بنایا ہے. مختلف منصوبہ جات اسی فریم ورک کی رو سے پایہ تکمیل تک پہنچ رہے ہیں۔

تعمیراتی اور ترقیاتی کاموں کی تکمیل میں تعمیراتی جگہوں پر کام کرنے والے مزدوروں/لیبر (بشمول خواتین) کی صحت اور کام کرنے کے دوران حفاظت بہت اہمیت رکھتی ہے۔ اس اہم مسئلہ کو ملحوظِ خاطر رکھتے ہوئے، پی ایم ڈی ایف سی کے زیرِ اہتمام پنجاب سٹیز پروگرام کی انوائرنمنٹ اینڈ سوشل مینجمنٹ ٹیم نے **" ترقیاتی منصوبوں کی تعمیر و مرمت کے دوران کام کرنے والے مزدوروں، ورکرز (بشمول خواتین لیبر/ورکرز) کی صحت، حفاظت اور ماحول کیلئے بنیادی اصول وضوابط"** مرتب کے ہیں تاکہ متعلقہ میونسپل کمیٹیز/کارپوریشنز (MCs) کے عہدیداران اور ٹھیکیداران کو آگاہی فراہم کی جائے۔

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اغراض و مقاصد

۱۔ مجوزہ معیاری اصول وضوابط پنجاب سیٹیز پروگرام (PCP) کے تحت پنجاب میونسپل ڈویلپمنٹ فنڈ کمپنی (PMDFC) کے ماہرین ماحولیات نے پروگرام ڈائریکٹر (PCP) اور ڈپٹی پروگرام ڈائریکٹر (PCP) کی زیرنگرانی تشکیل دیئے ہیں۔

۲۔ شہری ترقی کے ترقیاتی منصوبہ جات کی تعمیر ومرمت میں مزدور/ورکرز بنیادی کردار ادا کرتے ہیں۔ ان (SOPs) کا بنیادی مقصد مزدور/ورکرز (بشمول خواتین لیبر/ورکرز) کو تعمیراتی جگہوں (Constrcution sites) اور لیبر کیمپس میں ماحولیاتی اور سماجی تحفظ فراہم کرنا اور صحت، ماحولیات اور کسی خطرناک صورتحال سے بچنے کے لئے حفاظت فراہم کرنا ہے۔

۳۔ یہ SOPs (PCP) پنجاب سیٹیز پروگرام کے تحت 16 شہروں کی میونسپل کمیٹیز/کارپوریشنز میں تعمیر ومرمت کے تمام پراجیکٹس پر لاگو ہوں گے۔

۴۔ یہ SOPs مزدوروں/کام کرنے والوں/دیہاڑی دار (بشمول خواتین) پر بلاتخصیص لاگو ہوں گے۔

۵۔ ان SOPs کو موثر اور یقینی بنانے کے لیئے انھیں ٹھیکیداروں کے کنٹریکٹ کا حصہ بنانا اور ان پر عمل درآمد کرانا میونسپل کمیٹیز/کارپوریشنز کی ذمہ داری ہے۔ جسے پی ایم ڈی ایف سی کی متعلقہ پروگرام ٹیم یقینی بنائے گی۔

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پیغام

پاکستان کی ترقی میں تعمیراتی کاموں کے دوران کام کرنے والا مزدور طبقہ نہایت اہمیت کا حامل ہے اور انکے صحت وتندرستی سے متعلق مسائل کا مؤثر حل انتہائی ضروری ہے۔ " ترقیاتی منصوبوں کی تعمیر و مرمت کے دوران کام کرنے والے مزدوروں/ورکرز (بشمول خواتین لیبر/ورکرز) کی صحت، حفاظت اور ماحول کیلئے بنیادی اصول وضوابط " کی اشاعت و ترویج اوران پر بروقت عمل درآمد بے حد ضروری ہے جس سے اس طبقے کے بنیادی حقوق کا تحفظ یقینی بنایا جا سکے گا اور اس طرح اس طبقے کی کارکردگی میں بھی بہتری نظر آئے گی۔ ان اصولوں کے تحت ہر ٹھیکیدار کو ورکرز کی صحت اور حفاظت کی ذمہ داری دی گئی ہے۔ مزدور تعمیراتی کاموں کے دوران خطرات کے مطابق ذاتی حفاظتی سامان بھی استعمال کریں گے جس سے دوران کام حادثات میں بھی نمایاں کمی نظر آئے گی۔ ماحولیات اور صحت کے اصولوں کو مدنظر رکھتے ہوئے ہر سطح پر ہم اس بات کو یقینی بنانے کی کوشش کریں گے کہ ہماری پالیسیاں اور طرز عمل فعال ہوں۔ ماحولیات، صحت اور حفاظت (EHS) کے اصولوں کو اپنانے میں کسی بھی قسم کا سمجھوتہ نہیں کیا جائے گا۔ میں امید کرتا ہوں کہ ان اصول وضوابط کی روشنی میں مزدور/ورکرز (بشمول خواتین لیبر) کے حقوق کی پاسداری کو ایک نیا رخ ملے گا اور حکومتی عہدیداران اور ٹھیکیداران بھی اپنی ذمہ داریوں کا احساس کریں گے۔ اور اس سلسلے میں پی ایم ڈی ایف سی اور پنجاب سیٹیز پروگرام کی انوائرنمنٹ اینڈ سوشل سیف گارڈز (ESSs) ٹیم بلاشبہ مبارکباد کی مستحق ہے اور یہ توقع کی جا سکتی ہے کہ وہ مستقبل میں ان قواعد وضوابط کی نگرانی کے لئے بھرپور اقدامات کریں گے۔

محمد عامر نذیر
پروگرام ڈائریکٹر
پنجاب سیٹیز پروگرام (PCP)

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زیر نگرانی

افتخار رسول
ڈپٹی پروگرام ڈائریکٹر
پنجاب سیٹیز پروگرام (PCP)

عاشق چوھدری
سینئر پروگرام آفیسر (انفراسٹرکچر)
پنجاب سیٹیز پروگرام (PCP)

تکنیکی ٹیم

رضوانہ انجم
پروگرام آفیسر (انوائرنمنٹ اینڈ سوشل سیف گارڈز)
پنجاب سیٹیز پروگرام (PCP)

تہمینہ کرن
ڈپٹی پروگرام آفیسر (ESSs)
پنجاب سیٹیز پروگرام (PCP)

کنزیٰ ندیم
ریسرچ اینالسٹ
پنجاب سیٹیز پروگرام (PCP)

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(۱) لیبر کیمپس کے لئے معیاری اصول و ضوابط

سرگرمیاں

۱. مزدور / لیبر کیلئے عارضی کیمپ / رہائش گاہ کے انتظام و قیام کے لئے جگہ کا انتخاب

مسائل

- مقامی آبادی کے وسائل پر اضافی بوجھ
- مقامی آبادی سے تنازعات کا خدشہ
- سماجی، مذہبی، اور سکیورٹی کے مسائل۔

حفاظتی اقدامات

ٹھیکیدار لیبر کیمپس کے قیام کے وقت مندرجہ ذیل باتوں کا خیال رکھے گا:

- کیمپس ایسی جگہوں پر لگائے جائیں جو ماحولیاتی، مذہبی، سماجی اور ثقافتی نقطہ نظر سے قابل قبول ہوں۔
- مقامی آبادی کے ساتھ کسی تنازعہ سے بچنے کے لیئے آبادی سے دور جگہ کا انتخاب کیا جائے
- لیبر کیمپ کی جگہ اور سہولیات سے متعلق ایک تفصیلی نقشہ تیار کر کے متعلقہ میونسپل کمیٹی / کارپوریشن میں جمع کرایا جائے۔
- دیگر مقامی ادارے جیسے صحت، سکیورٹی وغیرہ کو لیبر کیمپ کے مقام اور مدت کے بارے مطلع کیا جائے تا کہ کسی ناگہانی صورتحال سے بچا جا سکے۔
- لیبر کیمپس کے قیام کیلیئے عارضی جگہ / زمین کا حصول زمین کے مالک کی مرضی، طے کردہ کرایہ اور باقاعدہ تحریری معاہدے کی صورت میں کیا جائے۔
- لیبر کیمپس سے ملحقہ بنیادی سہولتوں جیسے پینے کا پانی اور نکاسی آب کے انتظامات سے ماحولیاتی آلودگی میں اضافہ نہ ہو

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سرگرمیاں

۲۔ لیبر کیمپ میں مہیا کی جانے والی سہولیات

مسائل

- مناسب انفراسٹرکچر کی کمی
- بنیادی ضروریات اور سہولیات جیسے پانی اور بجلی کی فراہمی، صفائی ستھرائی کی سہولیات اور نکاسی آب کی فراہمی

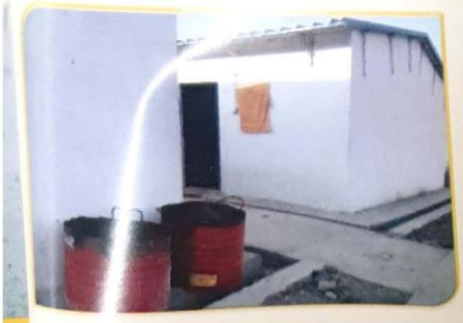
حفاظتی اقدامات

ٹھیکیدار کیمپ سائٹس پر درج ذیل باتوں کا خیال رکھے گا:

- ہوادار اور صاف ستھری رہائش گاہ
- عارضی کمروں کیلئے ایسے میٹریل کا استعمال جو جلد آگ نہ پکڑیں۔
- نہانے، دھونے اور پانی پینے کیلیے صاف اور مناسب پانی کی فراہمی۔
- تمام مزدوروں کیلئے مناسب جگہ کی موجودگی اور محفوظ ماحولیاتی معیار۔
- صاف ستھرے واش رومز اور نکاسی آب کا مناسب انتظام۔
- خواتین لیبر کیلئے پردے اور پرائیویسی کا انتظام اور الگ کمروں کا قیام مزید براں خواتین لیبر کی موجودگی کی صورت میں اُنکے لیے علیحدہ ٹوائلٹس رواش رومز کا انتظام۔
- بین الاقوامی معیار کے مطابق ہر دس افراد کیلئے مطلوبہ ٹوائلٹ کی سہولت کی تعداد ایک ہے۔
- اگر لیبر کیمپ طویل مدت کیلئے لگایا جانا ہو تو بارشوں رسیلاب کے پانی سے بچنے کیلئے مناسب انتظامات کا ہونا اور نکاسی آب کی فراہمی بے حد ضروری ہے۔
- ٹوائلٹس اور عارضی رہائش گاہوں میں بجلی کی فراہمی کو یقینی بنایا جائے۔

سرگرمیاں

۳۔ لیبر کیمپ سے پیدا ہونے والا سالڈ اور لیکوئڈ ویسٹ



مسائل

- تعفن اور بدبو
- صحت کے لیئے نقصان
- ماحولیات کے لیئے نقصان
- مقامی آبادی کے لیئے نقصان
- بیماریاں پیدا کرنے والے بیکٹیریا اور مچھروں کا ذریعہ

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حفاظتی اقدامات

- روزمرہ پیدا ہونے والے کوڑا کرکٹ اور کچن کے کوڑا کرکٹ کے لیئے الگ الگ کوڑا دانوں کا انتظام
- میونسپل کمیٹی رکارپوریشن کی جانب سے منتخب کردہ جگہ پر روزانہ کی بنیاد پر کوڑے کو اٹھانے اور تلف کرنے کا مناسب انتظام۔
- عارضی ٹوائلٹس سے پیدا شدہ فضلے اور لیکوئیڈ ویسٹ کو حفظان صحت کے اصولوں کے مطابق ٹھکانے لگانے کا انتظام۔
- فضلے کو ٹھکانے لگانے کے لیئے رہائش گاہ سے کم از کم 500 میٹر دور جگہ کا انتخاب کیا جائے جس کے اردگرد لوگوں کی رہائش نہ ہو۔
- عارضی ٹوائلٹس سے پیدا شدہ فضلے کو ٹھکانے لگانے کے لیئے منتخب کردہ جگہ کے اردگرد باڑ لگائی جائے یا درخت لگا دیے جائیں تا کہ بچے اور دیگر
- رہائشی داخل نہ ہوں اور مچھر اور بدبو بھی پیدا نہ ہو۔

سرگرمیاں

٤۔ کھانا پکانے کے لئیے ایندھن کی فراھمی

مسائل

- گیس اور دیگر ایندھن سے چلنے والے چولہوں کے پھٹنے کا اندیشہ
- ایندھن کے لیئے لکڑی کے حصول کے لیے درختوں کی کٹائی

حفاظتی اقدامات

ٹھیکیدار کیمپ سائٹس پر درج ذیل سہولیات مہیا کرے گا۔

- لیبر کیمپس میں کھانا پکانے، کمروں کو گرم رکھنے نیز سردیوں میں نہانے اور دھونے کے لیے گرم پانی کے لیے ایندھن کی لکڑی یا دیگر بائیوگیس استعمال کرنے کی حوصلہ شکنی کریں اور ایندھن کیلیے درختوں کی کٹائی نہ کریں۔
- درختوں اور اردگرد جنگلات کی حفاظت کیلیے مزدوروں/لیبر کو آگاہی دی جائے۔
- کھانا پکانے کے لیئے قدرتی گیس یا مٹی کے تیل کے محفوظ چولہے استعمال کیے جائیں۔

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سرگرمیاں

۵۔جانوروں /پرندوں کا شکار خرید و فروخت

مسائل

- جنگلی حیات کو خطرات
- ماحولیاتی وسائل کو خطرات

حفاظتی اقدامات

- لیبر/مزدوروں کو گاہی فراہم کی جائے کیونکہ ارد گرد موجود کسی بھی قسم کی جنگلی حیات کو نقصان پہنچانا ،ان کے گھونسلوں/ پناہ گاہوں میں کوئی مداخلت کرنا، شکار کرنا یا جانوروں/ پرندوں کو قید کرنا اور خرید و فروخت کرنا پنجاب وائلڈ لائف (پروٹیکشن ، پریزرویشن، کنزرویشن اینڈ مینجمنٹ ایکٹ 1974) کے مطابق ممنوع اور سرقابل تعزیر جرم ہے۔

سرگرمیاں

٦۔حفظان صحت کے اصول

مسائل

- حفظان صحت کے رہنما اصولوں پر عملدرآمد کرنے کی صورت میں مختلف بیماریاں مثلاً کرونا وائرس، ملیریا، ایچ آئی وی ایڈز اور دیگر انفیکشنز کے پھیلنے کا خطرہ

حفاظتی اقدامات

ٹھیکیدار لیبر کیمپس میں درج ذیل انتظامات مہیا کرے گا:

- لیبر کیمپس میں صحت وصفائی کی مناسب سہولیات کی فراہمی
- بیرونی علاقوں سے آنے والے مزدوروں کی صحت کی ابتدائی سکریننگ

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- چوبیس گھنٹے لیبر کیمپس میں پرفرسٹ ایڈ بکس کی سہولت موجود ہو۔ کیمپ سائٹس میں ابتدائی طبی امداد سے متعلقہ دواؤں کا موجود ہونا یقینی بنایا جائے۔ اور طویل المدتی کیمپ کی صورت میں کسی ڈسپنسر/ڈاکٹر کا کیمپ میں موجود ہونا چاہیئے۔
- کسی ایمرجنسی کے دوران مزدوروں کے لیے ایمبولینس کی سہولت فراہم کی جاے اور ایمرجنسی سروسز 1122 یا 15 پر کال کرنے کے لیے ٹیلیفون/موبائل کی سہولت مہیا کی جائے۔
- حفظان صحت کے بہترین اصولوں، صفائی ستھرائی اور صحت کی دیکھ بھال کے امور کیلیے مزدوروں/لیبر کو تربیت فراہم کی جائے جس میں تمام مزدوروں کی شرکت کو یقینی بنایا جائے۔
- جنسی طور پر منتقل ہونے والی بیماریوں اور ایڈز وغیرہ کے بارے میں مزدوروں کو مکمل معلومات فراہم کی جائیں اور ان بیماریوں سے بچنے کے لیے حفاظتی اصول اپنانے پر زور دیا جائے۔
- مچھروں اور دیگر بیکٹیریا کو پیدا ہونے سے روکنے کیلیئے حفاظتی سپرے لازمی کرائے جائیں۔
- کرونا سے بچنے کے لیئے ابتدائی سکریننگ یقینی بنائیں اور بار بار ہاتھ دھونے پر زور دیں اور علامات ظاہر ہونے پر فوری طور پر دیگر مزدوروں سے آئسولیشن کے مکمل اصولوں پر سختی سے عمل کیا جائے۔
- لیبر کیمپس کے اندر مناسب مقامات پر حفظان صحت کے اصولوں سے متعلقہ پیغامات اور طریقے ڈسپلے کیے جائیں اور تربیتی پروگرام کا اہتمام کیا جائے۔
- قریبی ڈسپنسری/ہیلتھ کلینک/ہسپتال کے رابطہ نمبر وغیرہ واضح مقامات پر آویزاں کئے جائیں۔

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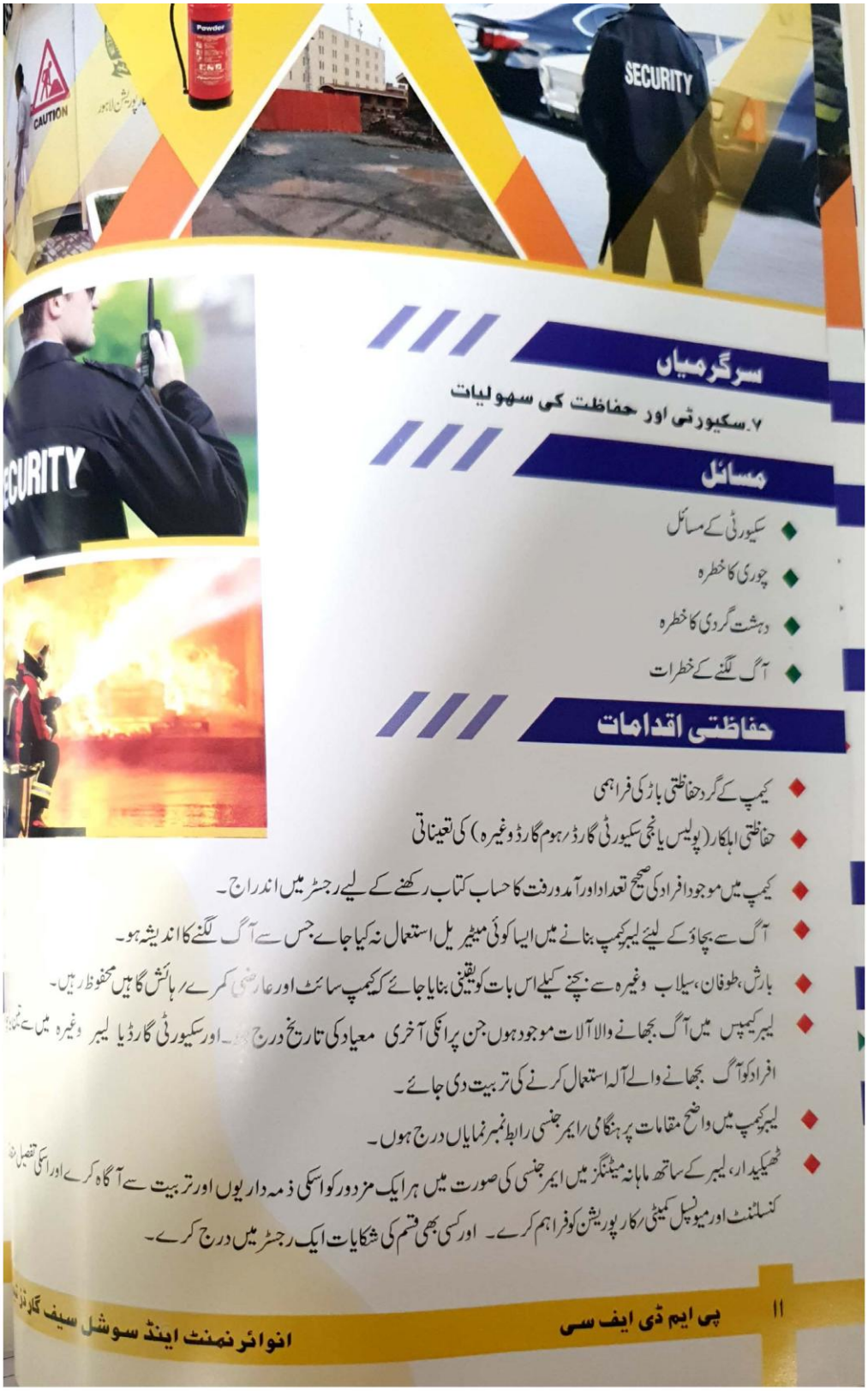

سرگرمیاں

۷۔سکیورٹی اور حفاظت کی سہولیات

مسائل

- سکیورٹی کے مسائل
- چوری کا خطرہ
- دہشت گردی کا خطرہ
- آگ لگنے کے خطرات

حفاظتی اقدامات

- کیمپ کے گرد حفاظتی باڑ کی فراہمی
- حفاظتی اہلکار (پولیس یا نجی سکیورٹی گارڈ/ہوم گارڈ وغیرہ) کی تعیناتی
- کیمپ میں موجود افراد کی صحیح تعداد اور آمد و رفت کا حساب کتاب رکھنے کے لیے رجسٹر میں اندراج۔
- آگ سے بچاؤ کے لیئے لیبر کیمپ بنانے میں ایسا کوئی میٹیریل استعمال نہ کیا جائے جس سے آگ لگنے کا اندیشہ ہو۔
- بارش، طوفان، سیلاب وغیرہ سے بچنے کیلئے اس بات کو یقینی بنایا جائے کہ کیمپ سائٹ اور عارضی کمرے/رہائش گاہیں محفوظ رہیں۔
- لیبر کیمپس میں آگ بجھانے والا آلات موجود ہوں جن پر انکی آخری معیاد کی تاریخ درج ہو۔ اور سکیورٹی گارڈ یا لیبر وغیرہ میں سے تمام افراد کو آگ بجھانے والے آلہ استعمال کرنے کی تربیت دی جائے۔
- لیبر کیمپ میں واضح مقامات پر ہنگامی/ایمرجنسی رابطہ نمبر نمایاں درج ہوں۔
- ٹھیکیدار، لیبر کے ساتھ ماہانہ میٹنگز میں ایمرجنسی کی صورت میں ہر ایک مزدور کو اسکی ذمہ داریوں اور تربیت سے آگاہ کرے اور اسکی تفصیلات کنسلٹنٹ اور میونسپل کمیٹی/کارپوریشن کو فراہم کرے۔ اور کسی بھی قسم کی شکایات ایک رجسٹر میں درج کرے۔

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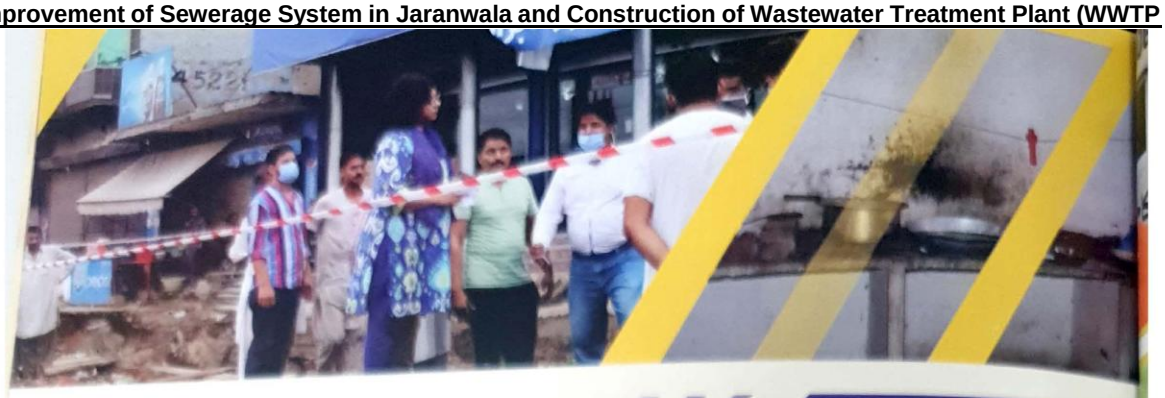

سرگرمیاں

۸۔ حفظان صحت کے اصولوں پر مبنی خوراک (Food Safety)

مسائل

- فوڈ پوائزنگ کا خدشہ
- بیماری کا ڈر

حفاظتی اقدامات

- مزدوروں کو صاف ستھرے اور تازہ کھانے کی فراہمی کو یقینی بنایا جائے۔

سرگرمیاں

۹۔ مذہبی و سماجی میل جول

مسائل

- مذہبی عبادات میں رکاوٹ
- سماجی تعلقات میں دشواری
- سماجی، ثقافتی اور مذہبی خیالات میں شدت پسندی یا لڑائی جھگڑا وغیرہ

حفاظتی اقدامات

- مزدوروں/لیبر کو ان کے مذہب اور فرقے کے مطابق مذہبی عبادات کی سہولیات فراہم کرنا۔
- خواتین لیبر کی موجودگی کی صورت میں ان کے لیے علیحدہ وضو، نماز اور پردے کا اہتمام کیا جائے۔
- تمام مزدوروں کی مذہبی، ثقافتی یا فرقے کی وابستگی سے قطع نظر غیر متعصّبانہ اور برابری کا سلوک کیا جائے۔
- مزدوروں کو تعمیراتی کام کے دوران نماز میں شرکت کرنے یا دیگر عبادات کی اجازت دی جائے اور اس سلسلے میں مذہبی اور سکیورٹی امور کے ذمہ دار مقامی حکام کو تعمیراتی کاموں کے آغاز سے پہلے باضابطہ طور پر آگاہ کیا جائے تاکہ صحت عامہ، معاشرتی اور حفاظتی امور پر موثر نگرانی برقرار رہ سکے۔

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سرگرمیاں

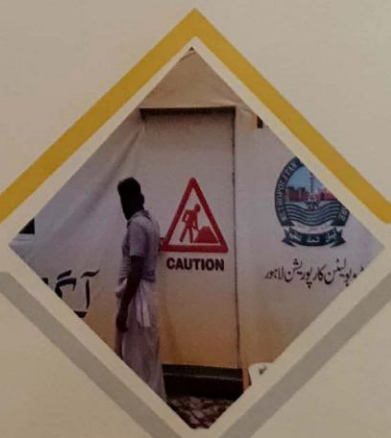
10۔ تعمیراتی کام ختم ہونے کے بعد کی ذمہ داریاں

مسائل

- فالتو سامان اور کوڑا کرکٹ کی گندگی

حفاظتی اقدامات

- کیمپ سائٹ کو اصل حالت میں بحال کیا جائے۔
- تعمیراتی کام کے مکمل ہونے پر فریم اور باڑ لگنے والے دروازوں سمیت لیبر کیمپ میں قائم تمام سہولیات کو ایسے ختم کیا جائے کہ وہاں کا ماحول رہے۔
- کام کم ہونے کے ساتھ لیبر کیمپ کو مرحلہ وار ختم کیا جائے (پورے کام کی تکمیل کا انتظار نہ کریں)
- لیبر کیمپ کو مسمار کرنے کے دوران شور اور کسی بھی قسم کی آلودگی مثلاً گرد و غبار، آبی آلودگی وغیرہ پھیلانے سے گریز کریں۔
- مسمار شدہ ملبہ کو دوبارہ استعمال کرنے اور دوبارہ قابل استعمال کرنے کیلیے کسی لوکل ڈیلر/ٹھیکیدار کی خدمات حاصل کریں۔
- کوڑا کرکٹ اور دوبارہ ناقابل استعمال سامان کو متعلقہ میونسپل کمیٹی/کارپوریشن کی جانب سے مقرر کردہ مقام پر مناسب طریقے سے تلف کیا جائے۔
- لیبر کیمپ کی زمین/جگہ کے مالک کے ساتھ طے شدہ معاہدے کے مطابق کام کریں اور کسی بھی قسم کے اختلاف یا جھگڑے سے گریز کریں۔ مالک جگہ کو متفقہ منصوبہ کے مطابق اسکے حوالے کیا جائے۔
- لیبر/مزدوروں سے آئندہ کام یا مراعات کے جھوٹے وعدے ہرگز نہ کیے جائیں۔



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سرگرمیاں

۱۔تمام قسم کے تعمیراتی سرگرمیاں اور کام

مسائل

- انجریز اور چوٹیں وغیرہ
- نامناسب دیکھ بھال اور بروقت امداد نہ ملنے کے باعث ہلاکت
- دہشت گردی اور سکیورٹی سے متعلق خطرات

حفاظتی اقدامات

- تمام مزدوروں/لیبر سے مقامی/بین الاقوامی معیار کے مطابق مناسب حفاظتی اور قانونی ضوابط کی پیروی کروائی جائے۔
- کام کی جگہ پر اردگرد کے علاقوں میں موجود دہشت گردی اور سکیورٹی کے خطرات کے مطابق حکمت عملی کی بروقت تیاری اور ایک محفوظ وصحت مند ماحول مہیا کیا جائے۔
- مزدوروں/لیبر کیلیے ذاتی حفاظت کے سامان (PPEs) کی فراہمی مثلاً حفاظتی جوتے، ہیلمٹ، ماسک، دستانے، حفاظتی لباس، چشمے، چہرے اور کان کی حفاظت کے سامان وغیرہ کی فراہمی
- تمام مزدوروں/لیبر کو ذاتی حفاظت کے ساز وسامان کے بارے میں مکمل آگاہی اور استعمال کے طریقے کار کے بارے تربیت کا انتظام۔
- اگر تعمیراتی کام ایک ماہ سے زائد عرصہ کیلئے جاری رہنا ہو تو تمام مدت کے لیئے صحت، صفائی اور تربیت یافتہ ماحولیات کی تعیناتی کی جائے جو مزدوروں کی صحت، صفائی اور ماحولیات کے امور کی نگرانی کرے اور انھیں تربیت وآگاہی فراہم کرے۔
- تعمیراتی کاموں کے دوران کسی چوٹ لگنے/انجریز کی صورت میں مزدور/لیبر کے علاج معالجے کی سہولت مہیا کرنا اور بروقت ہسپتال/ڈسپنسری و غیرہ پہچانا ٹھیکیدار کی ذمہ داری ہے۔
- مزید برآں دوران تعمیر تعمیراتی کام کی وجہ سے لگنے والی چوٹ/انجریز کے نتیجے میں ہلاکت ہو جانے کی وجہ سے مزدور/لیبر کی انشورنس اور اس کی بروقت ادائیگی کو یقینی بنایا جائے۔
- ایمرجنسی رابطہ نمبر مثلاً ریسکیو 1122 یا 15 اور دیگر قریبی ہسپتالوں/ڈسپنسری وغیرہ کے نمبر تعمیراتی جگہوں پر واضح درج ہونے چاہیں اور کال کی سہولت فراہم کی جائے۔
- شہری ترقی کے تعمیراتی منصوبہ جات کے اغاز سے قبل صحت، مذہبی امور اور شہری تحفظ/سکیورٹی فراہم کرنے والے مقامی اداروں کو آگاہ رکھا جائے اور اس سلسلے میں متعلقہ میونسپل کمیٹی/کارپوریشن کے تعاون سے موثر حکمت عملی تشکیل دی جائے۔

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سرگرمیاں

۲۔تمام قسم کی تعمیراتی سرگرمیاں اور کنسٹرکشن کے کام

مسائل

- 15 سال سے کم عمر بچوں کی صحت اور تعلیم کا نقصان
- 18 سال اور اس سے کم عمر بچوں کی صحت کا نقصان
- حاملہ مزدور عورتوں کی صحت سے متعلقہ خطرات

حفاظتی اقدامات

- دی پنجاب رسٹرکشن آن ایمپلائمنٹ آف چلڈرن ایکٹ 2016 کے مطابق 15 سال سے کم عمر بچوں کو مزدوری یا کسی سرگرمی کے لیئے کام پر نہیں رکھا جا سکتا۔
- ویسٹ پاکستان میٹرنٹی بنیفٹ آرڈیننس 1958 کے مطابق حاملہ خواتین یا ایسی خواتین جنہوں نے چھ ہفتے قبل بچے کو جنم دیا ہو، کو مزدوری یا کسی سرگرمی کے لیئے کام پر نہیں رکھا جا سکتا۔
- دی پنجاب رسٹرکشن آن ایمپلائمنٹ آف چلڈرن ایکٹ 2016 کے مطابق 18 سال اور اس سے کم عمر کے بچوں کہ محنت مزدوری کے ایسے کام کے لیئے نھیں رکھا جا سکتا جن میں صحت کو نقصان پہنچنے یا چوٹ لگنے یا کسی کیمیائی زہریلے مادے سے نقصان پہنچنے یا جہاں ہڈی ٹوٹنے کا اندیشہ ہو۔

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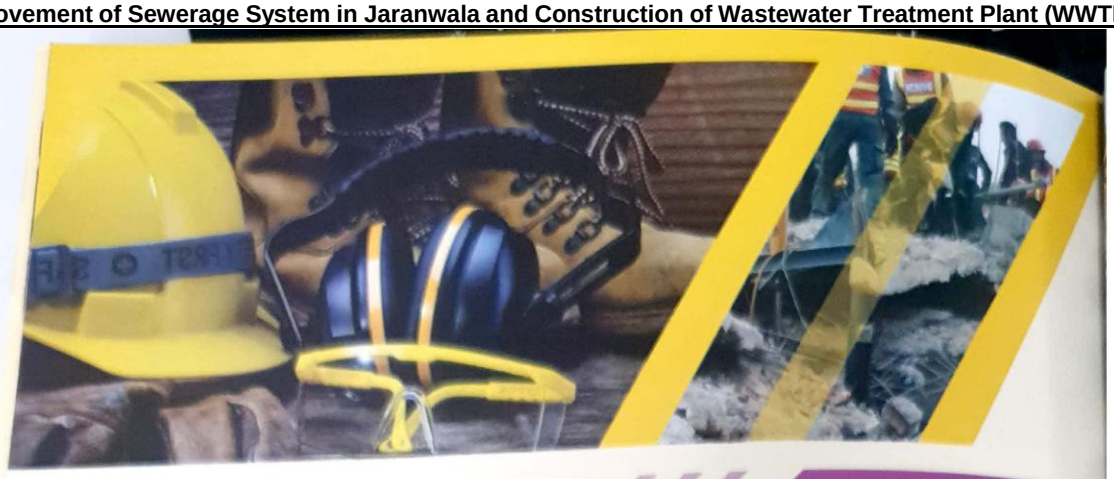

سرگرمیاں

۳.موران تعمیر حادثات کا پیش آنا

مسائل

- فوری طبی امداد کی کمی
- اردگرد کے علاقوں میں ابتدائی طبی سہولیات اور صحت عامہ کا فقدان

حفاظتی اقدامات

- تعمیراتی جگہ پر فرسٹ ایڈ باکس کی موجودگی کہ یقینی بنایا جائے اور فرسٹ ایڈ باکس میں تمام ضروری ادویات اور طبی امداد کا ضروری سامان موجود ہو۔
- تعمیراتی کاموں کے دوران پیش آنے والے حادثات بیماریوں اور واقعات کا مکمل ریکارڈ رکھا جائے۔اسی طرح حادثات کی نوعیت و وجوہات کا مکمل ریکارڈ موجود ہو۔
- مزدوروں کی صحت وسکیورٹی سے متعلق ممکنہ خطرات کی بروقت نشاندہی کی جائے خاص کر وہ خطرات جو جان لیوا ثابت ہو سکتے ہیں۔اور ضروری حفاظتی اقدامات بروقت کئے جائیں۔
- تعمیراتی کاموں سے متعلق مشینری چلانے والے ڈرائیوروں کو دوران ڈرائیونگ قواعد وضوابط پر سختی سے عملدرآمد کرانے کے لئے آگاہی فراہم کی جائے۔
- تعمیراتی علاقوں اور سڑکوں کے ساتھ ساتھ روشنی کا معقول انتظام ہو۔

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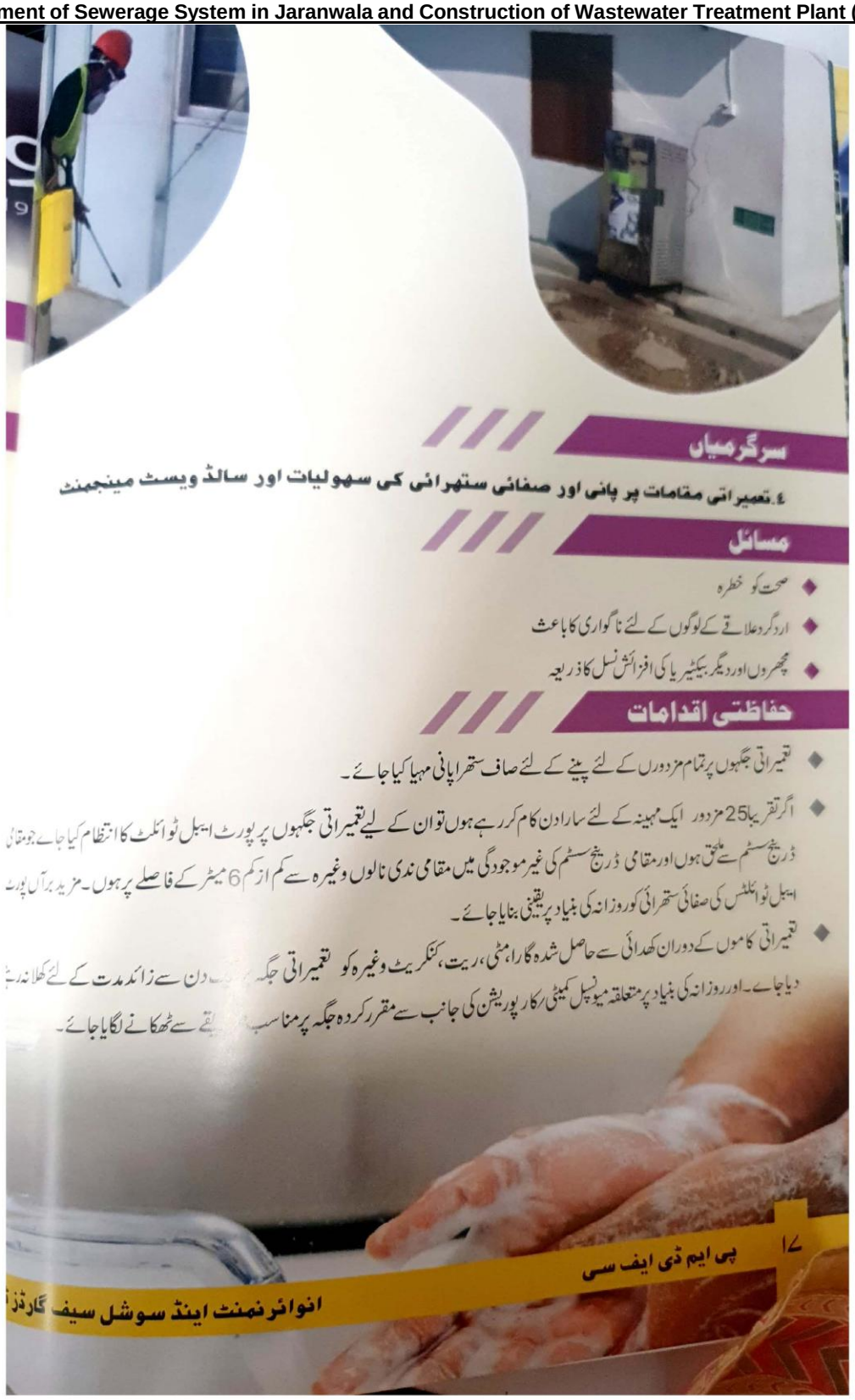

سرگرمیاں

٤.تعمیراتی مقامات پر پانی اور صفائی ستھرائی کی سہولیات اور سالڈ ویسٹ مینجمنٹ

مسائل

- صحت کو خطرہ
- اردگرد علاقے کے لوگوں کے لئے ناگواری کا باعث
- مچھروں اور دیگر بیکٹیریا کی افزائش نسل کا ذریعہ

حفاظتی اقدامات

- تعمیراتی جگہوں پر تمام مزدوروں کے لئے پینے کے لئے صاف ستھرا پانی مہیا کیا جائے۔
- اگر تقریباً 25 مزدور ایک مہینہ کے لئے سارا دن کام کر رہے ہوں تو ان کے لیے تعمیراتی جگہوں پر پورٹ ایبل ٹوائلٹ کا انتظام کیا جائے جو مقامی ڈرینج سسٹم سے ملحق ہوں اور مقامی ڈرینج سسٹم کی غیر موجودگی میں مقامی ندی نالوں وغیرہ سے کم از کم 6 میٹر کے فاصلے پر ہوں۔ مزید برآں پورٹ ایبل ٹوائلٹس کی صفائی ستھرائی کو روزانہ کی بنیاد پر یقینی بنایا جائے۔
- تعمیراتی کاموں کے دوران کھدائی سے حاصل شدہ گارا، مٹی، ریت، کنکریٹ وغیرہ کو تعمیراتی جگہ پر [illegible] دن سے زائد مدت کے لئے کھلا نہ رہنے دیا جائے۔ اور روزانہ کی بنیاد پر متعلقہ میونسپل کمیٹی/کارپوریشن کی جانب سے مقرر کردہ جگہ پر مناسب [illegible] طریقے سے ٹھکانے لگایا جائے۔

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COVID-19
CORONAVIRUS DISEASE 2019

سرگرمیاں

کرونا وائرس کی وبا کے دوران حفاظتی تدابیر

حفاظتی اقدامات

گورنمنٹ آف پنجاب اور ورلڈ بنک کی ہدایات کے مطابق کرونا کی وبا کے دوران درج ذیل حفاظتی اقدامات کی پابندی کروانا کنٹریکٹر کی ذمہ داری ہے:

- کرونا وائرس کی وبا کے دنوں میں کنسٹرکشن سائٹ پر ہاتھ دھونے کیلئے پانی (پورٹ ایبل ہینڈ واشنگ کی سہولت) اور صابن مہیا کیا جائے اور لیبر کو بار بار صابن سے ہاتھ دھونے کی تلقین کی جائے۔
- لیبر کیمپس میں اور کنسٹرکشن سائٹ پر سوشل ڈیسٹینسنگ (6m کا فاصلہ) کے اصولوں کو مدنظر رکھا جائے۔
- کرونا وائرس کی وبا کے دوران اس بات کا خاص خیال رکھا جائے کہ اگر کنسٹرکشن سائٹ پر آبادی میں وبا پھیلی ہوئی ہے تو آبادی اور مقامی لوگوں سے دور رہیں اور کسی قسم کا میل جول نہ رکھیں۔ اسی طرح اگر کوئی مزدور وبا کے علاقے سے روزانہ کی بنیاد پر آ رہا ہے تو اسے باقی لوگوں/مزدوروں سے میل جول سے دور رکھا جائے۔
- اگر کسی مریض میں وائرس کی علامات (خشک کھانسی، نزلہ، زکام، بخار وغیرہ) پائی جائیں تو اسے فوراً دوسرے مزدوروں سے آئسولیٹ کر دیا جائے اور ٹیسٹ کروانے کیلئے کہا جائے۔
- وبا کے دوران کنسٹرکشن سائٹ پر دیگر PPEs کے ساتھ ساتھ مزدوروں کو ماسک لازمی استعمال کرایا جائے۔

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تعمیراتی کاموں کے دوران خطرات/حادثات سے بچنے کیلئے سامان برائے ذاتی حفاظت کا خلاصہ

مقصد	تعمیراتی کام	تجویز کردہ سامان برائے ذاتی حفاظت	تصویریں
آنکھوں اور چہرے کی حفاظت/ تحفظ	اڑنے والے ذرات کا استعمال جیسے پگھلی ہوئی دھات مائع کیمیکل، گیسیں، اور بخارات، روشنی کی شعاعیں۔	حفاظتی عینکیں	
سر کی حفاظت/ تحفظ	ایسے تمام کام جن میں گرنے کا خطرہ ہو، بلندی پر کام کرنا، تعمیراتی کام کو سنبھالنے اور دوسری جگہ پر منتقل کرنے والے کام۔	اوپر اور اطراف سے نقصان سے بچاؤ کیلئے پلاسٹک کے ہیلمٹ	
سماعت کی حفاظت/ تحفظ	کھدائی/شور پیدا کرنے والے کام یا بھاری مشینری استعمال کرنے کی وجہ سے شور۔	سماعت کی حفاظت کے آلہ جات جیسے کن پوش یا ایئر پلگ	
پاؤں کی حفاظت/ تحفظ	تمام تعمیراتی کام جن میں چیزوں کا گرنا یا گھمانا، نوکیلی اشیا شامل ہوں۔ گلانے والا یا گرم مائع، کچرے کے ڈھیر سے کچرا اٹھانا۔	ملنے اور گرنے والی اشیاء، مائعات اور کیمیائی مواد سے بچاؤ کیلئے حفاظتی جوتے یا بوٹ	
ہاتھوں کی حفاظت/ تحفظ	جسمانی صحت کیلئے نقصان دہ سامان جیسے کچرے کو سنبھالنا، ایسے کام جس میں کاٹ یا گہرے زخم لگنے کا اندیشہ ہو، ارتعاش، بہت زیادہ درجہ حرارت۔	ربڑ یا مصنوعی مواد (نیوروپین)، چمڑا، سٹیل، غیر موصل مواد سے بنے گلوز	
تحفظ تنفس	دھول، دھند، شعلے، گیسیں، دھواں، بخارات	ایک جگہ سے دوسری جگہ لے جانے والے یا ایک ہی جگہ پڑے مواد کی فراہمی تعمیراتی جگہ پر بچاؤ کا سامان	
	آکسیجن کی کمی	چہرے کے ماسک جن میں دھول ہٹانے اور ہوا کو صاف رکھنے کیلئے (کیمیائی مواد، دھند، بخارات اور گیسوں سے) مناسب فلٹر لگے ہوں	
جسم / ٹانگوں کی حفاظت/ تحفظ	تمام کام جن میں شدید درجہ حرارت، نقصان دہ مواد، حیاتیاتی ایجنٹ، چھوٹے یا گہرے زخم لگنے کا اندیشہ ہو	مناسب میٹریل سے بنے غیر موصل کپڑے، ایپرن وغیرہ	
اونچائی پر کام کرتے ہوئے حفاظت	تمام تعمیراتی کام جو 4 فٹ یا اس سے زیادہ کی اونچائی پر کے جانے ہوں بشمول سٹریٹ لائٹس وغیرہ	ہیلمٹ، حفاظتی عینکیں، [illegible] کے گلوز اور ربڑ کے بوٹ	
اونچائی پر کام کرتے ہوئے حفاظت	تمام تعمیراتی کام جو 4 فٹ یا اس سے زائد اونچائی پر مسلسل ایک دن کیلئے کیے جانے ہوں	اینکر، بیلٹ، رسی، کنیکٹر، [illegible] ہ جگہ اور ایک ساتھی فرد	

انوائرنمنٹ اینڈ سوشل سیف گارڈ

پی ایم ڈی ایف سی ۱۹

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Summary of Recommended Personal Protective Equipment According to Hazard

Objective	Workplace Hazards	Suggested PPE	Pictures
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation.	Safety Glasses with side-shields, protective shades, etc.	
Head protection	Falling objects, inadequate height clearance, and overhead power cords.	Plastic Helmets with top and side impact protection.	
Hearing protection	Noise, ultra-sound.	Hearing protectors (ear plugs or ear muffs).	
Foot protection	Falling or rolling objects, pointed objects. Corrosive or hot liquids.	Safety shoes and boots for protection against moving & falling objects, liquids and chemicals.	
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures.	Gloves made of rubber or synthetic materials (Neoprene), leather, steel, insulating materials, etc.	
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors.	Facemasks with appropriate filters for dust removal and air purification (chemicals, mists, vapors and gases). Single or multi-gas personal monitors, if available.	
	Oxygen deficiency	Portable or supplied air (fixed	
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and	Insulating clothing, body suits, aprons etc.	
Working at *height	Rehabilitation Projects	Helmet, Safety glasses,	
	New Construction Projects	Anchor, belt, lanyard,	

*In general, use of PPEs is required for any height of 4 ft or more. *Ref: OSHA standards*

۲۰ پی ایم ڈی ایف سی

وائرنمنٹ اینڈ سوشل سیف گارڈز ٹیم

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(3) مقامی آبادی/دکانداروں اور رہائشیوں کی صحت، ماحولیات اور سماجیات سے متعلق رہنما اصول وحفاظتی تدابیر

سرگرمیاں

۱. تعمیراتی کاموں کے لئے منتخب کردہ مقام / جگہ پر کام کا آغاز

مسائل

- مقامی آبادی/رہائشیوں کیلئے تعمیراتی کام کی عدم آگاہی
- لیبر/مزدوروں کے داخلے سے رہائشی عورتوں کے پردے اور پرائیویسی کے مسائل
- مقامی آبادی کے ثقافتی، سماجی، مذہبی ورثہ، اور تاریخی مقامات/عمارتوں کو نقصان

حفاظتی اقدامات

ٹھیکیدار کو چاہئے کہ:

- متعلقہ میونسپل کمیٹی کے انوائرنمنٹ اینڈ سوشل فوکل پرسن (ز) منتخب کردہ اور متعلقہ ریجنل آفس میں موجود ڈپٹی پروگرام آفیسر (انوائرنمنٹ اینڈ سوشل سیف گارڈز) کی موجودگی میں مقامی آبادی/رہائشیوں اور دکانداروں کو تعمیراتی کام کے آغاز سے قبل تعمیراتی کام کی نوعیت، اغراض و مقاصد اور تکمیل کی معینہ مدت کے بارے میں مکمل آگاہی فراہم کرے۔
- تعمیراتی کام کے دوران پیش آنے والے ممکنہ سماجی اور ماحولیاتی مسائل اور ان کے مطابق حفاظتی اقدامات کے بارے میں مقامی رہائشیوں/دکانداروں کو کام کے آغاز سے قبل مکمل آگاہی دی جائے۔
- تعمیراتی کام کے آغاز سے پہلے مقامی رہائشیوں اور دکانداروں کو تعمیراتی کاموں کی وجہ سے سماجی/ماحولیاتی مسائل کی نشاندہی/شکایات/تجاویز کیلئے مندرجہ ذیل رابطہ نمبرز کے بارے میں مکمل آگاہی فراہم کی جائے۔
  - (a) ٹھیکیدار کا موبائل/ٹیلیفون نمبر
  - (b) متعلقہ میونسپل کمیٹی/کارپوریشن کے فوکل پرسن (ز) کے رابطہ نمبرز
  - (c) متعلقہ (PCP) ریجنل آفس میں تعینات ڈپٹی پروگرام آفیسر (ESSs) کے رابطہ نمبرز
- تعمیراتی کام کے آغاز سے پہلے تعمیراتی مقام/جگہ کو فیتہ کی مدد سے باقی علاقہ سے الگ کر دیا جائے۔

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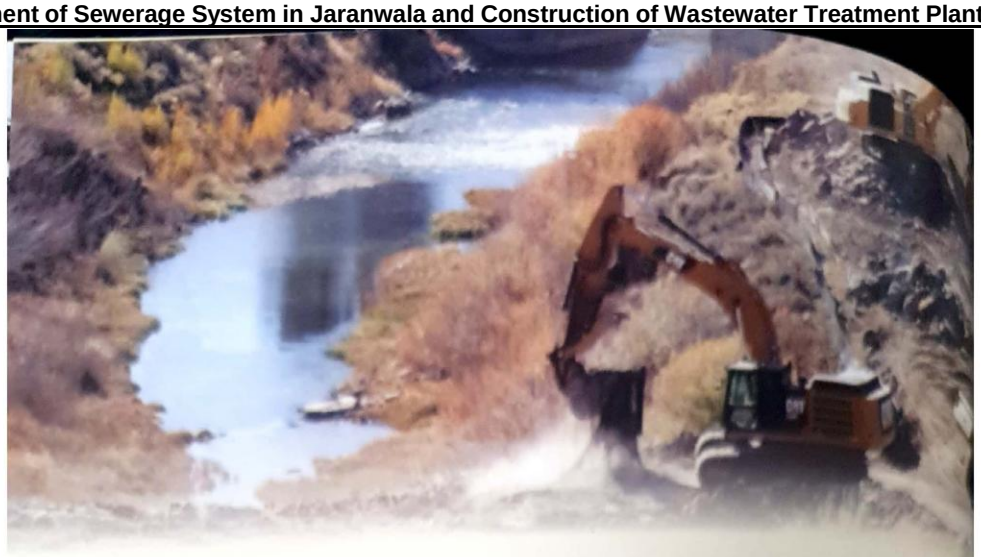

تعمیراتی جگہ/مقام پر واضح بورڈ نصب کر دیئے جائیں، جن پر درج ذیل پیغامات/احکامات لکھے ہوں:

(a) تعمیراتی کام کی نوعیت

(b) ٹریفک میں رکاوٹ کی صورت میں متبادل راستے کا نشان اور عارضی رکاوٹ کا پیغام

(c) ایمرجنسی اور شکایت کیلئے رابطہ نمبرز

(d) (PMDFC) کی جانب سے جاری کردہ سماجی و ماحولیاتی پیغامات پر مبنی پوسٹرز۔

تعمیراتی کام کی جگہ کے ارد گرد 100 میٹر تک کی حدود میں موجود ثقافتی، سماجی، مذہبی ورثہ، تاریخی عمارتوں اور مذہبی مقامات جیسے قبرستان، مساجد، مندر، گرجا گھروں وغیرہ کو کسی قسم کا نقصان نہ پہنچایا جائے اور ان کی حدود میں کوڑا کرکٹ ڈالنے یا فالتو پانی چھوڑنے سے گریز کیا جائے۔ مزید برآں کھدائی کے دوران کسی نئے آثارِ قدیمہ ملنے کی صورت میں متعلقہ مقامی محکمے سے رجوع کیا جائے اور کھدائی کا کام بند کر کے تعمیراتی کام روک دیا جائے۔

سرگرمیاں

2-کھدائی کی جگہ اور اس سے متعلقہ کام اور نالوں کی صفائی اور اس سے حاصل شدہ بھل وغیرہ

مسائل

- کھدائی سے حاصل شدہ مٹی/کنکر کے ڈھیر (Debris) سے رہائشیوں کی آمد و رفت اور ٹریفک میں رکاوٹ
- مقامی رہائشیوں کیلئے ناگواری کا باعث
- مچھروں اور دیگر بیماری پھیلانے والے جراثیم کی افزائش کا ذریعہ
- کھدائی کی جگہ پر گرنے اور حادثات کے خطرات

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حفاظتی اقدامات

- تعمیر کے دوران کھدائی کے تمام مقامات کے اردگرد حفاظتی ٹیپ / پٹی لگائی جائے اور کھدائی کی جگہ کو عارضی طور پر بند کر دیا جائے جس کے باہر اس جگہ سے دور رہنے کیلئے واضح پیغامات لکھے ہوں۔
- کھدائی سے حاصل شدہ مٹی / کنکر / پتھر وغیرہ کو ایک دن سے زیادہ اس جگہ پر موجود نہ رہنے دیا جائے بلکہ روزانہ کی بنیاد پر متعلقہ میونسپل کمیٹی / کارپوریشن کی منتخب کردہ جگہ پر محفوظ طریقے سے ٹھکانے لگایا جائے۔
- نالوں کی صفائی سے حاصل شدہ بھل / ریت وغیرہ کو ایک دن سے زیادہ اس جگہ پر موجود نہ رہنے دیا جائے بلکہ روزانہ کی بنیاد پر اٹھوایا جائے اور بھل کو ایک جگہ سے دوسری جگہ منتقلی کے دوران ٹریکٹر / ٹرالی کو ترپال کی مدد سے ڈھانپ کر لے جایا جائے۔

سرگرمیاں

3-تعمیراتی مشینری / تعمیراتی مٹیریل اور تعمیراتی کاموں کی وجہ سے عارضی بندش

مسائل

- ٹریفک میں رکاوٹ۔

حفاظتی اقدامات

- ٹریفک میں ممکنہ رکاوٹ کے پیش نظر متبادل راستے کا انتخاب اور اس کی نشاندہی کیلیئے پیغامات واضح درج کیے جائیں۔
- ٹریفک کونز (cones) کی مدد سے رکاوٹ والی جگہ کو الگ کر دیا جائے تاکہ حادثات سے بچا جا سکے۔
- ٹریفک میں زیادہ دنوں تک مسلسل رکاوٹ کی صورت میں مقامی ٹریفک پولیس کو آگاہ کیا جائے اور ان کے ساتھ مل کر ٹریفک مینجمنٹ پلان کو تشکیل دیا جائے جس کو واضح مقام پر نصب کیا جائے اور مقامی آبادی / رہائشیوں کو اس کے بارے میں مکمل آگاہی دی جائے۔

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سرگرمیاں

4-تعمیراتی کاموں کی وجہ سے راستوں میں عارضی رکاوٹ اور زمین کا عارضی حصول

مسائل

- روزمرہ معمولات اور کاموں میں رکاوٹ
- رہائشی خواتین کیلئے آنے جانے میں رکاوٹ
- دکانداروں کے دکانوں کے آگے رکاوٹیں اور گاہکوں کیلئے مشکلات
- مستقل وعارضی سٹالز لگا کر بیچنے والے چھوٹے بڑے مستقل دکانداروں کا گاہک کم ہو جانے کی وجہ سے مالی نقصان

حفاظتی اقدامات

- تعمیراتی علاقے میں اردگرد موجود تمام چھوٹی بڑی دکانوں، ٹھیلوں، عارضی خوانچہ فروشوں اور گھروں کا مکمل سروے (تعداد اور مالی حیثیت وغیرہ) او ان پر ممکنہ سماجی اور ماحولیاتی اثرات کا جائزہ لے کر ایک تفصیلی رپورٹ اور متعلقہ پلان میونسپل کمیٹی رکار پوریشن کے دفتر میں موجود ہونی چاہئے جو کہ فوکل پرسنز، متعلقہ علاقائی آفس میں موجود ڈپٹی پروگرام آفیسر (ESSs) کے ساتھ تعمیراتی کاموں کی مالیت کا اندازہ لگائے وقت تیار کی جائیگی۔ اس رپورٹ اور پلان میں موجود سماجی اور ماحولیاتی مسائل کے حل کیلئے مختص رقم اور ان کا صحیح طریقے سے استعمال ٹھیکیدار کے کنٹریکٹ حصہ ہوگا۔
- رہائشیوں کیلئے آنے جانے اور دکانوں رگھروں تک رسائی کے لیے متبادل راستے مہیا کرنا ٹھیکیدار کی ذمہ داری ہے۔
- دکانوں رتھڑوں رٹھیلوں وغیرہ کے باہر کسی بھی قسم کے نقصان یا توڑ پھوڑ کی صورت میں ٹھیکیدار طے شدہ ضوابط کے مطابق اس کی قیمت متاثرہ لوگوں ادا کرے گا۔
- لیبر رمزدور کو تربیت دی جائے کہ وہ اردگرد رہائشی عورتوں اور بچوں کے آنے جانے میں کوئی رکاوٹ نہ بنیں اور رہائشیوں کے ساتھ بلاضرورت کو میل جول نہ رکھیں۔
- تعمیراتی کیمپ لگانے، تعمیراتی کام کرنے یا مشینری اور تعمیراتی سامان رکھنے کے لیئے عارضی طور پر حاصل کی گئی زمین کا کرایہ مالک مکان کو وقت پر ادا کی جائے گا۔ اور تحریری معاہدے کی صورت میں ٹھیکیدار تمام قواعد وضوابط کا پابند ہوگا۔
- تعمیراتی کاموں رکیمپ وغیرہ لگانے کے لیئے عارضی زمین حاصل کرنے کے لئے مقامی رہائشیوں سے مشاورت اور دنوں کے حساب سے کرایہ اور اس کا مکمل طریقہ کار وضع کر کے باقاعدہ لکھا جائے گا۔ اور خلاف ورزی کی صورت میں ٹھیکیدار ذمہ دار ہوگا۔

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سرگرمیاں

۵۔تعمیراتی کام اور ہیوی مشینری کا استعمال

مسائل

- شور غل
- پانی کی آلودگی
- ہوائی آلودگی
- دیگر ماحولیاتی مسائل

حفاظتی اقدامات

- تعمیراتی علاقے میں موجود ہسپتالوں، سکولوں/کالجوں وغیرہ اور رہائشی گھروں/دکانوں کی تمام تفصیلات کی رپورٹ متعلقہ میونسپل کمیٹی کے دفتر میں موجود ہونی چاہئے جو کہ ٹھیکیدار کے کنٹریکٹ کا حصہ ہوگی۔ اور ٹھیکیداران تفصیلات کے مطابق ایسا پلان ترتیب دے گا جس سے اردگرد عمارتوں/رہائشیوں اور دکانداروں کو کم سے کم پریشانی کا سامنا کرنا پڑے مثلاً زیادہ شور پیدا کرنے والے کام دن کے اس حصے میں کئے جائیں جب ہسپتالوں، اور سکولوں/کالجوں وغیرہ کے مصروف اوقات کار نہ ہوں اور ایسے کام جن کی وجہ سے راستوں کی عارضی بندش ضروری ہوں وہ رات کو کیئے جائیں جب رہائشیوں کی آمدورفت نہ ہو۔
- تعمیراتی کاموں کے دوران پیدا شدہ فاضل پانی یا پورٹیبل ٹوائلٹس کا پانی/فضلہ وغیرہ کا محفوظ اور مناسب طریقے سے ٹھکانے لگانے کا بندوبست کیا جائے اور فاضل پانی کو پینے کے صاف پانی کے ساتھ شامل ہونے سے بچانے کا ہر ممکن قدم اٹھایا جائے۔
- واٹر سپلائی کی سکیموں یا ایسی تمام کام جن کی وجہ سے رہائشیوں کو پانی یا سیوریج وغیرہ میں عارضی بندش کا سامنا کرنا پڑ سکتا ہو۔، ایسے تمام کاموں کے آغاز سے پہلے رہائشیوں کو پیشگی اطلاع دی جائے اور متبادل انتظامات کا خاطر خواہ انتظام کیا جائے۔
- تعمیراتی کاموں کی وجہ سے درختوں کی کٹائی سے ہر حال میں گریز کیا جائے اور ناگزیر صورت حال میں ایک درخت کی کٹائی کے متبادل کے طور پر چار درخت لگانا ضروری ہیں۔
- تعمیراتی جگہ پر پیدا ہونے والے کوڑا کرکٹ کو ٹھکانے لگانے کیلئے ڈسٹ بن لگائے جائیں اور ان کو روزانہ کی بنیاد پر متعلقہ میونسپل کمیٹی کی طرف سے مقرر کردہ مقام پر ٹھکانے لگایا جائے۔
- کوڑا کرکٹ اور فاضل پانی اردگرد موجود فصلوں اور ندی نالوں میں پھینکنے سے گریز کریں۔
- گرد و غبار اور ہوائی آلودگی کی صورت میں پانی کا باقاعدہ چھڑکاؤ کریں۔
- تعمیراتی کام کی مدت اور نوعیت کے مطابق کام کے آغاز سے پہلے، کام کے دوران اور کام کے بعد شور، آلودگی، ہوائی آلودگی اور آبی آلودگی کے نمونہ جات حاصل کر کے ان کی جانچ پڑتال کرانا ٹھیکیدار کی ذمہ داری ہے۔ اس سلسلے میں ریجنل آفس میں موجود ڈپٹی پروگرام آفیسر (ESSs) سے مزید رہنمائی حاصل کریں۔
- تعمیراتی کام مکمل ہو جانے کے بعد علاقے کی صفائی ستھرائی اور ماحولیاتی خوبصورتی کا خاص خیال رکھیں اور پہلے سے بہتر حالت میں چھوڑیں۔

* سپریم کورٹ آف پاکستان کے سو موٹو کیس نمبر 25 بر طابق 2009 حوالہ نمبر "کنٹنگ آف ٹریز فار کینال ووائیڈننگ پراجیکٹ لاہور" تعمیراتی کاموں کے دوران ہر ایک درخت کی کٹائی کے متبادل چار درخت لگائے جائیں گے۔

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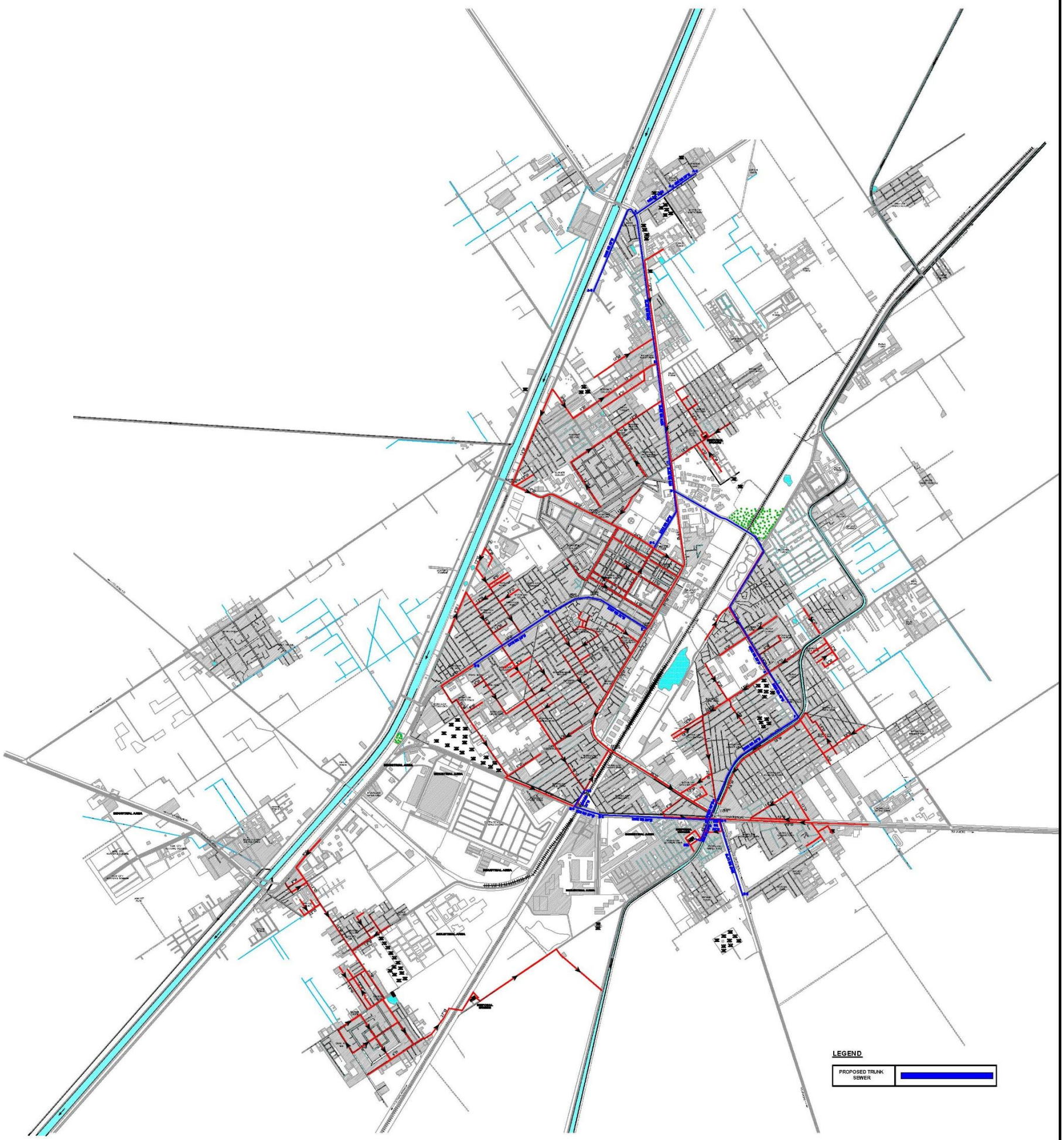
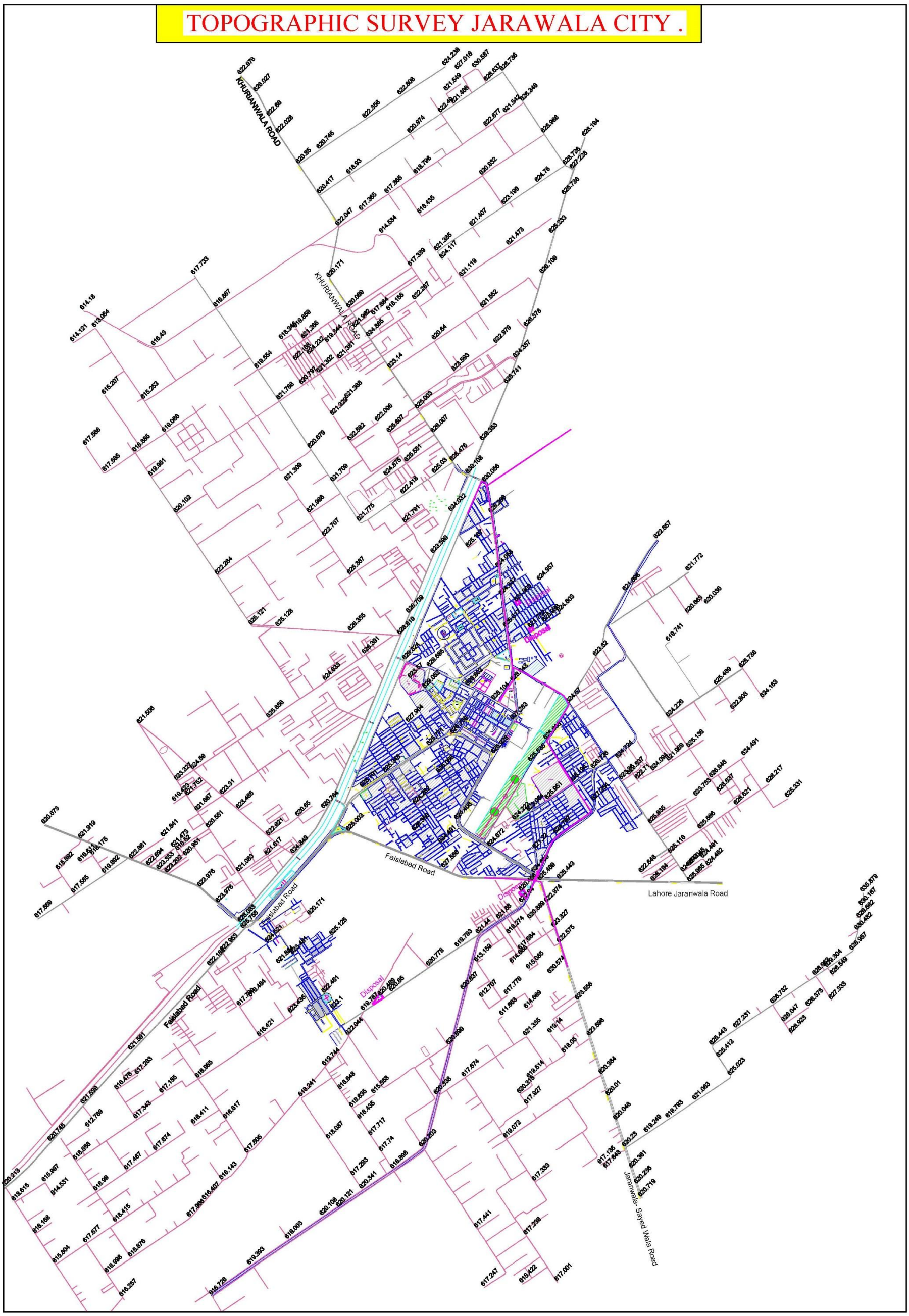
Annexure M: Design (Hydraulic Analysis) Maps and Drawings

Zone	NODE	Length of Line (in ft)		Area (acre)			Population (No's) @ 85 person/acre	Consumption in gallon @ 40 GPCD	Avg. Sew. Flow (in cusec)	Peak Factor	Peak Flow (in cusec)	Infilteration @ 5% of average flow (in cusec)	Storm Allow 50% of peak flow (in cusec)	Design Flow (in cusec)	Proposed Dia (inches)	Velocity ft/sec	Capacity of proposed dia (inch)	Grade of Sewer	Road Levels		Invert Elevation		Elev difference	
				online	Previous	TOTAL													u/s MH	d/s MH	u/s MH	d/s MH	u/s MH	d/s MH
																		ft/ft	ft	ft	s	ft	ft	Ft
Zone C i t y	A3-A	1,903		95.98		95.98	8,158	326,332	0.51	4.23	2.18	0.02572	1.09	3.29	18	2.50	4.42	0.00178	627.64	628.35	617.64	614.25	10.00	14.10
	A2-A1	430		75.82		75.82	6,445	257,788	0.41	4.40	1.79	0.02032	0.89	2.71	15	2.50	3.07	0.00227	627.37	627.91	617.37	616.39	10.00	11.52
	A1-A	855		60.45	75.82	136.27	11,583	463,318	0.73	4.00	2.92	0.03652	1.46	4.41	18	2.50	4.42	0.00178	627.91	628.35	616.14	614.62	11.77	13.73
	A-B	2,916		58.89	232.25	291.14	24,557	989,876	1.56	3.52	5.50	0.07803	2.75	8.32	27	2.50	9.94	0.00103	628.35	624.63	613.87	610.87	14.48	13.76
	B-C	1,970		75.12	291.14	366.26	31,132	1,245,284	1.96	3.39	6.66	0.09817	3.33	10.08	30	2.50	12.27	0.00089	624.63	628.47	610.62	608.87	14.01	19.60
	C-D	570		65.13	366.26	431.39	36,668	1,466,726	2.31	3.30	7.63	0.11562	3.82	11.56	30	2.50	12.27	0.00089	628.47	628.34	608.87	608.36	19.60	19.98
	D1-D	1,213		23.78	153.78	177.56	15,093	603,704	0.95	3.82	3.64	0.04759	1.82	5.51	24	2.50	7.85	0.00121	628.12	628.34	610.33	608.86	17.79	19.48
	D-E	4,882		157.15	608.95	766.10	65,119	2,604,550	4.11	3.00	12.32	0.20533	6.16	18.68	36	2.65	18.72	0.00079	628.34	625.19	607.86	604.00	20.48	21.19
	E-F	1,050		61.55	766.10	827.65	70,350	2,814,010	4.44	2.96	13.14	0.22183	6.57	19.93	42	2.50	24.04	0.0006	625.19	626.50	603.50	602.90	21.69	23.60
	F-G	2,393		133.45	827.65	961.10	81,694	3,267,550	5.15	2.89	14.88	0.25760	7.44	22.58	42	2.50	24.04	0.0006	626.50	624.66	602.90	601.54	23.60	23.12
	G-H	370		198.15	961	1159.25	98,536	3,941,450	6.21	2.80	17.40	0.31070	8.70	26.41	48	2.50	31.40	0.00048	624.66	625.48	601.04	600.86	23.62	24.62
	H3-H2	370		8.45	149	157.43	13,382	535,262	0.84	3.90	3.29	0.04219	1.65	4.98	21	2.50	6.01	0.00145	625.90	625.34	613.90	613.36	12.00	11.98
	H2-H1	533		121.55	157	278.98	23,713	948,532	1.50	3.55	5.30	0.05577	2.65	8.03	27	2.50	9.94	0.00103	625.34	625.48	612.86	612.31	12.48	13.17
	H1-H	2,103		105.63	279	384.61	32,692	1,307,655	2.06	3.36	6.93	0.10308	3.47	10.50	30	2.50	12.27	0.00089	625.48	623.10	612.06	610.19	13.42	12.91
	H5-H4	1,547		28.51	115	143.87	12,229	489,158	0.77	3.96	3.05	0.03856	1.53	4.62	21	2.50	6.01	0.00145	624.16	625.80	612.16	609.92	12.00	15.88
	H4-H	220		348.31	144	492.18	41,835	1,673,412	2.64	3.23	8.52	0.13191	4.26	12.91	36	2.50	17.66	0.00079	625.80	625.48	608.42	608.24	17.38	17.24
	H-D/W	550		5.15	2,009	2014.58	171,239	6,849,572	10.80	2.55	27.59	0.53995	13.80	41.93	54	2.65	42.13	0.00046	625.48	622.59	600.36	600.11	25.12	22.48
												LINE K2-K					0.00							
	K2-K1	1,770		15.25	89.50	104.75	8,904	356,150	0.56	4.17	2.34	0.02808	1.17	3.54	18	2.50	4.42	0.00178	625.34	625.90	616.59	613.44	8.75	12.46
	K1-K	2,157		68.15	104.75	172.90	14,697	587,860	0.93	3.84	3.56	0.04634	1.78	5.39	21	2.50	6.01	0.00145	625.90	625.92	613.19	610.06	12.71	15.86

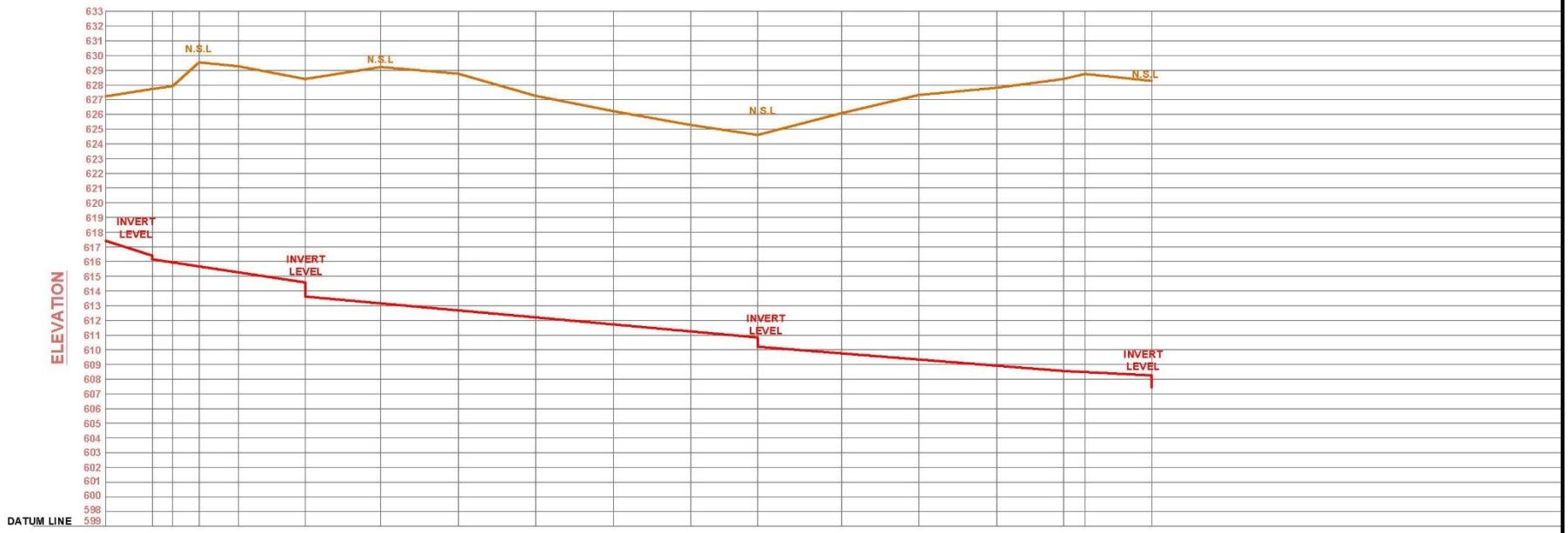
PROPOSED LAY OUT PLAN TRUNK SEWER JARAWALA CITY.




TOPOGRAPHIC SURVEY JARAWALA CITY .
KHURIANWALA ROAD
KHURIANWALA ROAD
Faislabad Road
Faislabad Road
Faislabad Road
Lahore Jaranwala Road
Jaranwala- Sayed Wala Road
Disposal
Disposal
Disposal

PROFILE OF TRUNK SEWER JARAWALA CITY.

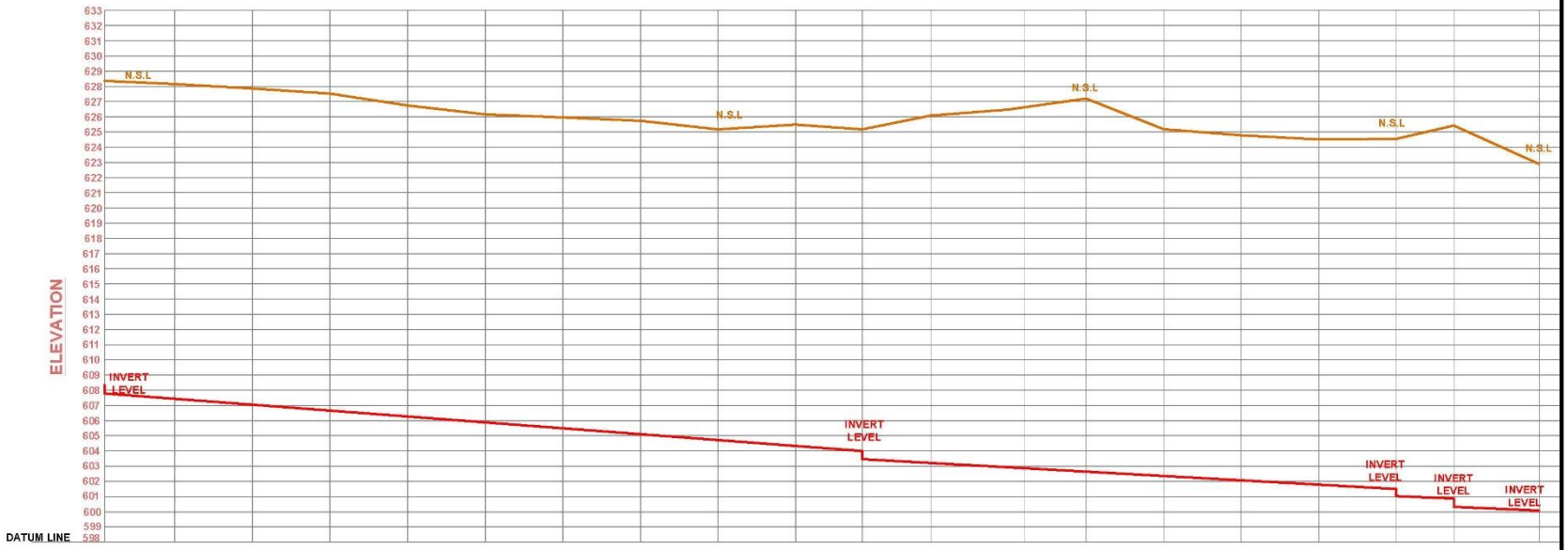
Sheet # 1 Ref Point = A-2 to D



REDUCED DISTANCE	0.0'	300'	430'	600'	855'	1285'	1771'	2271'	2771'	3271'	3771'	4201'	4741'	5241'	5741'	6171'	6311'	6741'
N.S.L	627.37	627.75	627.91	628.50	629.30	628.35	629.12	628.75	627.20	626.12	625.22	624.63	626.12	627.37	627.81	628.47	628.85	628.34
INVERT LEVEL	617.37	616.39	616.14			614.62 613.87						610.87 610.62				608.87		608.36 607.86
VELOCITY (ft/sec)	2.5		2.5			2.5						2.5				2.5		
SLOPE	0.0023		0.00178			0.00103						0.00089				0.00089		
DIA OF PIPE	15" Ø		18" Ø			27" Ø						30" Ø				30" Ø		
REF. POINT	A-2		A-1			A						B				C		D

PROFILE OF TRUNK SEWER JARAWALA CITY.

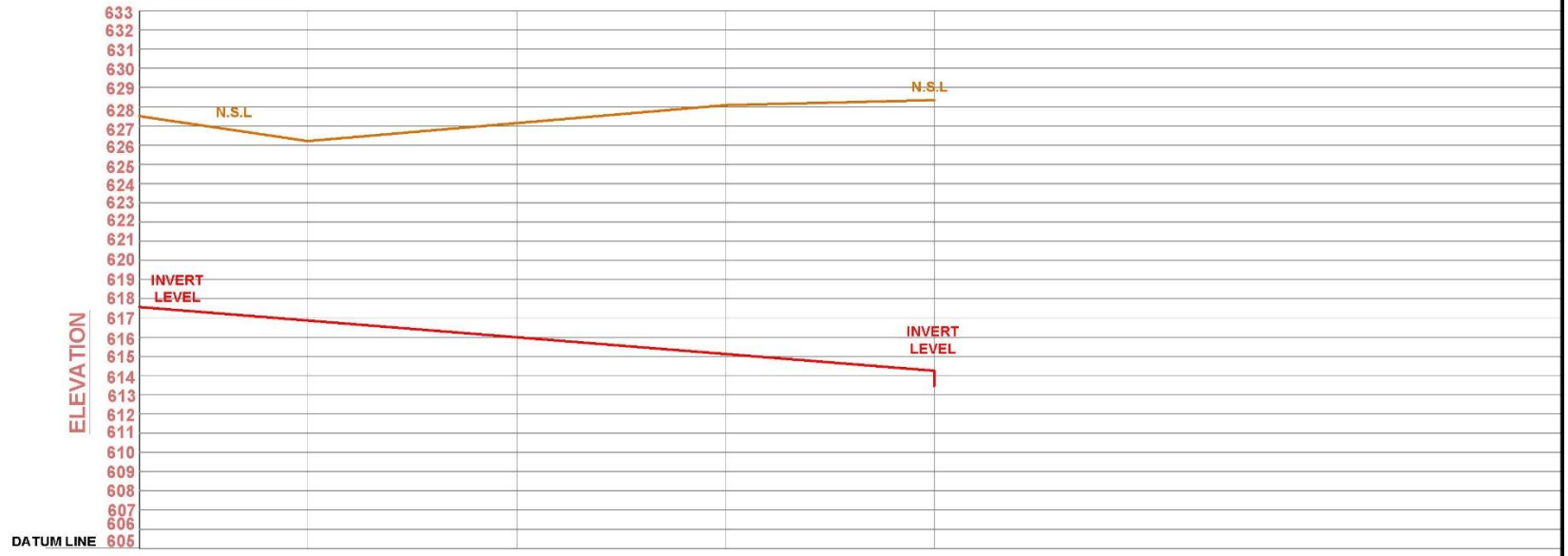
Sheet # 2 Ref Point = D to Disposal Station



REDUCED DISTANCE	6741'	7193'	7693'	8193'	8693'	9193'	9693'	10193'	10693'	11193'	11623'	12066'	12566'	13066'	13566'	14066'	14566'	15066'	15436'	15986'
N.S.L	628.34	628.12	627.85	627.50	626.75	626.15	625.95	625.72	625.12	625.50	625.19	626.12	626.50	627.24	625.12	624.78	624.60	624.66	625.46	622.94
INVERT LEVEL	608.36 607.86										604.00 603.50		602.90					601.54 601.04	600.86 600.36	600.11
VELOCITY	2.65												2.50					2.65	2.65	
SLOPE	0.00079												0.00057					0.00053	0.00046	
DIA OF PIPE	36" Ø												42" Ø					48" Ø	54" Ø	
REF. POINT	D										E		F					G	H	Disposal Station

PROFILE OF TRUNK SEWER JARAWALA CITY.

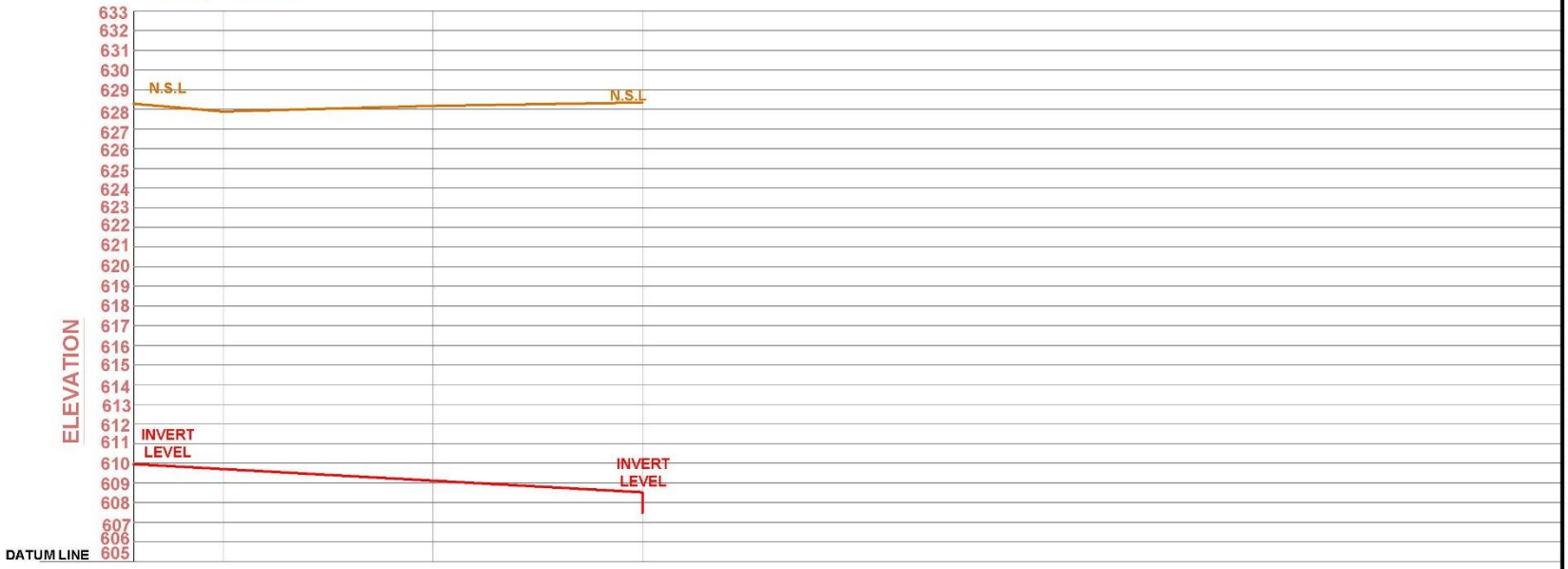
Ref Point = A-3 to A



REDUCED DISTANCE	00'	403'	903'	1403'	1903'
N.S.L	627.64	626.12	627.24	628.03	628.35
INVERT LEVEL	617.64				614.25 613.50
VELOCITY	2.50				
SLOPE	0.00178				
DIA OF PIPE	18" Ø				
REF. POINT	A-3				A

PROFILE OF TRUNK SEWER JARAWALA CITY.

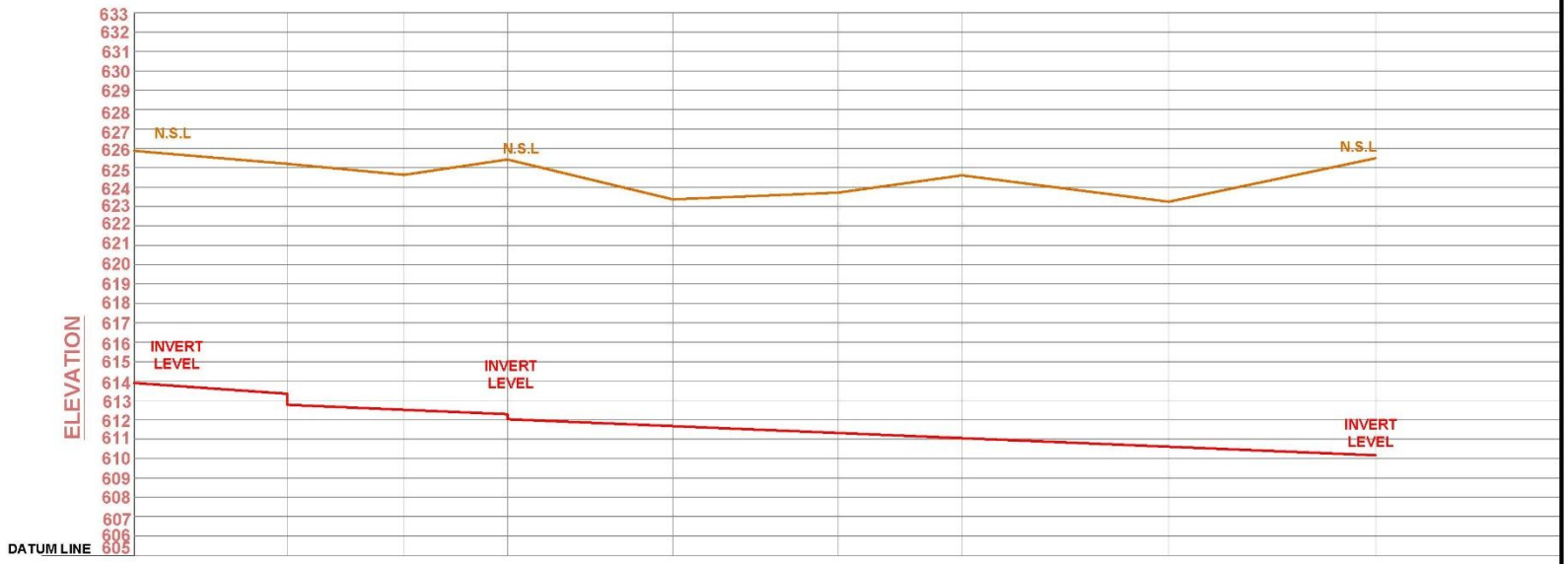
Ref Point = D-1 to D



REDUCED DISTANCE	00'	213'	713'	1213'
N.S.L	628.12	627.98	628.14	628.34
INVERT LEVEL	609.96		608.49	607.49
VELOCITY	2.50			
SLOPE	0.00121			
DIA OF PIPE	24" Ø			
REF. POINT	D-1			D

PROFILE OF TRUNK SEWER JARAWALA CITY.

Ref Point = H-3 to H



REDUCED DISTANCE	00'	370'	653'	903'	1303'	1703'	2003'	2503'	3003'
N.S.L	625.90	625.34	624.60	623.10	622.18	623.88	624.65	623.14	625.48
INVERT LEVEL	613.90	613.36 / 612.86		612.31 / 612.06					610.19
VELOCITY	2.50		2.50				2.50		
SLOPE	0.00145		0.00103				0.00089		
DIA OF PIPE	21" Ø		27" Ø				30" Ø		
REF. POINT	H-3	H-2		H-1					H

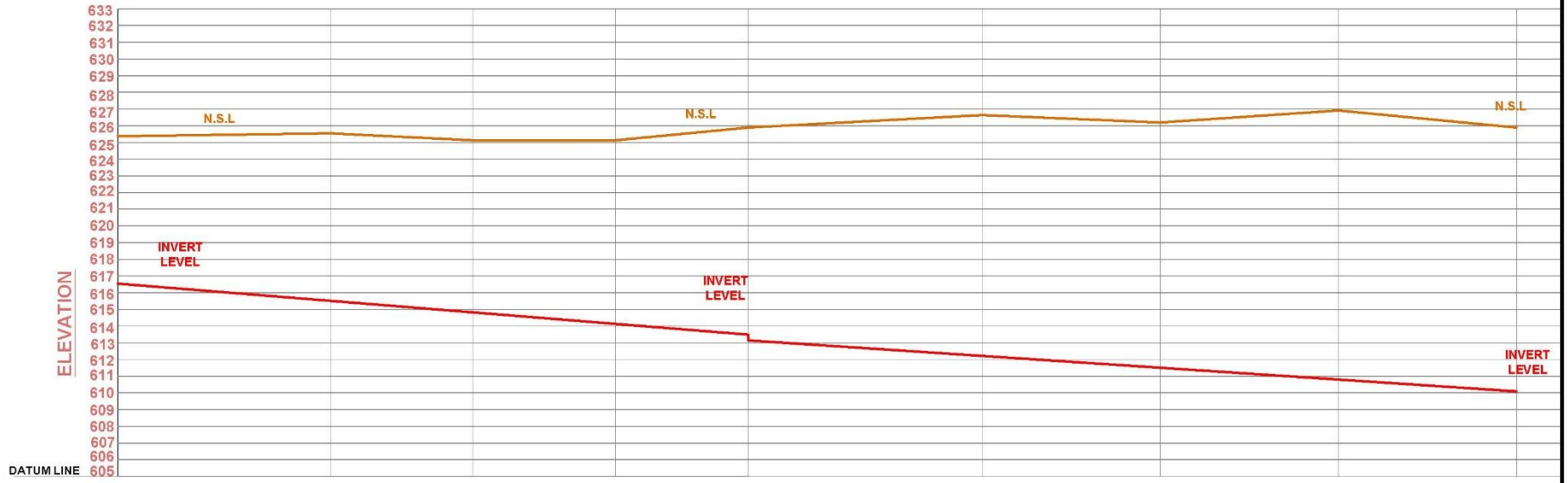
PROFILE OF TRUNK SEWER JARAWALA CITY.

Ref Point = H-5 to H

REDUCED DISTANCE	00'	300'	600'	900'	1200'	1547'	1767'
N.S.L	624.16	622.57	623.32	622.87	623.29	625.80	625.48
INVERT LEVEL	612.16					609.92 / 608.42	608.24 / 600.36
VELOCITY	2.50					2.65	
SLOPE	0.00145					0.00079	
DIA OF PIPE	21" Ø					36" Ø	
REF. POINT	H-5					H-4	H

PROFILE OF TRUNK SEWER JARAWALA CITY.

Ref Point = K-2 to K



REDUCED DISTANCE	00'	597'	997'	1397'	1770'	2427'	2927'	3427'	2927'
N.S.L	625.34	625.50	625.18	625.12	625.90	626.72	626.19	626.90	625.92
INVERT LEVEL	616.59				613.44 613.19				610.06
VELOCITY			2.50				2.50		
SLOPE			0.00178				0.00145		
DIA OF PIPE			18" Ø				21" Ø		
REF. POINT	K-2				K-1				K

15"ø

REINFORCEMENT FOR BARREL

Class	Dia of Bars		No.of Rings	Dia of Rings		Spacing of Rings	
	Inches	mm		Inches	mm	Inches	mm
II	3/16	4.76	20	16.88	429	4.64	118
III	3/16	4.76	22	16.88	429	4.00	102
IV	3/16	4.76	27	16.88	429	3.26	83

REINFORCEMENT FOR BELL

Class	Dia of Bars		No.of Rings	Dia of Rings		Spacing of Bars	
	Inches	mm		Inches	mm	Inches	mm
II	3/16	4.76	2	22.24	565	2.75	70
III	3/16	4.76	2	22.24	565	2.75	70
IV	3/16	4.76	2	22.24	565	2.75	70
	5/32	3.97	2	22.24	565	2.75	70

CONCRETE STRENGTH 4000 psi = 281 Kg / cm ^{2}

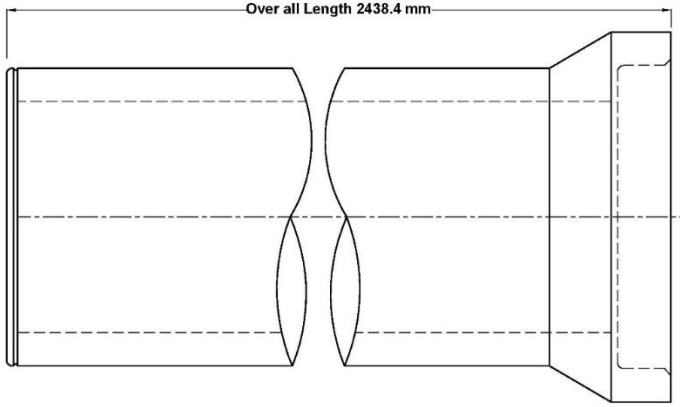
Strength Requirement / Ft Length					
Type of Pipe	Wall	Proof Load		Ultimate Load	
		Lbs	Tonne	Lbs	Tonne
Class II	B	1250	0.57	1825	0.83
Class III	B	1688	0.77	2000	1.13
Class IV	B	2500	1.13	3750	1.70

Longitudinal Reinforcement Class II-IV		
Dia of Bars		No. of Bars
Inches	mm	
3/16	4.76	4
Bars to be Equally Spaced Around 360°		

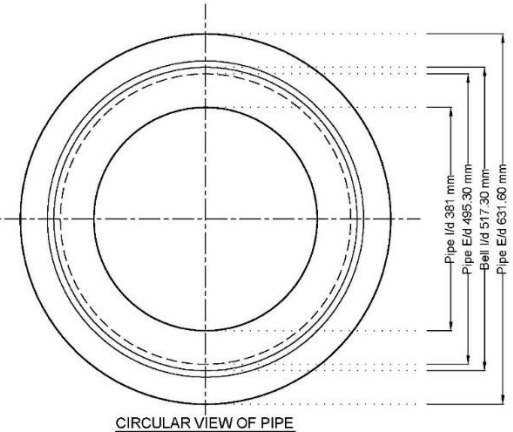
RUBBER RING

Size (Thickness)		Internal Dia	
Inches	mm	Inches	mm
9/16	14.3	18.42	468

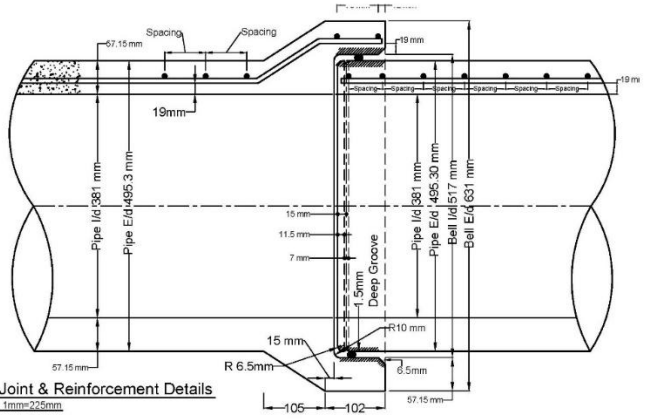
WALL THICKNESS OF PIPE	
Inches	mm
2.25	57



RCC PIPE LONGITUDINAL VIEW
Scale: 1mm=225mm



CIRCULAR VIEW OF PIPE
Scale: 1mm=225



Specific Socket & Spigot Joint & Reinforcement Details
Scale: 1mm=225mm

NOTE:

1. TOLERANCE
   (a) Other than these faces marked //// all tolerances are ASTM C 76
   (b) Faces marked //// ± 1 mm on diameter
2. 381 mm (15") I/d Pipe will not be allowed to be laid beyond depth as identified in WASA design criteria hand book.
3. 381 mm (15") Internal Dia RCC Pipe, Class II III IV ASTM C 76-88

TITLE:

Standard Drawing of RCC Sewer Pipe, Joint & Reinforcement Detail (15"Ø)

Class	Dia of Bars		No.of Rings	SINGLE CAGE			
				Dia of Rings		Spacing of Rings	
	Inches	mm		Inches	mm	Inches	mm
II	3/16	4.76	19	20.35	517	4.62	118
III	3/16	4.76	22	20.35	517	4.25	108
IV	3/16	4.76	39	20.35	517	2.24	57
	1/4	6.35	21	20.35	517	4.17	106

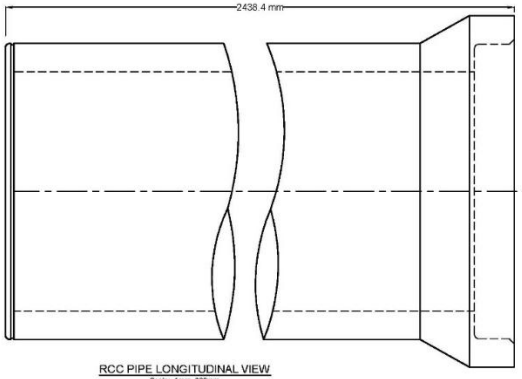
Class	Dia of Bars		No.of Rings	SINGLE CAGE			
				Dia of Rings		Spacing of Rings	
	Inches	mm		Inches	mm	Inches	mm
II	3/16	4.76	2	26.25	667	2.75	70
III	3/16	4.76	2	26.25	667	2.75	70
IV	3/16	4.76	2	26.25	667	2.75	70
	1/4	6.35	2	26.25	667	2.75	70

Strength Requirement / Ft Length					
Type of Pipe	Wall	Proof Load		Ultimate Load	
		Lbs	Tonne	Lbs	Tonne
Class II	B	1499	0.68	2250	1.02
Class III	B	2025	0.92	3000	1.36
Class IV	B	3000	1.36	4500	2.04

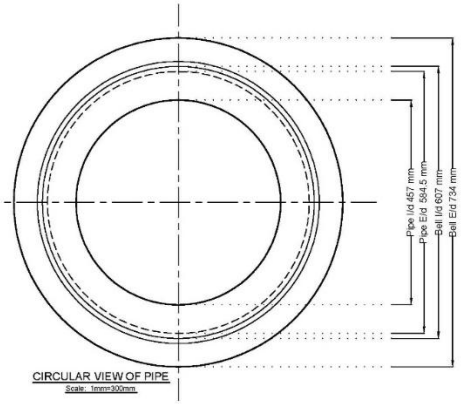
Longitudinal Reinforcement Class II-IV		
Dia of Bars		No. of Bars
Inches	mm	
3/16	4.76	4
Bars to be Equally Spaced Around 360°		

Size (Thickness)		Internal Dia	
Inches	mm	Inches	mm
9/16	14.3	21.73	552

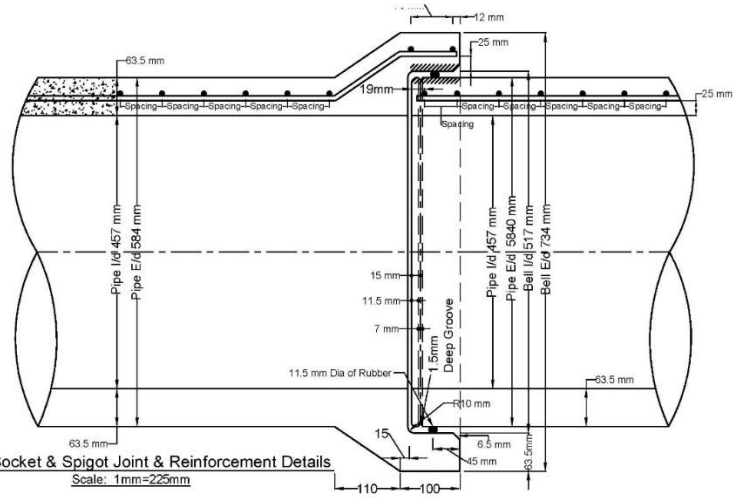
WALL THICKNESS OF PIPE	
Inches	mm
2.5	64



RCC PIPE LONGITUDINAL VIEW
Scale: 1mm=300mm



CIRCULAR VIEW OF PIPE
Scale: 1mm=300mm



Specific Socket & Spigot Joint & Reinforcement Details
Scale: 1mm=225mm

NOTE:

1. TOLERANCE
   (a) Other than these faces marked //// all tolerances are ASTM C 76
   (b) Faces marked //// ± 1 mm on diameter
2. 457 mm (18") I/d Pipe will not be allowed to be laid beyond depth as identified in WASA design criteria hand book.
3. 457 mm (18") Internal Dia RCC Pipe, Class II, III & IV, ASTM C 76-88

TITLE:

Standard Drawing of RCC Sewer Pipe, Joint & Reinforcement Detail (18"Ø)

REINFORCEMENT FOR BARREL

Class	Dia of Bars		No of Rings	Dia of Rings		Spacing of Rings	
	Inches	mm		Inches	mm	Inches	mm
II	**3/16**	**4.76**	**19**	**23.74**	**603**	**4.56**	**116**
III	**3/16**	**4.76**	**22**	**23.74**	**603**	**4.25**	**108**
IV	3/8	9.52	13	23.74	603	6.69	170
	1/4	**6.35**	**31**	**23.74**	**603**	**2.80**	**71.23**

REINFORCEMENT FOR BELL

Class	Dia of Bars		No.of Rings	Dia of Rings		Spacing of Rings	
	Inches	mm		Inches	mm	Inches	mm
II	**3/16**	**4.76**	**2**	**30.15**	**766**	**2.75**	**70**
III	**3/16**	**4.76**	**2**	**30.15**	**766**	**2.75**	**70**
IV	3/8	9.52	2	30.15	766	2.75	70
	1/4	**6.35**	**2**	**30.15**	**766**	**2.75**	**70**

CONCRETE STRENGTH 4000 psi = 281 Kg / cm ˆ

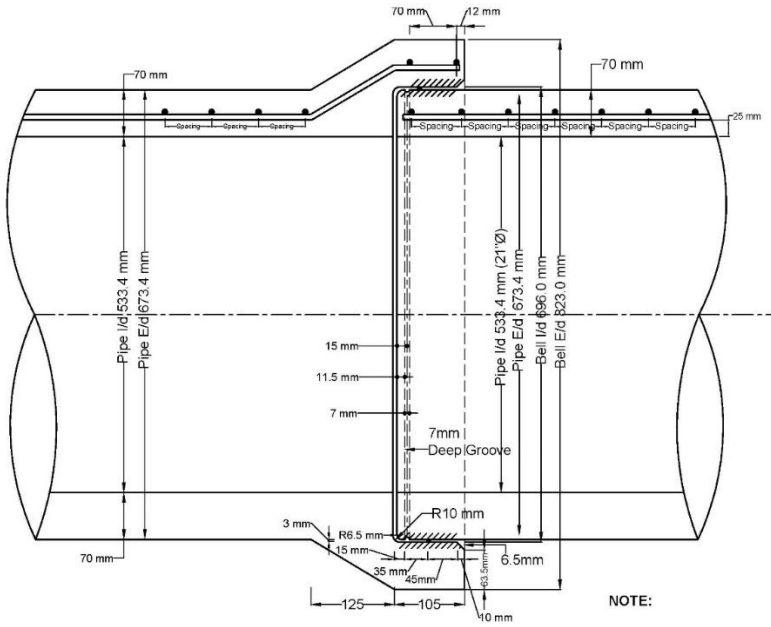
Strength Requirement / Ft Length					
Type of Pipe	Wall	Proof Load		Ultimate Load	
		Lbs	Tonne	Lbs	Tonne
Class II	B	1750	0.79	2625	1.19
Class III	B	2363	1.07	3500	1.51
Class IV	B	3500	1.58	5250	2.36

Longitudinal Reinforcement Class II-IV		
Dia of Bars		No. of Bars
Inches	mm	
3/16	4.76	4
Bars to be Equally Spaced Around 360°		

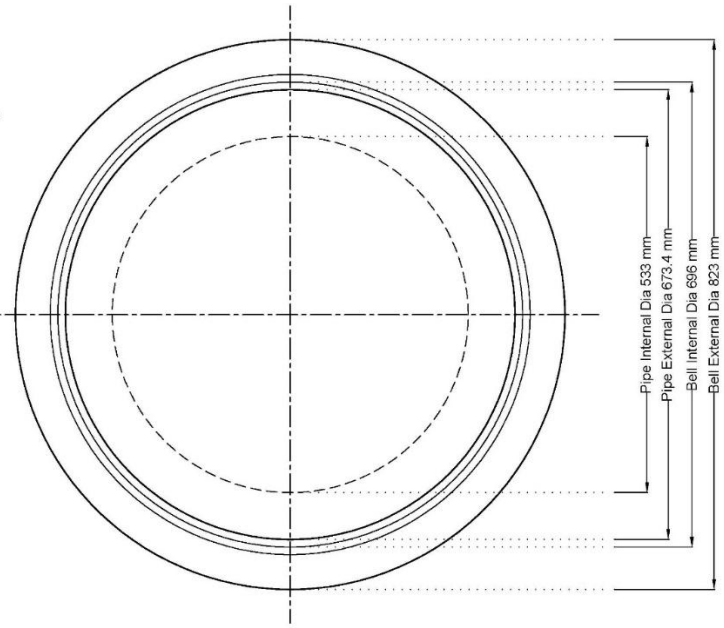
RUBBER RING

Size (Thickness)		Internal Dia	
Inches	mm	Inches	mm
9/16	14.3	25.07	637

WALL THICKNESS OF PIPE	
Inches	mm
2.75	70



Specific Socket & Spigot Joint & Reinforcement Details
Scale: 1mm=200mm



CIRCULAR VIEW OF PIPE
Scale: 1mm=200mm

NOTE:

1. TOLERANCE
   (a) Other than these faces marked //// all tolerances are ASTM C 76
   (b) Faces marked //// ± 1 mm on diameter
2. 534mm (21") I/d Pipe will not be allowed to be laid beyond depth as identified in WASA design criteria hand book.
3. 534mm (21") Internal Dia RCC Pipe, Class II, III & IV, ASTM C 76-88

TITLE:

Standard Drawing of RCC Sewer Pipe, Joint & Reinforcement Detail (21"Ø)

REINFORCEMENT FOR BARREL

Class	Dia of Bars		Spacing		No.of Rings	Dia of Rings	
	Inches	mm	Inches	mm		Inches	mm
II	**3/16**	**4.76**	**2.65**	**65**	**35**	**29.76**	**756**
III	1/4	6.35	3.70	94	24	29.76	756
	3/16	**4.76**	**2.08**	**53**	**43**	**29.76**	**756**
IV	**1/4**	**6.35**	**1.88**	**48**	**47**	**29.76**	**756**
	3/8	9.52	4.25	108	21	29.76	756

REINFORCEMENT FOR SOCKET

Class	Dia of Bars		Spacing		No.of Rings	Dia of Rings ± 6mm	
	Inches	mm	Inches	mm		Inches	mm
II	**3/16**	**4.76**	**1.02**	**26**	**3**	**32.20**	**818**
III	1/4	6.35	1.02	26	3	32.04	814
	3/16	**4.76**	**1.02**	**26**	**3**	**32.20**	**818**
IV	**1/4**	**6.35**	**1.02**	**26**	**3**	**32.04**	**814**
	3/8	9.52	1.02	26	3	31.81	808

REINFORCEMENT FOR SPIGOT

Class	Dia of Bars		Spacing		No.of Rings	Dia of Rings ± 6mm	
	Inches	mm	Inches	mm		Inches	mm
II	**3/16**	**4.76**	**1.02**	**26**	**3**	**28.34**	**720**
III	1/4	6.35	1.02	26	3	28.36	720
	3/16	**3.76**	**1.02**	**26**	**3**	**28.34**	**720**
IV	**1/4**	**6.35**	**1.02**	**26**	**3**	**28.34**	**720**
	3/8	9.52	1.02	26	3	28.34	720

Longitudinal Reinforcement Class II-IV		
Dia of Bar		No. of Bars
Inches	mm	
1/4	6.35	8
3/16	**4.76**	**12**
Bars to be Equally Spaced Around 360°		

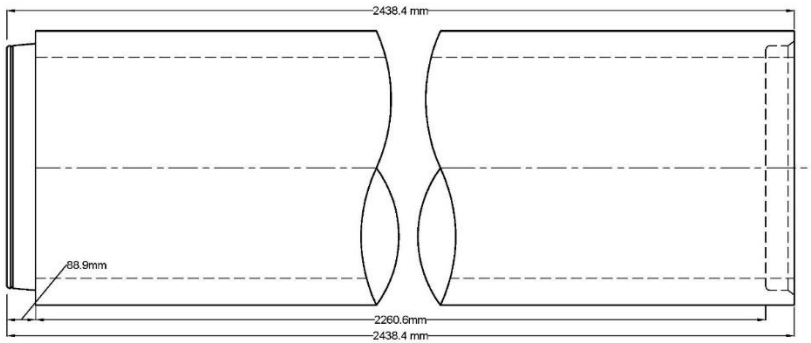
CONCRETE STRENGTH 4000 psi = 281 Kg / cm²

Strength Requirement / Ft Length					
Type of Pipe	Wall	Proof Load		Ultimate Load	
		Lbs	Tonne	Lbs	Tonne
Class II	B	2250	1.02	3375	1.53
Class III	B	3038	1.37	4500	2.04
Class IV	B	4500	2.04	6750	3.06

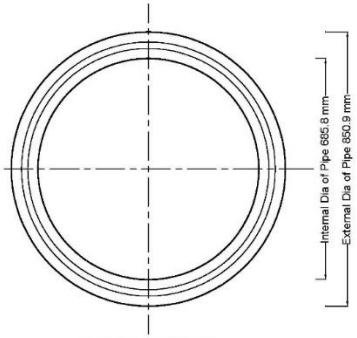
WALL THICKNESS OF PIPE	
Inches	mm
3.25	82.5

RUBBER RING

Rubber Ring	Size (Thickness)		Internal Dia	
	Inches	mm	Inches	mm
For 27"Ø Pipe	9/16	14.3	28.08	713



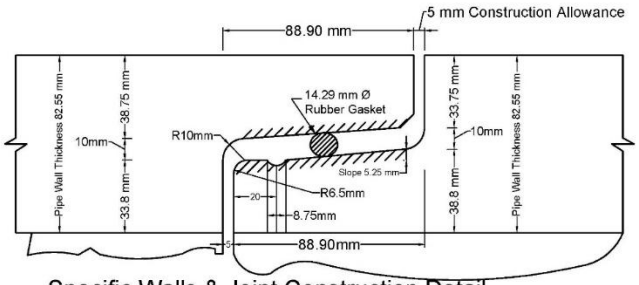
RCC LONGITUDINAL VIEW
Scale: 1mm=100mm



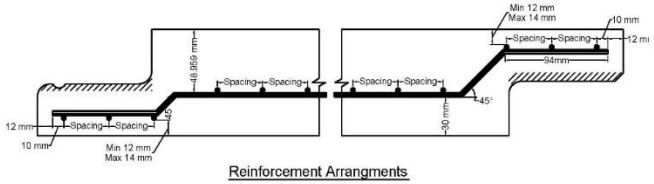
CIRCULAR VIEW OF PIPE
Scale: 1mm=100mm

NOTE:

1. TOLERANCE
   (a) Other than these faces marked //// all tolerances are ASTM C 76
   (b) Faces marked //// ± 1 mm on diameter
2. 686mm (27") I/d Pipe will not be allowed to be laid beyond depth as identified in WASA design criteria hand book.
3. 686mm (27") Internal Dia RCC Pipe, Class II, III & IV, ASTM C 76-88



Specific Walls & Joint Construction Detail
Scale: 1mm=60mm



Reinforcement Arrangments
Scale: 1mm=100mm

TITLE:

Standard Drawing of RCC Sewer Pipe, Joint & Reinforcement Detail (27"Ø)

30 x

REINFORCEMENT FOR BARREL

Class	Dia of Bars		Spacing		No.of Rings	Dia of Rings	
	Inches	mm	Inches	mm		Inches	mm
II	**3/16**	**4.76**	**2.34**	**59**	**42**	**32.83**	**835**
	1/4	6.35	4.36	110	23	32.83	835
III	3/16	4.76	1.81	46	54	32.83	835
	1/4	**6.35**	**3.40**	**87**	**29**	**32.83**	**835**
IV	**1/4**	**6.35**	**1.69**	**43**	**54**	**32.83**	**835**
	3/8	9.53	9.60	244	11	32.83	835

REINFORCEMENT FOR SOCKET

Class	Dia of Bars		Spacing		No.of Rings	Dia of Rings	
	Inches	mm	Inches	mm		Inches	mm
II	**3/16**	**4.76**	**1.38**	**35**	**3**	**36.41**	**904**
	1/4	6.35	1.38	35	3	36.41	904
III	3/16	4.76	1.38	35	3	36.41	904
	1/4	**6.35**	**1.38**	**35**	**3**	**36.41**	**904**
IV	**1/4**	**6.35**	**1.38**	**35**	**3**	**36.41**	**904**
	3/8	9.53	1.38	35	3	36.41	904

REINFORCEMENT FOR SPIGOT

Class	Dia of Bars		Spacing		No.of Rings	Dia of Rings	
	Inches	mm	Inches	mm		Inches	mm
II	**3/16**	**4.76**	**1.38**	**35**	**3**	**31.42**	**799**
	1/4	6.35	1.38	35	3	31.42	799
III	3/16	4.76	1.38	35	3	31.42	799
	1/4	**6.35**	**1.38**	**35**	**3**	**31.42**	**799**
IV	**1/4**	**6.35**	**1.38**	**35**	**3**	**31.42**	**799**
	3/8	9.53	1.38	35	3	31.42	799

Longitudinal Reinforcement Class II-IV		
Dia of Bar		No. of Bars
Inches	mm	
1/4	6.35	8
3/16	**4.76**	**12**
Bars to be Equally Spaced Around 360°		

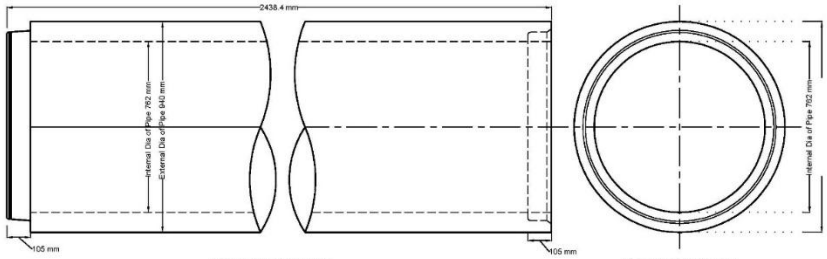
CONCRETE STRENGTH 4000 psi = 281 Kg / cm²

Strength Requirement / Ft Length					
Type of Pipe	Wall	Proof Load		Ultimate Load	
		Lbs	Tonne	Lbs	Tonne
Class II	B	2500	1.134	3750	1.701
Class III	B	3375	1.531	5000	2.268
Class IV	B	5000	2.268	7500	3.400

RUBBER RING

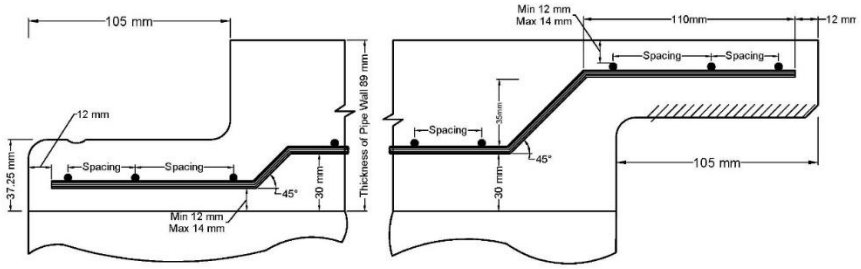
Rubber Ring	Size (Thickness)		Internal Dia	
	Inches	mm	Inches	mm (-5%)
For 30"Ø Pipe	9/16	14.33	31.29	795

WALL THICKNESS OF PIPE	
Inches	mm
3.5	89

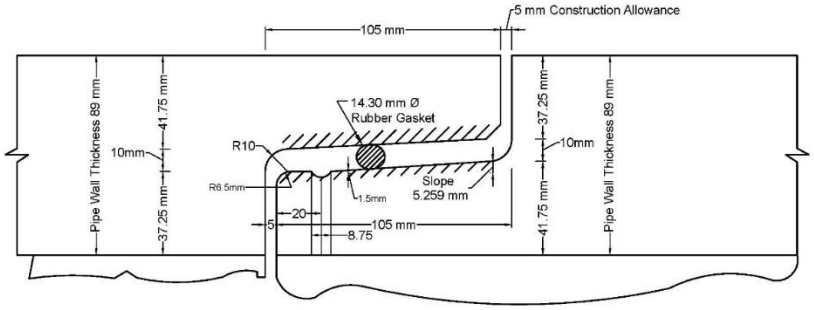


RCC LONGITUDINAL VIEW
Scale: 1mm=600mm

CIRCULAR VIEW OF PIPE
Scale: 1mm=600mm



Reinforcement Arrangments
Scale: 1mm=70mm



Specific Walls & Joint Construction Detail
Scale: 1mm=60mm

NOTE:

1. TOLERANCE

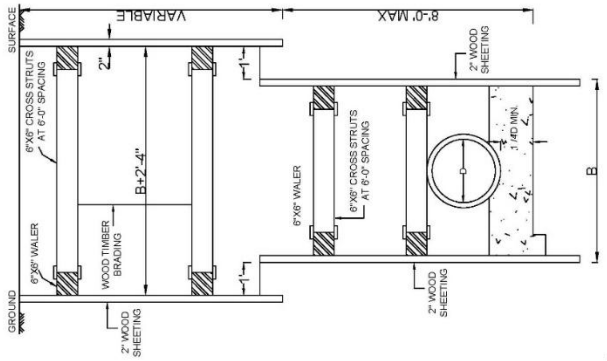
(a) Other than these faces marked //// all tolerances are ASTM C 76
(b) Faces marked //// + 1 mm on diameter

2. 762mm (30") I/d Pipe will not be allowed to be laid beyond depth as identified in WASA design criteria hand book. -

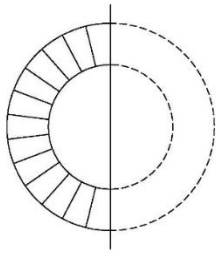
3. 762mm (30") Internal Dia RCC Pipe, Class II, III & IV, ASTM C 76-88

TITLE:

Standard Drawing of RCC Sewer Pipe, Joint & Reinforcement Detail (30"Ø)



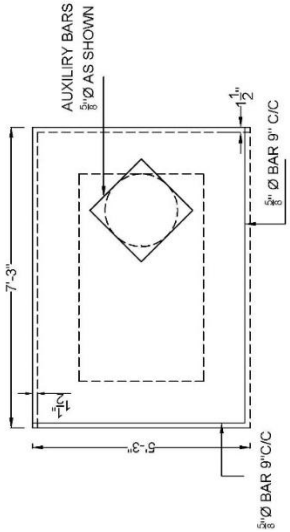
SECTION



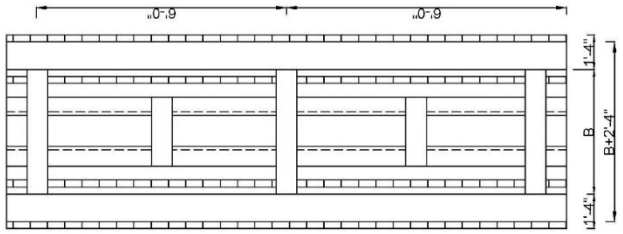
ARCHING IN MANHOLE FOR PIPE

VARIABLE DIMENSIONS
FOR SEWER MANHOLE

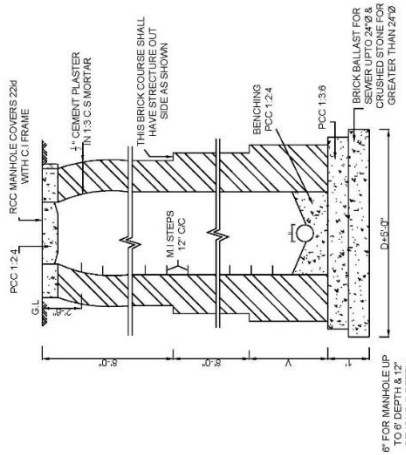
PIPE DIAMETER	D	H
9" TO 15"	4' - 0"	3' - 0"
18" TO 30"	5' - 0"	4' - 0"
36" TO 42"	6' - 0"	4' - 8"
48" TO 54"	7' - 6"	5' - 0"
60"	8' - 0"	5' - 8"
66"	8' - 8"	6' - 0"
72"	9' - 0"	6' - 8"
78"	9' - 6"	7' - 0"
84"	10' - 0"	7' - 6"
90"	10' - 8"	8' - 0"
96"	11' - 0"	8' - 8"



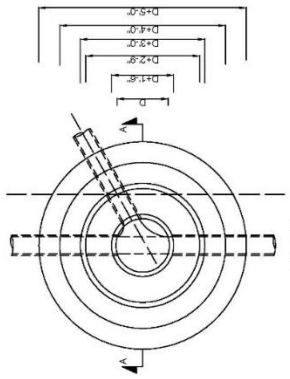
RCC SLAB
REINFORCEMENT DETAIL



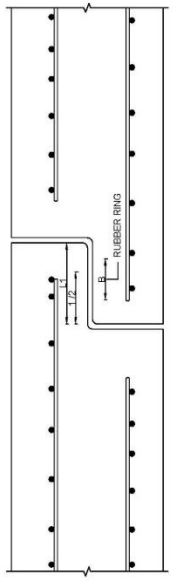
PLAN
TRENCH EXCAVATION WITH
TIMBERINGAND BRACING



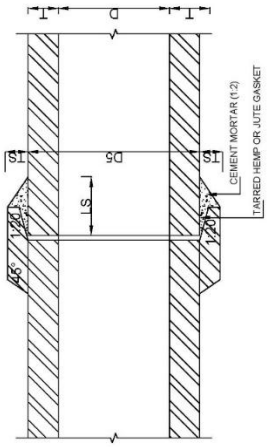
SECTION A-A



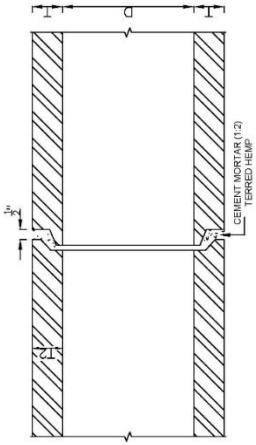
PLAN
TYPICAL SEWER MANHOLE



SKETH TONGUE & GROOVE JOINT

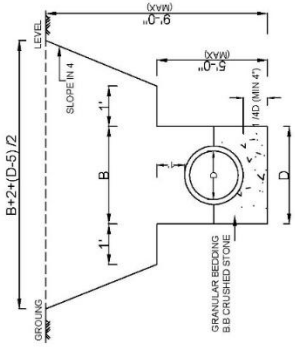


RIGID (CEMENT MORTAR) JOINT
(FOR USE IN DRY EXCAVATION ONLY)

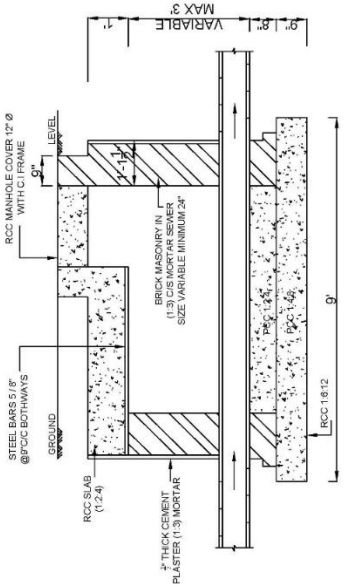


BELL AND SPIGOT JOINT

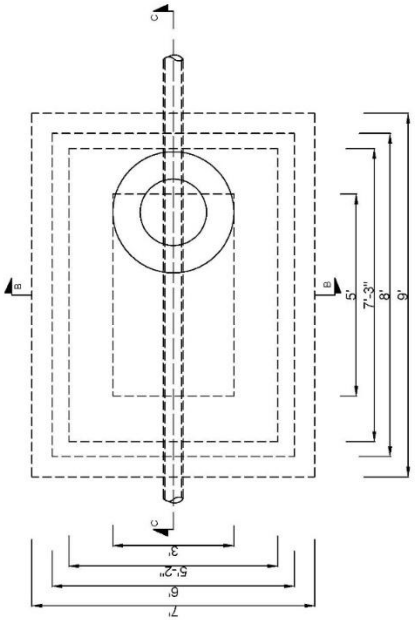
TONGUE AND GROOVE JOINT



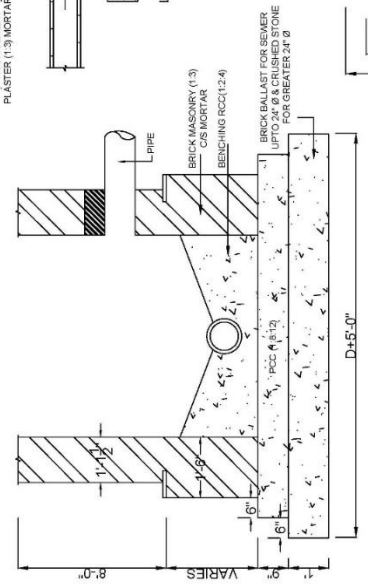
TRENCH EXCAVATION WITHOUT
TIMBERING & BRACING



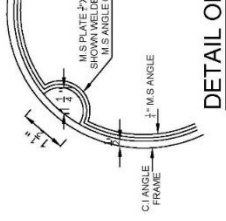
SECTION C-C



PLAN



DETAIL OF NOTCH

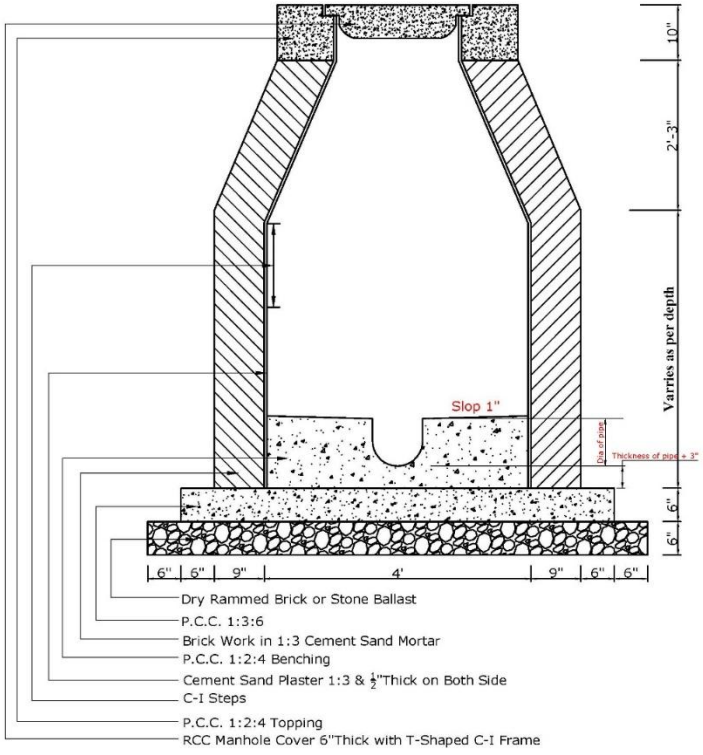


VARIABLE
TRENCH DIMENSIONS

PIPE INSIDE DIA	TRENCH WITHOUT TIMBERING	WIDTH(B) WITH TIMBERING
6"	2' - 0"	3' - 0"
9"	2' - 3"	3' - 0"
12"	2' - 8"	3' - 8"
15"	3' - 0"	3' - 10"
18"	3' - 3"	4' - 2"
21"	3' - 7"	4' - 6"
24"	3' - 10"	4' - 10"
27"	4' - 2"	5' - 2"
30"	4' - 5"	5' - 7"
36"	5' - 8"	6' - 3"
42"	6' - 3"	7' - 3"
48"	6' - 10"	7' - 10"
54"	7' - 5"	8' - 5"
60"	8' - 0"	9' - 0"
66"	8' - 7"	9' - 7"
72"	9' - 2"	10' - 2"
78"		10' - 9"
84"		11' - 4"
90"		11' - 11"
96"		12' - 6"

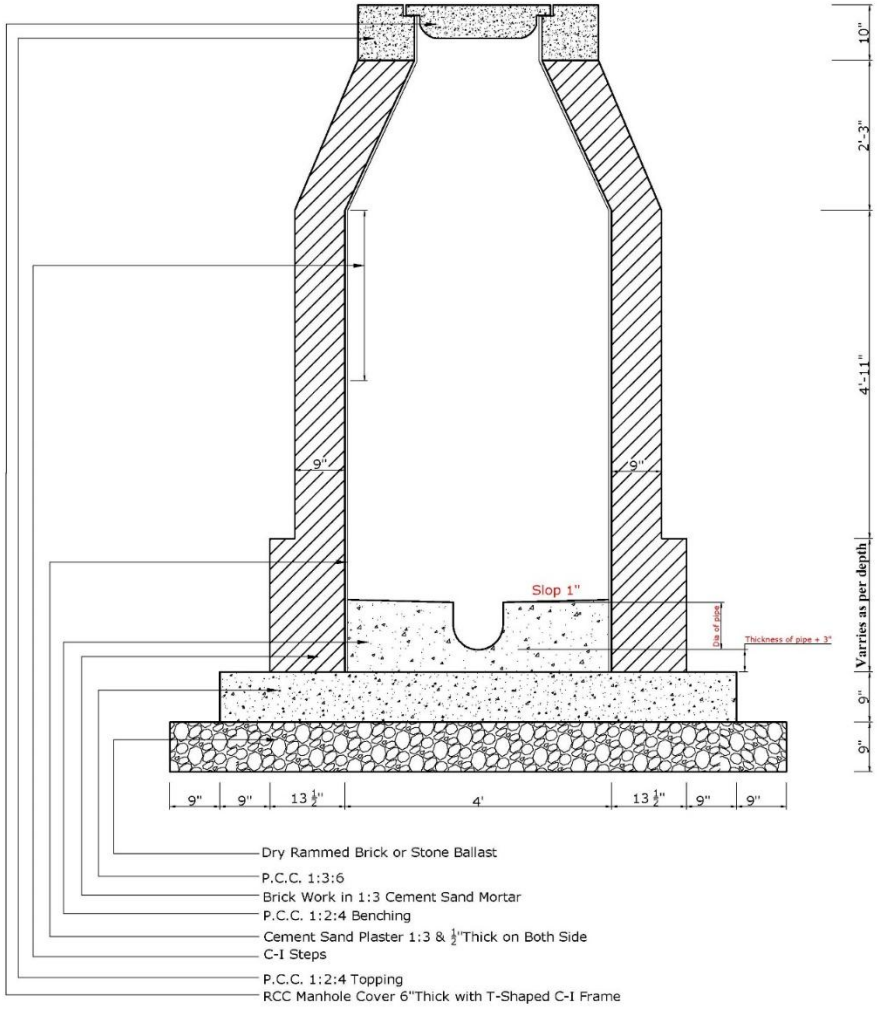
Typical X-Section of Manhole for up to Depth 8Ft.

(FOR 9" TO 15" DIA)



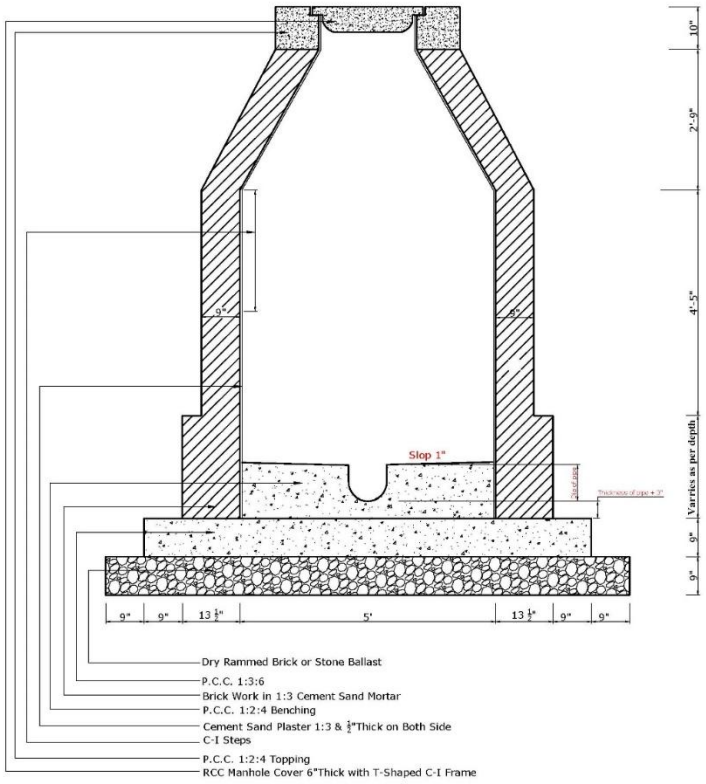
Typical X-Section of Manhole for Up to 14Ft Depth.

(FOR 9" TO 15" DIA)



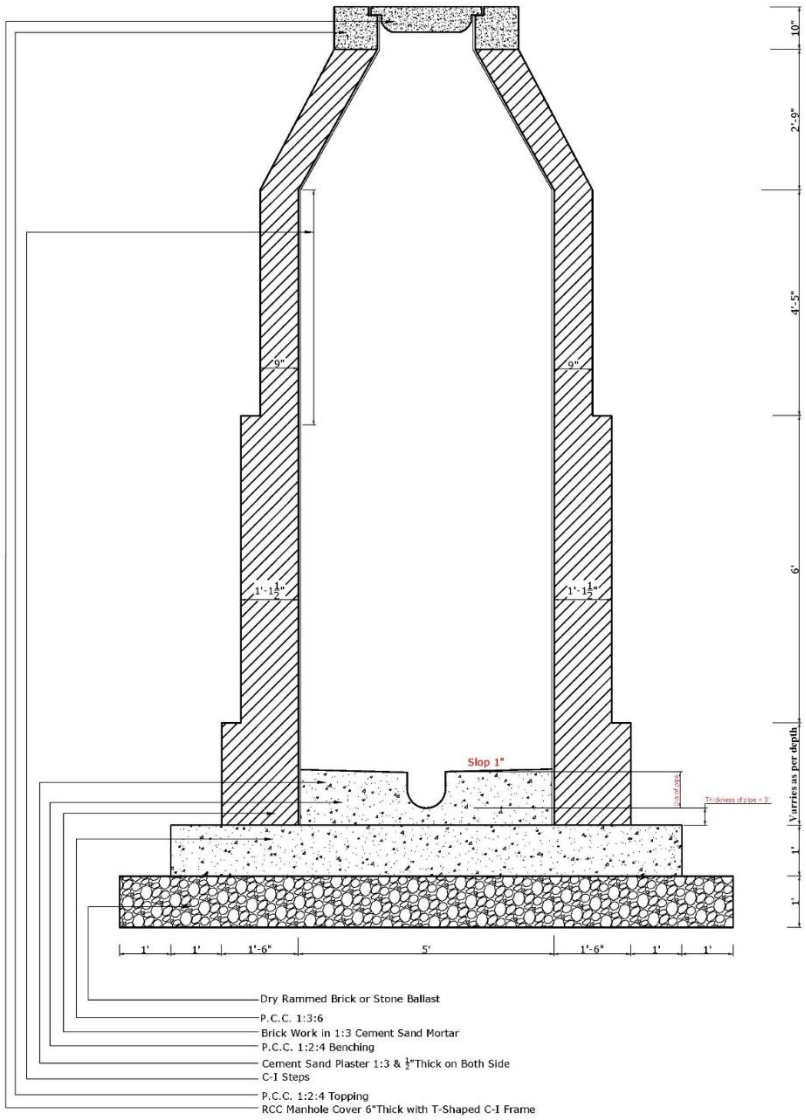
Typical X-Section of Manhole for Up to 14Ft Depth.

(FOR 18" TO 24" DIA)



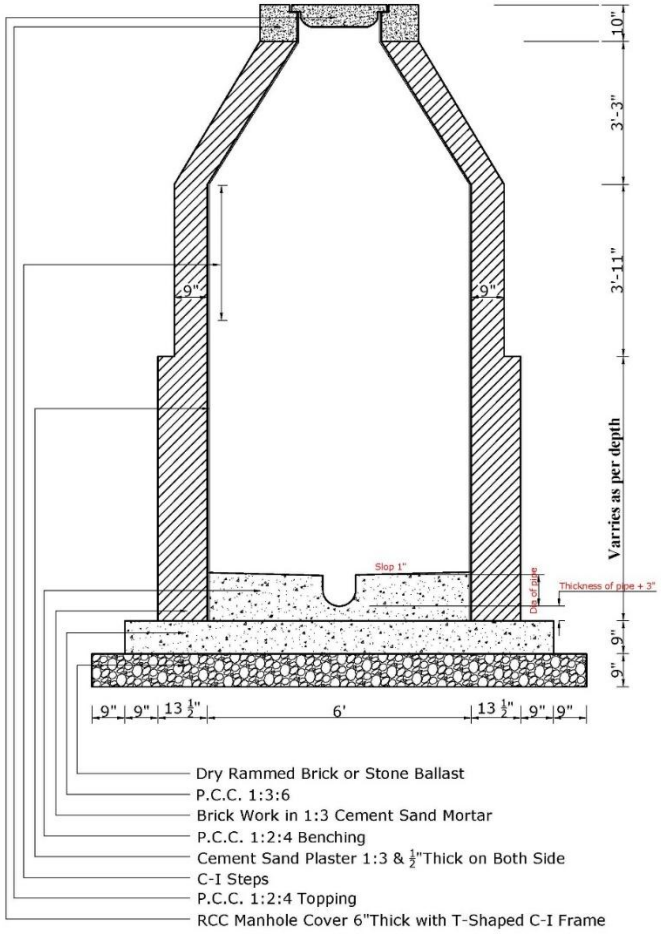
Typical X-Section of Manhole for Up to 20Ft Depth.

(FOR 18" TO 24" DIA)



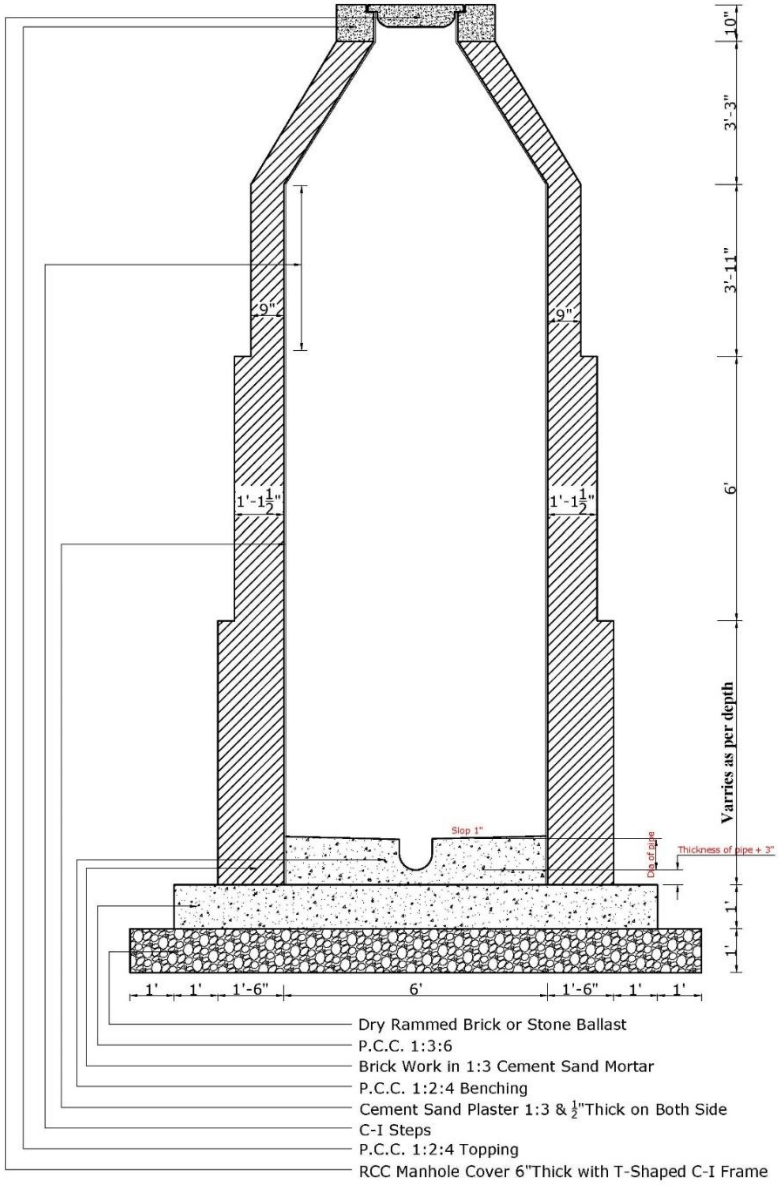
Typical X-Section of Manhole for Up to 14Ft Depth.

(FOR 30" TO 42" DIA)



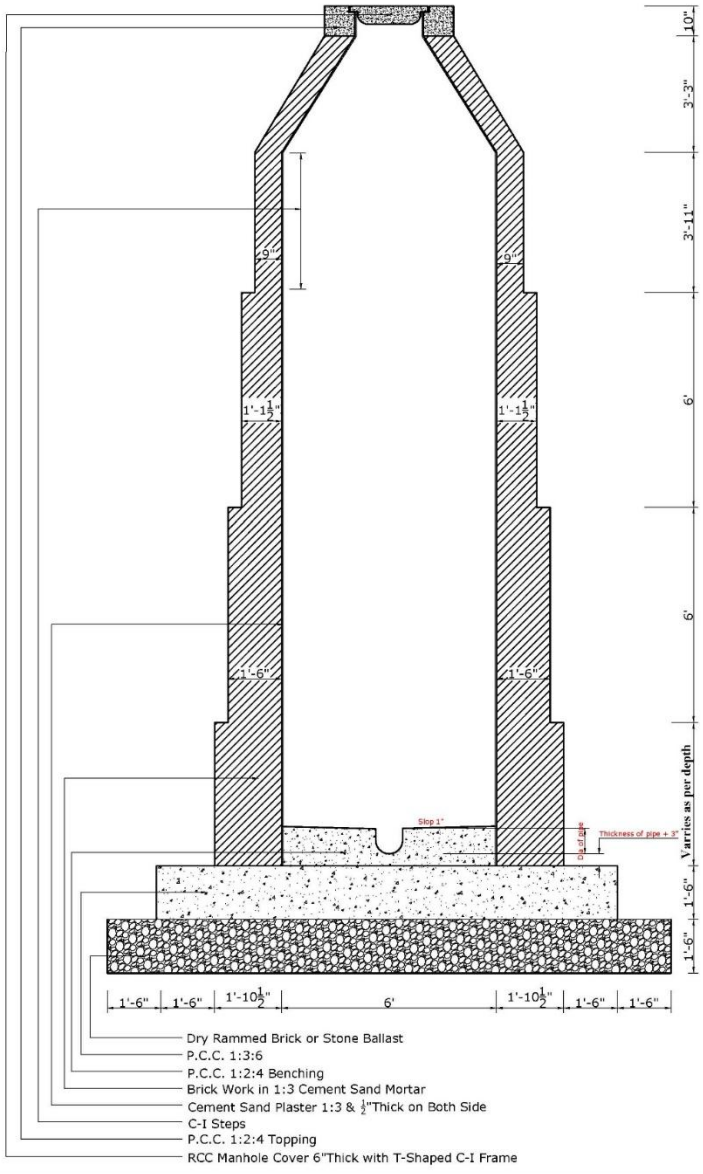
Typical X-Section of Manhole for Up to 20Ft Depth.

(FOR 30" TO 42" DIA)



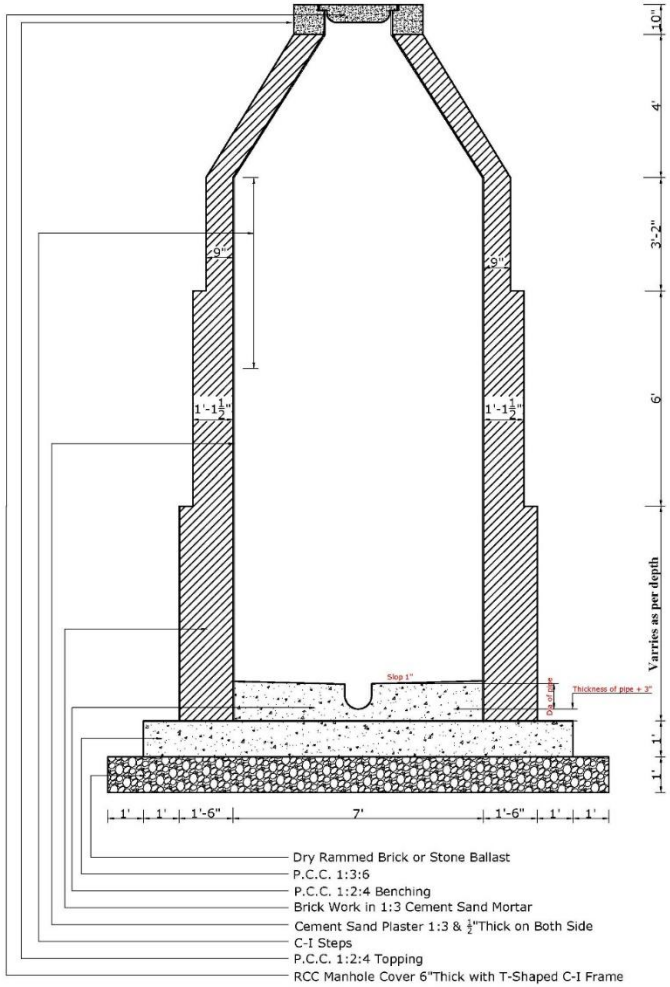
Typical X-Section of Manhole for Up to 24Ft Depth.

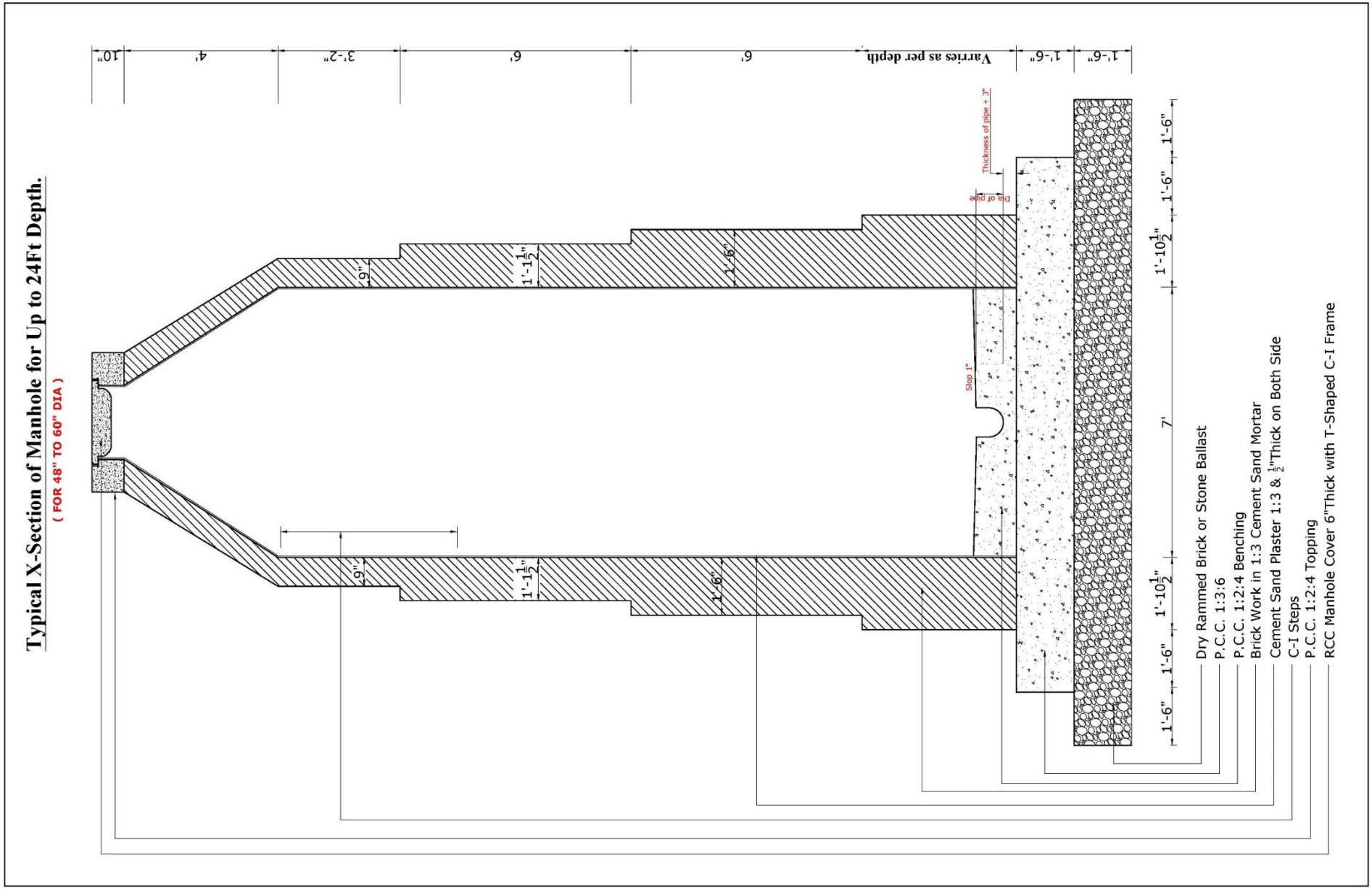
(FOR 30" TO 42" DIA)

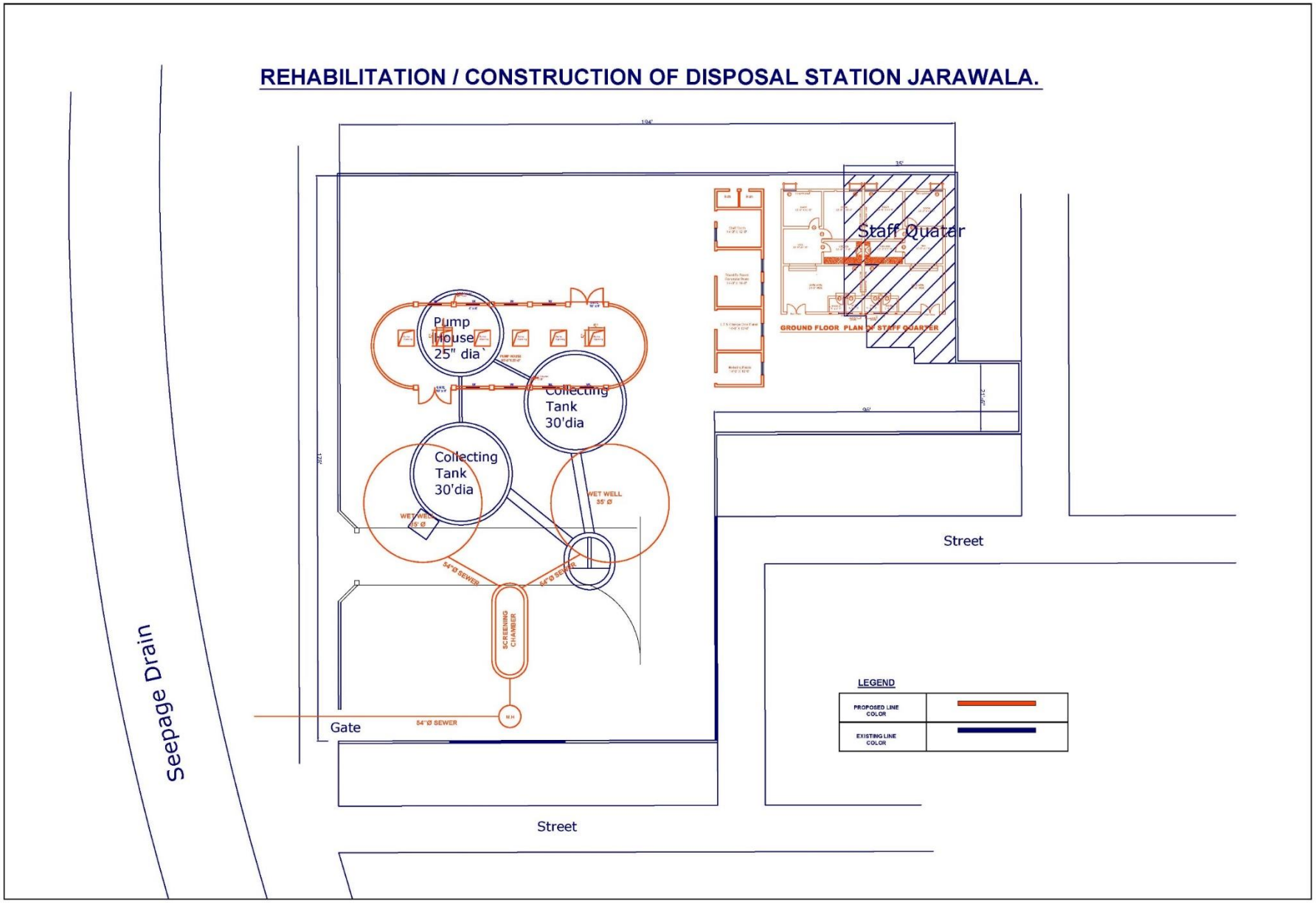


Typical X-Section of Manhole for Up to 20Ft Depth.

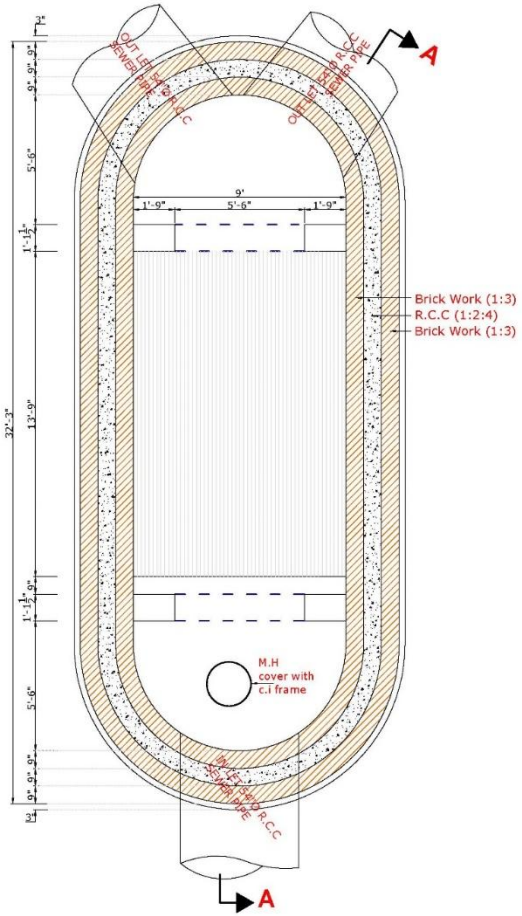
(FOR 48" TO 60" DIA)



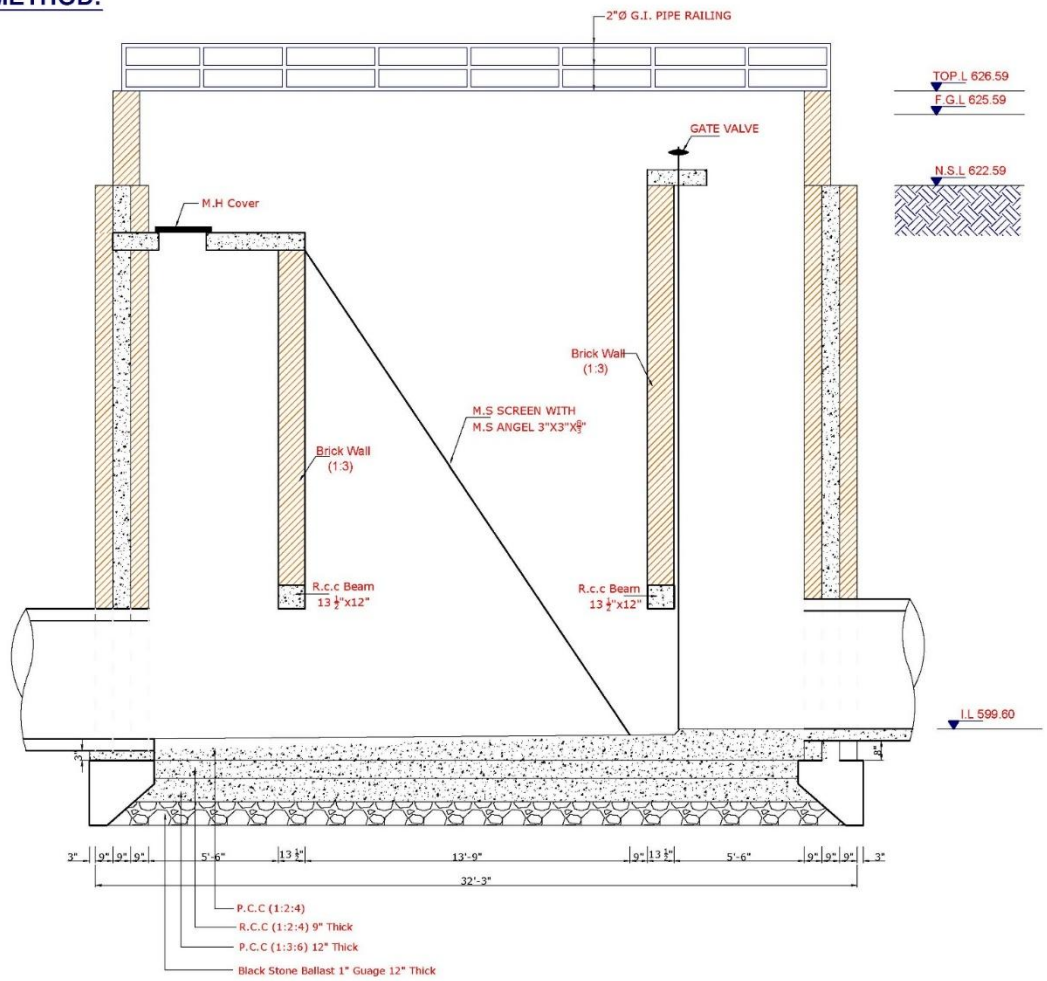

Typical X-Section of Manhole for Up to 24Ft Depth.
(FOR 48" TO 60" DIA)
10"
4'
3'-2"
6'
6'
Varries as per depth
1'-6"
1'-6"
9"
1'-1½"
1'-6"
Thickness of pipe + 3"
Dia of pipe
Slop 1"
1'-6"
1'-10½"
7'
1'-10½"
1'-6"
1'-6"
1'-6"
1'-6"
Dry Rammed Brick or Stone Ballast
P.C.C. 1:3:6
P.C.C. 1:2:4 Benching
Brick Work in 1:3 Cement Sand Mortar
Cement Sand Plaster 1:3 & ½"Thick on Both Side
C-I Steps
P.C.C. 1:2:4 Topping
RCC Manhole Cover 6"Thick with T-Shaped C-I Frame


REHABILITATION / CONSTRUCTION OF DISPOSAL STATION JARAWALA.
Pump House 25" dia`
Collecting Tank 30'dia
Collecting Tank 30'dia
WET WELL 35' Ø
WET WELL 35' Ø
54"Ø SEWER
54"Ø SEWER
SCREENING CHAMBER
M.H
54"Ø SEWER
Gate
Staff Quater
GROUND FLOOR PLAN OF STAFF QUARTER
Street
Street
Seepage Drain
LEGEND
PROPOSED LINE COLOR
EXISTING LINE COLOR

CONSTRUCTION OF SCREENING CHAMBER AT JARAWALA DISPOSAL WITH SINKING METHOD.

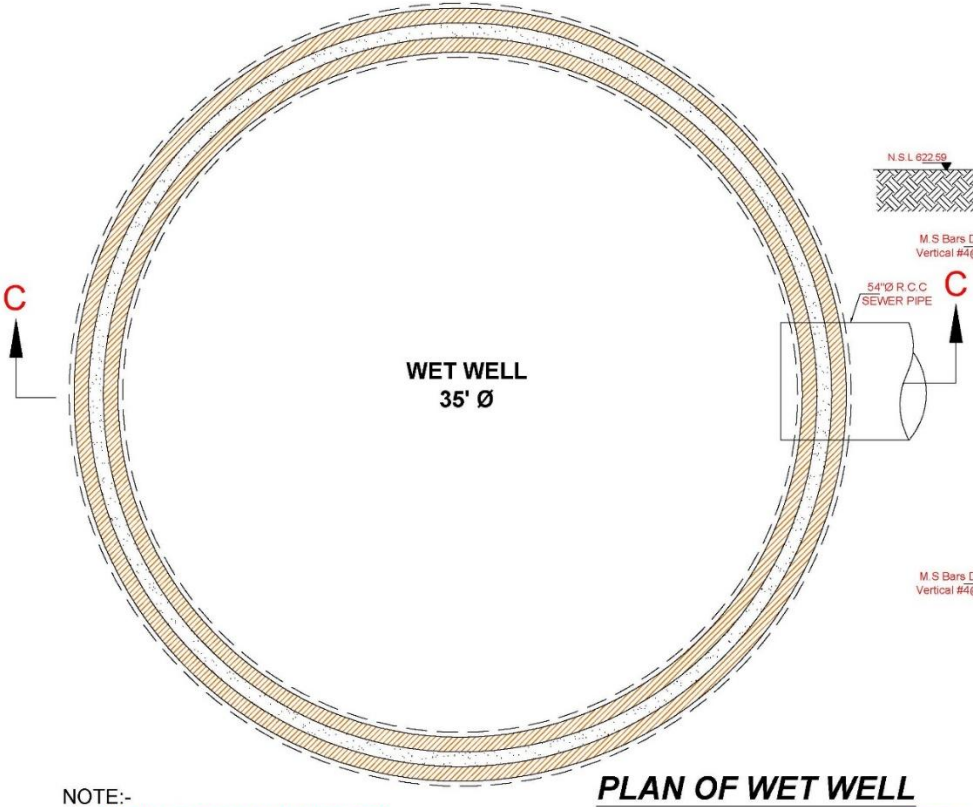


PLAN SCREENING CHAMBER

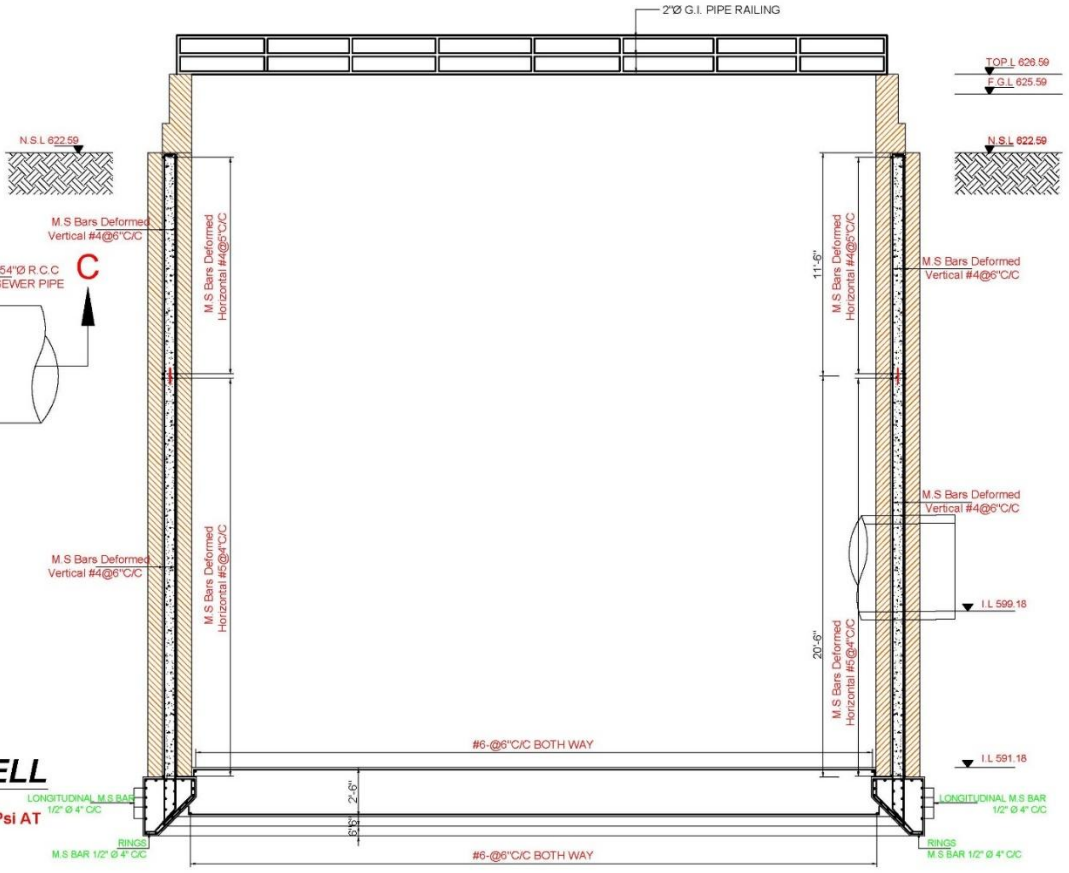


SECTION OF SCREENING CHAMBER A-A

WET WELL AT JARAWALA DISPOSAL WITH SINKING MATHOD



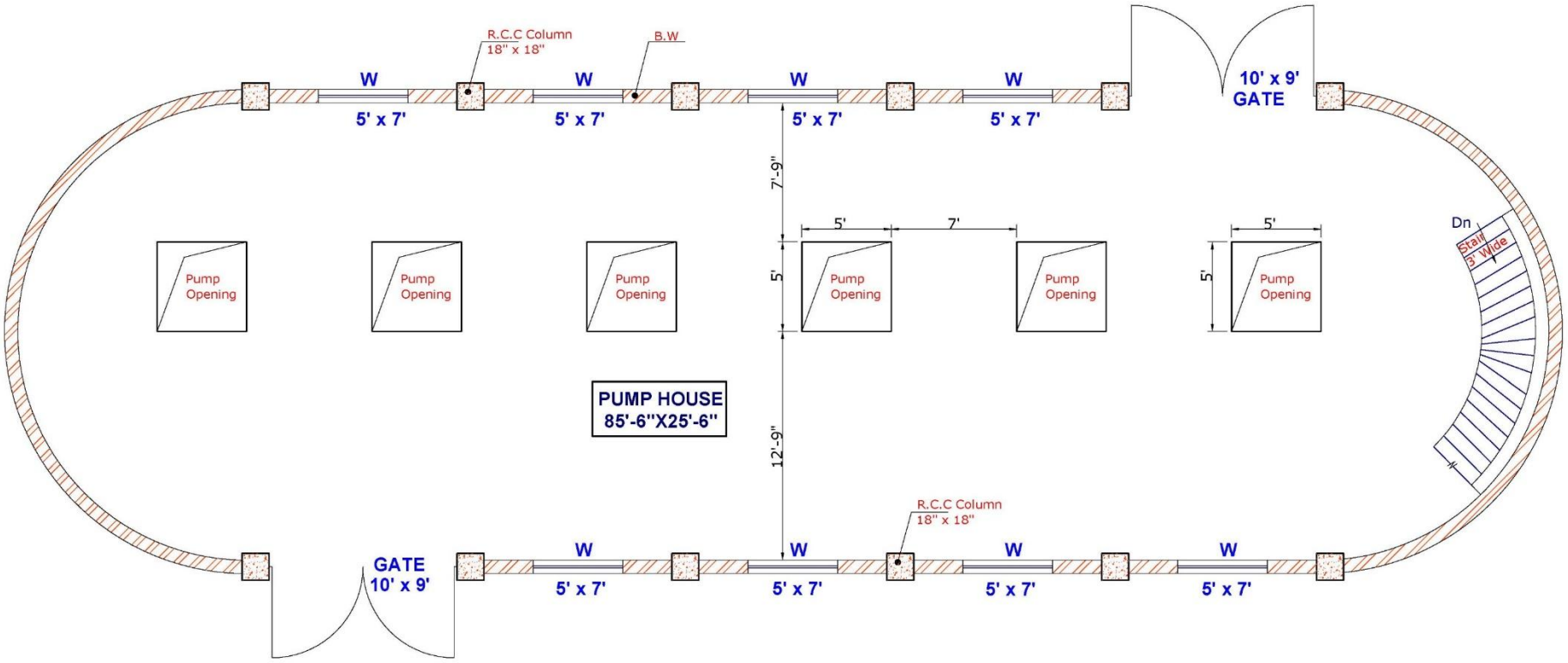
PLAN OF WET WELL



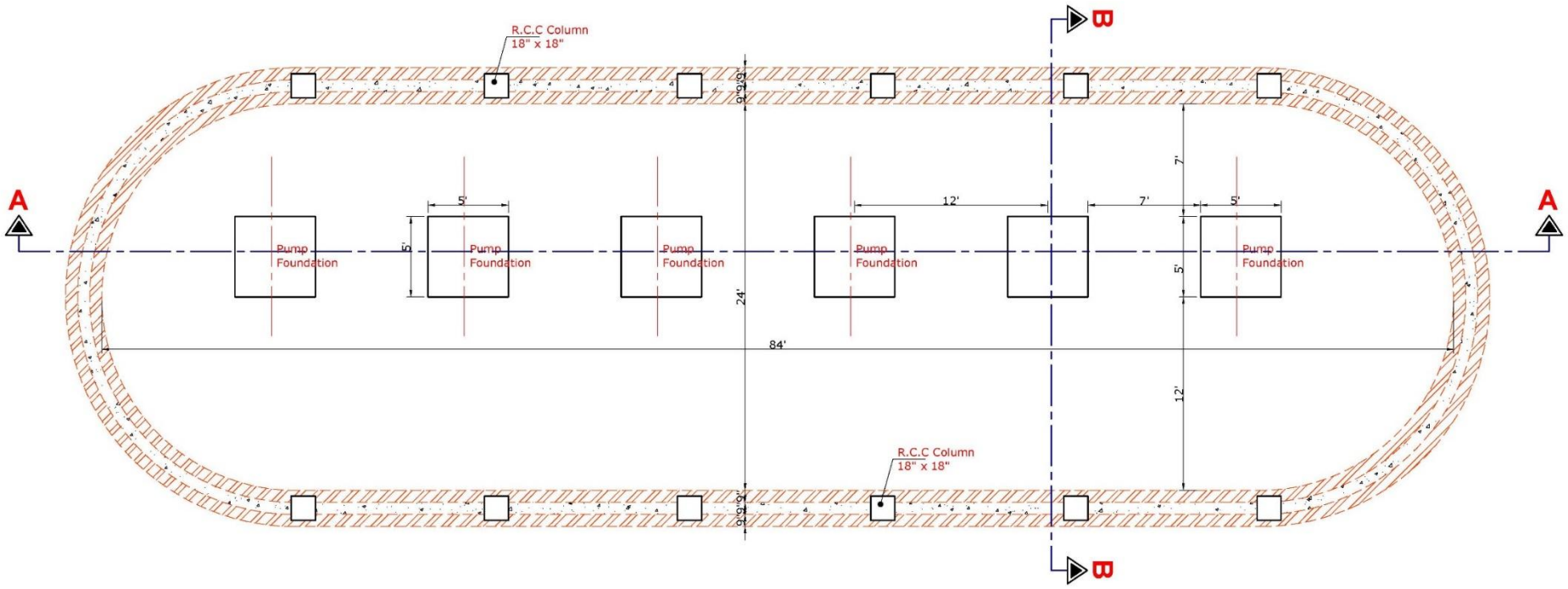
SECTION C-C

NOTE:-

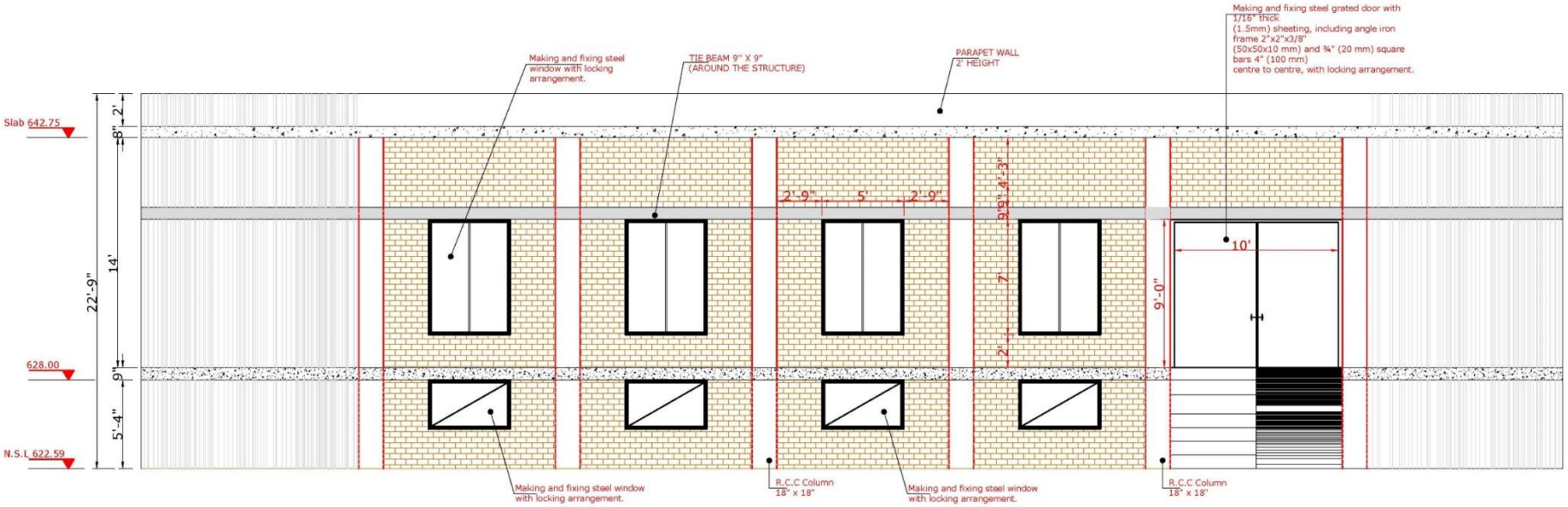
1. ALL DIMENSION IN FEET AND INCHES.
2. THE MINIMUM COMPRESSIVE CYLINDER STRENGTH OF REINFORCED CONCRETE SHALL BE 3000 Psi AT 28 DAYS.
3. THE REINFORCINGSTEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM DESIGNATION A615-GRADE 40
4. THE MINIMUM COMPRESSIVE CYLINDER STRENGTH OF BLINDING CONCRETE SHALL BE 2000 Psi AT 28 DAYS.
5. CLEAR COVER TO REINFORCEMENT SHALL BE
   a, EXTERNAL FACED 1 $\frac{1}{2}$" to 2"
   INTERNAL FACED 1 $\frac{1}{2}$" to 2"
   b, FOR SLABS AND STAIR ETC 1" to $\frac{3}{4}$"
6. THE CONTRACTOR MUST MAKE SURE THAT ALL ITEMS TO BE EMBEDDED IN CONCRETE ARE SECURE AT PROPER LOCATION BEFORE CONCRETING.



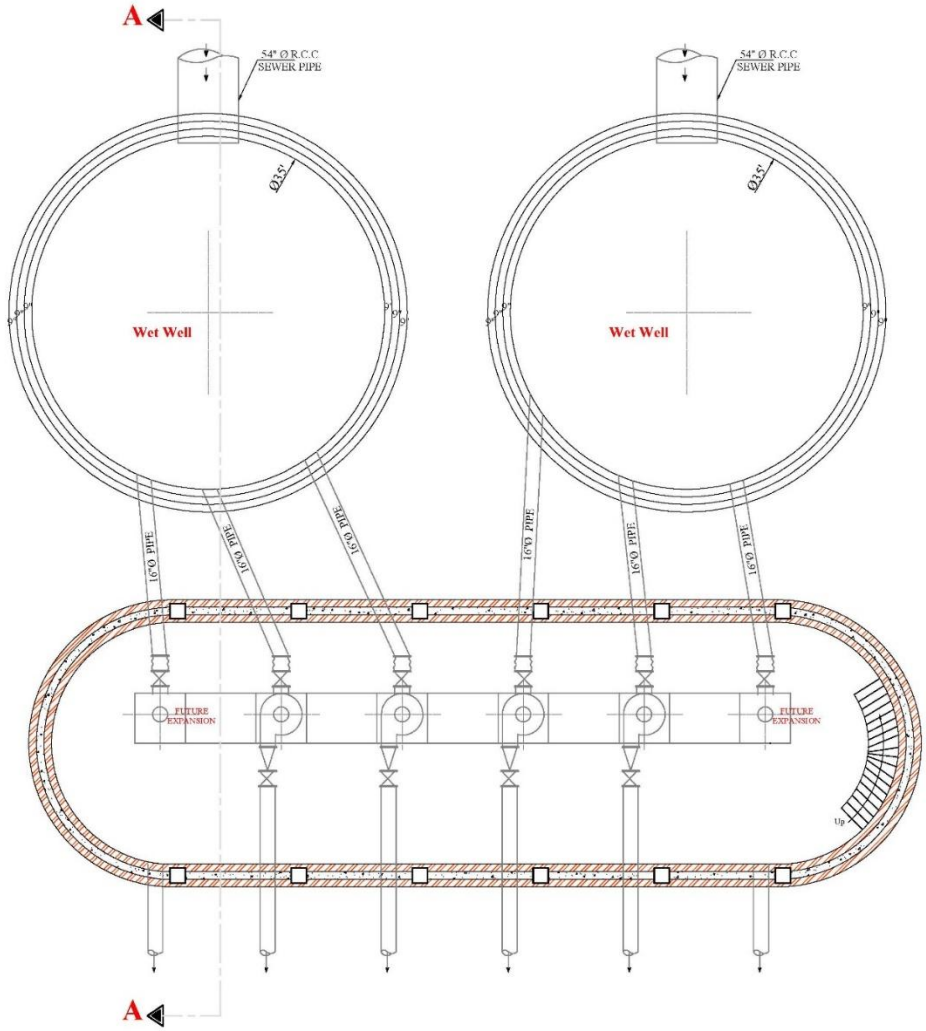
GROUND FLOOR PLAN PUMP HOUSE AT JARAWALA DISPOSAL STATION.

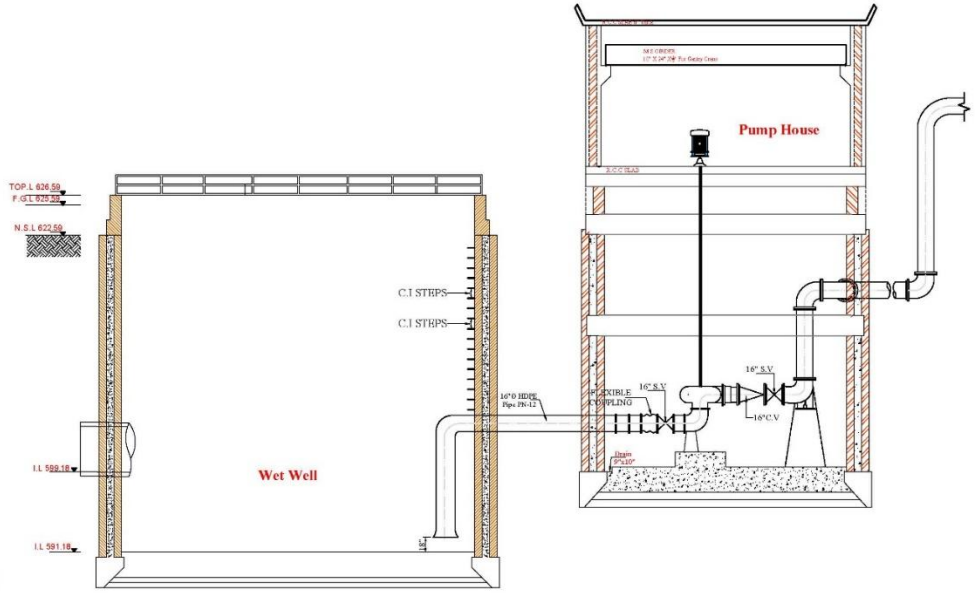


PUMP HOUSE FOUNDATION PLAN JARAWALA DISPOSAL STATION.



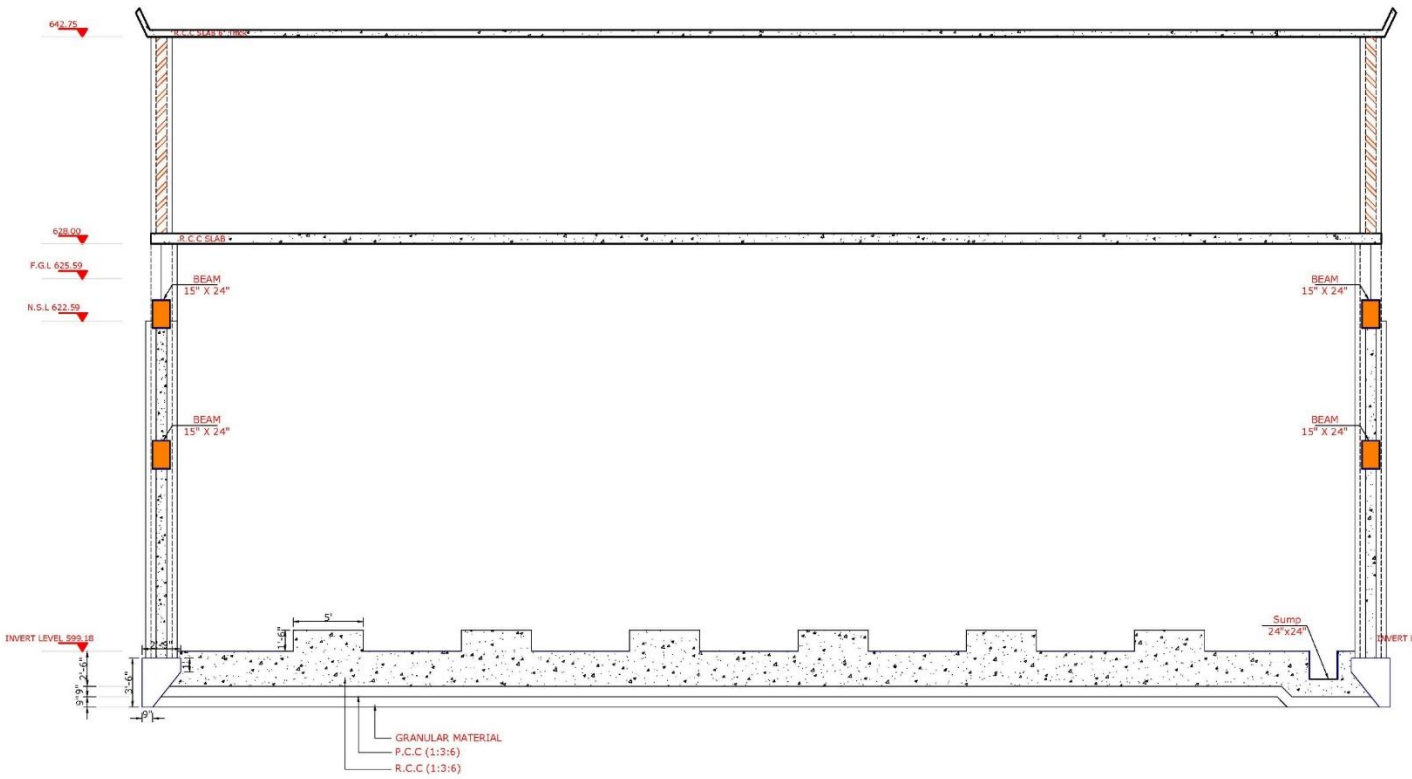
FRONT ELEVATION OF PUMP HOUSE AT JARAWALA DISPOSAL



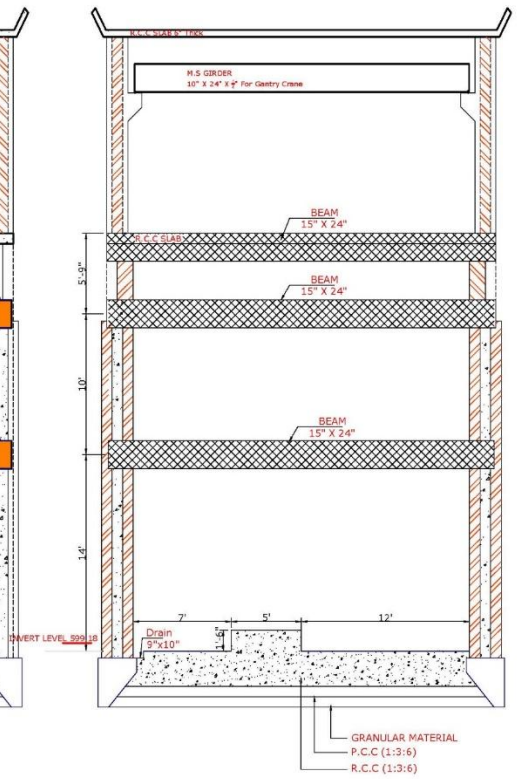


SECTION A-A

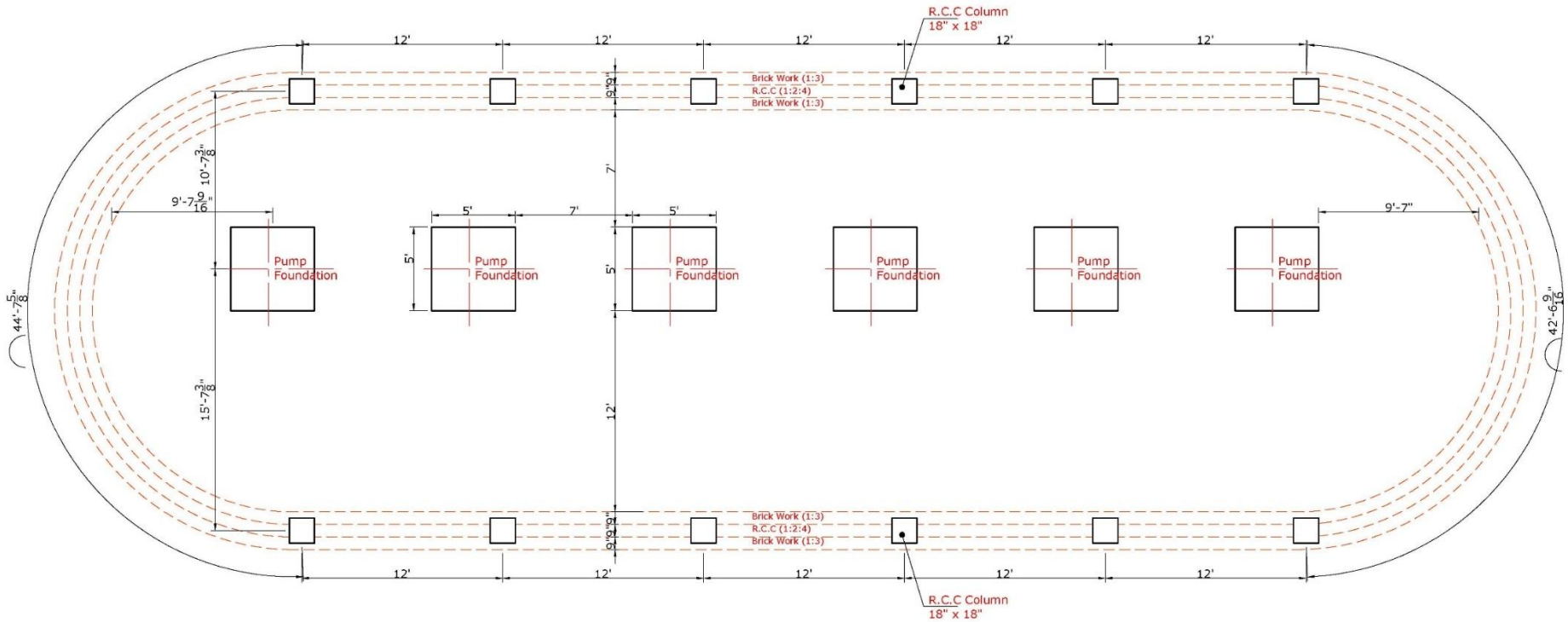
X-SECTION OF PUMP HOUSE JARAWALA CITY.



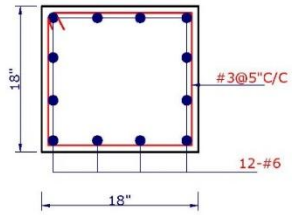
SECTION A-A PUMP HOUSE



SECTION B-B PUMP HOUSE

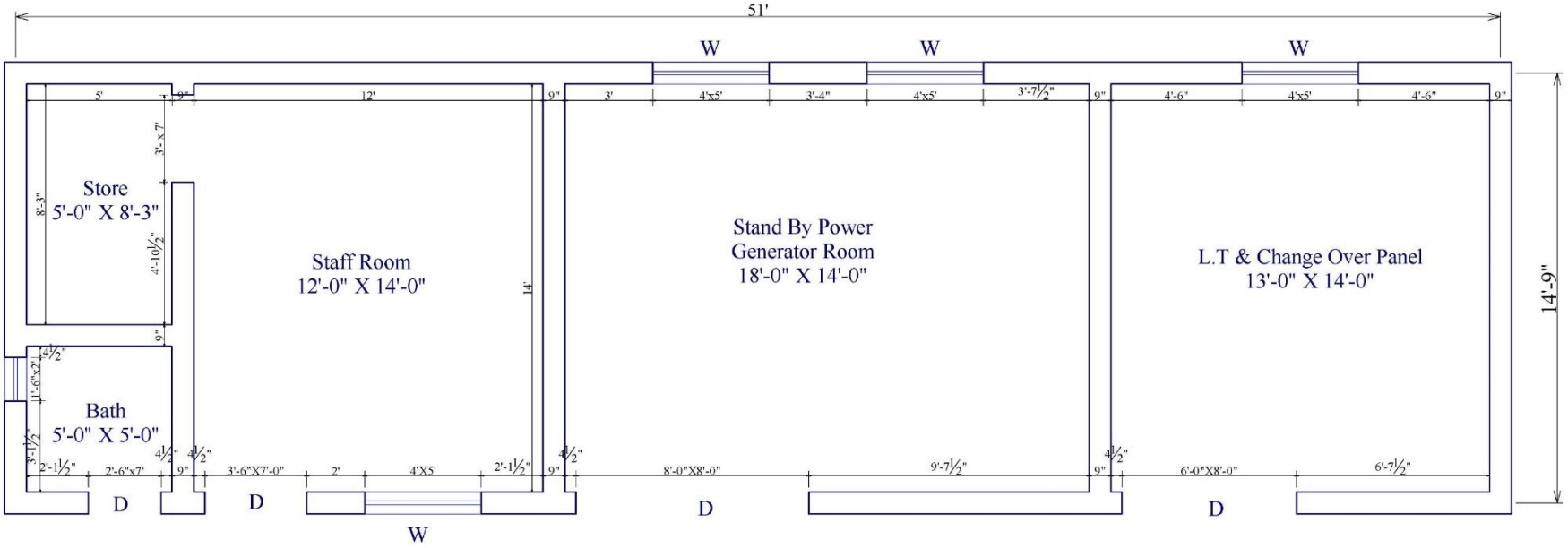


COLOUMN LAY OUT PLAN AT JARAWALA DISPOSAL .

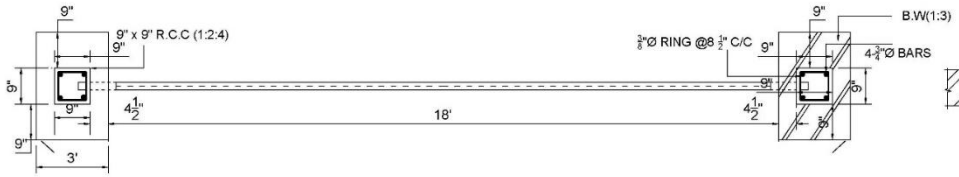


X - SECTION OF R.C.C COLUMN

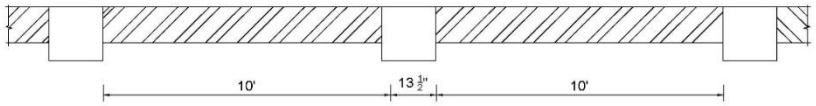
Lay out Plan of L.T & Change Over Panel Stand By Power Generator Room / Staff Room.



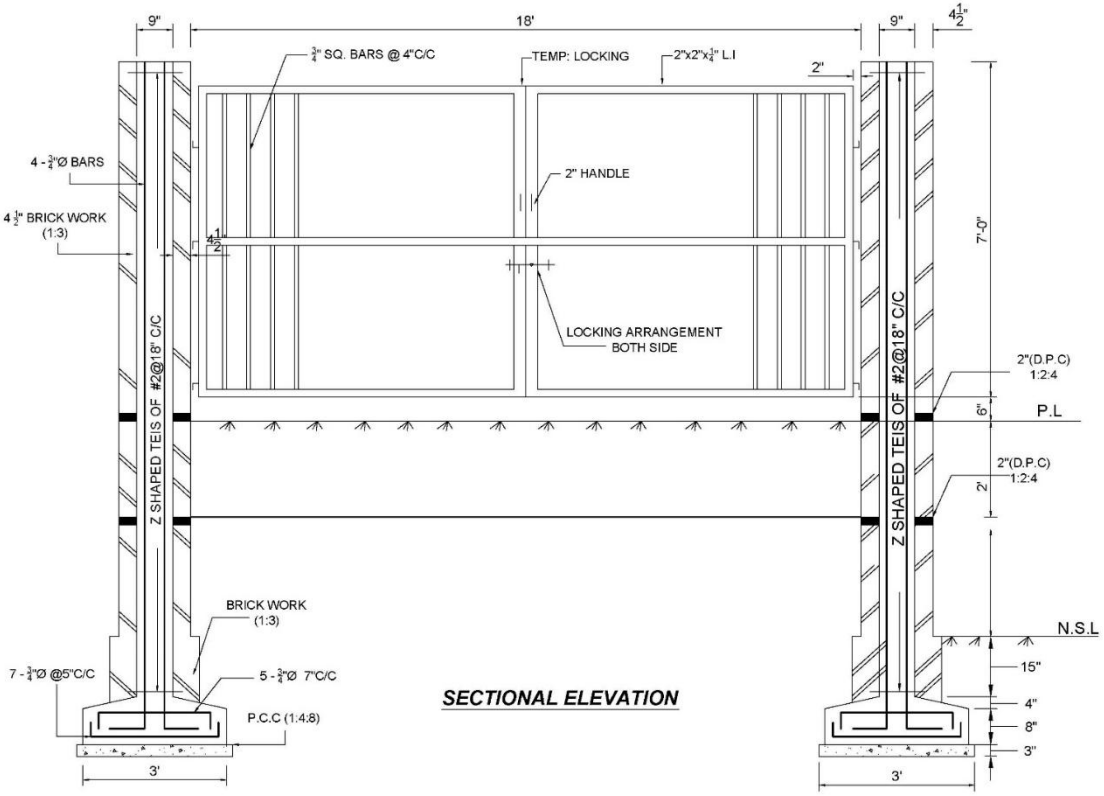
PLAN OF MAIN GATE JARAWALA CITY DISPOSAL STATION .



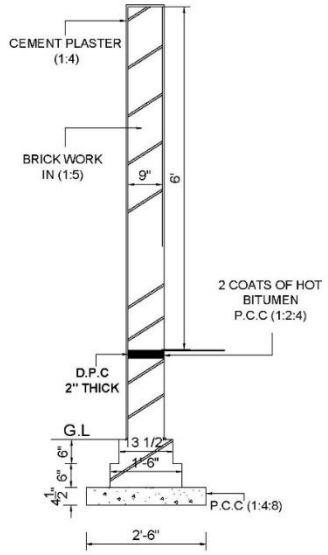
PLAN OF MAIN GATE



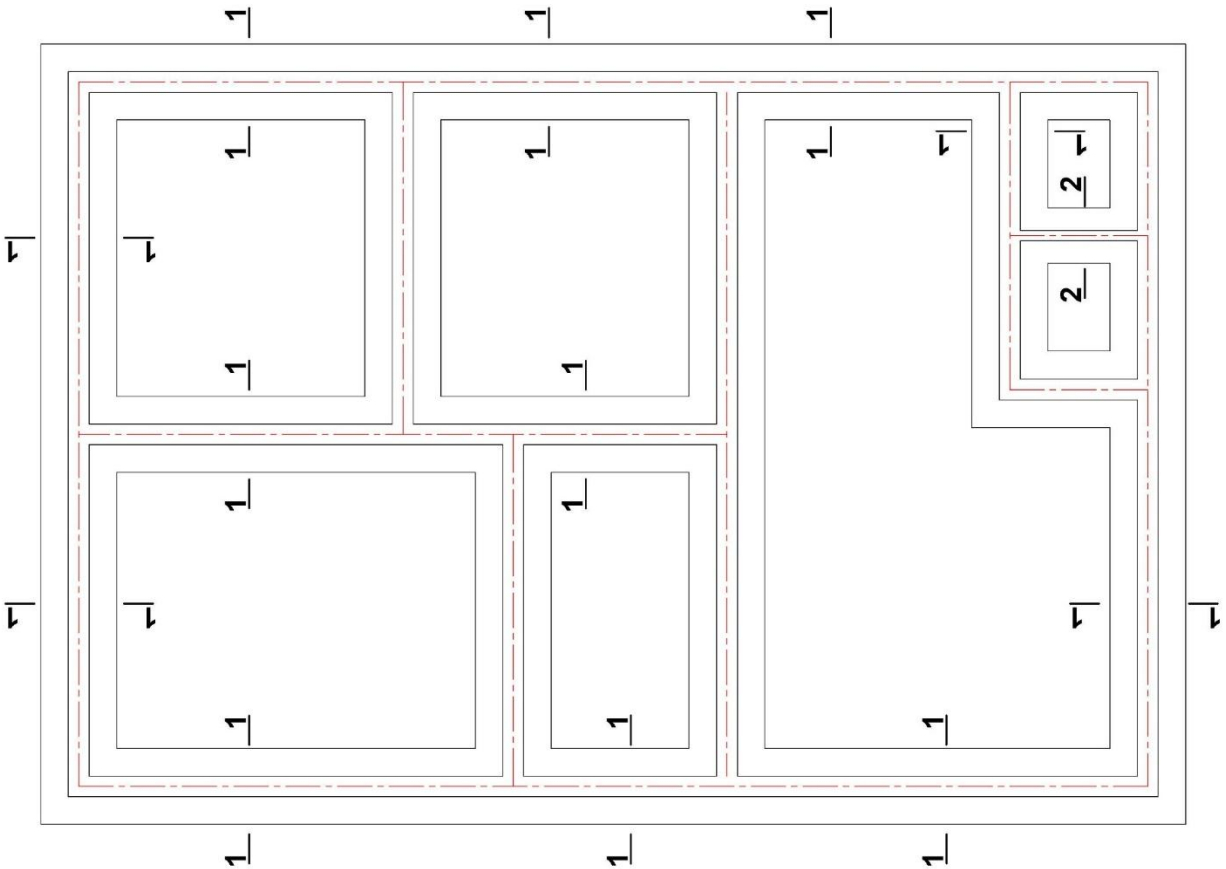
PLAN OF BOUNDARY WALL (9" THICK)



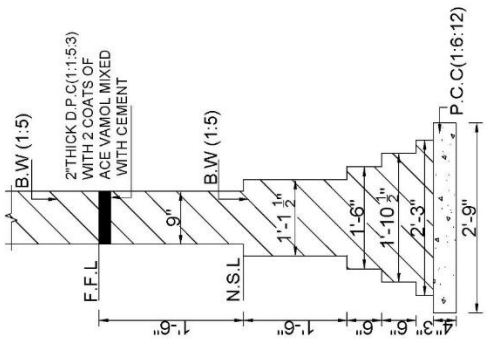
SECTIONAL ELEVATION



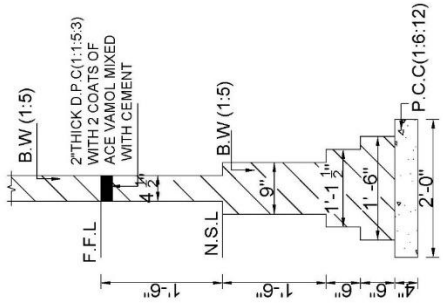
TYPICAL SECTION OF BOUNDARY WALL 9" THICK



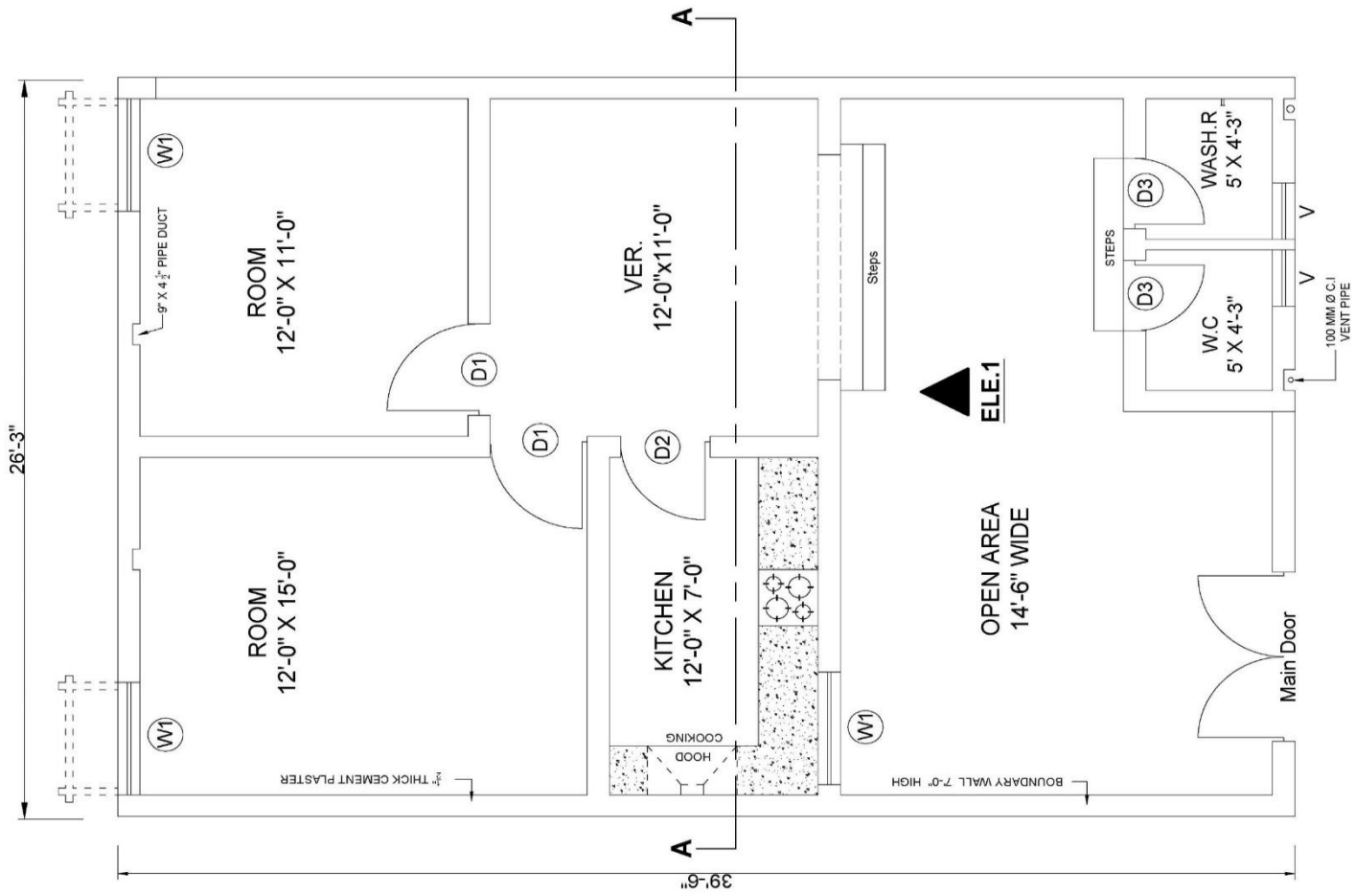
FOUNDATION PLAN OF STAFF QUARTER JARAWALA CITY DISPOSAL STATION



SEC 1-1



SEC 2-2



STAFF QUARTER

PLAN OF STAFF QUARTER JARAWALA CITY DISPOSAL .

Annexure N: Geo Tech Investigation Report

SAFE TECHNICAL SERVICES

Geotechnical Investigation, Concrete, Asphalt Designs and Their Related Field & Laboratory Testing SERVICES

STS/Sr# 322 PEC#72401

GEO-TECHNICAL INVESTIGATION FOR ALGEO-TECHNICAL INVESTIGATION FOR IMPROVEMENT OF SEWERGE SYSTEM JARANWALA AND CONSTRUCTION OF WASTEWATER TREATMENT

Client

MR. MMP PAKISTAN

Reported By:

M/s Safe Technical Services

f) House # 19, ST # 2, Mohallah Farooqabad, Samundari Road Faisalabad.

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- safetechnicalservices@gmail.com

Project

Imp ovement of Sewerage System **Jaranwala and Construction of Wastewater Treatment Plant.**

Client

MMP **Pakistan**

Subject

Geo-Technical Investigation Report

Prepared By

Safe Technical Services House# 19, ST # 2, Mohallah Farooqabad, Samtmdari Road Faisalabad. Cell: 0300-7600142

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28	-----	Bearing Capacity Curves	-----
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30	-----	Test Results Sheet	-----

Geotechnical Investigation for Improvetnent of Sewerage System Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

INTRODUCTION

1- Client has decided the *Improvement of Sewerage System Including Construction of Treatment and Waste Water Plant.* In order to place the foundation at suitable depth, a comprehensive understanding of the engineering properties of soil and evaluation of engineering parameters is a pre-requisite. The assignment to carryout subsoil investigation was entrusted to M/s STS Faisalabad. The site was explored during the month of May, 2023. After the site execution entire soil samples were transported to the laboratory at STS Faisalabad to evaluate the safe and economical bearing pressures. The detailed sub-soil investigation report has been prepared and discussed as under: -

2- SCOPE OF WORK

As per TOR for site investigation, following scope of work was given by client

1- Drilling of 12 Nos. of boreholes down to 10.0, 25.0, & 40.0 feet depth

2- The performance of Standard Penetration Test at 2.5-5 feet depth Interval up to maximum 10.0, 25.0, & 40.0 feet depth.

3- Collection of disturbed soil samples with the help of split spoon barrel sampler.

4- To prepare log of soil strata as per field classification ASTM D-2488.

5- To carry out necessary soil tests on the samples in Laboratory in accordance with ASTM-Standards.

6- To evaluate bearing capacity for foundation.

7- - Conclusion and recommendations

The subsurface investigation has been carried out is accordance with ASTM D 420-87. The investigation consists of three sections.

2.1 - METHODOLOGY

Keeping in view the scope of work and specifications generally followed for the detailed geotechnical studies, a program of field work was prepared. The exploratory boreholes were drilled by using hand auger cum light percussion method. One drilling crew mobilizes to the site for carrying out exploratory drilling bore holes.

Field tests (i.e. Standard Penetration Tests) were performed m designated boreholes in accordance with relevant ASTM standards.

Soil samples were collected from designated depths from boreholes using appropriate samplers for identification and subsequent laboratory testing. Selected soil samples were subjected to various laboratory tests for evaluation of classification and strength characteristics of sub-soils.

This report has been prepared on the basis of detailed soil investigations carried out at the project site and subsequent laboratory testing performed on the selected soil samples. An evaluation of foundation soils, foundation design parameters and recommendations regarding type of foundations, and respective allowable bearing pressures are also provided in this report.

Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

SECTION-I

Field investigation

SECTION-II

Laboratory Investigation/Testing

SECTION-III

Bearing pressures Analysis

SECTION-I

3- FIELD INVESTIGATION

Field investigation comprises the following.

3.1 Drilling

As :per recommended practice of ASTM D-420, percussion method was adopted for sub-soil exploration. The hole was advanced by hand augur drilling method. The drilling of the holes was carried out up to 10.0, 25.0, & 40.0 feet depth from existing ground level.

3.2 Standard Penetration Test

The objective of this test is to ascertain the resistance afforded to the penetration apparatus to a defined 12" depth. This test gives valuable information regarding the compactness of underlying strata. The test was performed in accordance with ASTM D 1586-84 by Donut type manually operated hammer. Generally The SPT N-value Increases downward. The degree of compactness and SPT N values of underlying strata represented in borehole logs.

3.3.1 Disturbed Samplin g

After the boring is advanced to the desired sampling depth, the disturbed samples are collected with help of spilt spoon sampler. The disturbed sample have been collected and preserved in the Jars which have been properly indexed and transported to the Laboratory

3.4 Water Table

At the timof these investigations ground water table were not encountered at under given depths in Exploratory Boreholes in the month of May, 2023.

Borehole No.	Depth of Ground Water(feet) Respectively
1 to 12	18.0, 19.3, 25.0, 18.0, 9.5, 10.0, Nil, Nil, Nil, Nil, 25.0, 25.0 (9.5 ft to 25.0 ft)

SECTION-II

4 -LABORATORY TESTING

Selected soil samples were tested for evaluation of physical and engineering characteristics of the sub-soils, in the laboratory. The laboratory testing was carried out at testing facilities of STS. The following laboratory tests were performed on selected soil samples.

- Sieve Analysis
- Hydrometer Analysis
- Atterberg's limits
- Direct Shear Test
- Moisture Content

4.1 Sieve Analysis

Total thirty nine (39) soil samples selected for classification from the various depths after proper treatment were sieved under wet conditions in accordance with ASTM Standard. The curves have been plotted graphically and attached at end of this report.

4.2 Sedimentation/Hydrometer Test

The soil samples collected from the drill hole were sieved through No. 200, but to differentiate between silt and clay fraction, sedimentation test was employed in this test soil sample was treated with very diluted HCL and then with Sodium met phosphate for deflocclation. The procedure defined in ASTM standard for Hydrometer analysis was followed. The % age of different sizes were plotted on the grain size curves.

4.3 Atterberg's Limits (Liquid & Plastic Limits)

The cohesive soil retrieved with the help of split spoon sampler was tested for liquid and plastic limits in accordance with ASTM D-4318-84. The consistency limits of cohesive soils at various depths. Detail results shown in summary sheet.

4.4 Direct Shear Test

The soil possessing non-cohesive characteristics were prepared and tested for their angle of internal friction **O** and cohesion C in accordance with ASTM D-3080. The detailed results are given at summary sheet.

4.5 Field Moisture Content

The soil samples collected from the bore holes with shell by tube were tested for their field moisture contents. The values are given at summary sheet & table-1.

5 Sub Soil Characterization

5.1 General

The geotechnical investigations carried for the project comprised field and lab<?ratory work. The field and laboratory investigations were aimed at evaluating the engineering characteristics of the foundation soils. The subsurface conditions and engineering characteristics of the soils existing at the proposed project site are discussed in the following sections.

5.2 Sub Soil Profile

Consistency limits in conjunction with grain size distribution was used to classify the soil in accordance with ASTM D-2488 (field classification) and ASTM D-2487 (Laboratory classification).

Strata are described as under: -

BH #	Strata	BH #	Strata
1	From 0.0 ft to 2.0 ft: Filling From 2.0 ft to 7.5 ft: Clayey silt From 7.5 ft to 10.0 ft: Sandy silt From 10.0 ft to 15.0 ft: Silty sand From 15.0 ft to 40.0 ft: Sand	7	From 0.0 ft to 5.0 ft: Clayey sandy silt From 5.0 ft to7.5 ft: Sandy clayey silt From 7.5 ft to 10.0 ft: Silty sand/sandy silt
2	From 0.0 ft to 1.5 ft: Filling From 1.5 ft to 2.5 ft: Clayey sandy silt From 2.5 ft to 10.0 ft: Clayey silt From 10.0 ft to 40.0 ft: Sand	8	From 0.0 ftto7.5 ft: Sandy clayey silt From 7.5 ft to 10.0 ft: Sandy silt
3	From 0.0 ft to 1.5 ft: Filling From 1.5 ft to 2.5 ft: Clayey sandy silt From 2.5 ft to 15.0 ft: Clayey silt From 15.0 ft to 25.0 ft: Silty clay/clayey silt	9	From 0.0 ft to 4.0 ft: Filling From 4.0 ft to 7.5 ft: Clayey sandy silt From 7.5 ft to 10.0 ft: Sandy clayey silt From 10.0 ft to 25.0 ft: Silty sand
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SECTION-III

6- BEARING CAPACITY ANALYSIS

6.1- Foundation Analysis

A foundation design consideration of any structure depends upon the magnitude of loading, type of structure and the sub-soil conditions. In consideration of safety, a foundation is required to meet two essential conditions. One is that the soil should be capable of withstanding the load without shear failure. The second is its ability to carry the load not exceeding the design settlement. The above two condition can be fulfilled if the loads are distributed in such a manner that no excessive stresses and settlements preyailed within the supporting soil strata.

6.2- Lateral Earth Pressure

In case of buried structures and retaining walls, use of cohesion-less backfill is recommended. The evaluation of static earth pressure on buried wall/ retaining walls depends upon the movement allowed for in the design, configuration of the wall, backfill geometry and the type of soil used as backfill. For smooth vertical walls with horizontal backfill, the following simplified expressions can be used for determination of coefficients of lateral earth pressure;

Coefficient of active earth pressure, $K_a = (1 - \sin 0')/(1 + \sin 0')$

Coefficient of earth pressure at rest, $K_0 = (1 - \sin 0')$

Coefficient of passive earth pressure, $K_p = (1 + \sin 0')/(1 - \sin 0')$

Where

O' Effective angle of internal friction of backfill soil

For evaluation of earth pressure under earthquake conditions, the equations pr posed by Mononobe-Okabe may be used.

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tsf)	Isolated (tsf)	Footing Width (ft)	Raft/Mat (tsf)
1	3.0	3	0.558	0.655	10	0.780
2		4	0.499	0.596	11	0.765
3		5	0.441	0.538	12	0.750
4		6	0.382	0.479	13	0.735
5		7	0.323	0.420	14	0.720
6		8	0.264	0.361	15	0.705
7		9	0.205	0.302	16	0.690
8		-	-	-	17	0.677
9		-	-	-	18	0.665
10		-	-	-	19	0.653
11		-	-	-	20	0.645
12		-	-	-	21	0.637
13		-	-	-	22	0.632
14		-	-	-	23	0.627
15		-	-	-	24	0.623
16		-	-	-	25	0.621

Table 2.0 BH-2&9 Isolated, stnp and mat foundation allowable beanng pressure w.r.t footmg width

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tsf)	Isolated (tsf)	Footing Width (ft)	Raft/Mat (tsf)
1	3.0	3	0.465	0.562	10	0.696
2		4	0.406	0.503	11	0.681
3		5	0.348	0.445	12	0.666
4		6	0.289	0.386	13	0.651
5		7	0.230	0.327	14	0.636
6		8	0.171	0.268	15	0.621
7		9	0.112	0.209	16	0.606
8		-	-	-	17	0.593
9		-	-	-	18	0.581
10		-	-	-	19	0.569
11		-	-	-	20	0.561
12		-	-	-	21	0.553
13		-	-	-	22	0.548
14		-	-	-	23	0.543
15		-	-	-	24	0.539
16		-	-	-	25	0.537

Table 3.0 BH-3,5&6 isolated, strip and mat foundation allowable beanng pressure w.r.t footmg width

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tst)	Isolated (tst)	Footing Width (ft)	Raft/Mat (tst)
1	3.0	3	0.540	0.637	10	0.773
2		4	0.481	0.578	11	0.758
3		5	0.423	0.520	12	0.743
4		6	0.364	0.461	13	0.728
5		7	0.305	0.402	14	0.713
6		8	0.246	0.343	15	0.698
7		9	0.187	0.284	16	0.683
8		-	-	-	17	0.670
9		-	-	-	18	0.658
10		-	-	-	19	0.646
11		-	-	-	20	0.638
12		-	-	-	21	0.630
13		-	-	-	22	0.625
14		-	-	-	23	0.620
15		-	-	-	24	0.616
16		-	-	-	25	0.614

Table 4.0 BH-4 Isolated, stnp and mat foundation allowable beanng pressure w.r.t footing width

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tst)	Isolated (tst)	Footing Width (ft)	Raft/Mat (tst)
1	3.0	3	0.525	0.622	10	0.755
2		4	0.466	0.563	11	0.740
3		5	0.408	0.505	12	0.725
4		6	0.349	0.446	13	0.710
5		7	0.290	0.387	14	0.695
6		8	0.231	0.328	15	0.680
7		9	0.172	0.269	16	0.665
8		-	-	-	17	0.652
9		-	-	-	18	0.640
10		-	-	-	19	0.628
11		-	-	-	20	0.620
12		-	-	-	21	0.612
13		-	-	-	22	0.607
14		-	-	-	23	0.602
15		-	-	-	24	0.598
16		-	-	-	25	0.596

Table 5.0 BH-7&8 Isolated, strip and mat foundation allowable bearmg pressure w.r.t footmg width

Project

Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

Client

MMP Pal(istan

Subject

Geo-Technical Investigation Report

Prepared By

Safe Technical Services House#

19, ST # 2, Mohallah Farooqabad, Samundari Road Faisalabad.

Ce11:0300-7600142

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7	3.3	Disturbed Sampling	3
8	3.4	Water Table	3
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10	4.1	Sieve Analysis	4
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12	4.3	Atterberg's Limits (Liquid & Plastic Limits)	5
13	4.4	Direct Shear Test	5
14	4.5	Bulk Density and Field Moisture Content	5
15	■	Sub Soil Characterization	6
16	5.1	General	6
17	5.2	Sub Soil Profile	6
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20	6.2	Lateral Earth Pressure	7
21	6:3	Settlements	8
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1- Client has decided the *Improvement of Sewerage System Including Construction of Treatment and Waste Water Plant.* In order to place the foundation at suitable depth, a comprehensive understanding of the engineering properties of soil and evaluation of engineering parameters is a pre-requisite. The assignment to carryout subsoil investigation was entrusted to *Mls* STS Faisalabad. The site was explored during the month of May, 2023. After the site execution entire soil samples were transported to the laboratory at STS Faisalabad to evaluate the safe and economical bearing pressures. The detailed sub-soil investigation report has been prepared and discussed as under: -

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As per TOR for site investigation, following scope of work was given by client

1- Drilling of 12 Nos. of boreholes down to 10.0, 25.0, & 40.0 feet depth
2- The performance of Standard Penetration Test at 2.5-5 feet depth Interval up to maximum 10.0, 25.0, & 40.0 feet depth.
3- Collection of disturbed soil samples with the help of split spoon barrel sampler.
4- To prepare log of soil strata as per field classification ASTM D-2488.
5- To carry out necessary soil tests on the samples in Laboratory in accordance with ASTM-Standards.
6- To evaluate bearing capacity for foundation.
7- Conclusion and recommendations

The subsurface investigation has been carried out is accordance with ASTM D 420-87. The investigation consists of three sections.

2.1 - METHODOLOGY

Keeping in view the scope of work and specifications generally followed for the detailed geotechnical studies, a program of field work was prepared. The exploratory boreholes were drilled by using hand auger cum light percussion method. One drilling crew mobilizes to the site for carrying out exploratory drilling bore holes.

Fieid tests (i.e. Standard Penetration Tests) were performed in designated boreholes in accordance with relevant ASTM standards.
Soil samples were collected from designated depths from boreholes using ap lopriate samplers for identification and subsequent laboratory testing. Selected soil samples were subjected to various laboratory tests for evaluation of classification and strength characteristics of sub-soils.

This report has been prepared on the basis of detailed soil investigations carried out at the project site and subsequent laboratory testing performed on th selected soil samples. An evaluation of foundation soils, foundation design parameters and recommendations regarding type of foundations, and respective allowable bearing pressures are also provided in this report.

SECTION-I

Field investigation

SECTION-II

Laboratory Investigation/Testing

SECTION-lii

Bearing pressures Analysis

SECTION-I

3- FIELD INVESTIGATION

Field investigation comprises the following.

3.1 Drilling

As per recommended practice of ASTM D-420, percussion method was adopted for sub-soil exploration. The hole was advanced by hand augur drilling method. The drilling of the holes was carried out up to 10.0, 25.0, & 40.0 feet depth from existing ground level.

3.2 Standard Penetration Test

The objective of this test is to ascertain the resistance afforded to the penetration apparatus to a defined 12" depth. This test gives valuable information regarding the compactness of underlying strata. The test was performed in accordance with ASTM D 1586-84 by Donut type manually operated hammer. Generally The SPT N-value Increases downward. The degree of compactness and SPT N values of underlying strata represented in borehole logs.

3.3.1 Disturbed Sampling

After the boring is advanced to the desired sampling depth, the disturbed samples are collected with help of spilt spoon sampler. The disturbed sample have been collected and preserved in the Jars which have been properly indexed and transported to the Laboratory

3.4 Water Table

At the time of these investigations ground water table were not encountered at under given depths in Exploratory Boreholes in the month of May, 2023.

Borehole No.	Depth of Ground Water(feet) Respectively
1 to 12	18.0, 19.3, 25.0, 18.0, 9.5, 10.0, Nil, Nil, Nil, Nil, 25.0, 25.0 (9.5 ft to 25.0 ft)

SECTION-II

4 -LABORATORY TESTING

Selected soil samples were tested for evaluation of physical and engineering characteristics of the sub-soils, in the laboratory. The laboratory testing was carried out at testing facilities of STS. The following laboratory tests were performed on selected soil samples.

- Sieve Analysis
- Hydrometer Analysis
- Atterberg's limits
- Direct Shear Test
- Moisture Content

4.1 Sieve Analysis

Total thirty nine (39) soil samples selected for classification from the various depths after proper treatment were sieved under wet conditions in accordance with ASTM Standard. The curves have been plotted graphically and attached at end of this report.

4.2 Sedimentation/Hydrometer Test

The soil samples collected from the drill hole were sieved through No. 200, but to differentiate between silt and clay fraction, sedimentation test was employed in this test soil sample was treated with very diluted HCL arid then with Sodium met phosphate for deflocclation. The procedure defined in ASTM standard for Hydrometer analysis was followed. The % age of different sizgs were plotted on the grain size curves.

5 Sub Soil Characterization

5.1 General

The- geotechnical investigations carried for the project comprised field and laboratory work. The field and laboratory investigations were aimed at evaluating the engineering characteristics of the foundation soils. The subsurface conditions and engineering characteristics of the soils existing at the proposed project site are discussed in the following sections.

5.2 Sub Soil Pt:"ofile

Consistency limits in conjunction with grain size distribution was used to classify the soil in accordance with ASTM D-2488 (field classification) and ASTM D-2487 (Laboratory classification).

Strata are described as under: -

BH #	Strata	BH #	Strata
1	From 0.0 ft to 2.0 ft: Filling From 2.0 ft to 7.5 ft: Clayey silt From 7.5 ft to 10.0 ft: Sandy silt From 10.0 ft to 15.0 ft: Silty sand From 15.0 ft to 40.0 ft: Sand	7	From 0.0 ft to 5.0 ft: Clayey sandy silt From 5.0 ft to7.5 ft: Sandy clayey silt From 7.5 ft to 10.0 ft: Silty sand/sandy silt
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SECTION-III

6- BEARING CAPACITY ANALYSIS

6.1- Foundation Analysis

A foundation design consideration of any structure depends upon the magnitude of loading, type of structure and the sub-soil conditions. In consideration of safety, a foundation is required to meet two essential conditions. One is that the soil should be capable of withstanding the load without shear failure. The second is its ability to carry the load not exceeding the design settlement. The above two condition can be fulfilled if the loads are disfributed in such a manner that no excessive stresses and settlements prevailed within the supporting soil strata.

6.2- Lateral Earth Pressure

In case of buried structures and retaining walls, use of cohesion-less backfill is recommended. The evaluation of static earth pressure on buried wall/ retaining walls depends upon the movement allowed for in the design, configuration of the wall, backfill geometry and the type of soil used as backfill. For smooth vertical walls with horizontal backfill, the following simplified expressions can be used for determination of coefficients of lateral earth pressure; Coefficient of active earth pressure, $K_a = (1 - \sin 0')/(1 + \sin 0')$

Coefficient of earth pressure at rest, $K_0 = (1 - \sin 0')$

Coefficient of passive earth pressure, $K_p = (1 + \sin 0')/(1 - \sin 0')$

Where

O' Effective angle of internal friction of backfill soil

For evaluation of earth pressure under earthquake conditions, the equations proposed by Mononobe-Okabe may be used.

6.3- Settlements

The allowable bearing pressures for strip/isolated footings are based on 25.04 mm (1 inch) settlement and for raft/mat foundation is 50.08 mm (2 inch).

6.4-Modulus of Sub-Grade Reaction

Modulus of sub-grade reaction Ks to be used in computer model for structural analysis can be evaluated from the basic definition of Ks by using the evaluated net allowable bearing pressure which causes the settlement under themaximum structural pressure and is as follows:

For Strip and Square Footings with 25.4 mm tolerable settlement

$$Ks\ (kN/m^3) = \frac{\text{Evaluated Net Allowable Bearing Pressure x FOS}}{\text{Settlement (25.4 mm) under maximum structural pressure}}$$

6.5-Foundation Type and Depth

The Project site *Improvement of Sewerage System Including Construction of Treatment and Waste Water Plant,*. The normal foundation for such projects is strip; isolated and mat footing.

6.6-Design Parameters

Following -equations used for evaluation of allowable bearing pressures for shallow footings

Qutt==CNcSc+qNq Where C=Cohesion Nc,Nq=Bearing Capacity factors Sc=Shape factor (Shear Based Formula)	Qa=!i {.B.±£3}.2* Kd for BF4 F2 B Qa=fi * Kd for 8$F4 F1 N= Corrected N Value F1,F2, F3, F4 = Bearing Capacity Factor | Fl | 0.05 | F2 | 0.08' | F3 | 0.3 | F4 | 1.2 | B= Width offooting,Kd= 1.33 D/B :Sl.33 Adopted by J.E Bowles forth edition (1996). (Settlement Based Formula)

6.7 Allowable Bearing Pressure

The calculated and average allowable bearing pressures of Strip Isolated and Raft/Mat foundationis given in the below tables for design considerations. The respective charts/graphs are attached in summary sheets.

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tsf)	Isolated (tsf)	Footing Width (ft)	Raft/Mat (tsf)
1	3.0	3	0.516	0.613	10	0.757
2		4	0.457	0.554	11	0.742
3		5	0.399	0.496	12	0.727
4		6	0.340	0.437	13	0:712
5		7	0.281	0.378	14	0.697
6		8	0.222	0.319	15	0.682
7		9	0.163	0.260	16	0.667
8		-	-	-	17	0.654
9		-	-	-	18	0.642
10		-	-	-	19	0.630
11		-	-	-	20	0.622
12		-	-	-	21	0.614
13		-	-	-	22	0.609
14		-	-	-	23	0.604
15		-	-	-	24	0.600
16		-	-	-	25	0.598

Table 1.0 BH-1 isolated, stnp and mat foundation allowable beanng pressure w.r.t footmg width

Sr. No	n·epth From · EGL (ft)	Footing Width (ft)	Strip (tsf)	Isolated (tsf)	Footing Width (ft)	Raft/Mat (tsf)
1	3.0	3	0.558	0.655	10	0.780
2		4	0.499	0.596	11	0.765
3		5	0.441	0.538	12	0.750
4		6	0.382	0.479	13	0.735
5		7	0.323	0.420	14	0.720
6		8	0.264	0.361	15	0.705
7		9	0.205	0.302	16	0.690
8		-	-	-	17	0.677
9		-	-	-	18	0.665
10		-	-	-	19	0.653
11		-	-	-	20	0.645
12		-	-	-	21	0.637
13		-	-	-	22	0.632
14		-	-	-	23	0.627
15		-	-	-	24	0.623
16		-	-	-	25	0.621

Table 2.0 BH-2&9 Isolated, stnp and mat foundation allowable bearmg pressure w.r.t footmg width

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tsf)	Isolated (tsf)	Footing Width (ft)	Raft/Mat (tsf).
1	3.0	3	0.465	0.562	10	0.696
2		4	0.406	0.503	11	0.681
3		5	0.348	0.445	12	0.666
4		6	0.289	0.386	13	0.651
5		7	0.230	0.327	14	0.636
6		8	0.171	0.268	15	0.621
7		9	0.112	0.209	16	0.606
8		-	-	-	17	0.593
9		-	-	-	18	0.581
10		-	-	-	19	0.569
11		-	-	-	20	0.561
12		-	-	-	21	0.553
13		-	-	-	22	0.548
14		-	-	-	23	0.543
15		-	-	-	24	0.539
16		-	-	-	25	0.537

Table 3.0 BH-3,5&6 isolated, strip and mat foundation allowable bearing pressure w.r.t footing width

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tsf)	Isolated (tsf)	Footing Width (ft)	Raft/Mat (tsf)
1	3.0	3	0.540	0.637	10	0.773
2		4	0.481	0.578	11	0.758
3		5	0.423	0.520	12	0.743
4		6	0.364	0.461	13	0.728
5		7	0.305	0.402	14	0.713
6		8	0.246	0.343	15	0.698
7		9	0.187	0.284	16	0.683
8		-	-	-	17	0.670
9		-	-	-	18	0.658
10		-	-	-	19	0.646
11		-	-	-	20	0.638
12		-	-	-	21	0.630
13		-	-	-	22	0.625
14		-	-	-	23	0.620
15		-	-	-	24	0.616
16		-	-	-	25	0.614

Table 4.0 BH-4 Isolated, stnp and mat foundatiOn allowable bearing pressure w.r.t footing width

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tsf)	Isolated (tsf)	Footing Width (ft)	Raft/Mat (tsf)
1	3.0	3	0.525	0.622	10	0.755
2		4	0.466	0.563	11	0.740
3		5	0.408	0.505	12	0.725
4		6	0.349	0.446	13	0.710
5		7	0.290	0.387	14	0.695
6		8	0.231	0.328	15	0.680
7		9	0.172	0.269	16	0.665
8		-	-	-	17	0.652
9		-	-	-	18	0.640
10		-	-	-	19	0.628
11		-	-	-	20	0.620
12		-	-	-	21	0.612
13		-	-	-	22	0.607
14		-	-	-	23	0.602
15		-	-	-	24	0.598
16		-	-	-	25	0.596

Table 5.0 BH-7&8 isolated, strip and mat foundation allowable bearing pressure w.r.t footmg w1dth

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tsf)	Isolated (tsf)	Footing Width (ft)	Raft/Mat (tsf)
1	3.0	3	0.557	0.654	10	0.784
2		4	0.498	0.595	11	0.769
3		5	0.440	0.537	12	0.754
4		6	0.381	0.478	13	0.739
5		7	0.322	0.419	14	0.724
6		8	0.263	0.360	15	0.709
7		9	0.204	0.301	16	0.694
8		-	-	-	17	0.681
9		-	-	-	18	0.669
10		-	-	-	19	0.657
11		-	-	-	20	0.649
12		-	-	-	21	0.641
13		-	-	-	22	0.636
14		-	-	-	23	0.631
15		-	-	-	24	0.627
16		-	-	-	25	0.625

Table 6.0 BH-10 Isolated, stnp and mat foundation allowable bearing pressure w.r.t footing width

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tsf)	Isolated (tsf)	Footing Width (ft)	Raft/Mat (tsf)
1	7.0	3	0.474	0.571	10	0.720
2		4	0.415	0.512	11	0.705
3		5	0.357	0.454	12	0.690
4		6	0.298	0.395	13	0.675
5		7	0.239	0.336	14	0.660
6		8	0.180	0.277	15	0.645
7		9	0.121	0.218	16	0.630
8		-	-	-	17	0.617
9		-	-	-	18	0.605
10		-	-	-	19	0.593
11		-	-	-	20	0.585
12		-	-	-	21	0.577
13		-	-	-	22	0.572
14		-	-	-	23	0.567
15		-	-	-	24	0.563
16		-	-	-	25	0.561

Table 7.0 BH-11 isolated, stnp and mat foundation allowable beanng pressure w.r.t footmg width

Sr. No	Depth From EGL (ft)	Footing Width (ft)	Strip (tsf)	Isolated (tsf)	Footing Width (ft)	Raft/Mat (tsf)
1	3.0	3	0.467	0.564	10	0.708
2		4	0.408	0.505	11	0.693
3		5	0.350	0.447	12	0.678
4		6	0.291	0.388	13	0.663
5		7	0.232	0.329	14	0.648
6		8	0.173	0.270	15	0.633
7		9	0.114	0.211	16	0.618
8		-	-	-	17	0.605
9		-	-	-	18	0.593
10		-	-	-	19	0.581
11		-	-	-	20	0:573
12		-	-	-	21	0.565
13		-	-	-	22	0.560
14		-	-	-	23	0.555
15		-	-	-	24	0.551
16		-	-	-	25	0.549

Table 8.0 BH-12 Isolated, stnp and mat foundatiOn allowable beanng pressure w.r.t footmg width

Sr. No.	Depth (ft)	BH	Average Allowable Bearing Pressure (tsf) Strip	Average Allowable Bearing Pressure (tsf) Isolated	Average Allowable Bearing Pressure (tsf) Raft
1	3	BHl	0.340	0.437	0.660
2	3	BH2&9	0.382	0.479	0.683
3	3	BH3,5&6	0.289	0.386	0.599
4	3	BH4	0.364	0.461	0.676
5	3	BH7&8	0.349	0.446	0.658
6	3	BHlO	0.381	0.478	0.687
7	7	BHll	0.298	0.395	0.623
8	3	BH12	0.291	0.388	0.611
15	-	ALL AVE.	0.337	0.434	0.650

Table 9.0 Average Allowable Bearing Pressure ()tsf) of all Boreholes locations

7 CONCLUSIONS AND RECOMMENDATIONS

1. Dufing these investigations, the subsurface was explored to a maximum depth of 10.0, 25.0, & 40.0 feet below the existing ground surface. Various soil layers encountered at the site below the existing ground surface are described in borehole logs.
2. In order to provide foundation options to the structural engineer/designer, shallow foundations have been proposed. The shallow foundation may be square, strip or raft foundations as per objective of load and site conditions.
3. In case the floors are to be placed on in-situ soils then the top layer of soil containing organic matter and roots must be excavated and replaced with two 150 mm thick compacted layers of engineering fill comprising suitable granular material.
4. If required back filling, engineering fill A-2-4(0) should be used as a back fill material.
5. The soils at foundation level must be carefully inspected prior to placing the foundations to ensure that the soils are similar to those encountered in the boreholes. In case any loose/ weak material or fill material is encountered in the foundation excavation, it must be completely removed and replaced with properly compacted engineering fill prior to placing the foundations. The foundation excavation must be protected from ingress of water during foundation construction.
6. Plinth protection slab sloping away from the buildings should be provided around the structure to reduce ingress of water to foundation soils.
7. Proper surface drainage should be provided in the project area and the area should be graded to keep the surface runoff away from the structure. The ingress of water from any source should be avoided.
8. The side slopes should be stabilized and erosion of the soil and ingress of water into the soil must be protected.

A

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SUMMARY SHEET

Summary Sheet for Laboratory Test Results

Geotechnical Investigation for Improvement of Sewerage System Including Construction of Treatment and Waste Water Plant.

BH No.	Depth in (feet)	Sample #	Log Strata	Soil Strata Sieve (%)			Atterberg's Limits			Bulk Density and N.M.C %		Direct Shear Test	
				Gravel (%)	Sand (%)	Silt& Clay (%)	LL	PL	PI	Bulk Density in glee	N.M.C%	¢ (degrees)	C(kpa)
1	5.0	SPT-2	clayey silt	0	3	97	24	20	4	.....	.....	.....	.....
	10.0	SPT-4	sandy silt	0	14	86	.....	.....	.....	.....	.....	.....	.....
	20.0	SPT-6	sand	0	77	23	Non-Plastic			.....	.....	26	1.5
	30.0	SPT-8	sand	0	90	10	Non-Plastic			.....	.....	.....	.....
2	7.5	SPT-3	clayey silt	0	3	97	.....	.....	.....	.....	.....	.....	.....
	25.0	SPT-7	sand	0	89	11	Non-Plastic			.....	.....	.....	.....
	40.0	SPT-10	sand	0	96	4	Non-Plastic			.....	.....	30	1.0
3	2.5	SPT-1	clayey sandy silt	0	9	91	25	20	5	.....	.....	.....	.....
	15.0	SPT-5	clayey silt	0	5	95	.....	.....	.....	.....	.....	.....	.....
	25.0	SPT-7	silty clay/clayey silt	0	2	98	27	21	6	.....	.....	.....	.....
4	5.0	SPT-2	clayey sandy silt	0	7	93	.....	.....	.....	.....	.....	.....	.....
	20.0	SPT-6	silty sand	0	57	43	Non-Plastic			.....	.....	26	2.5

Material Engineer

APE Technical Services
w1ouse # 19. St # 2,MohaRah
t=arooqabad Samundrl oad,
Faisala

Summary Sheet for Laboratory Test Results

Geotechnical Investigation for Improvement of Sewerage System Including Construction of Treatment and Waste Water Plant,

BH No.	Depth in (feet)	Sample #	Log Strata	Soil Strata Sieve (%)			Atterberg's Limits			Bulk Density and N.M.C %		Direct Shear Test	
				Gravel (%)	Sand (%)	Silt & Clay (%)	LL	PL	PI	Bulk Density in glee	N.M.C%	¢ (degrees)	C(kpa)
5	7.5	SPT-3	?layey sandy silt	0	7	93	.....	.....	.....	.....	.....	.....	.....
	20.0	SPT-6	sandy clayey silt	0	12	88	.....	.....	.....	.....	.....	.....	.....
	40.0	SPT-10	silty clay/clayey silt	0	2	98	26	18	8	.....	.....	.....	.....
6	2.5	SPT-1	clayey sandy silt	0	7	93	.....	.....	.....	.....	.....	.....	.....
	25.0	SPT-7	sandy clayey silt	0	8	92	.....	.....	.....	.....	.....	.....	.....
7	5.0	SPT-2	clayey sandy silt	0	5	95	.....	.....	.....	.....	.....	.....	.....
	10.0	SPT-4	silty sand/sandy silt	0	42	58	Non-Plastic			.....	.....	.....	.....
8	7.5	SPT-3	sandy clayey silt	0	6	94	.....	.....	.....	.....	.....	.....	.....
9	15.0	SPT-5	sandy silt/silty sand	0	54	46	Non-Plastic			.....	.....	24	3.4
	25.0	SPT-7	silty clayey sand	0	51	49	Non-Plastic			.....	.....	.....	.....

Afzal%i f

House # 19, St # 2. Mohallah
Farooqabad Samundri Road,
Faisalabad.

Summary Sheet for Laboratory Test Results

Geotechnical Investigation for Improvement of Sewerage System Including Construction of Treatment and Waste Water Plant.

BH No.	Depth in (feet)	Sample #	Log Strata	Soil Strata Sieve (%)			Atterberg's Limits			Bulk Density and N.M.C %		Direct Shear Test	
				Gravel (%)	Sand (%)	Silt & Clay (%)	LL	PL	PI	Bulk Density in glee	N.M.C%	0 (degrees)	C(kpa)
10	5.0	SPT-2	clayey sandy silt	0	10	90	.....	.....	.....	.....	.....	.....	.....
	10.0	SPT-4	clayey silt	0	4	96	.....	.....	.....	.....	.....	.....	.....
	20.0	SPT-6	sand	0	83	17	Non-Plastic			.....	.....	28.0	1.0
11	2.5	SPT-1	clayey silt	0	5	95	.....	.....	.....	.....	.....	.....	.....
	15.0	SPT-5	clayey sandy silt	0	10	90	.....	.....	.....	.....	.....	.....	.....
12	20.0	SPT-6	silty clay/clayey silt	0	2	98	24	20	4	.....	.....	.....	.....
	40.0	SPT-10	silty sand	0	58	42	Non-Plastic			.....	.....	26.0	2.9

Material Engineer

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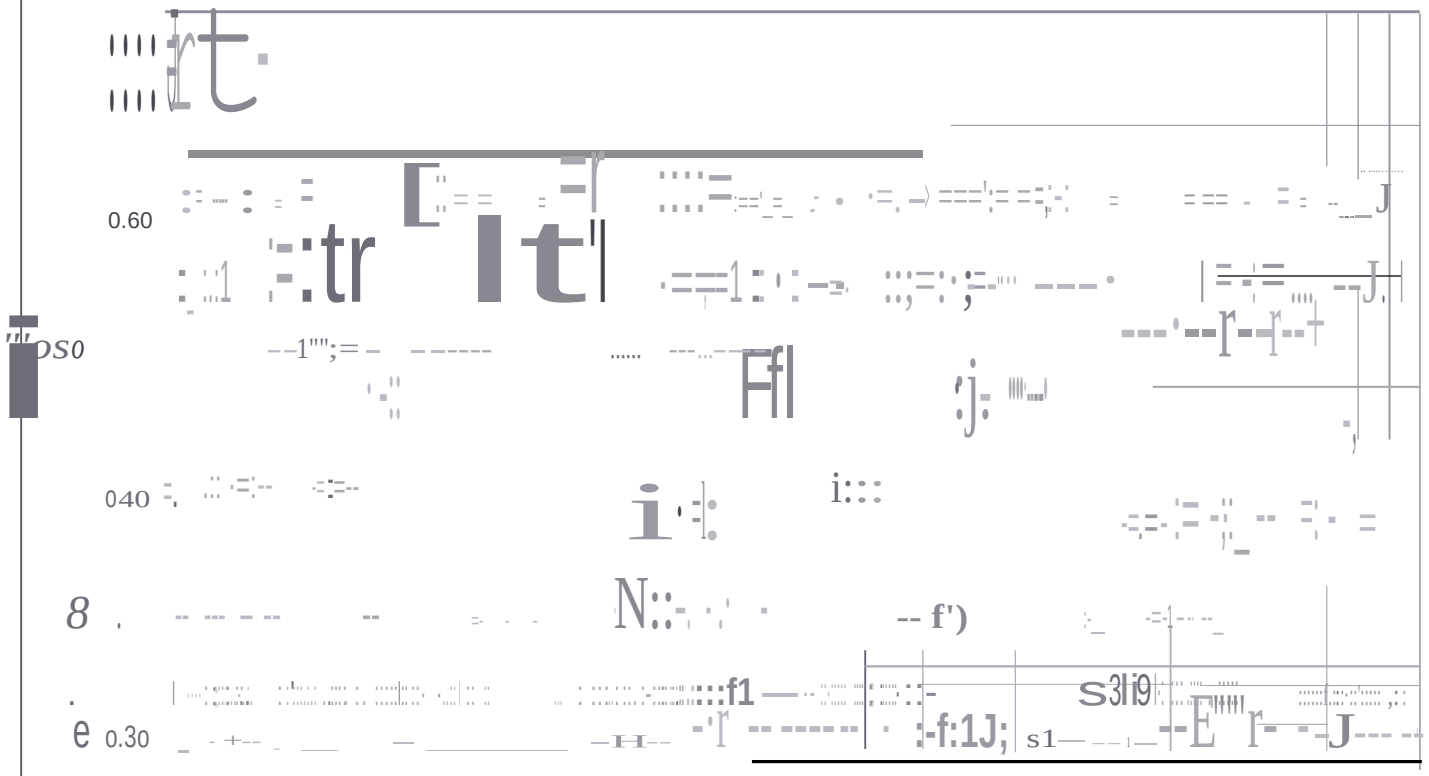
Faisala

BEARING CAPACITY CURVES

BH-1 (N:31.322459, E:73.414281) Allowable Bearing Capacity for Shallow Foundation

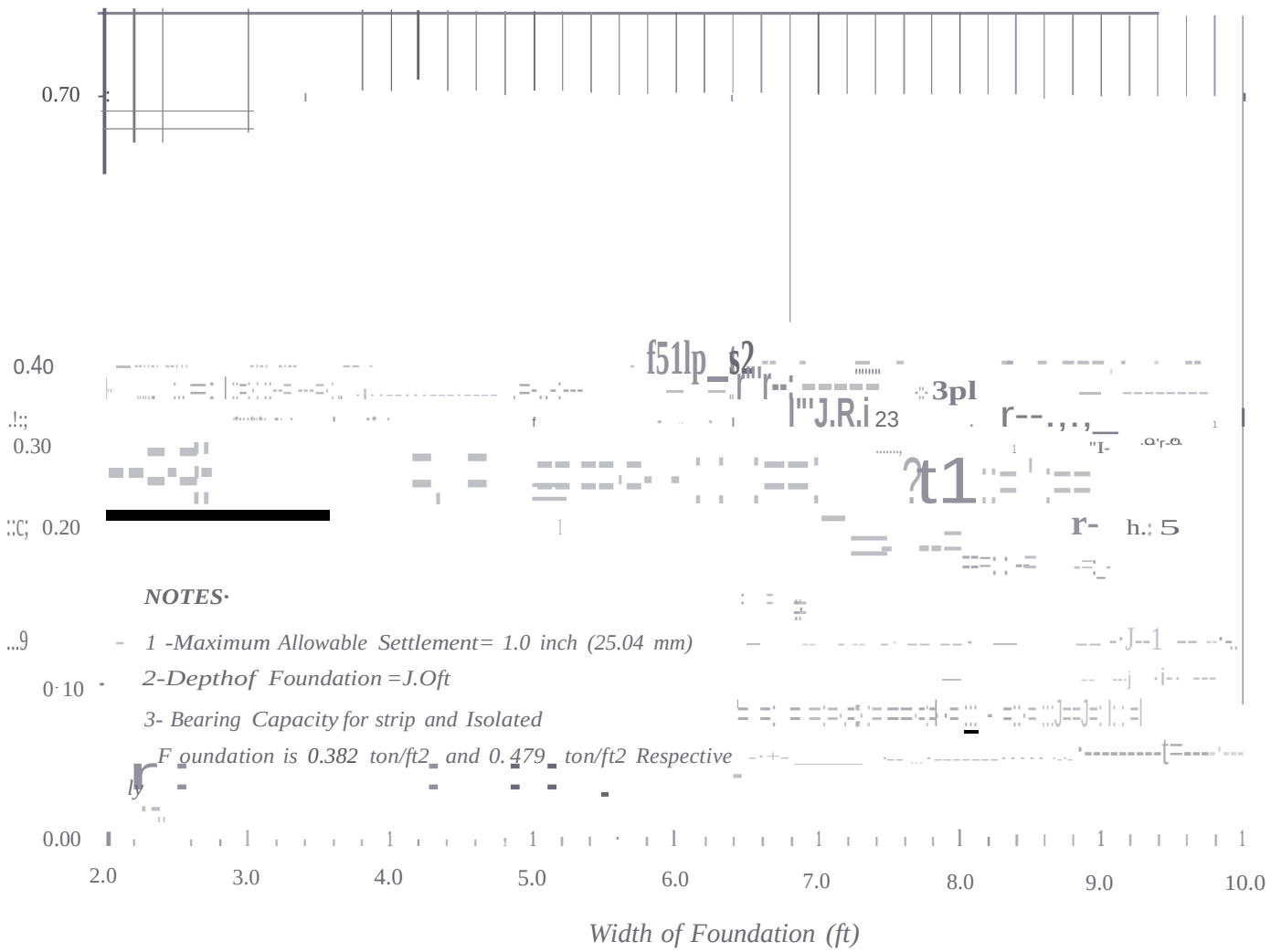


1 - Maximum Allowable Settlement = 1.0 inch (25.04 mm)
2- Depth of Foundation= 3.0ft
3- Bearing Capacity for strip and Isolated

Foundation is 0.340 ton/ft2 and 0.437ton/ft2 Respectively

BH 2&9 (N:31.322492, E:73.42422) & (N:31.324038, E:73.425389

Allowable Bearing Capacity for Shallow Foundation



NOTES·

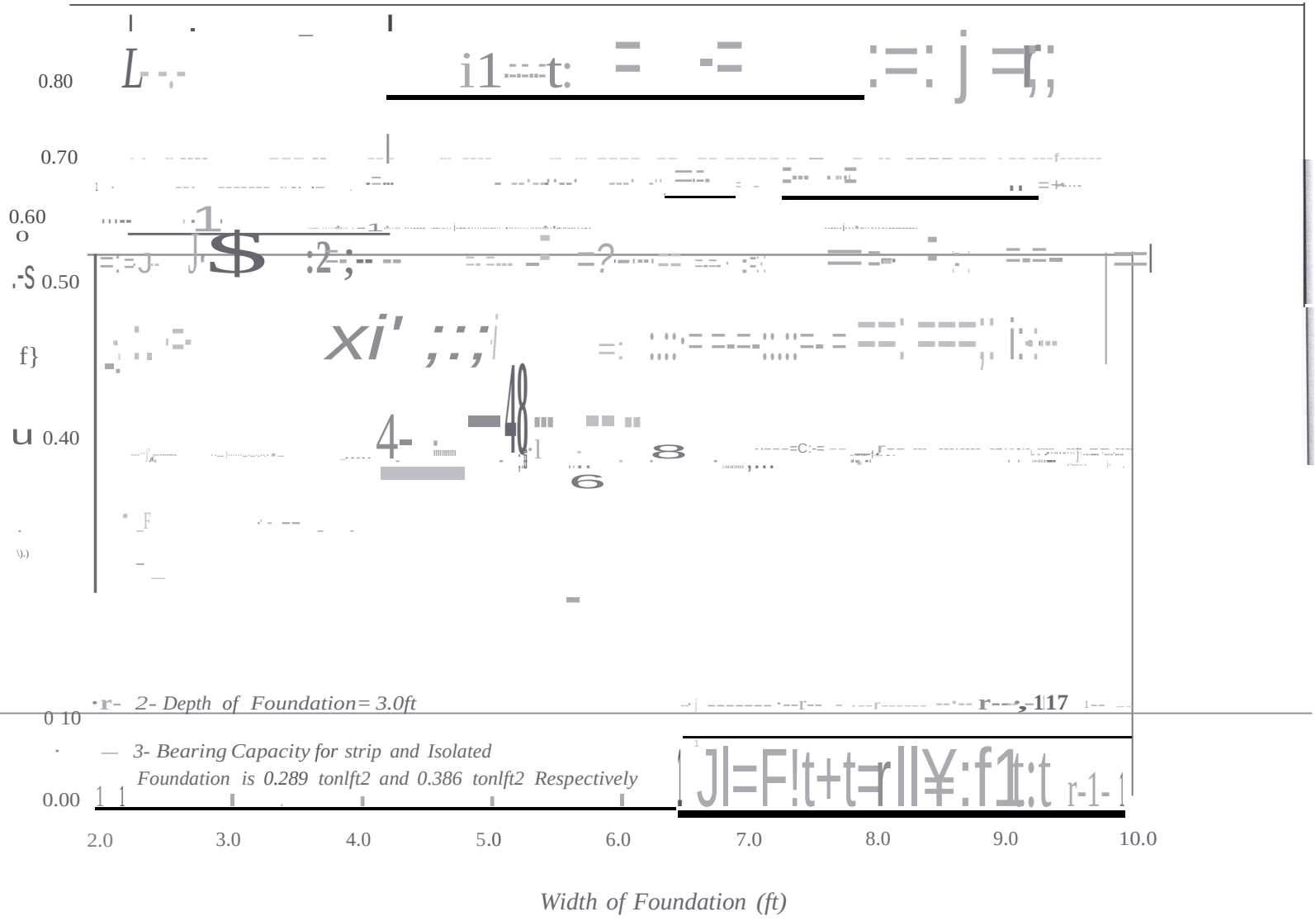
1 -Maximum Allowable Settlement= 1.0 inch (25.04 mm)

2-Depthof Foundation =J.Oft

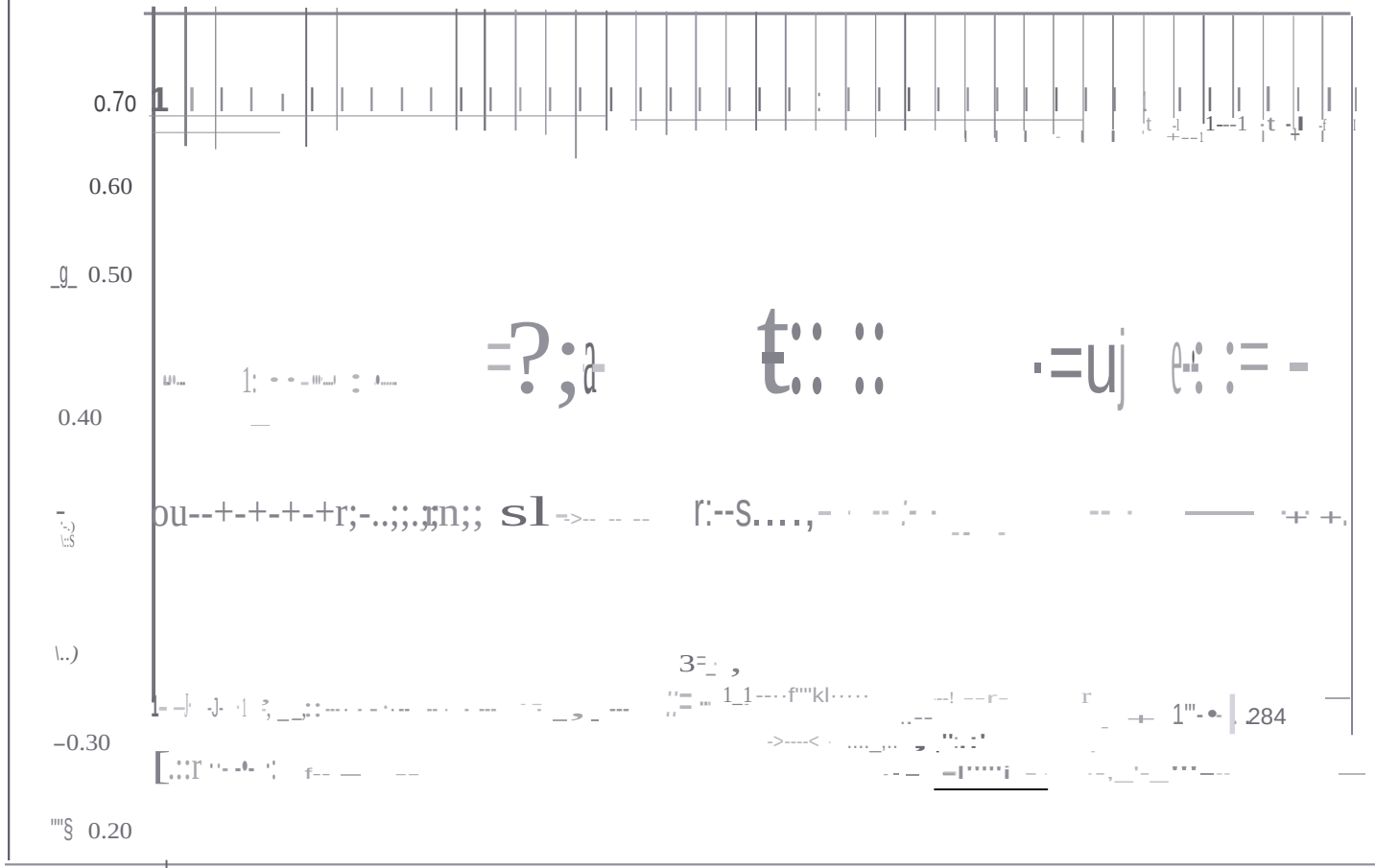
3- Bearing Capacity for strip and Isolated

F oundation is 0.382 ton/ft2 and 0.479 ton/ft2 Respectively

BH 3,5&6 (N:31.339066, E:73.42695),
(N:31.339114, E:73.423060),
(N:31.339231, E:73.422440)
Allowable Bearing Capacity for Shallow Foundation



BH 4(N:31.348148, E:73.4214)
Allowable Bearing Capacity for Shallow Foundation



NOTES·

1 -Maximum Allowable Settlement = 1.0 inch {25.04 mm)

2- Depth of Foundation= 3.0ft

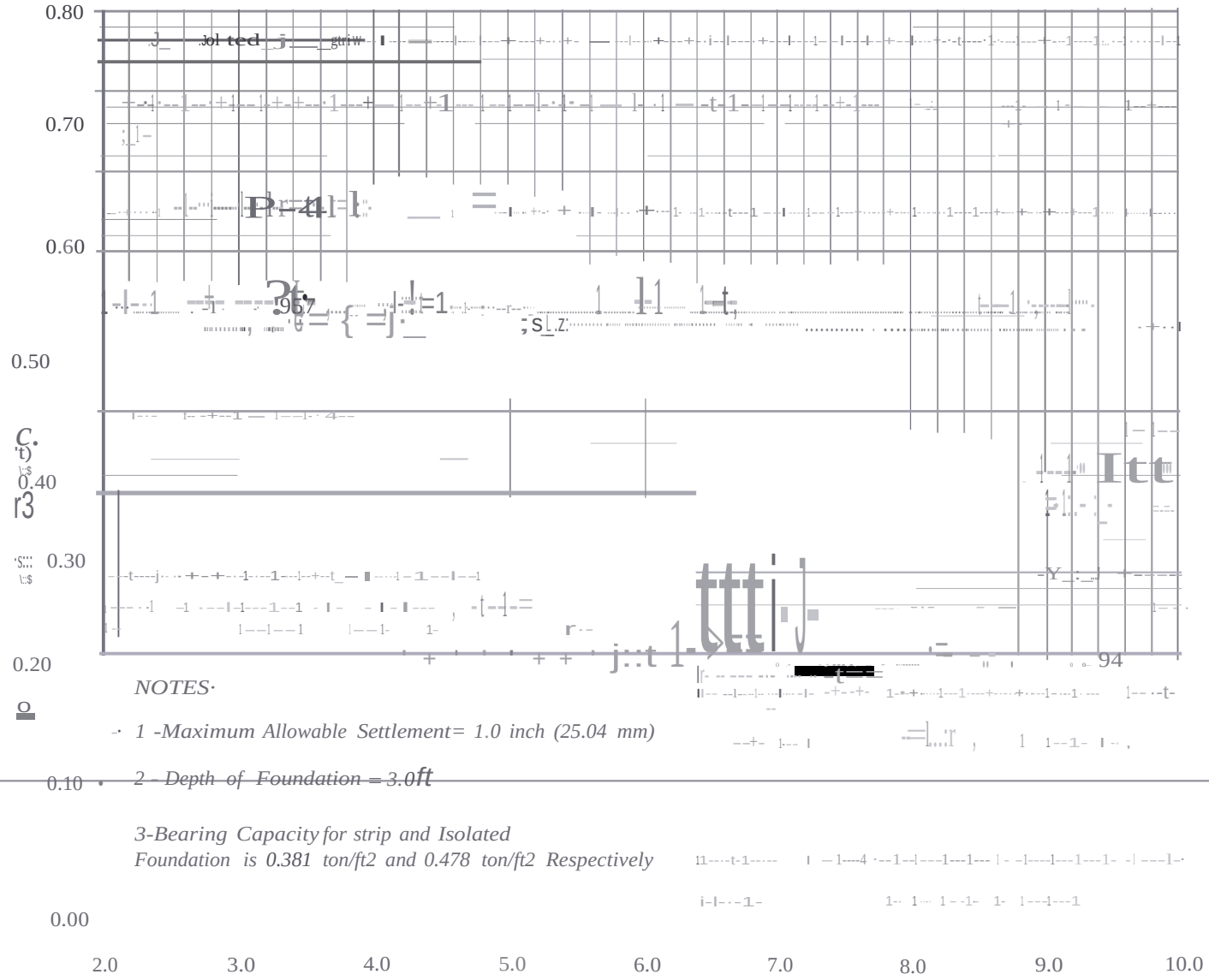
3- Bearing Capacity for strip and Isolated Foundation is 0.364 ton/ft2 and 0.461ton/ft2 Respectively

2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0

Width of Foundation (ft)

BH 10 (N:31.328873, E:73.430411)

Allowable Bearing Capacity for Shallow Foundation



NOTES·

1 -Maximum Allowable Settlement= 1.0 inch (25.04 mm)

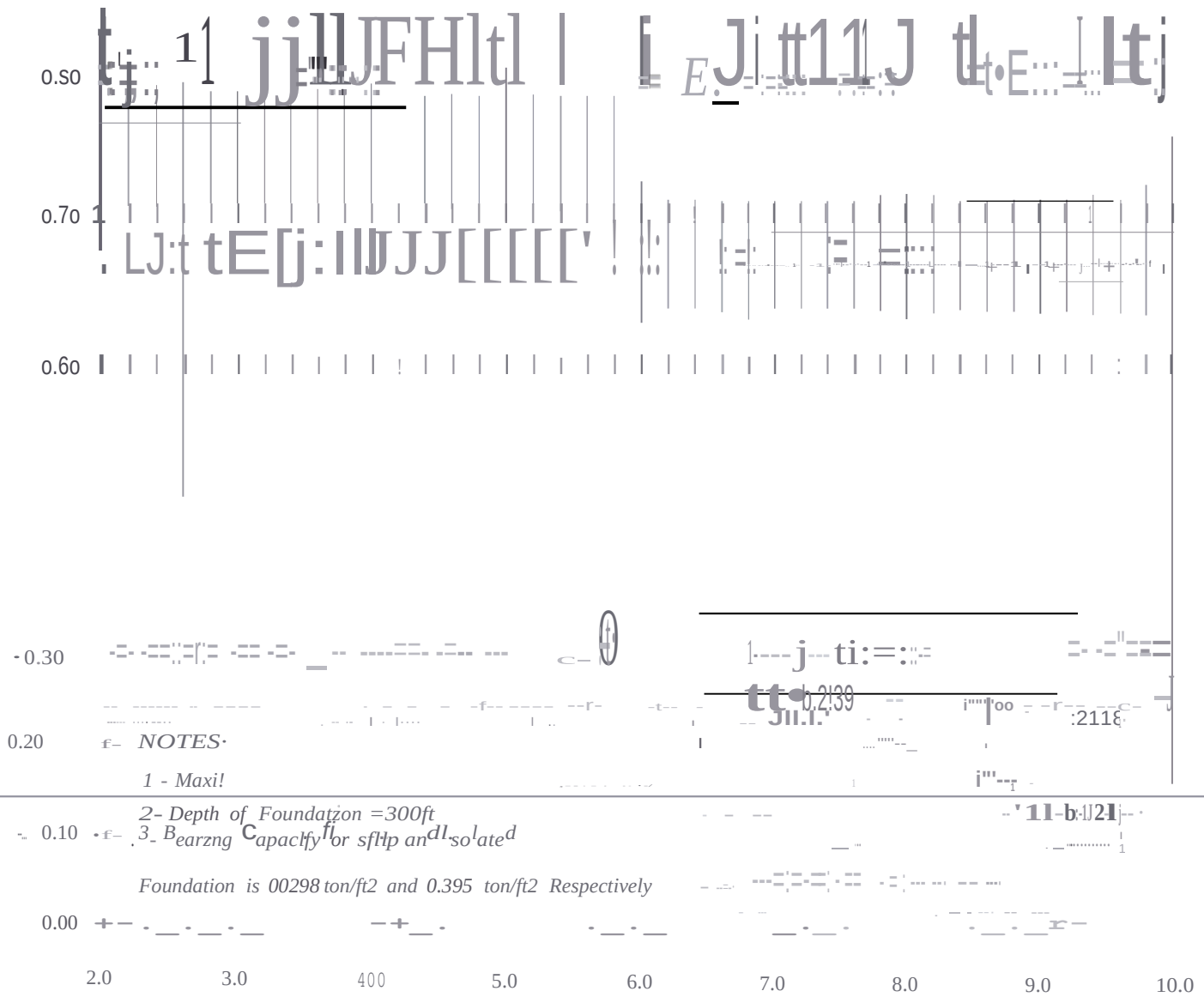
2 – Depth of Foundation = 3.0ft

3-Bearing Capacity for strip and Isolated Foundation is 0.381 ton/ft2 and 0.478 ton/ft2 Respectively

Width of Foundation (ft)

BH-11 (N:31.340982, E:73.423006)

Allowable Bearing Capacity for Shallow Foundation



NOTES·

1 - Maxi!

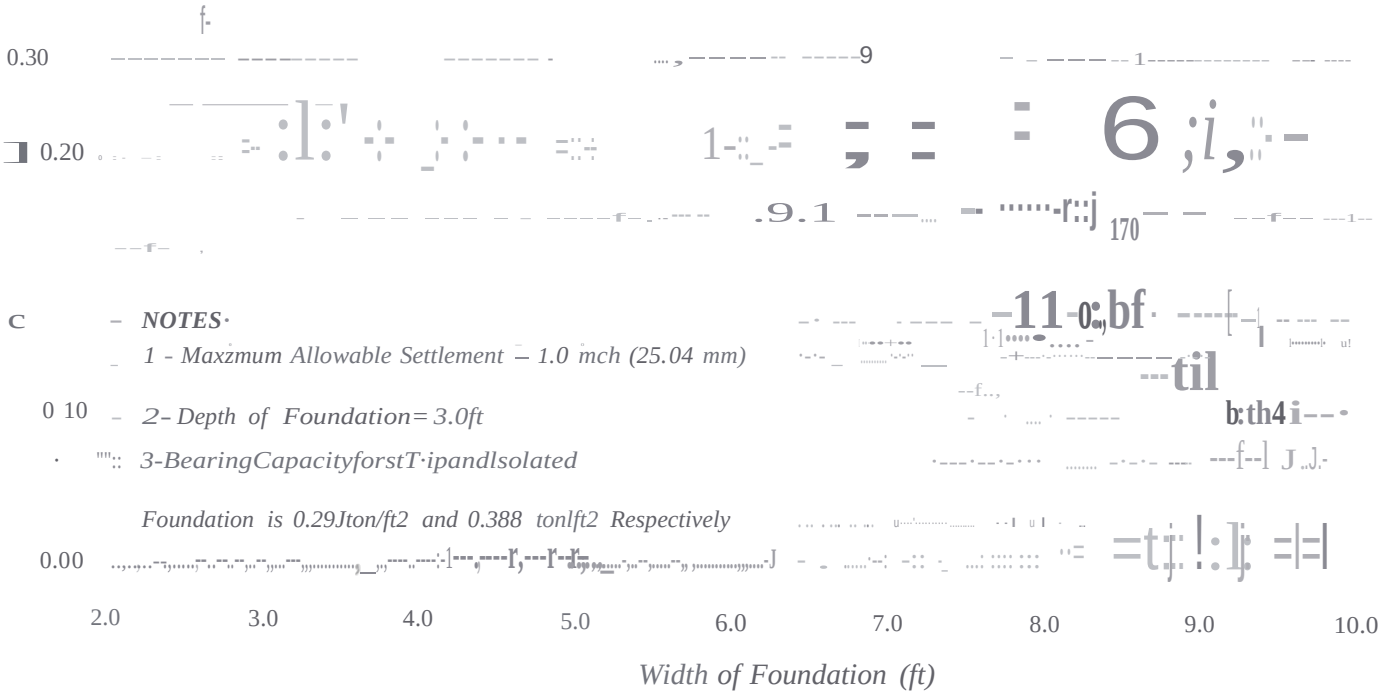
2- Depth of Foundatzon =300ft

3- Bearzng Capaclfy fl or sflHp and so l ate d

Foundation is 00298 ton/ft2 and 0.395 ton/ft2 Respectively

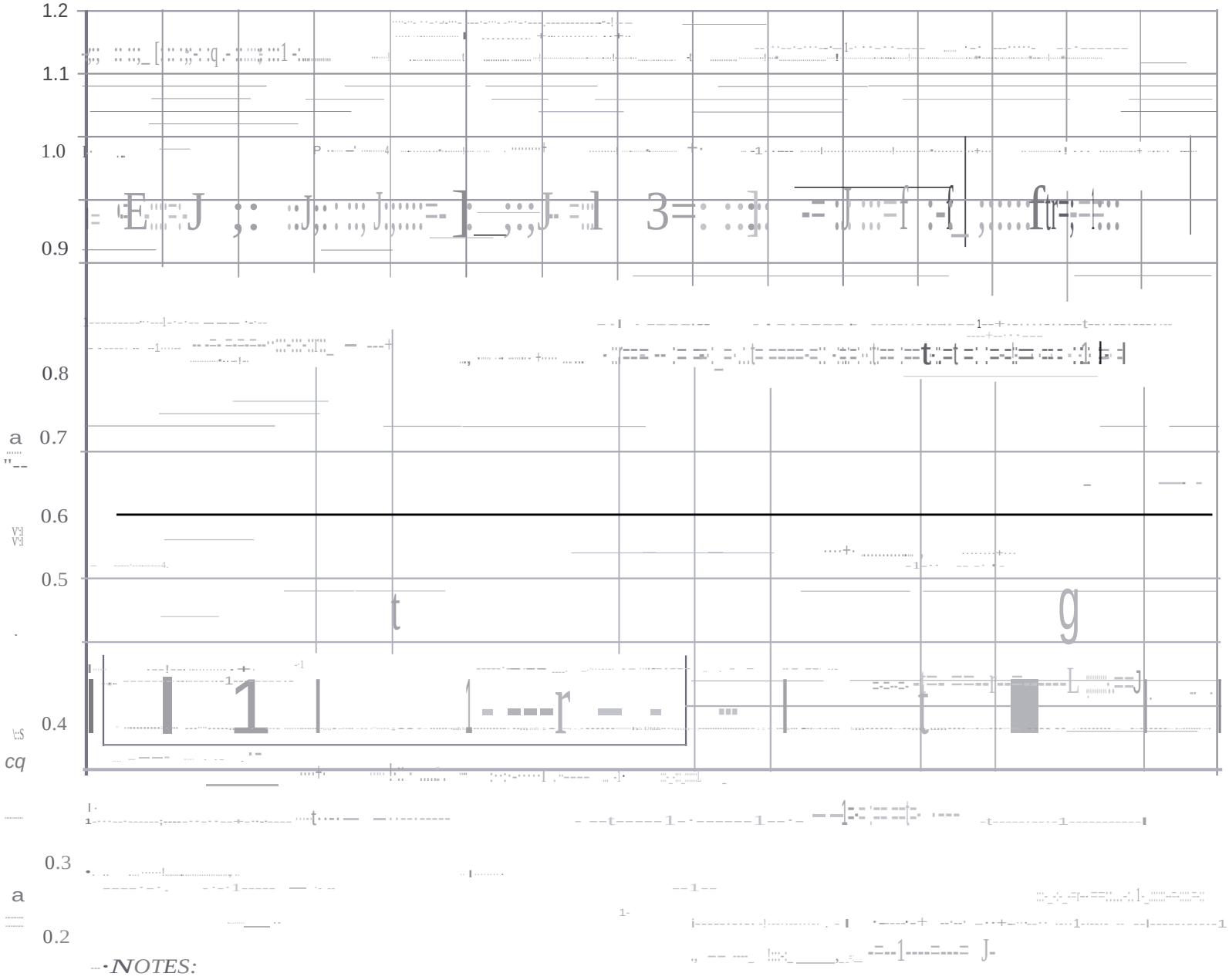
Width of Foundation (ft)

BH 12 (N:31.3133558, E:73.417361)
Allowable Bearing Capacity for Shallow Foundation


0.30
0.20
0 10
0.00
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Width of Foundation (ft)
NOTES·
1 - Maxzmum Allowable Settlement – 1.0 mch (25.04 mm)
2- Depth of Foundation= 3.0ft
3-BearingCapacityforstT·ipandlsolated
Foundation is 0.29Jton/ft2 and 0.388 tonlft2 Respectively

BH-1 (N:31.322459, E:73.414281)

Bearing Capacity Curves for Mat/Raft Foundation



NOTES:

0.1 -1-1 *I - Maximum Allowable Settlement = 2.0 inch (50.0 4mm)*
2- Average Bearing Capacity at Depth 3.0 ft is. 0.660 tsf

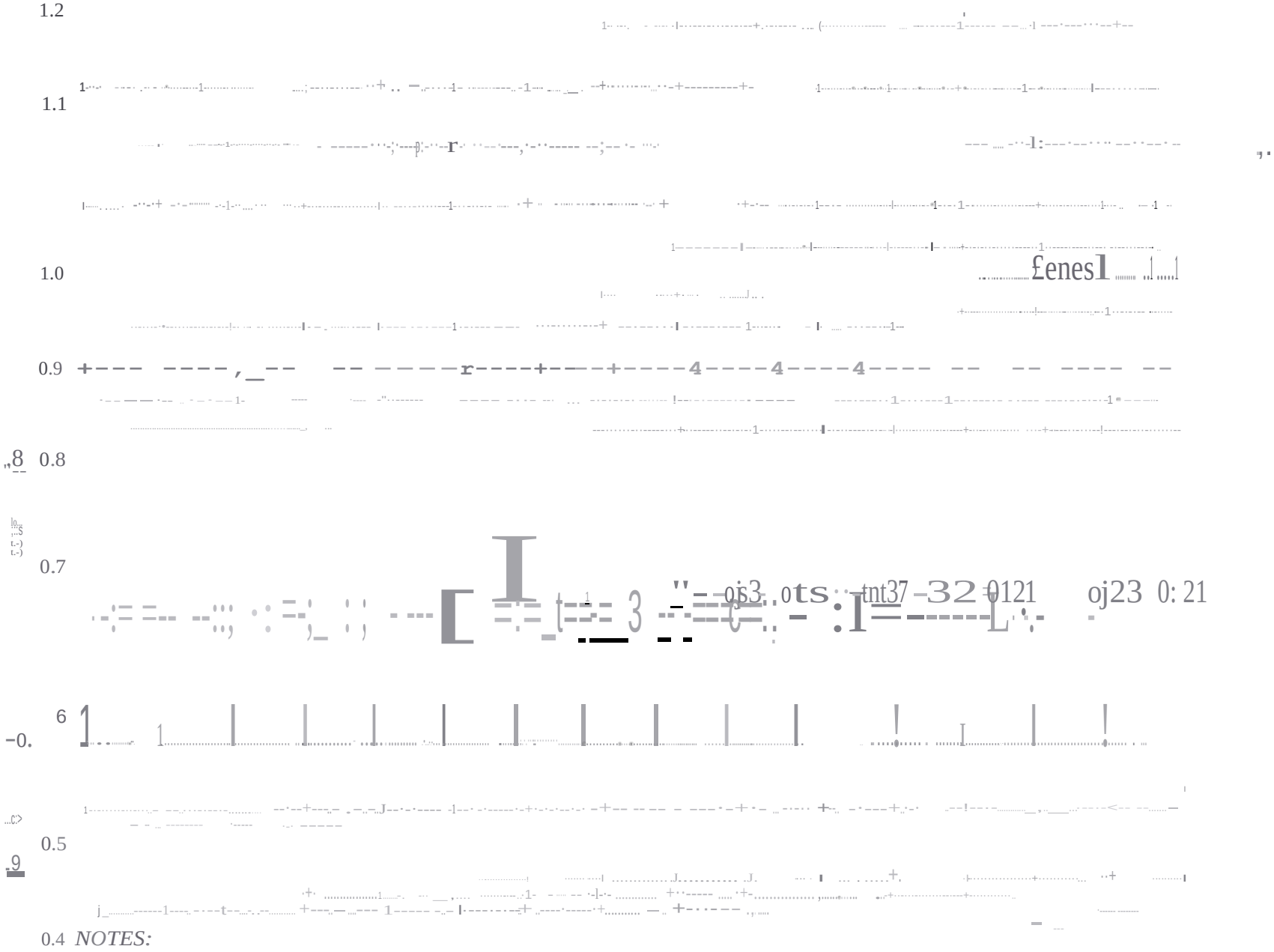
0.0

10 15 20 25

Width of Mat Foundation (ft)

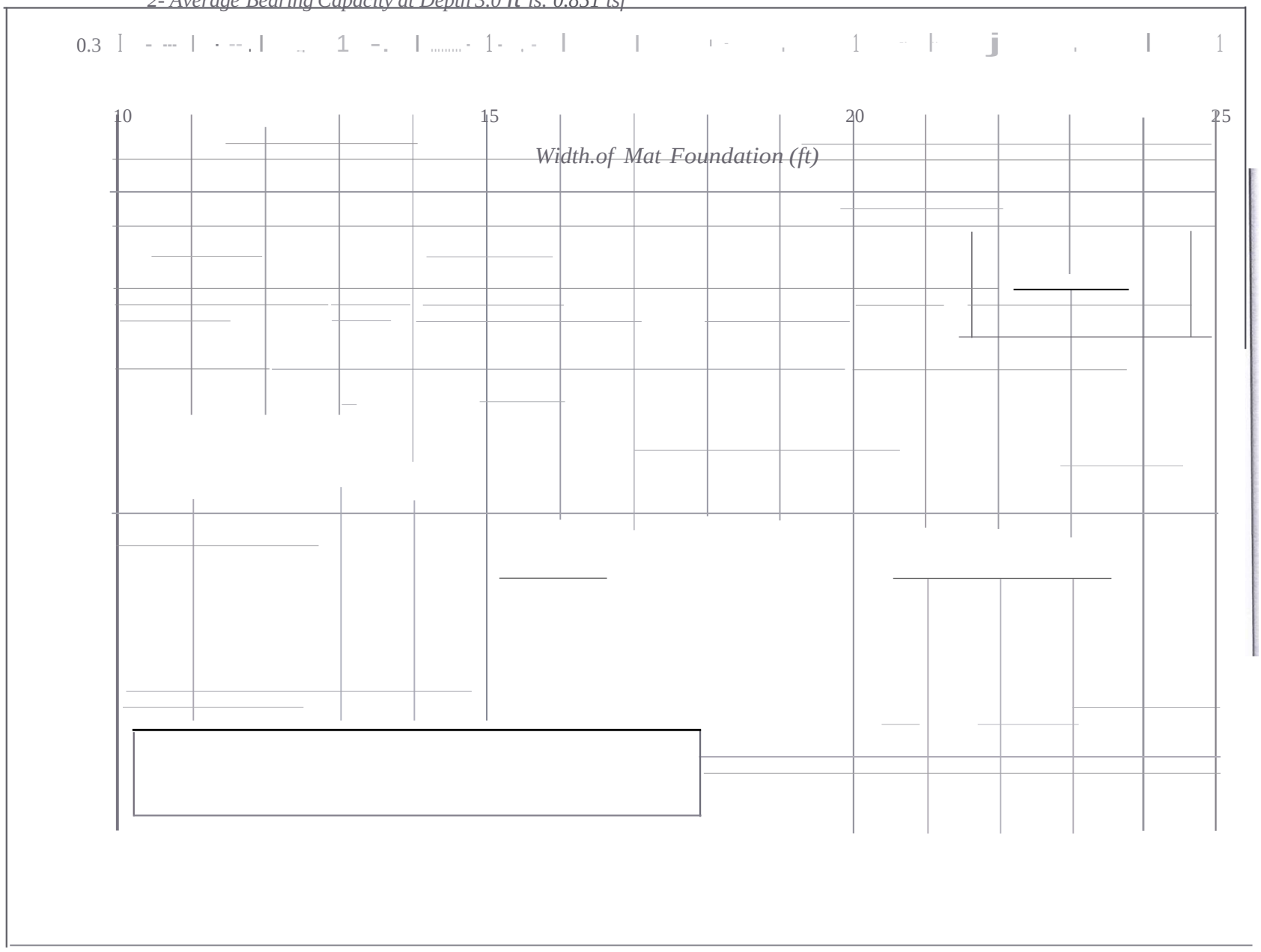
BH 2&9 (N:31.322492, E:73.42422) & (N:31.324038, E:73.425389)

Bearing Capacity Curves for Mat/Raft Foundation



NOTES:

I - Maximum Allowable Settlement = 2.0 inch (50.0 4mm)
2- Average Bearing Capacity at Depth 3.0 ft is. 0.851 tsf



BH 3,5&6 (N:31.339066, E:73.42695), (N:31.339114, E:73.423060), (N:31.339231, E:73.422440)

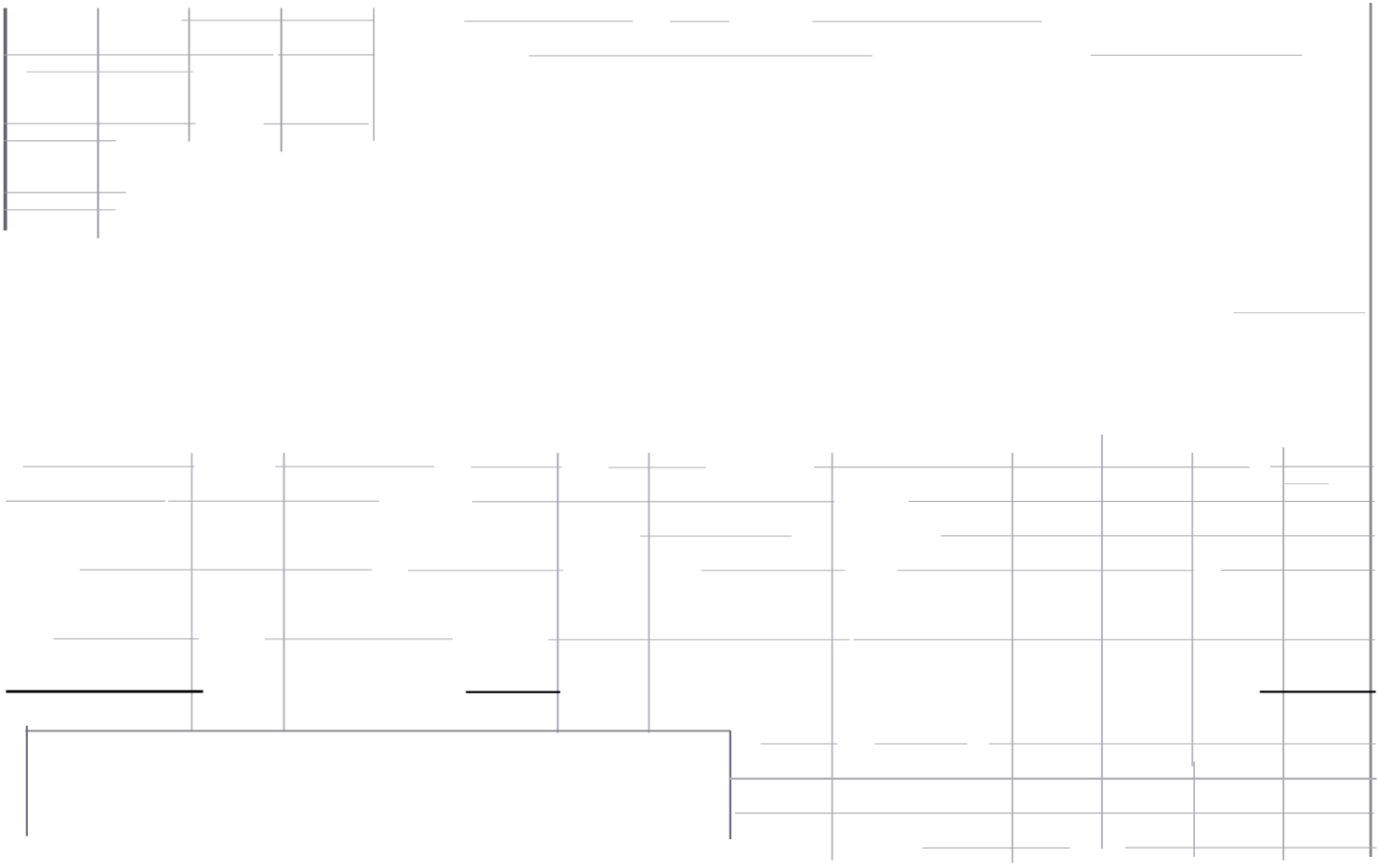
Bearing Capacity Curves for Mat/Raft Foundation

NOTES:

1- Maximum Allowable Settlement= 2.0 inch (50.0 4mm)

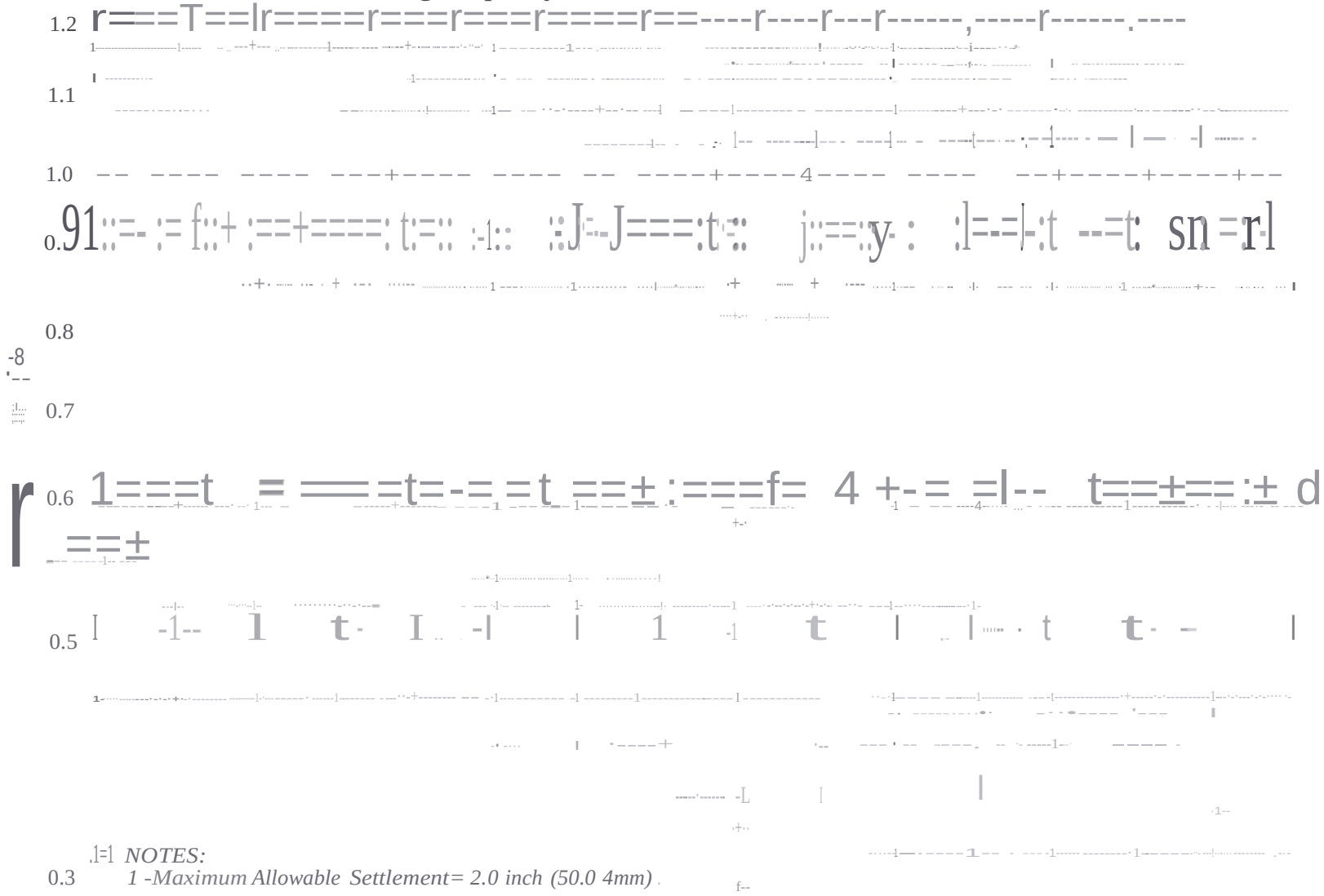
2- Average Bearing Capacity at Depth 3.0 fl is. 0.599 tsf

Width of Mat Foundation (ft)



BH 4(N:31.348148, E:73.4214)

Bearing Capacity Curves for Mat/Raft Foundation



NOTES:

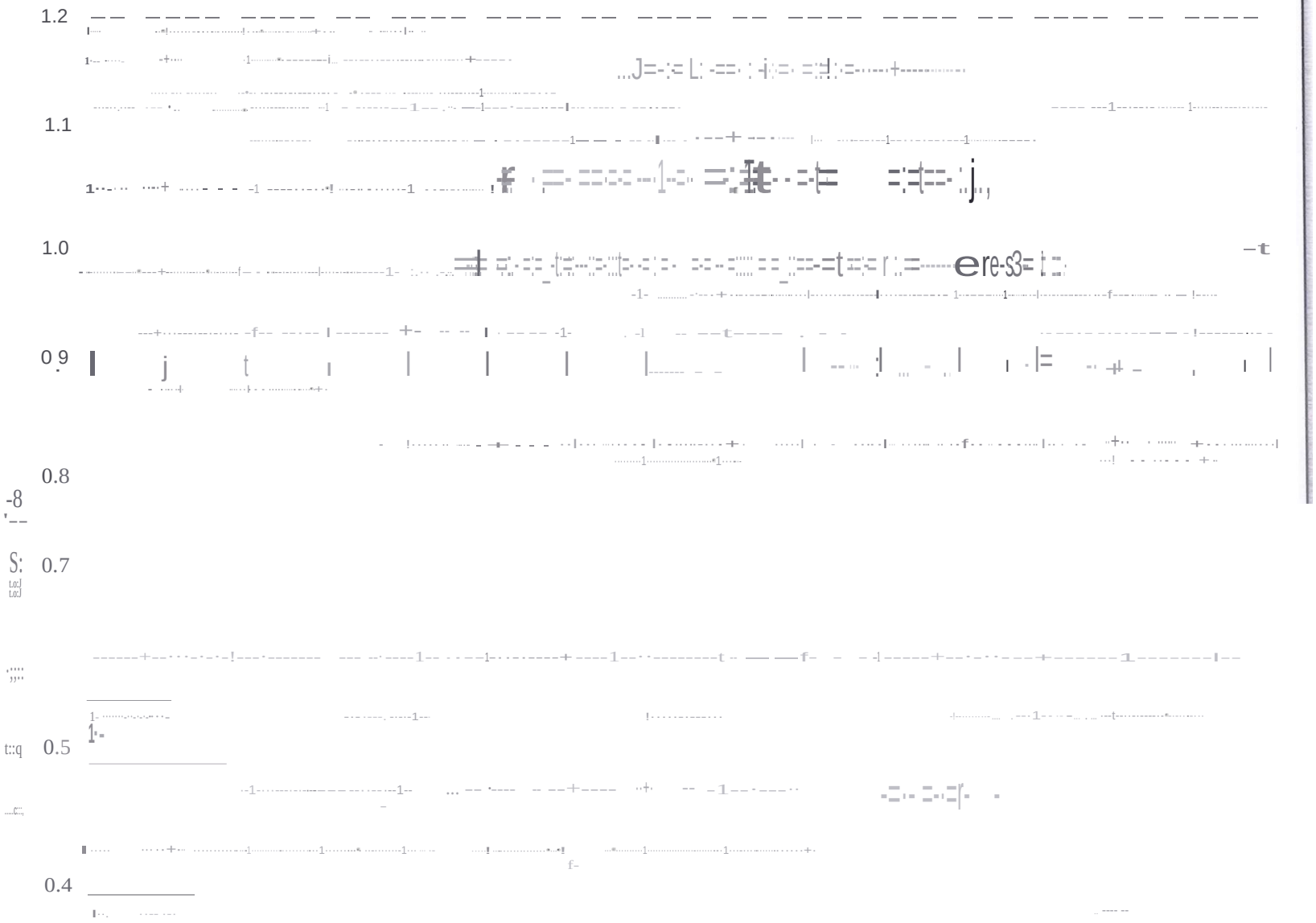
1 -Maximum Allowable Settlement= 2.0 inch (50.0 4mm)

2- Average Bearing Capacity at Depth 3.0 ft is. 0.676 tsf

10
15
20
25
Width of Mat Foundation (ft)

BH 7 & 8 (N:31.309172,E:73.454208), (N:31.309571,E:73.454069)

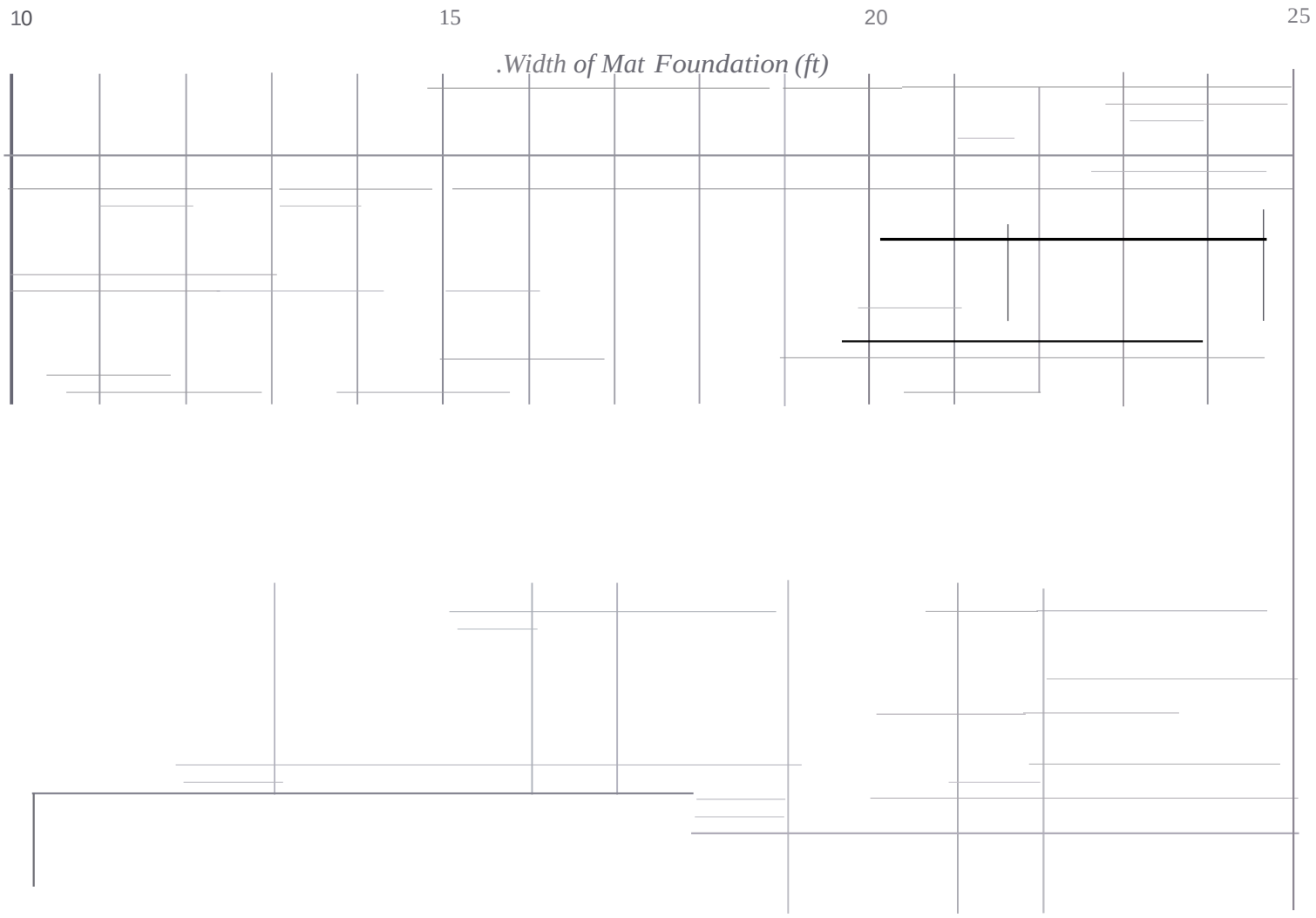
Bearing Capacity Curves for Mat/Raft Foundation



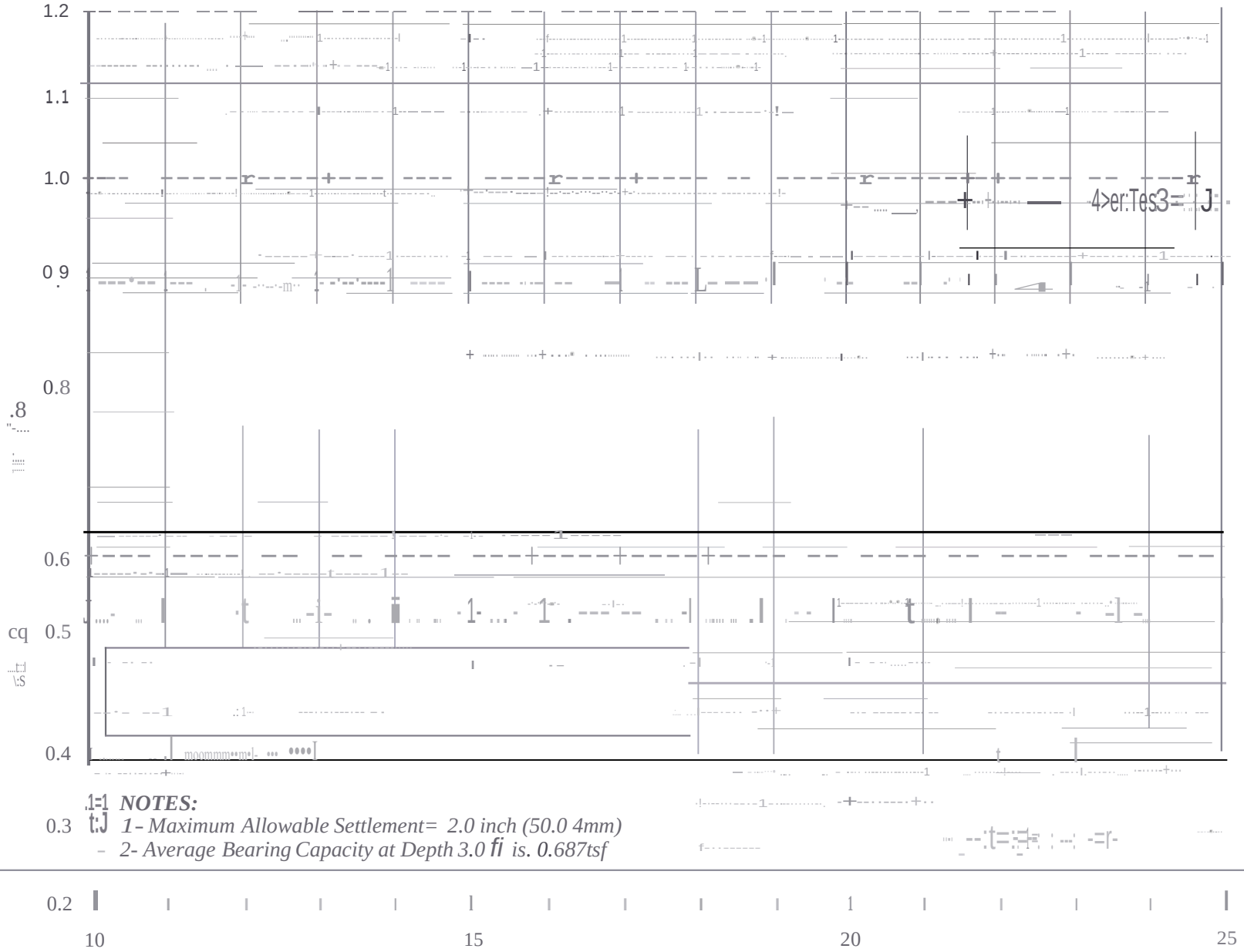
NOTES:

1- Maximum Allowable Settlement= 2.0 inch (50.0 4mm)

2- Average Bearing Capacity at Depth 3.0 ft is. 0.658 tsf



BH 10 (N:31.328873, E:73.430411)
Bearing Capacity Curves for Mat/Raft Foundation



NOTES:

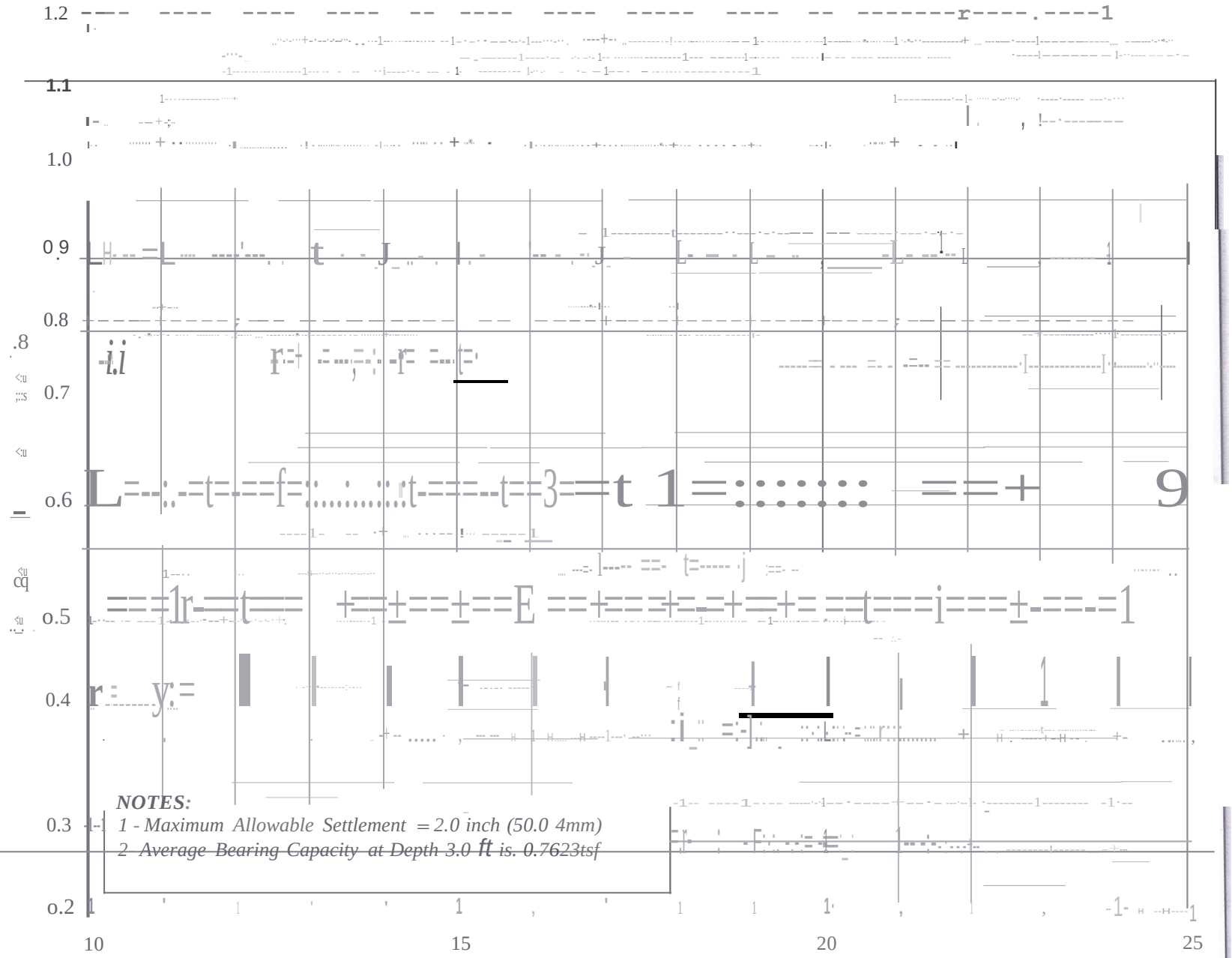
1- Maximum Allowable Settlement= 2.0 inch (50.0 4mm)

2- Average Bearing Capacity at Depth 3.0 ft is. 0.687tsf

Width of Mat Foundation (ft)

Fig. 1

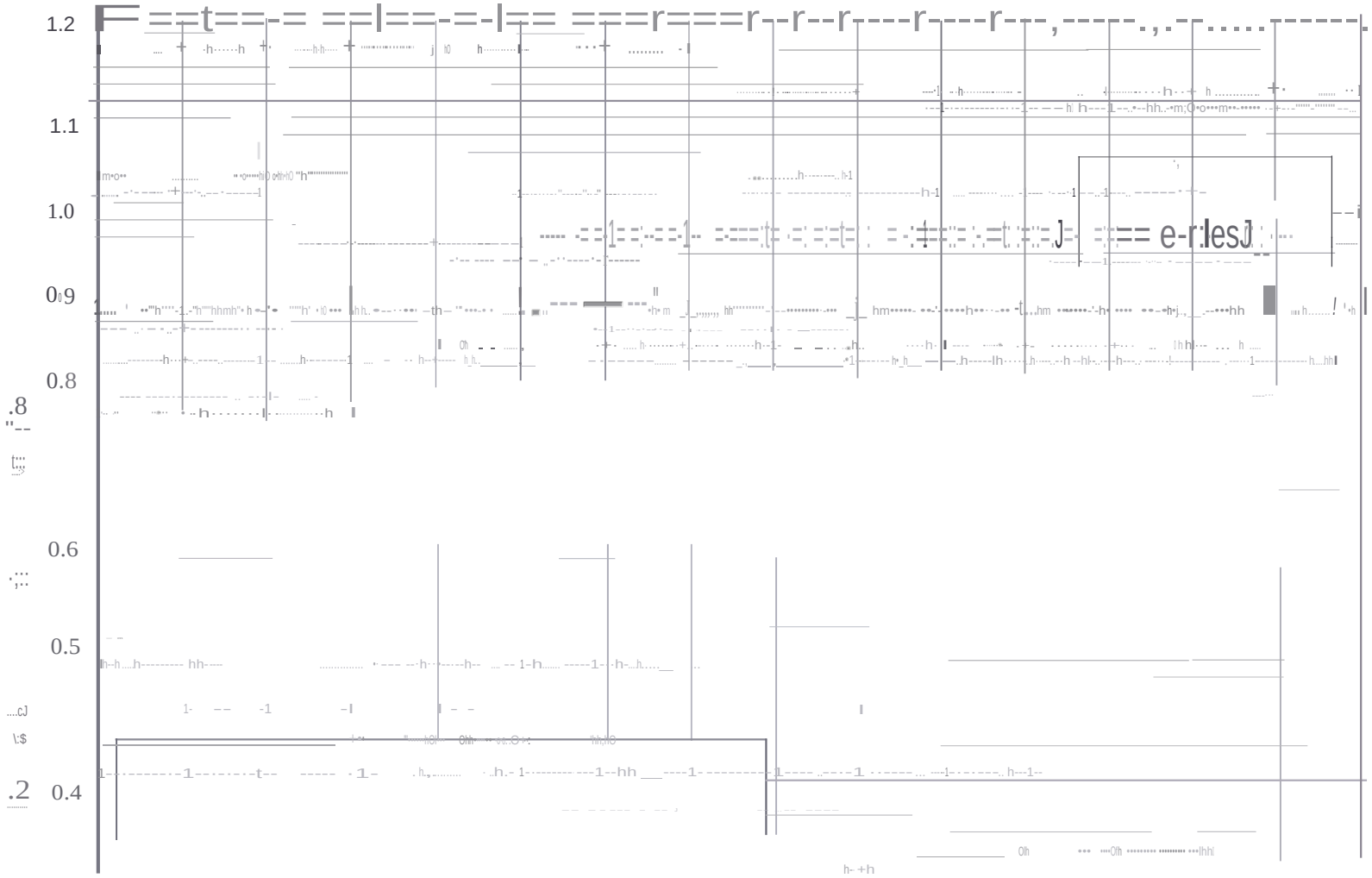
BH-11 (N:31.340982, E:73.423006)
Bearing Capacity Curves for Mat/Raft Foundation



Width of Mat Foundation (ft)

BH 12 (N:31.3133558, E:73.417361)

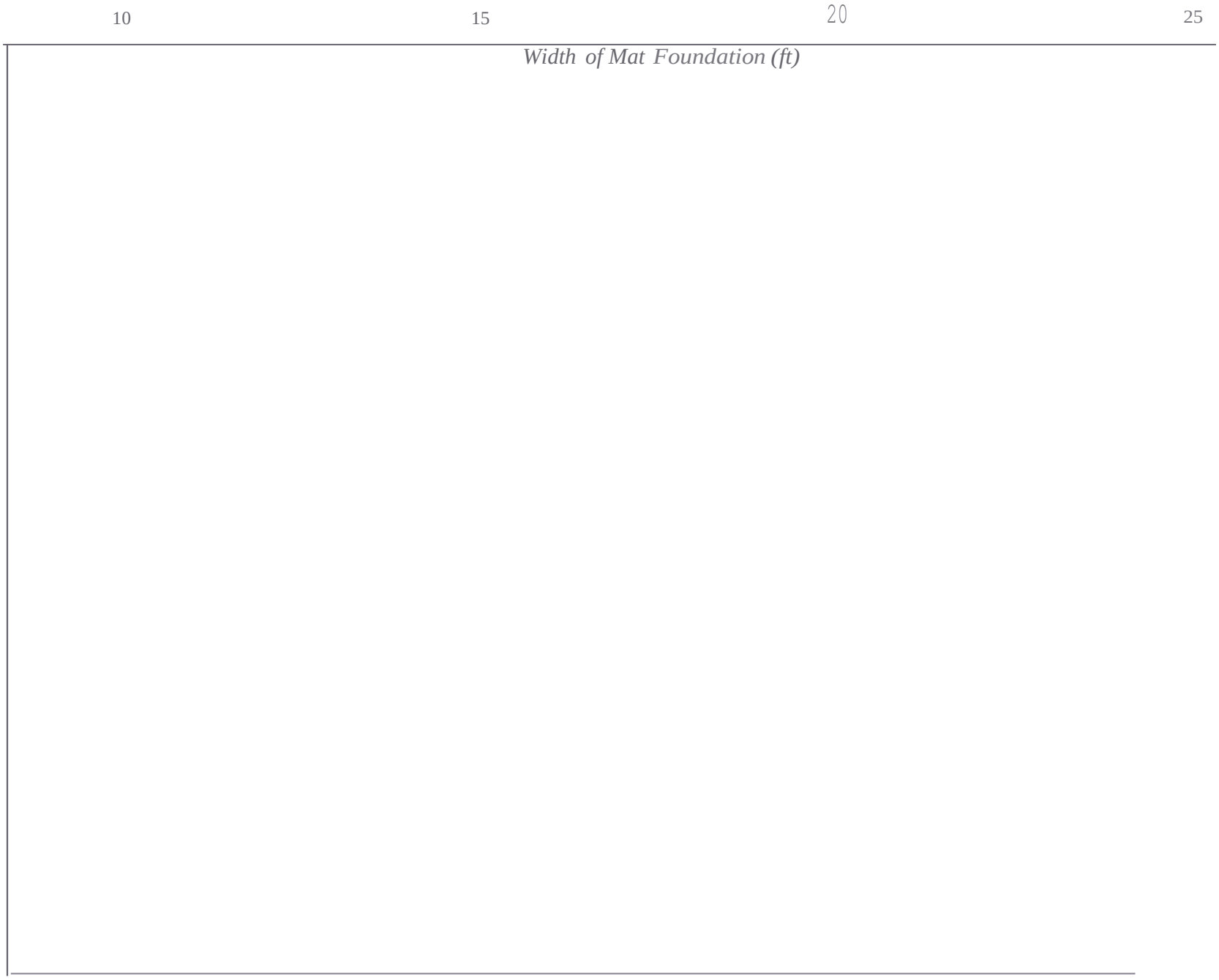
Bearing Capacity Curves for Mat/Raft Foundation



NOTES:

1 - Maximum Allowable Settlement= 2.0 inch (50.0 4mm)

2-Average Bearing Capacity at Depth 3.0 jtis. 0.611 tsf


10
15
20
25
Width of Mat Foundation (ft)

BORE HOLE LOGS

BORE HOLE EXPLORATION LOG

BH.No.	
SHE ET	1 of1

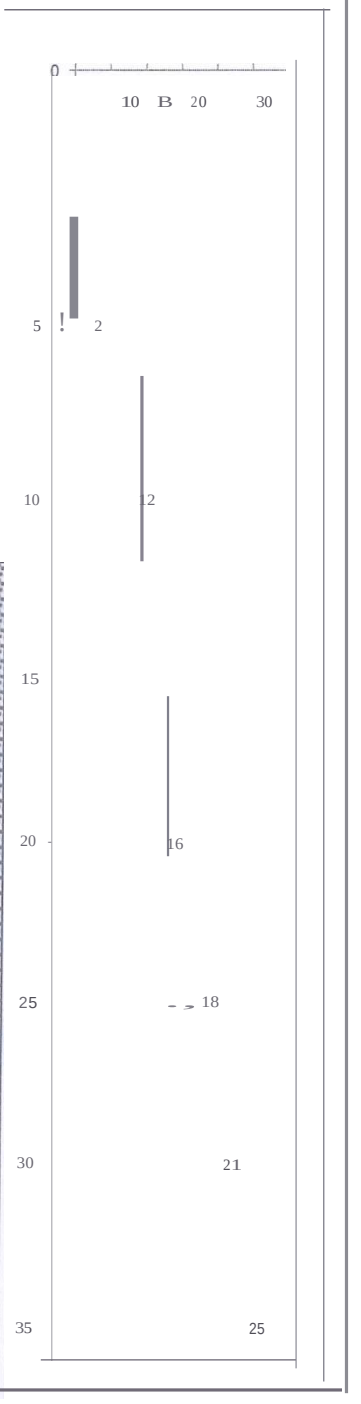
Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

Address: Jaranwala City | Light Percussion

E:73.414281 | 31.322459 | Alufd D. | 18.0 ft

40.0 ft | 10 May 2022

Depth (feet)	Simple No.	Material Description	Legends	SPT N VALUE
		From 0.0 ft to 5.0 ft: (0.0 ft to 2.0 ft Filling) Clayey silt; Light yellowish brown, soft, dry		
2.5	SPT-1			
5	SPT-2	From 5.0 ft to 10.0 ft: Clayey silt; Light yellowish brown, soft, low plastic, dry		
7.5	SPT-3			
		From 10.0 ft to 15.0 ft: Sandy silt; Light yellowish brown, stiff, dry		
10	SPT-4	From 15.0 ft to 20.0 ft: Silty sand; Brownish grey, fine grained, medium dense, moist		
15	SPT-5	From 20.0 ft to 25.0 ft: Sand; Light brownish grey, fine grained, medium dense, wet		
20	SPT-6	From 25.0 ft to 35.0 ft: Sand; Grey, fine grained, medium dense, wet		
25	SPT-7			
30	SPT-8			
	SPT-9	From 35.0 ft to 40.0 ft: Sand; Grey, fine to medium grained, medium dense, wet		
35				
40				



Soil Consistancy

Sand N Value	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 loose	2 to 4 Soft
10 to 30 M.Dense	4to 8 Firm
30 to SO Dense	8 to 1S Stiff
>SO V. Dense	1S to 30 V. Stiff
	> 30 Hard

Legends

SPT/CPT J UDS G.W.

Fill

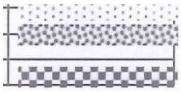
Clay/Silty Clay

Silty Sand

Gravel/Sand

Hard Strata

SAFE Technical Services FAISALABAD



BORE HOLE EXPLORATION LOG

BH.No. 2

SHEET 1 of 1

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Constrution of Wastewater Treatment Plant.

Address: Jaranwata uty

Depth (feet)	Sample No.	Material Description	SPT N VALUE
		Clayey sandy silt; Light yellowish brown, soft, dry	
2.5	SPT-1	From 2.5 ft to 5.0 ft: Clayey silt; Light yellowish brown, soft, low plastic, dry, concretions	
5	SPT-2		3
7.5	SPT-3	Clayey silt; Light yellowish brown, firm, low plastic, dry, concretions	
10	SPT-4	Clayey silt; Light yellowish brown, stiff, low plastic, dry, concretions	
		Sand; Light brownish grey, fine grained, medium dense, moist	
15	SPT-5	From 15.0 ft to 35.0 ft: Sand; Grey, fine grained, medium dense, wet	12
20	SPT-6		16
25	SPT-7		19
30	SPT-8		22
35	SPT-9	From 35.0 ft to 40.0 ft: Sand; Grey, fine to medium grained, medium dense, wet	26
40	SPT-10		4

Soil Consistancy

Sand N Value	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 loose	2 to 4 Soft
10 to 30 M.Dense	4to 8 Firm
30 to SO Dense	8 to 15 Stiff
> 50 V. Dense	15 to 30 V. Stiff
	> 30 Hard

Legends

SPT/CPT UDS G.W.

Fill

Clay/Silty Clay

Silty Sand

Gravel/Sand

Hard Strata

SAFE Technical Services FAISALABAD

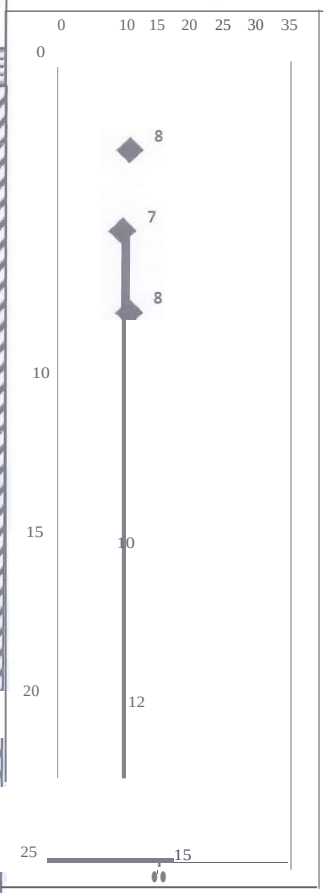
STS	BORE HOLE EXPLORATION LOG	BH.No.	3
		SHEET	1 of 1

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Constrution of Wastewater Treatment Plant

Address:	Jaranwala City						
Type of Boring	Light Percussion		Client/Consultant	MMP Pakistan			
location	E:73.42695		N: 31.339066	Elv:		G.W.T.	25.0 ft
Borehole Length	25.0 ft	Geologist	Nasir	Date	10 May 2023	to	10 May 2023

Depth (feet)	Sample No.	Material Description	Legends
		From 0.0 ft to 2.5 ft:(0.0 ft to 1.5 ft Filling) Clayey sandy silt; Light yellowish brown, soft, dry	
2.5	SPT-1	From 2.5 ft to 7.5 ft: Clayey silt; Light yellowish brown, firm, dry	
5	SPT-2		
7.5	SPT-3	From 7.5 ft to 15.0 ft: Clayey silt; Light yellowish brown, stiff, dry	
10	SPT-4		
15	SPT-5	From 15.0 ft to 20.0 ft Silty clay/clayey silt; Light yellowish brown, stiff, low plastic,dry	
20	SPT-6	Silty clay/clayey silt; Light yellowish brown, stiff, low platic,wet	
25		End of Borehole at 25.0 ft	
30	SPT-8		
35	SPT-9		
40	SPT- 10		

SPT N VALUE



Soil Consistancy

Sand N Value	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 loose	2 to 4 Soft
10 to 30 M.Dense	4to 8 Firm
30 to SO Dense	Sto 1S Stiff
> SO V. Dense	IS to 30 V. Stiff
	> 30 Hard

Legends

SPT/CPT 1 UDS G.W.

-F-ill -- --------

t-C.,.-Iay-.,./S....,il-ty ,CI,-ay-----t-

Silty Sand

Gravel/Sand

Hard Strata

SAFE Technical Services STS FAISALABAD.

BORE HOLE EXPLORATION LOG

BH.No.	4
SHEET	1 of 1

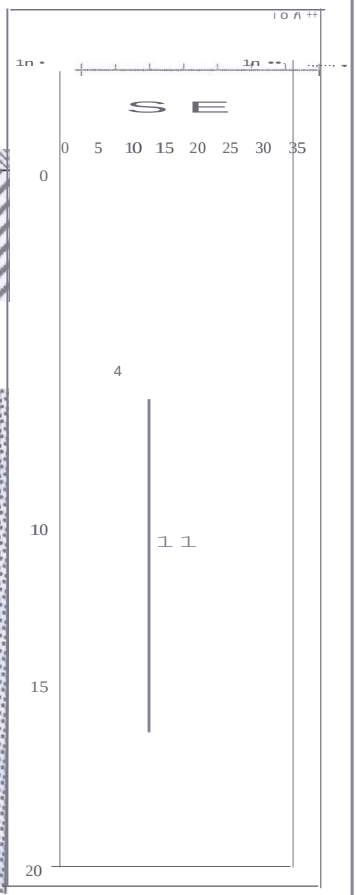
Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

Address: Jaranwata City

Light Percussion

G.W.T.

Depth (feet)	Sample No.	Material Description	Legends
		0.0 ft to 4.0 ft Filling	
2.5			
5	SPT-2	Clayey sandy silt; Light yellowish brown, firm, dry	
7.5	PT-3	Clayey sandy silt; Light yellowish brown, firm, dry, concretions	
10	SPT-4	Silty sand; Brownish grey, fine grained, medium dense, dry	
	SPT-5	From 15.0 ft to 25.0 ft: Silty sand; Light brownish grey, fine grained, medium dense, moist	
15			
20	SPT-6	End of Borehole at 25.0 ft	
25	SPT-7		
30	SPT-8		
35	SPT-9		
40	SPT-10		



Soil Consistancy

Sand N V lue	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 loose	2 to 4 Soft
10 to 30 M.Dense	4to8 Firm
30 to 50 Dense	8 to 15 Stiff
	15 to 30 v. Stiff

Legends

SPT/CPT UDS G.W.

Fill

Clay/Silty Clay

Silty Sand

Gravel/Sand

Hard Strata

SAFE Technical Services

> SOV. Dense	> 30 Hard

STS	BORE HOLE EXPLORATION LOG	BH.No.	5
		SHEET	1 ofl

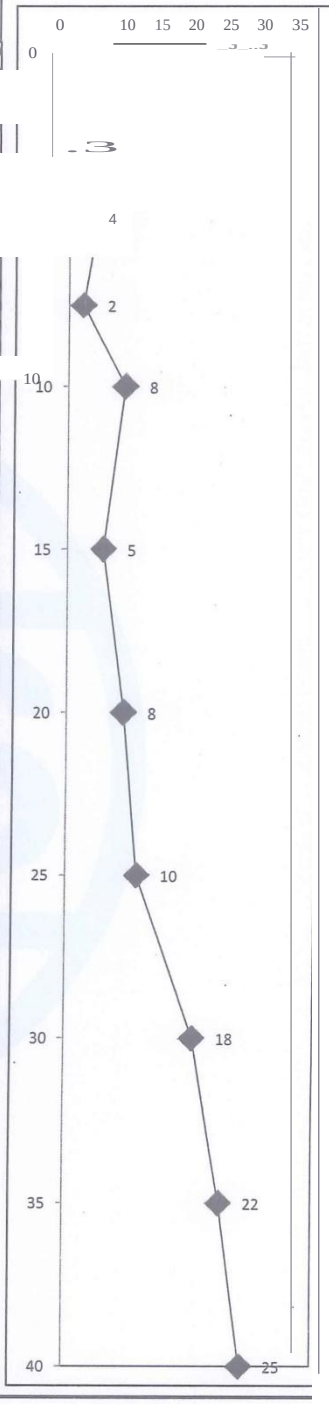
Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

Address: Jaranwala City

Type of Boring	Light Percussion		Client/Consultant	MMP Pakistan			
location	E:73.423060	N: 31.339114		Elv:		G.W.T.	9.5 ft
Borehole Length	40.0 ft	Geologist	Nasir	Date	11 May 2023	to	11 May 2023

Depth (feet)	Sample No.	Material Description	Legends
		From 0.0 ft to 2.5 ft: Clayey sandy silt; Light yellowish brown, soft, dry	
2.5		Clayey sandy silt; Light yellowish brown,soft, dry	
5			
7.5	SPT-3	From 7.5 ft to 10.0 ft: Clayey silt; Light yellowish brown, firm, wet	
10	SPT-4	Sandy clayey silt; Light yellowish brown, firm, wet	
15	SPT-5		
20	SPT-6	From 20.0 ft to 25.0 ft: Sandy clayey silt; Light yellowish brown, stiff, wet	
25	SPT-7	From 25.0 ft to 30.0 ft Clayey silt; Light yellowish brown, very stiff, low plastic, wet, trace concretion	
30	SPT-8	From 30.0 ft to 35.0 ft Clayey silt; Light yellowish brown, very stiff, low plastic, wet	
35	SPT-9	From 35.0 ft to 40.0 ft Silty clay/clayey silt; Light yellowish brown, very stiff, medium plastic, wet	
40	SPT-10		

SPT N VALUE



Soil Consistancy

Sand N Value	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 loose	2 to 4 Soft
10 to 30 M.Dense	4to8 Firm
30 to S0 Dense	8 to 15 Stiff
>50 V. Dense	15 to 30 V. Stiff
	> 30 Hard

Legends

SPT/CPT	UDS	G.W.
Fill		
Clay/Silty Clay		
Silty Sand		
Gravel/Sand		
Hard Strata		

SAFE Technical Services STS FAISALABAD.

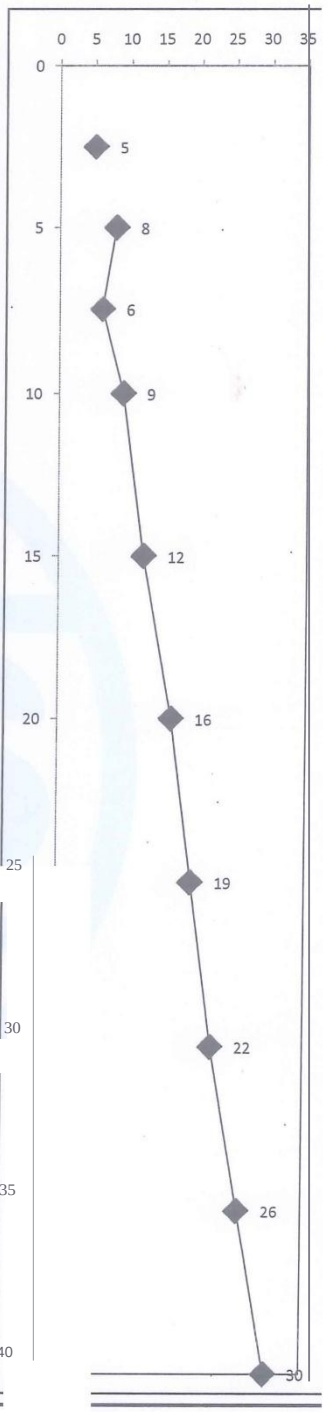
STS	BORE HOLE EXPLORATION LOG	BH.No.	6
		SHEET	1 of 1

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

Address:	Jaranwala City						
Type of Boring	Light Percussion		**Client/Consultant**	MMP Pakistan			
location	E:73.422440	N: 31.339231		**Ely:**		**G.W.T.**	10.0 ft
Borehole Length	40.0 ft	**Geologist**	**Nasir**	**Date**	11-May-2023	to	11-May-2023

Depth (feet)	Sample No.	Material Description	Legends
		From 0.0 ft to 7.5 ft: Clayey sandy silt; Light yellowish brown, firm, dry	
2.5	SPT-1		
	SPT-2		
7.5	SPT-3		
		From 7.5 ft to 15.0 ft: Clayey silt; Light yellowish brown, stiff, wet,concretion	
10	SPT-4		
15	SPT-5		
		From 15.0 ft to 25.0 ft: Sandy clayey silt; Light yellowish brown, very stiff, wet	
20	SPT-6		
25	SPT-7		
		Clayey sandy silt; Light yellowish brown, very stiff, wet	
30	SPT-8		
		Clayey sandy silt; Light yellowish brown, very stiff, wet, trace concretion	
35	SPT-9		
40	SPT-10		

SPT N VALUE



Soil Consistancy

Sand N Value	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 loose	2 to 4 Soft
10 to 30 M.Dense	4to 8 Firm
30 to SO Dense	8 to 15 Stiff
> SOV. Dense	15 to 30 V. Stiff
	> 30 Hard

Legends

SPT/CPT	UDS	G.W.
Fill		
Clay/Silty Clay		
Silty Sand		
Gravel/Sand		
Hard Strata		

SAFE Technical Services FAISALABAD

BORE HOLE EXPLORATION LOG

BH.No. 8

SHEET 1 of 1

Project: Geotechnical Investigation for Improvement of Sewerage System Including Construction of Treatment and Waste Water Plant, Jimwala City

Address: Jaranwala City

Type of Boring	Light Percussion	CHent/Consultant	MMP Pakistan		
location	E:73.454069	N: 31.309571	Elv:	G.W.T.	Nil
Borehole Length	10.0ft	Geologist Nasir	Date 11-May-2023	to	11-May-2023

Depth (feet)	Sample No.	Material Description	Legends SPTNVALUE
		From 0.0 ft to 2.5 ft: Sandy clayey silt; Light yellowish brown, soft, dry,trace concretion	0 10
2.5	SPT-1	From 2.5 ft to 7.5 ft: Sandy clayey silt; Light yellowish brown, firm, dry	2.5
5	SPT-2		
7.5	SPT-3	From 7.5 ft to 10.0 ft: Sandy silt; Light yellowish brown, stiff, dry	7.5
10	SPT-4	End of Borehole at 10.0 ft	10
15	SPT-5		
20	SPT-6		
25	SPT-7		
30	SPT-8		

Soil Consistancy

Legends

SPT/CPT UDS G.W.

Sand N Value	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 Loose	2 to 4 Soft
10 to 30 M.Dense	4to8 Firm
30 to 50 Oense	8 to 1S Stiff
> 50 V. Dense	15 to 30 V. Stiff
	> 30 Hard

1C_lay.../S_ilty_C_lay

-

#

1S_ilt-y_Sa_nd

1G_ravel/S_and

Hard Strata

BORE HOLE EXPLORATION LOG

BH.No. 9

SHEET 1oft

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

[Address: [Jaranwala Ctty

Depth (feet)	Sample No.	Material Description	Legends
		0.0 ft to 4.0 ft Filling	
2.5	SPT-1	Clayey sandy silt; Light yellowish brown, soft, dry	
5	SPT-2	Clayey sandy silt; Light yellowish brown, firm, dry,	
7.5	$PT-3	concretions	
10	SPT-4	Sandy clayey silt; Light yellowish brown, soft, dry, trace concretion	
15	PT-5	Sandy silt/silty sand; Brownish grey, fine grained, medium dense, dry	
20	SPT-6	Silty sand; Brownish grey, fine grained, medium dense, dry	
25	SPT-7	Silty clayey sand; Brownish grey, fine grained, medium dense, moist,concretions	
30	SPT-8		
35	SPT-9		
40	SPT-10		

	0	5	10	15	20	25	30	35
0								
0								
5	3							
10	3							
15	12							
20	16							
25	20							

Soil Consistancy

Sand N Value	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 loose	2 to 4 Soft
10 to 30 M.Dense	4to8 Firm
30 to SO Dense	8 to 1S Stiff
>SO V. Dense	1S to 30 V. Stiff
	> 30 Hard

Legends

SPT/CPT 1 UDS G.W.

1-C.,.--lay--:-/5--:-il-ty---,Cl-ay-----+

Silty Sand

Gravel/Sand

Hard Strata

SAFE Technical Services

BORE HOLE EXPLORATION LOG

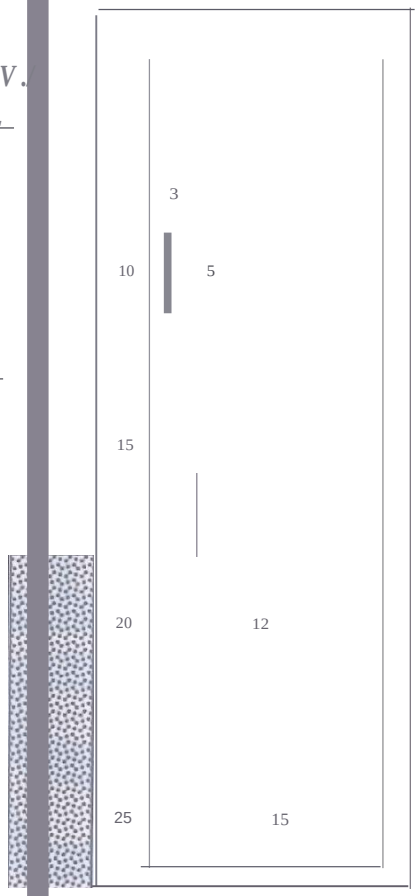
BH.No. 10

SHEET 1 fl

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

A<l<lress: Jaranwala ury

Depth (feet)	Sample No.	Material Description
		0.0 ft to 4.5 ft Filling
2.5	SPT-1	
		Clayey sandy silt; Light yellowish brown, soft, dry
5	SPT-2	
7.5	SPT-3	Clayey silt; Light yellowish brown, finn, dry
10	SPT-4	
		Clayey silt; Light yellowish brown, finn, low plastic,dry
15	SPT-5	
		Sand; Light brownish grey, fine grained, medium dense, dry
20	SPT-6	
25	SPT-7	
		End of Borehole at 25.0 ft
30	SPT-8	
35	SPT-9	
40	SPT-10"	



Soil Consistancy

Sand N Value	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 loose	2 to 4 Soft
10 to 30 M.Dense	4to 8 Firm
30 to SO Dense	8 to 15 Stiff
> 50 V. Derlse	1S to 30 v. Stiff
	> 30 Hard

Legends

SPT/CPT 1 UDS G.W.

Fill

Silty Sand

Gravel/Sand

ard Strata

STS	BORE HOLE EXPLORATION LOG	BH. No.	11
		SHEET	1 of 1

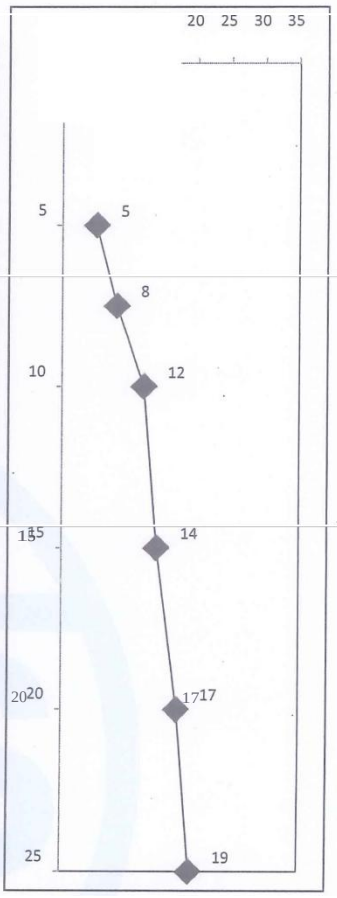
Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewate r Treatment Plant.

Address: Jaranwala City

Type of Boring	Light Percussion		Client/Consultant	MMP Pakistan			
location	E:73.423006	N: 31.340982		Elv:		G.W.T.	25.0 ft
Borehole Length	25.0 ft	Geologist	Nasir	Date	12 May 2023	to	12 May 2023

Depth (feet)	Sample No.	Material Description	Legends
		From 0.0 ft to 2.5 ft: Clayey silt; Light yellowish brown, stiff, dry	
2.5	SPT-1		
		From 2.5 ft to 7.5 ft: Clayey sandy silt; Light yellowish brown, firm, dry	
5	SPT-2		
7.5	SPT-3		
		From 7.5 ft to 15.0 ft: Clayey sandy silt; Light yellowish brown, stiff, dry	
	SPT-4		
15	SPT-5		
		Clayey sandy silt; Light yellowish brown, very stiff, dry	
20	SPT-6		
25	SPT-7	End of Borehole at 25.0 ft	
30	SPT-8		
35	SPT-9		
40	SPT-10		

SPT N VALUE



Soil Consistancy

Sand N Value	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 loose	2 to 4 Soft
10 to 30 M.Dense	4to 8 Firm
30 to SO Dense	8to 15 Stiff
> 50V. Dense	15 to 30 V. Stiff
	> 30 Hard

Legends

SPT/CPT UDS G.W.

Silty Sand

Gravel/Sand

Hard Strata

SAFE Technical Services STS FAISALABAD.

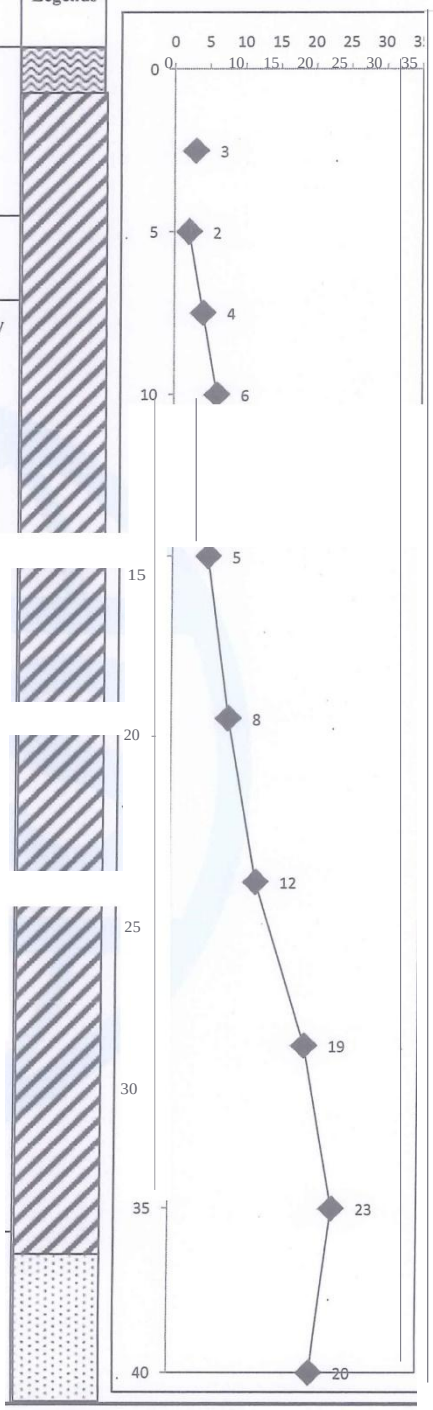
STS	BORE HOLE EXPLORATION LOG	BH.No.	12
		SHEET	1 of1

Project: Geotechn ical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

Address:	Jaranwala City						
Type of Boring	Light Percussion		Client/Consultant	MMP Pakistan			
location	E:73.417361		N: 31.3133558	Elv:		G.W.T.	25.0 ft
Borehole Length	40.0 ft	Geologist	Nasir	Date	12 May 2023	to	12 May 2023

Depth (feet)	Sample No.	Material Description	Legends
		From 0.0 ft to 5.0 ft:(0.0 ft to 2.0 ft Filling) Sandy silt; Light yellowish brown, soft, dry	
2.5	SPT-1		
5	SPT-2	From 5.0 ft to 7.5 ft: Clayey silt; Light reddish brown, firm, low, dry	
7.5	SPT-3	From 7.5 ft to 15.0 ft: Clayey sandy silt; Light yellowish brown, firm, dry	
10	SPT-4		
15	SPT-5	Silty clay/clayey silt; Light yellowish brown, firm, low plastic, dry, concretions	
20	SPT-6	Silty clay/clayey silt; Light yellowish brown, stiff, low plastic, wet, concretions	
25	SPT-7	Silty clay/clayey silt; Light yellowish brown, very stiff, low plastic, dry, concretions	
30	SlPT-8		
35	SPT-9	From 35.0 ft to 40.0 ft Silty sand; Brownish grey, fine grained, medium dense, wet	
40	SPT-10		

SPT N VALUE



Soil Consistancy

Sand N Value	Silt/Clay N Value
<4 V.loose	<2 V.Soft
4 to 10 loose	2 to 4 Soft
10 to 30 M.Dense	4to8 Firm
30 to S0 Dense	Bto 15 Stiff
>50V. e	15 to 30 V. Stiff
	> 30 Hard

Legends

SPT/CPT 1 UDS G.W.

Silty Sand

Gravel/Sand

Hard Strata

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TEST RESULT SHEETS

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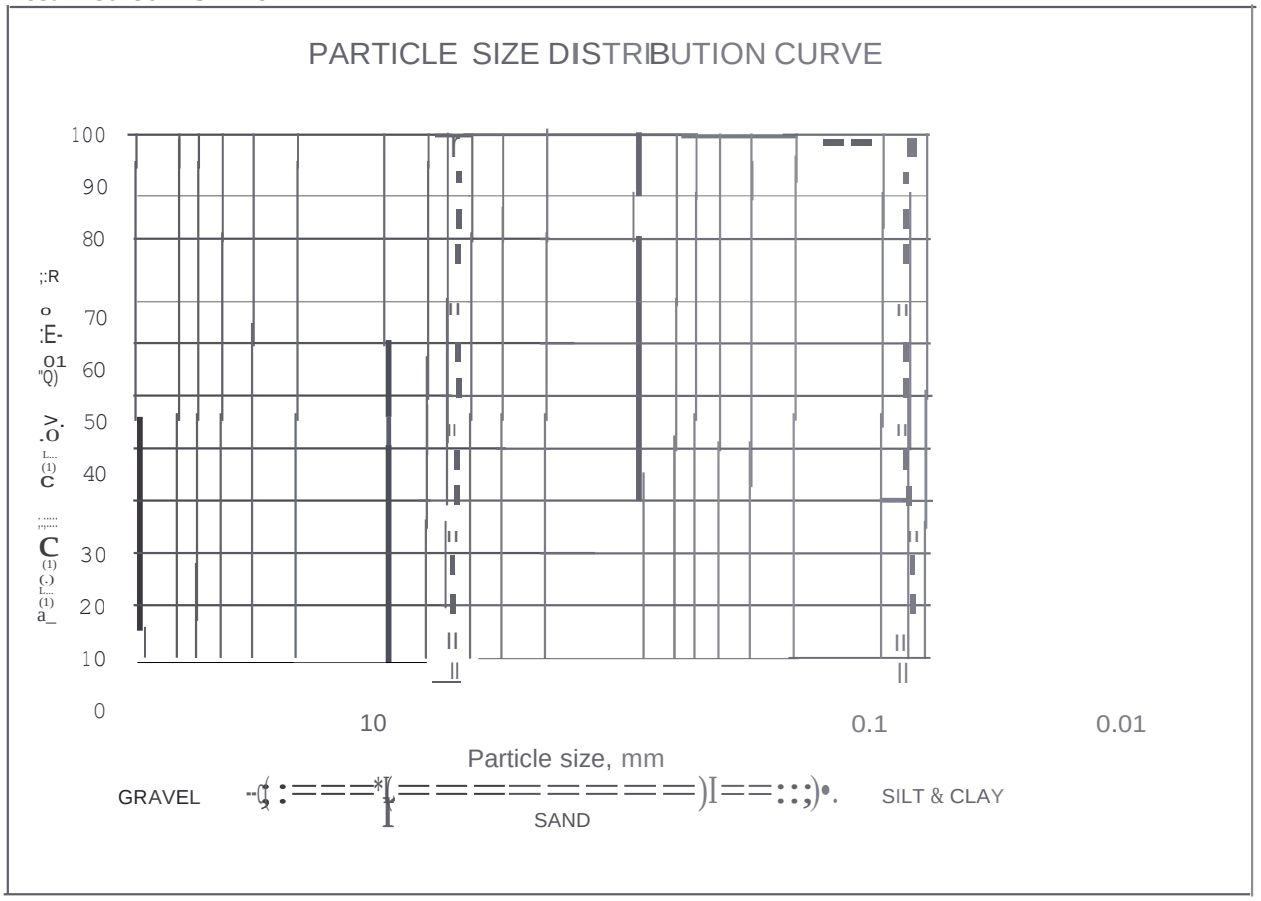
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-1	Gravel=	0 %
Sample No:	SPT-2	Sand=	3 %
Depth (ft):	5.0	Silt & Clay=	97 %

Test Method: ASTM 0422



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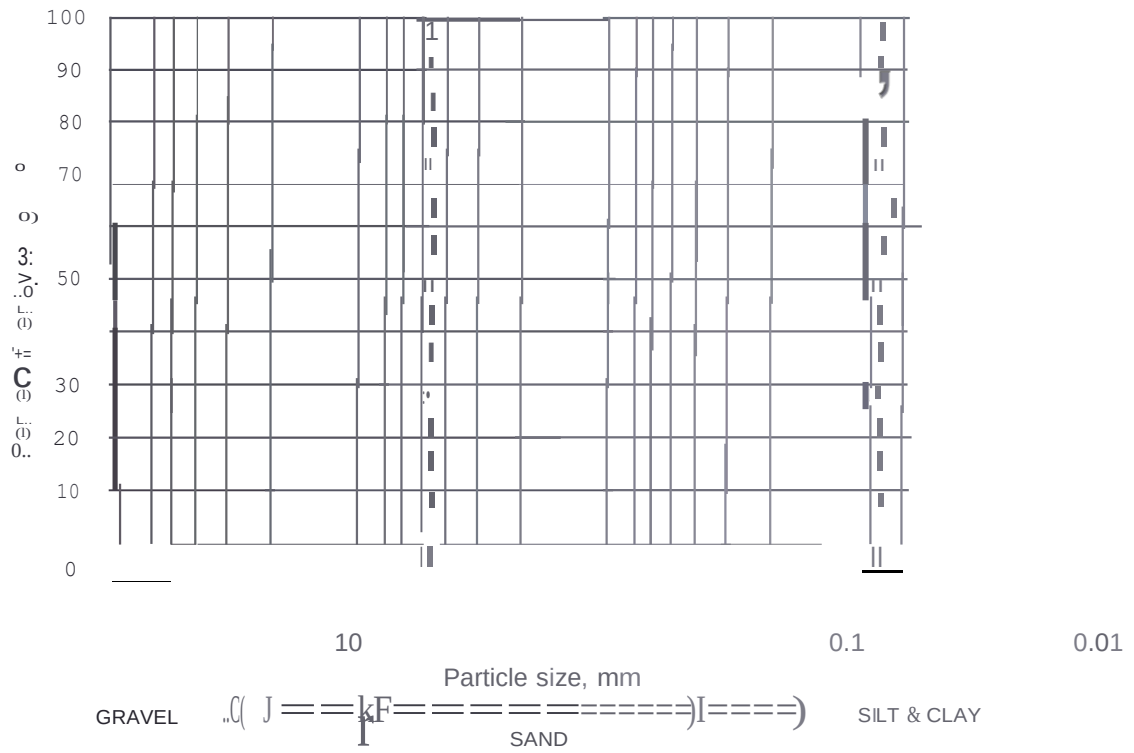
"PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-1	Gravel=	0 %
Sample No:	SPT-4	Sand=	14 %
Depth (ft):	10.0	Silt & Clay=	86%

Test Method: ASTM 0422

-PARTICLE SIZE DISTRIBUTION CURVE



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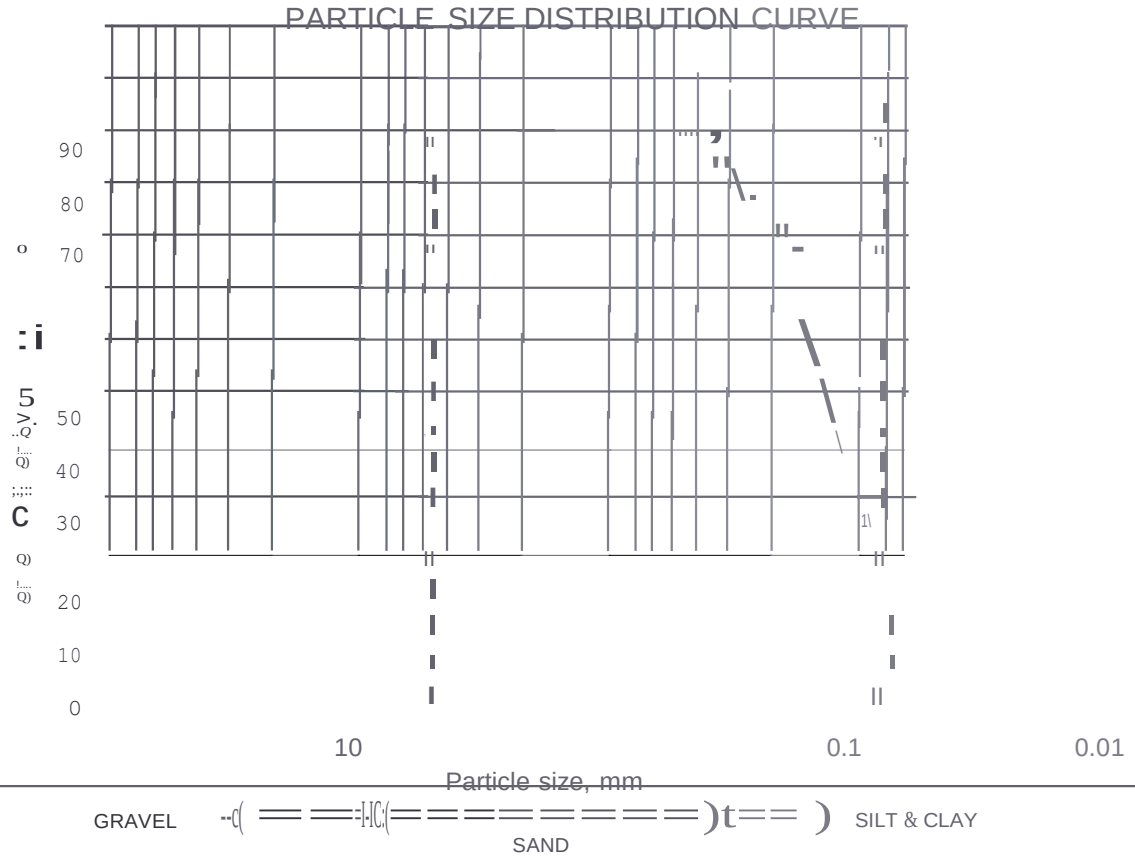
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-1	Gravel=	0%
Sample No:	SPT-6	Sand=	77%
Depth (ft):	20.0	Silt & Clay=	23%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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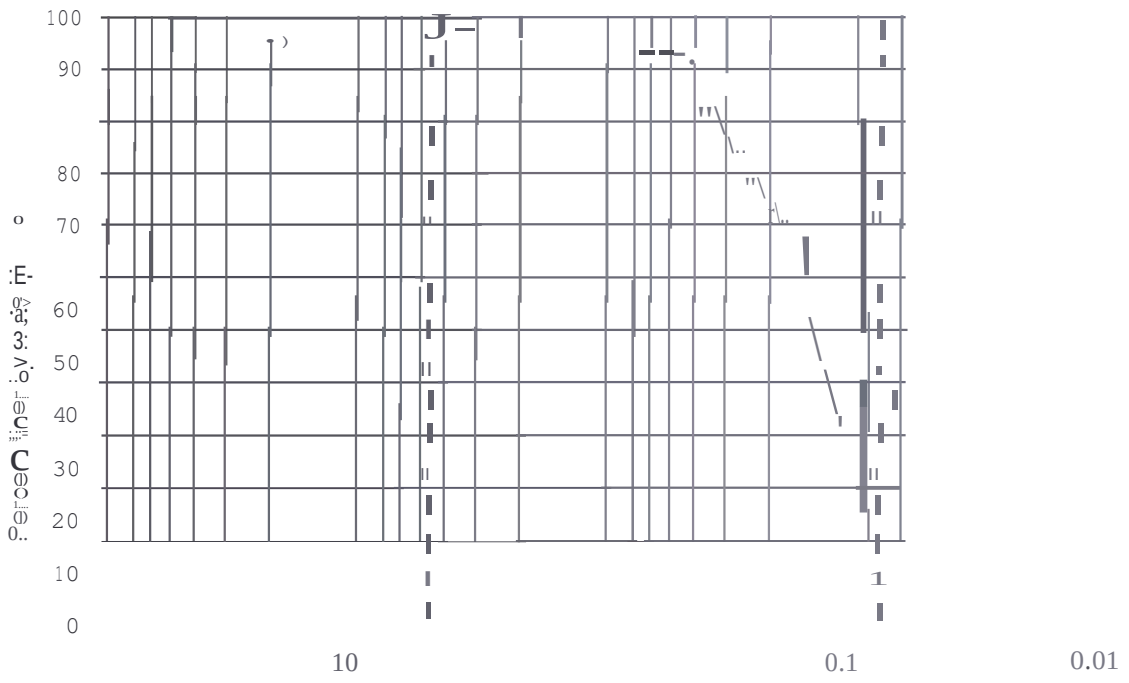
'jpARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-1	Gravel=	0%
Sample No:	SPT-8	Sand=	90%
Depth (ft):	30.0	Silt & Clay=	10%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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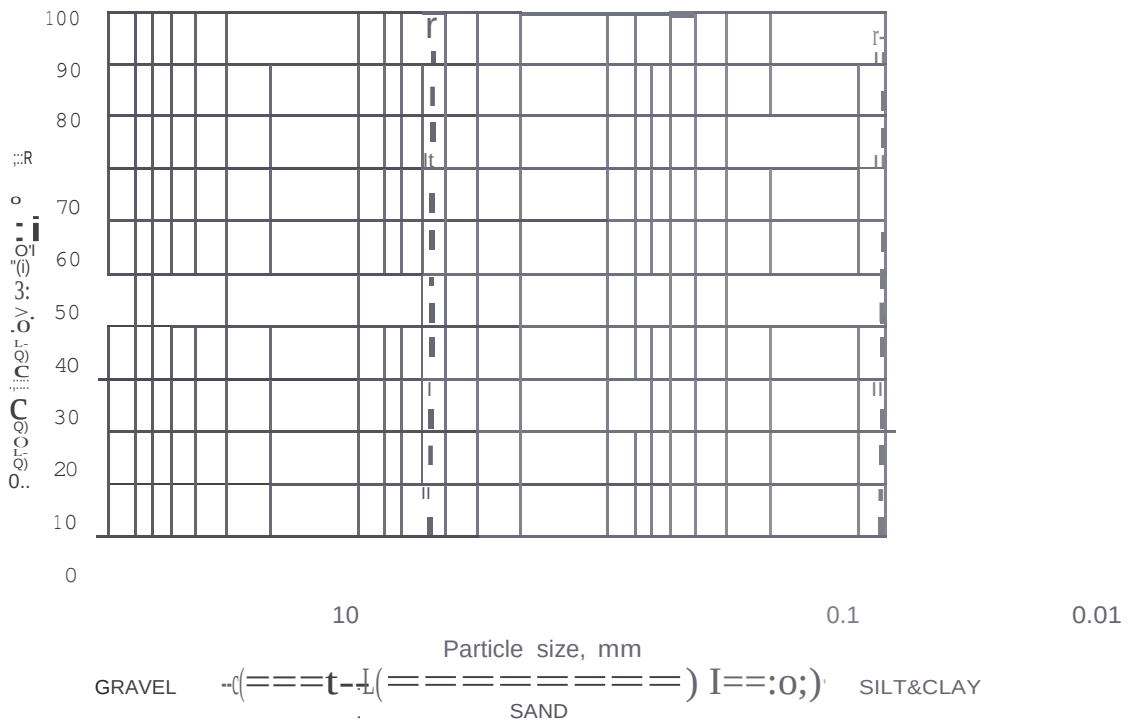
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-2	Gravel=	0%
Sample No:	SPT-3	Sand=	3%
Depth (ft):	7.5	Silt & Clay=	97%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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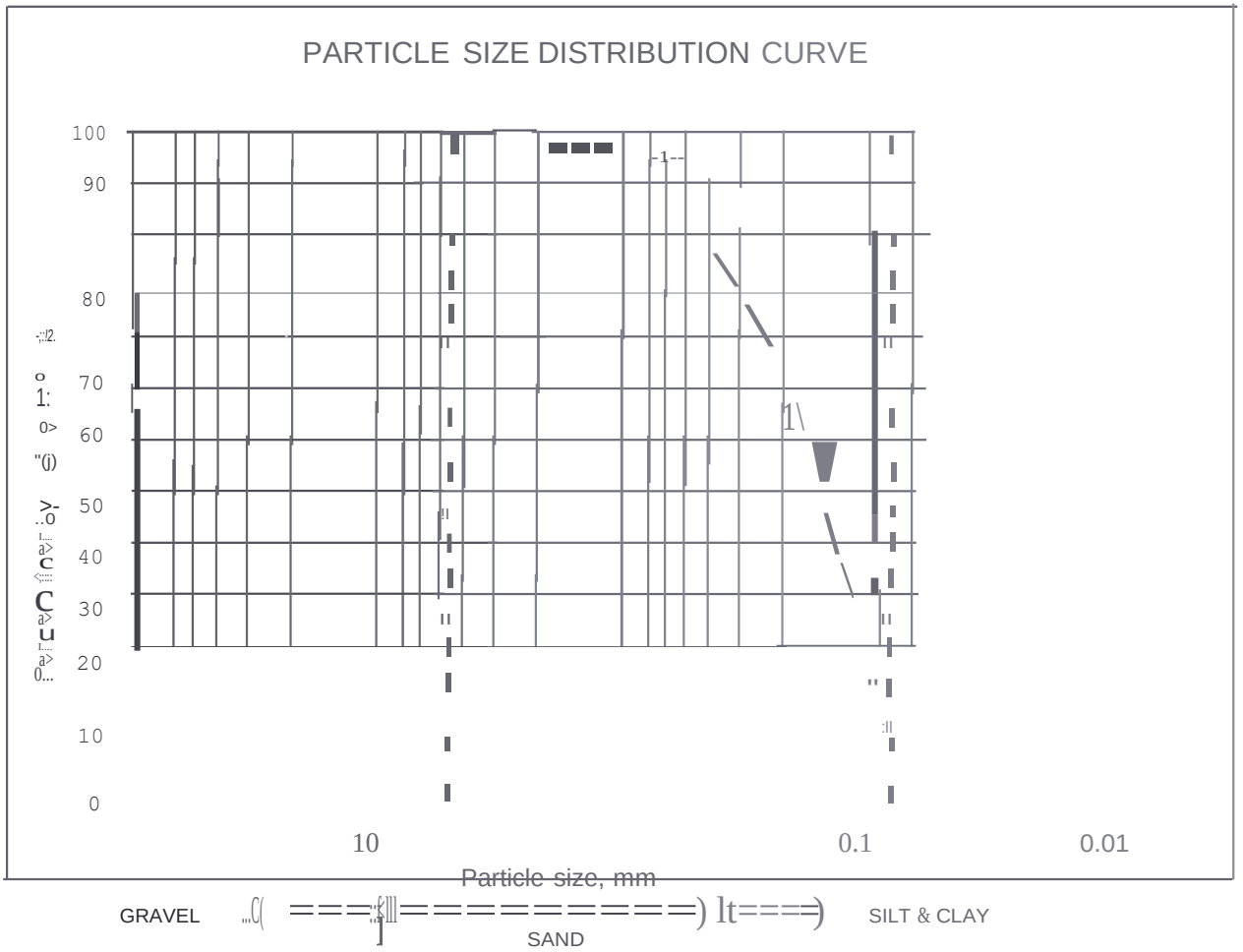
PARTICLE SIZE DISTRIBUTION

Project: Geotechgical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-2	Gravel=	0%
Sample No:	SPT-7	Sand=	89%
Depth (ft):	25.0	Silt & Clay=	11 %

Test Method: ASTM 0422



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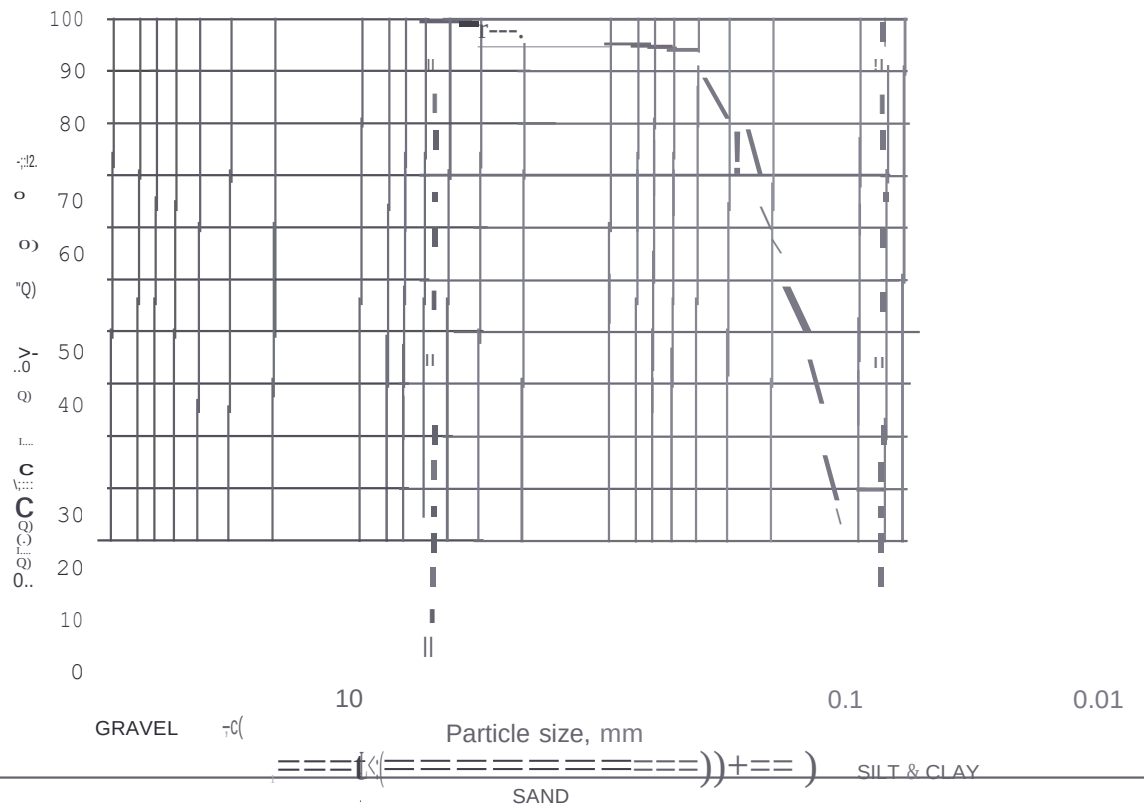
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-2	Gravel=	0%
Sample No:	SPT-10	Sand=	96%
Depth (ft):	40.0	Silt & Clay=	4%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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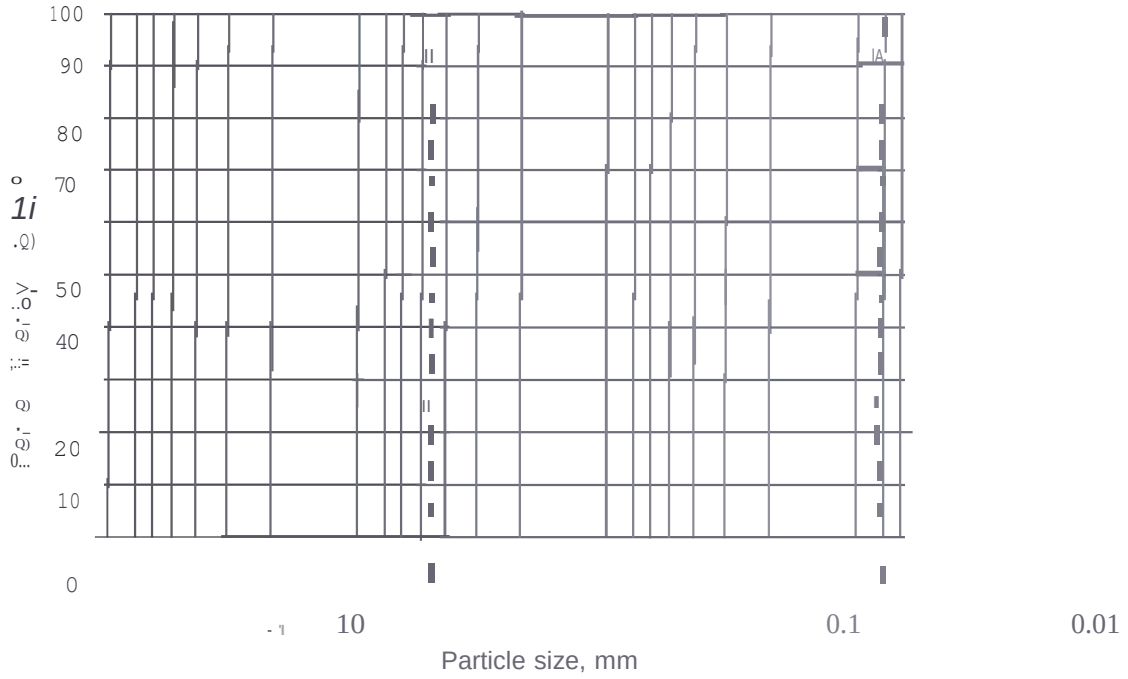
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-3	Gravel=	0%
Sample No:	SPT-1	Sand=	9%
Depth (ft):	2.5	Silt & Clay=	91%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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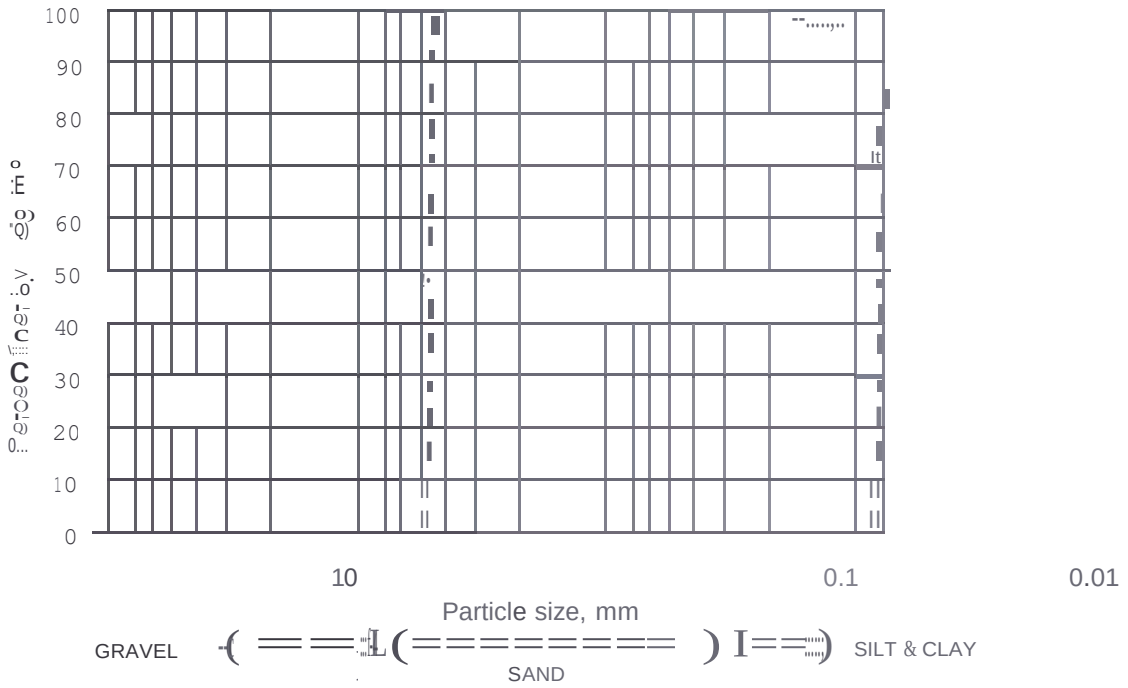
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-3	Gravel=	0%
Sample No:	SPT-5	Sand=	5%
Depth (ft):	15.0	Silt & Clay=	95%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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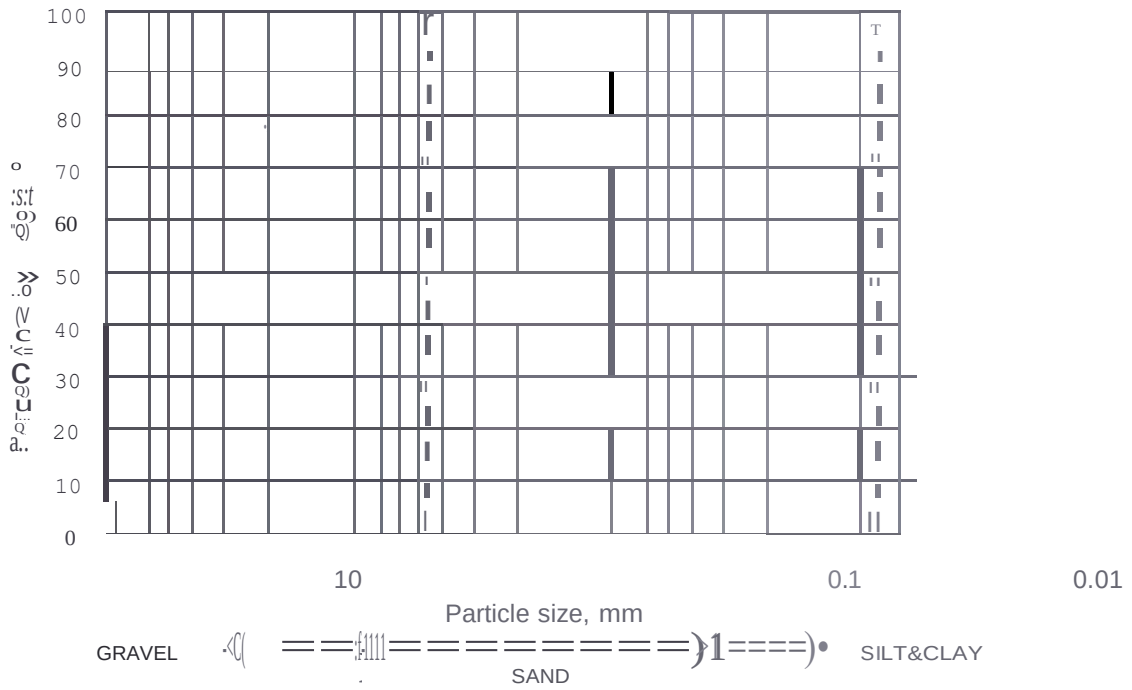
PARTICLE SIZE DISTRIBUTION

Project: Geotechhical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	• BH-3	Gravel =	0 %
Sample No:	SPT-7	Sand =	2%
Depth (ft):	25.0	Silt & Clay =	98%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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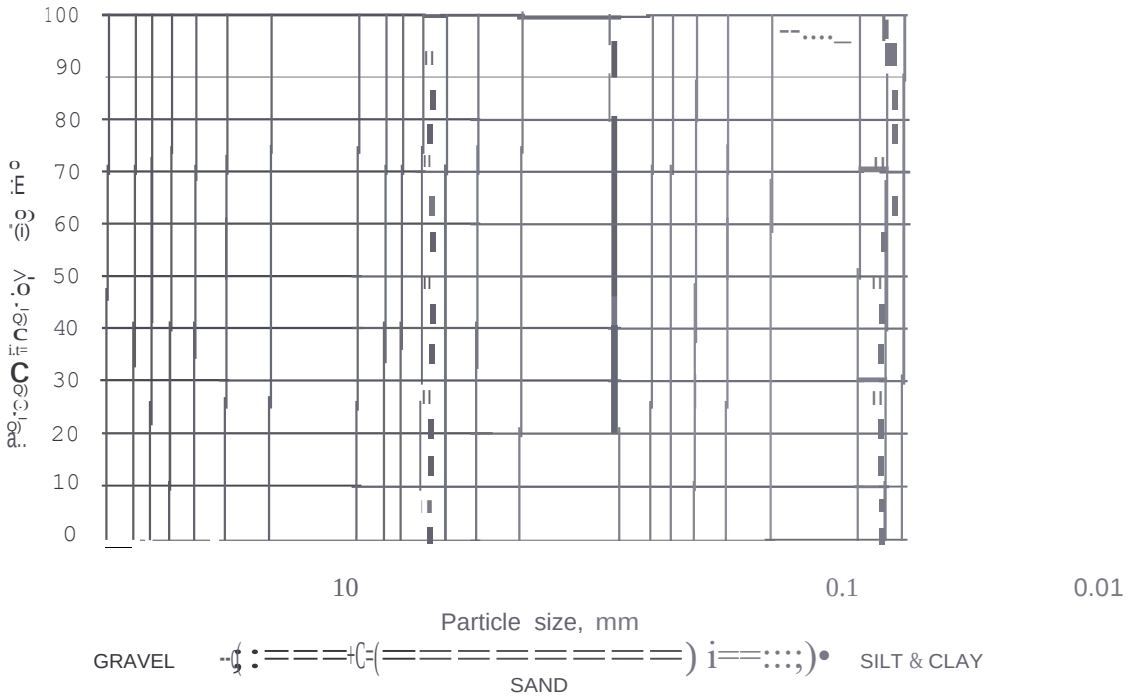
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-4	Gravel=	0%
Sample No:	SPT-2	Sand=	7%
Depth (ft):	5.0	Silt & Clay=	93%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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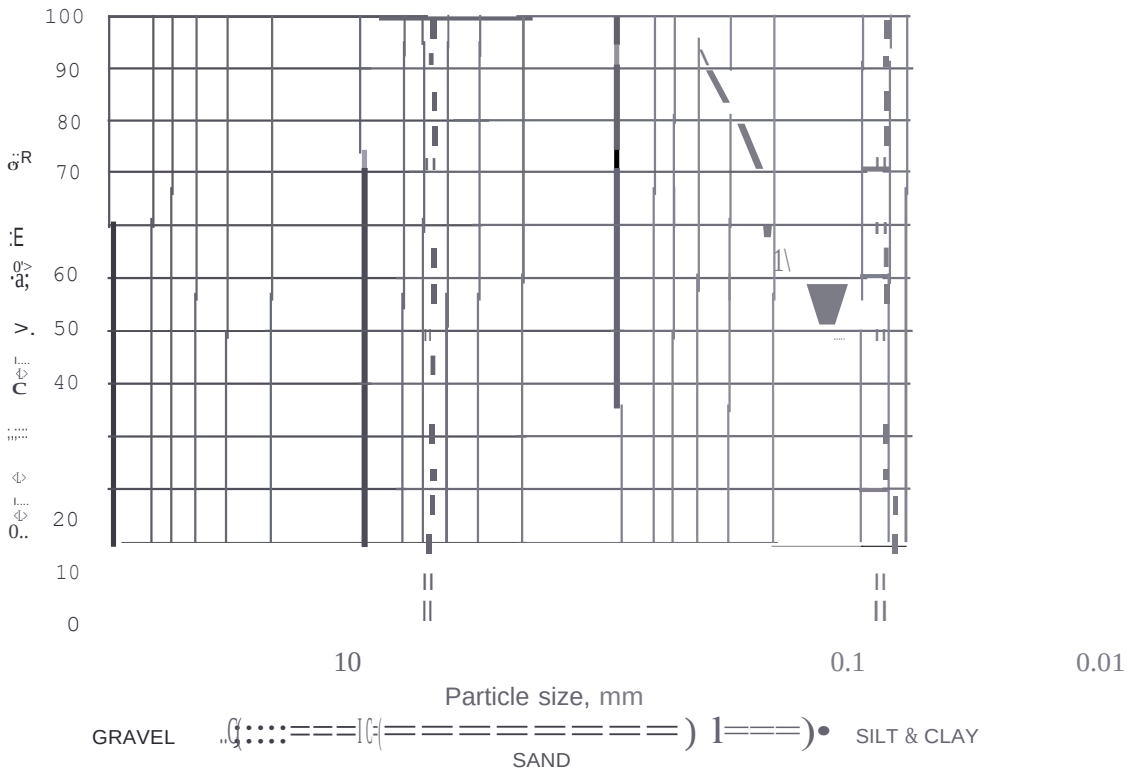
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-4	Gravel=	0%
Sample No:	SPT-6	Sand=	57%
Depth (ft):	20.0	Silt & Clay=	43%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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PARTICLE SIZE DISTRIBUTION

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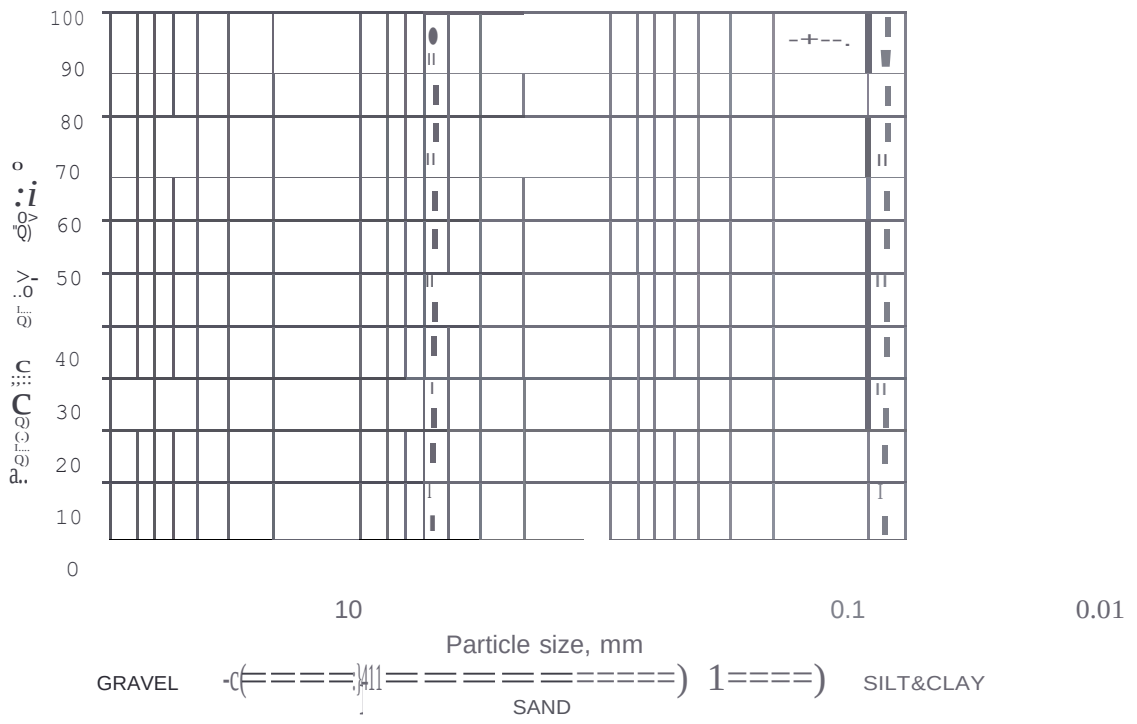
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-5	Gravel=	0%
Sample No:	SPT-3	Sand=	7%
Depth (ft):	7.5	Silt & Clay=	93%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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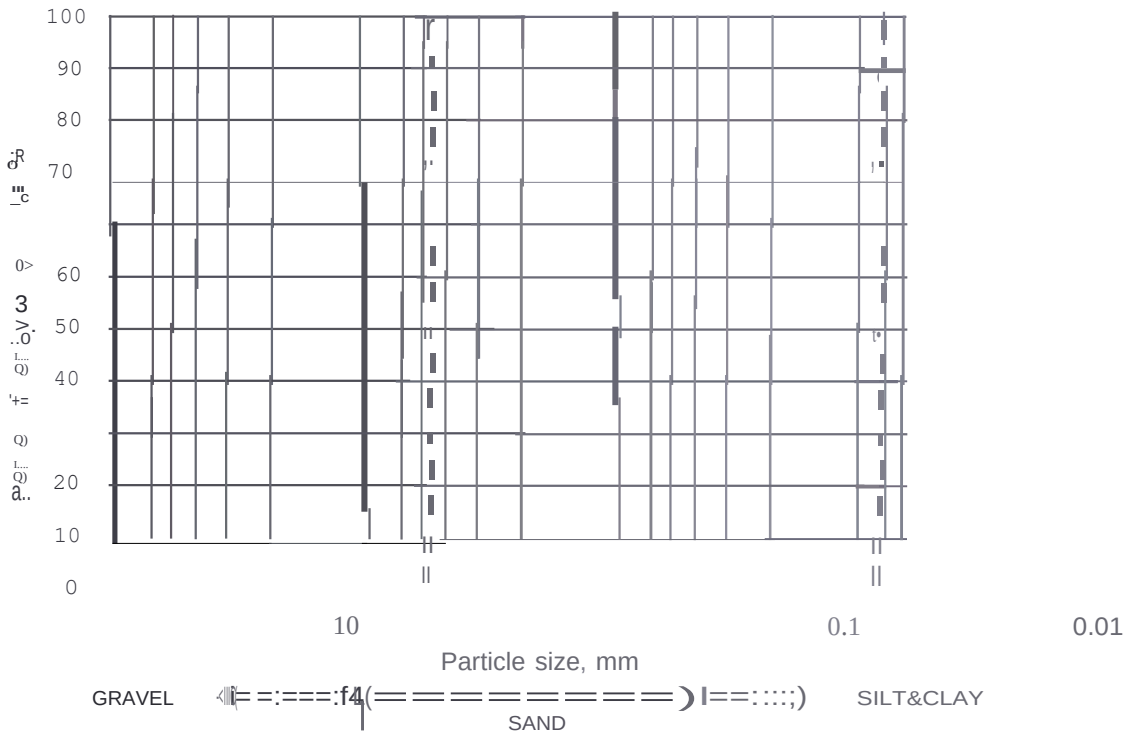
Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-5	Gravel =	0 %
Sample No:	SPT-6	Sand =	12 %
Depth (ft):	20.0	Silt & Clay =	88%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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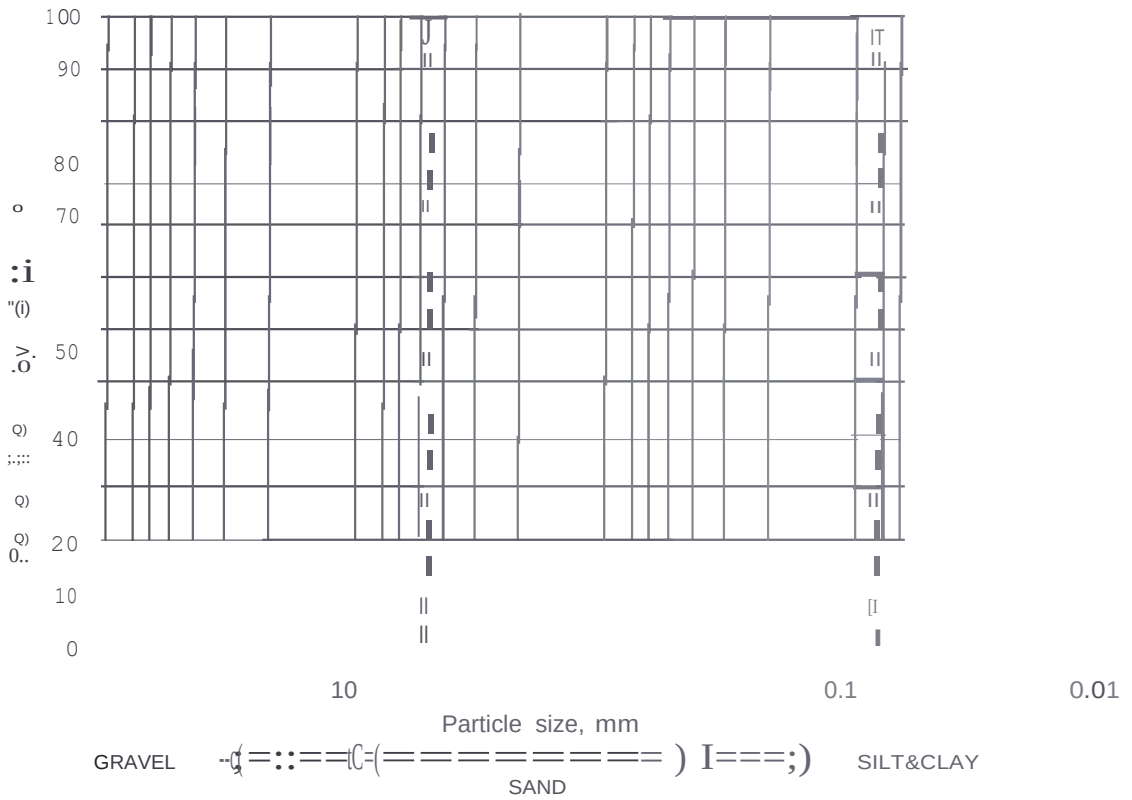
Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-5	Gravel=	0%
Sample No:	SPT-10	Sand=	2%
Depth (ft):	40.0	Silt & Clay=	98%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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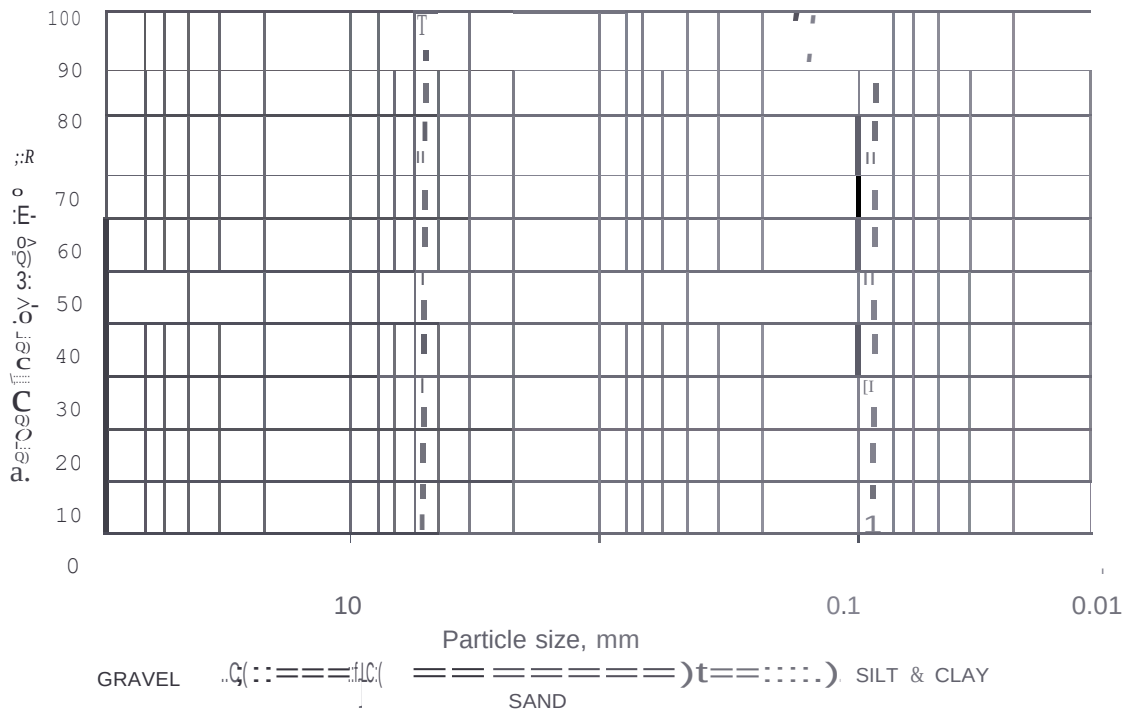
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-6	Gravel=	0%
Sample No:	SPT-1	Sand=	7%
Depth (ft):	2.5	Silt & Clay=	93%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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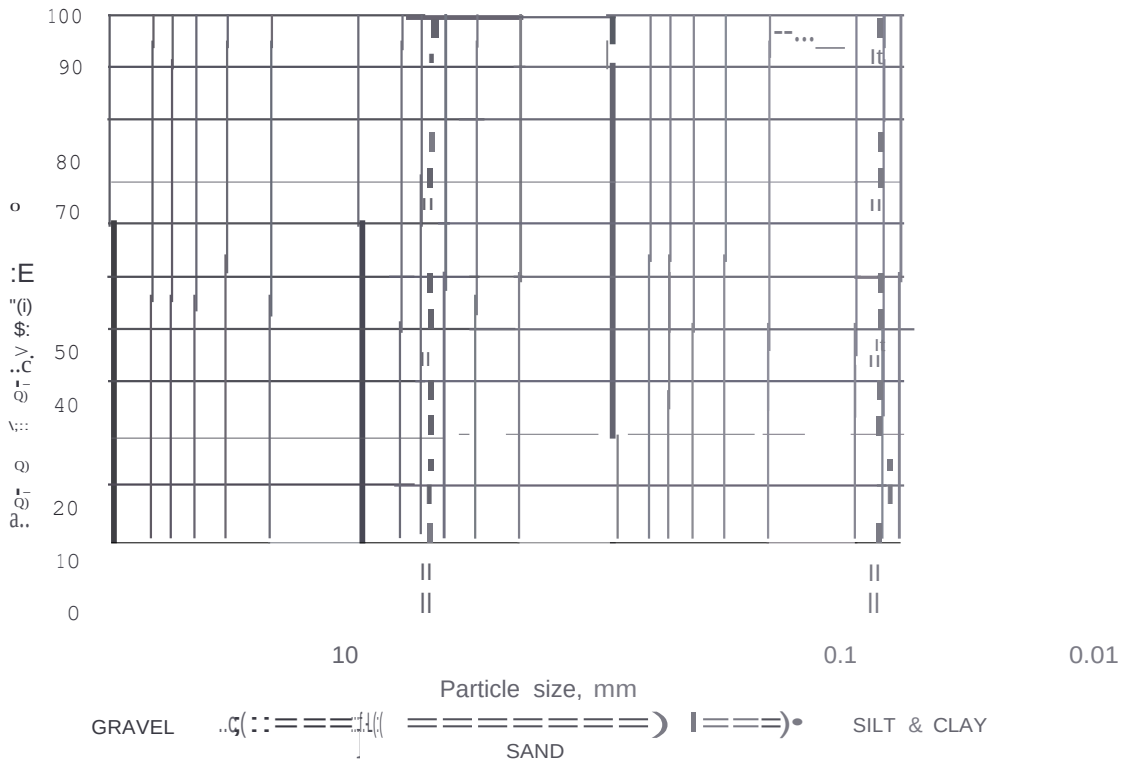
PARTICLE SIZE DISTRIBUTION

Project : Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-6	Gravel=	0%
Sample No:	SPT-7	Sand=	8%
Depth (ft):	30.0	Silt & Clay=	92%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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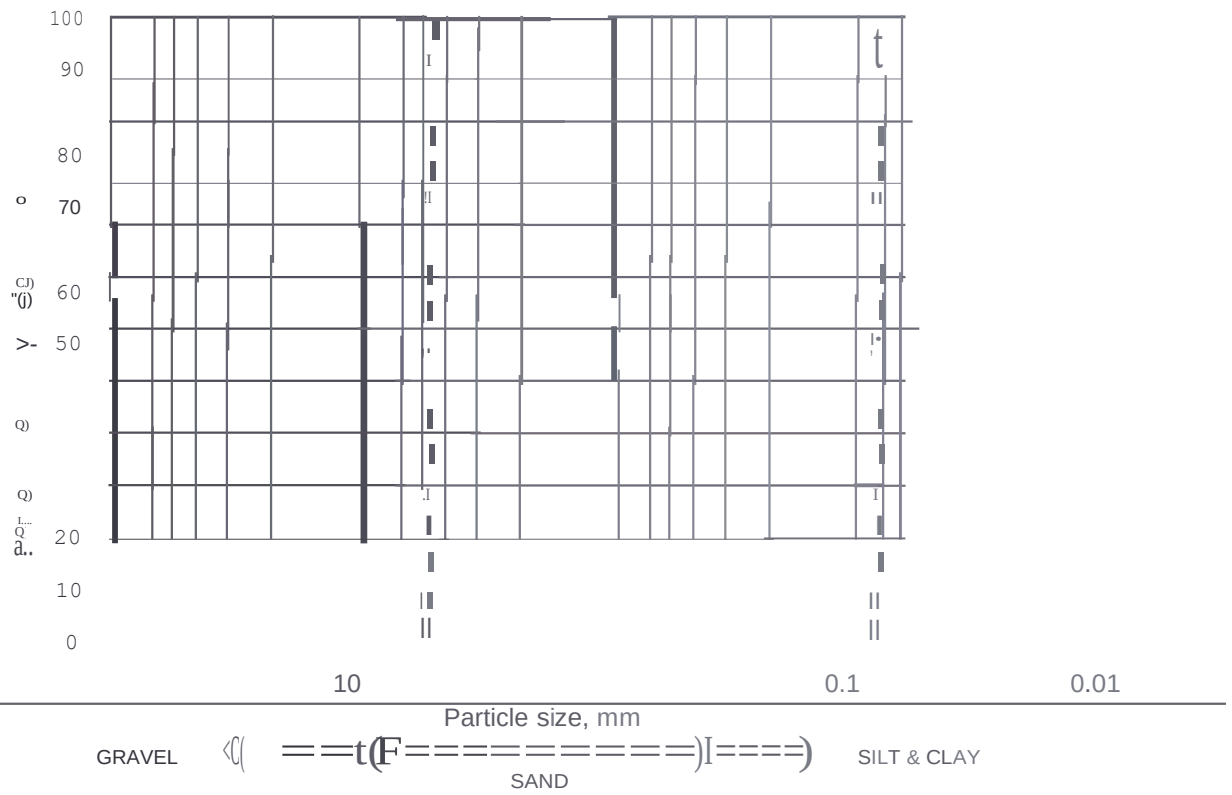
PARTICLE SIZE DISTRIBUTION

Project: Geotechl)ical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-7	Gravel=	0 %
Sample No:	SPT-2	Sand=	5 %
Depth (ft):	5.0	Silt & Clay=	95 %

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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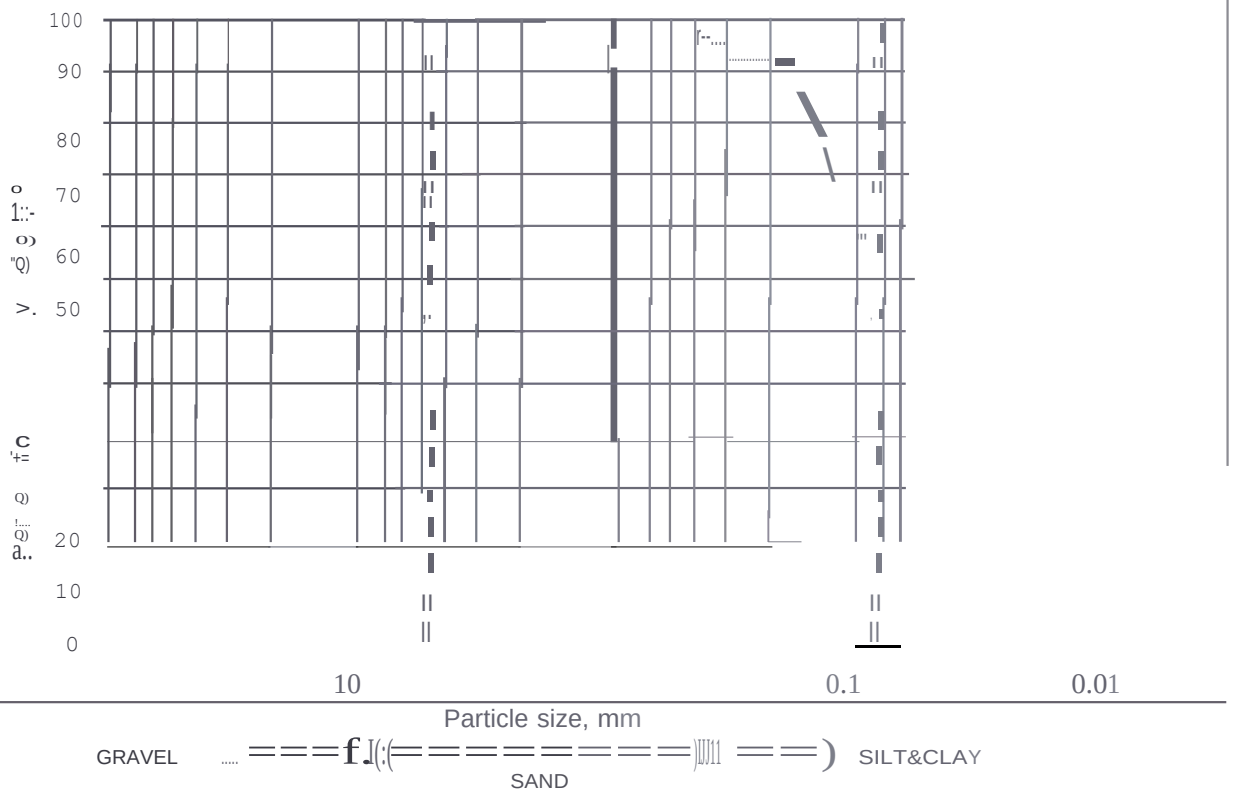
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-7	Gravel =	0 %
Sample No:	SPT-4	Sand=	42%
Depth (ft):	10.0	Silt & Clay=	58%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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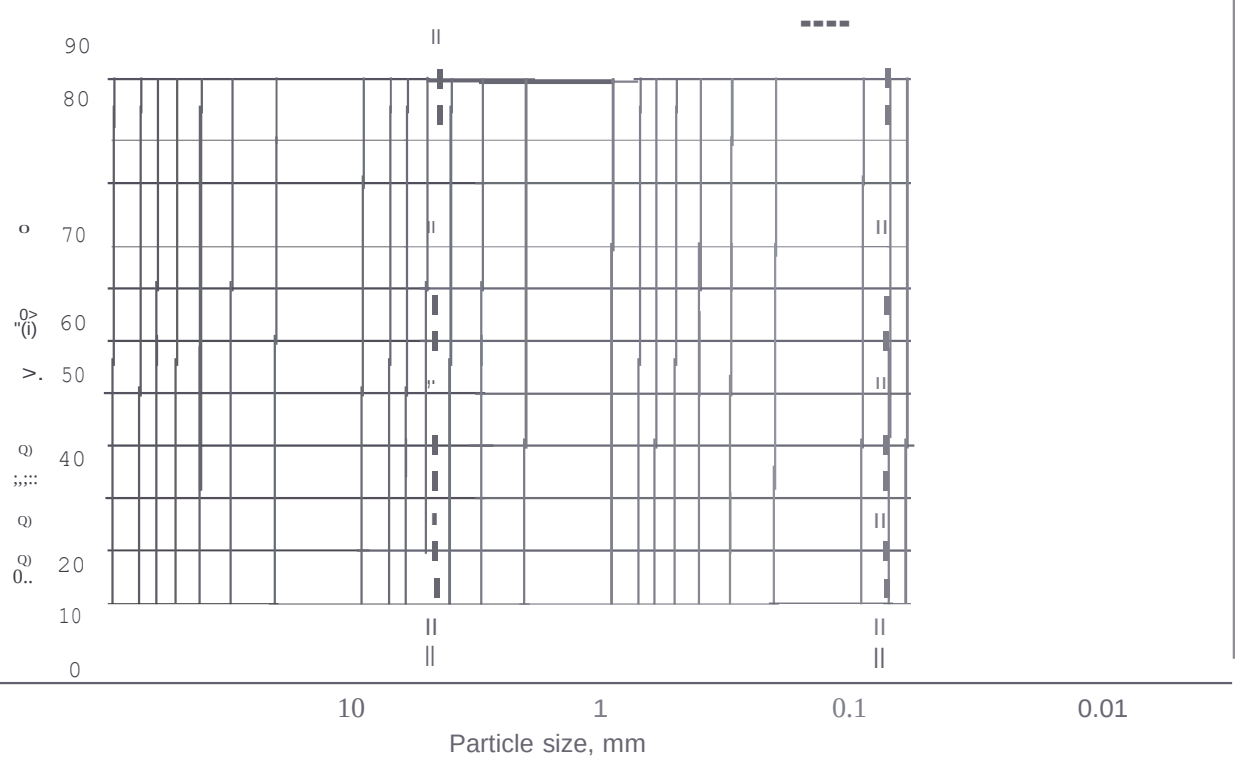
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-8	Gravel=	0%
Sample No:	SPT-3	Sand=	6%
Depth (ft):	7.5	Silt & Clay=	94%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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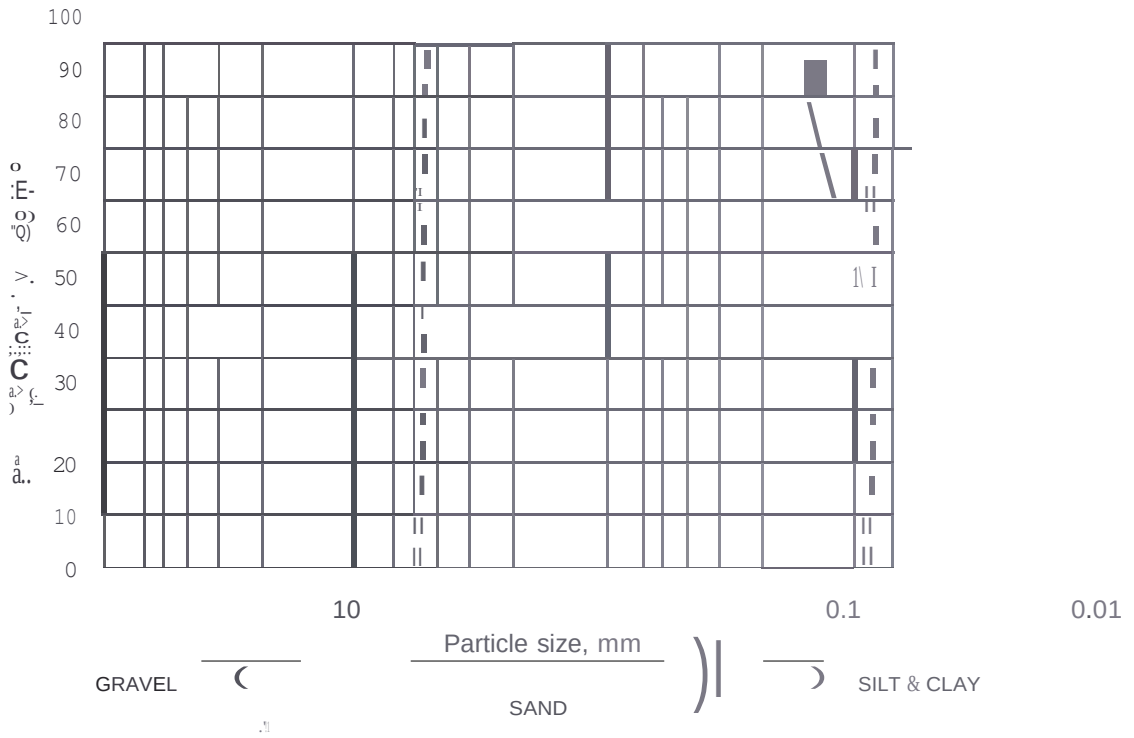
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-9	Gravel=	0%
Sample No:	SPT-5	Sand=	54%
Depth (ft):	15.0	Silt & Clay=	46%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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PARTICLE SIZE DISTRIBUTION

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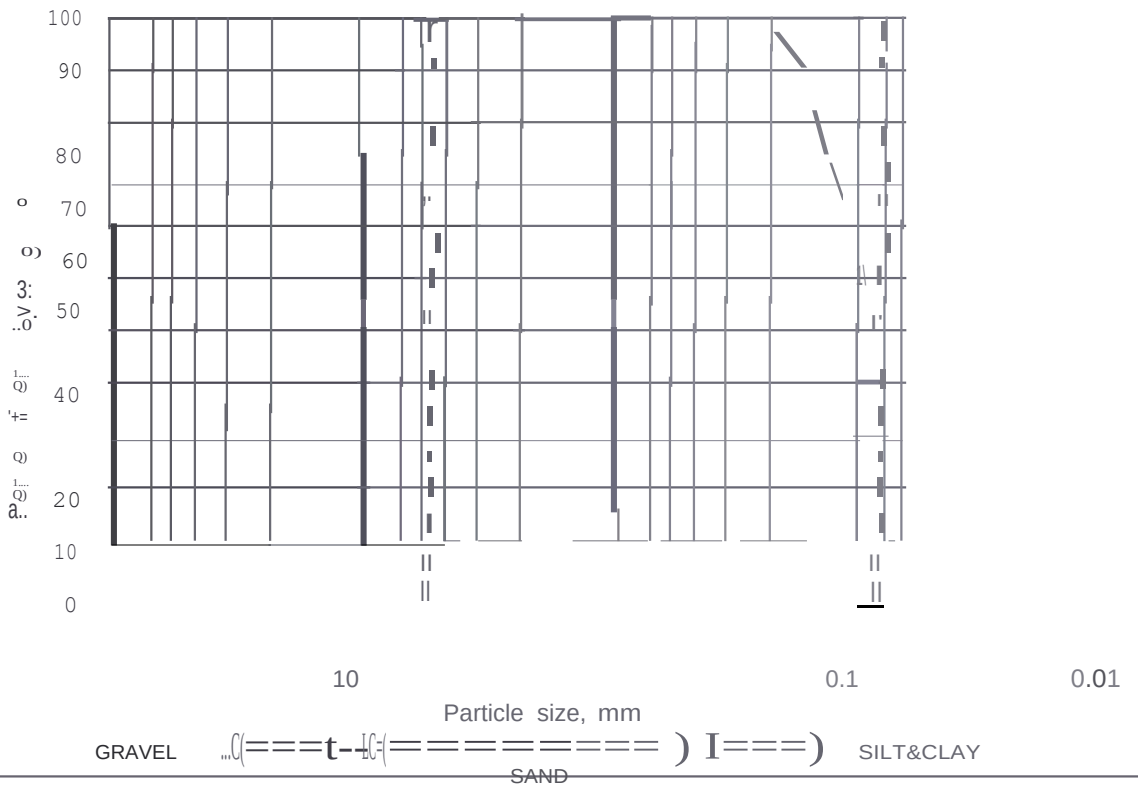
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-9	Gravel=	0%
Sample No:	SPT-7	Sand=	51%
Depth (ft):	25.0	Silt & Clay=	49%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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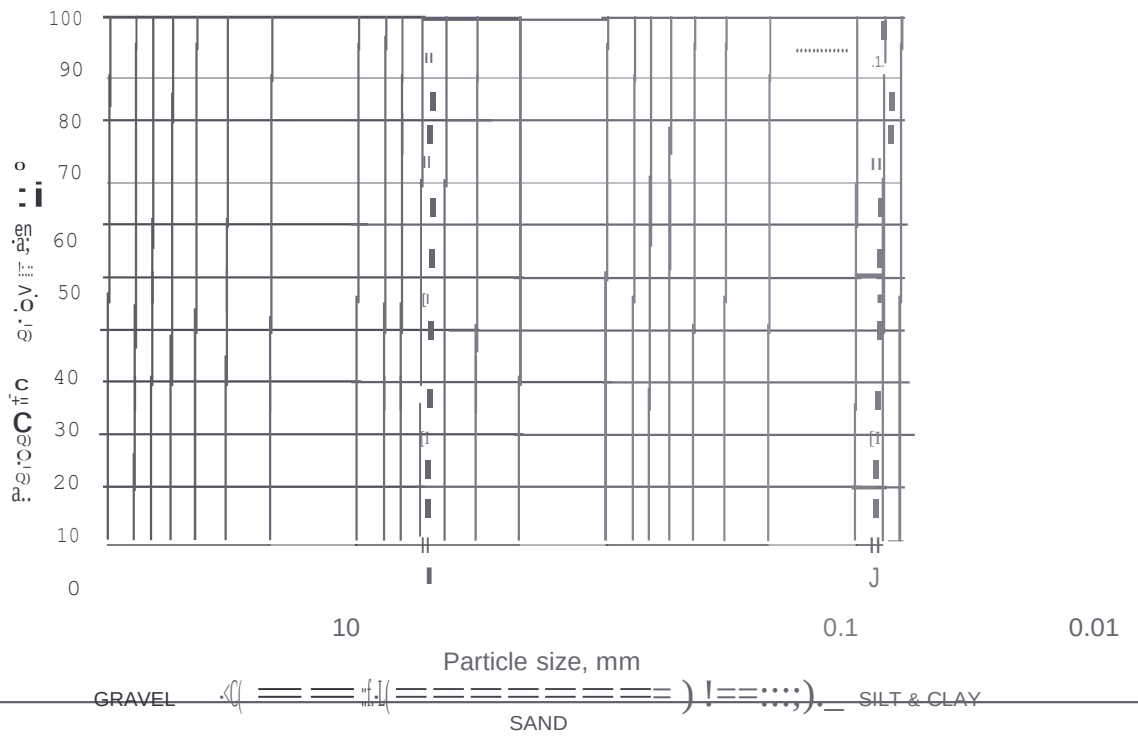
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-10	Gravel=	0%
Sample No:	SPT-2	Sand=	10%
Depth (ft):	5.0	Silt & Clay=	90%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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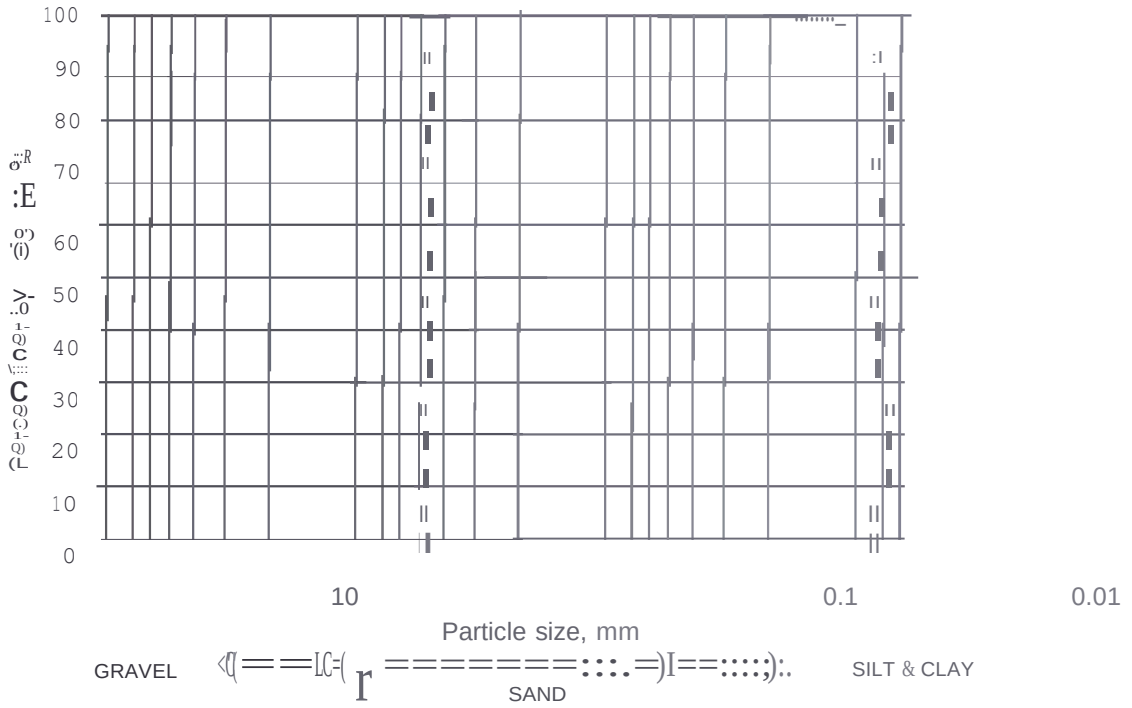
Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-10	Gravel=	0%
Sample No:	SPT-4	Sand=	4%
Depth (ft):	10.0	Silt & Clay=	96%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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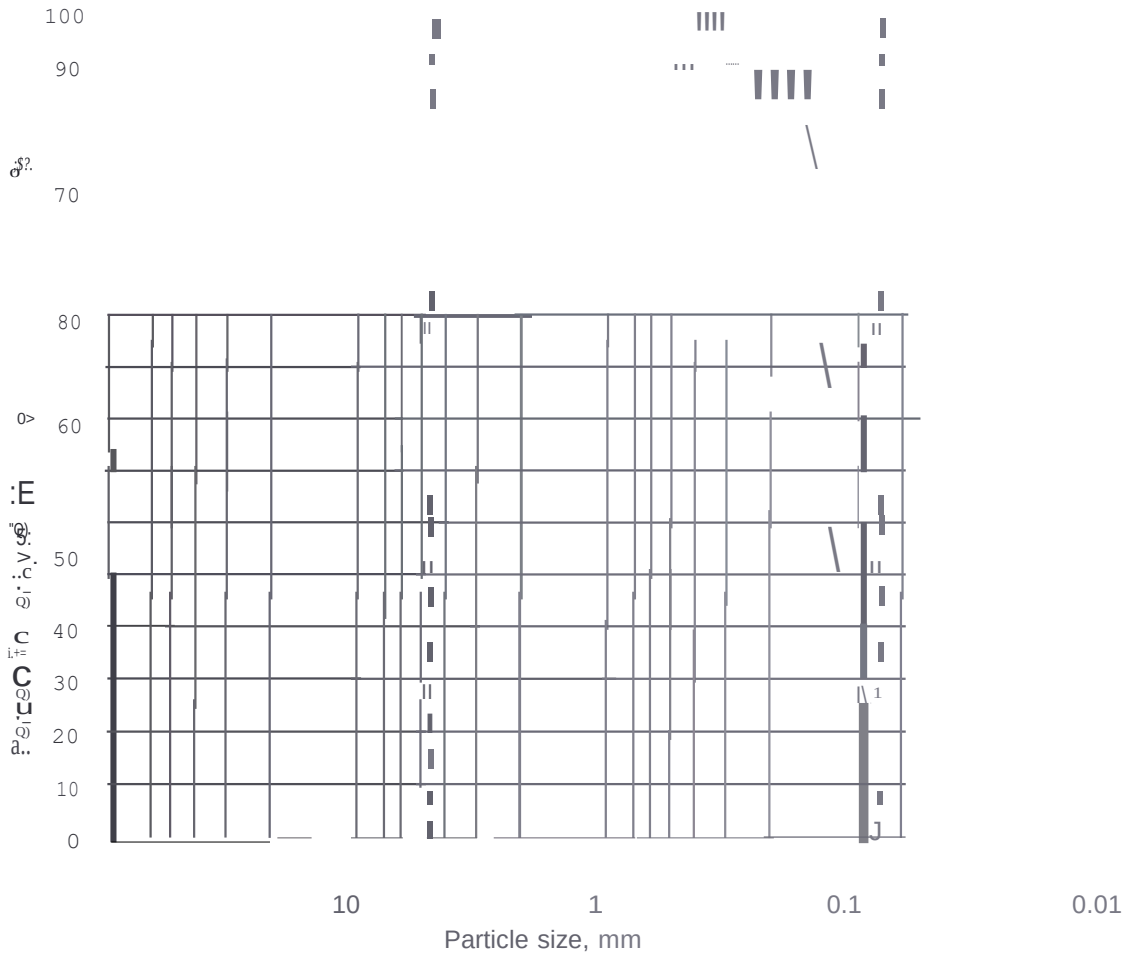
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-10	Gravel=	0%
Sample No:	SPT-6	Sand=	83%
Depth (ft):	20.0	Silt & Clay=	17%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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GRAVEL -((==t(==========)MI==::::;)• SILT&CLAY
SAND

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Checked By:

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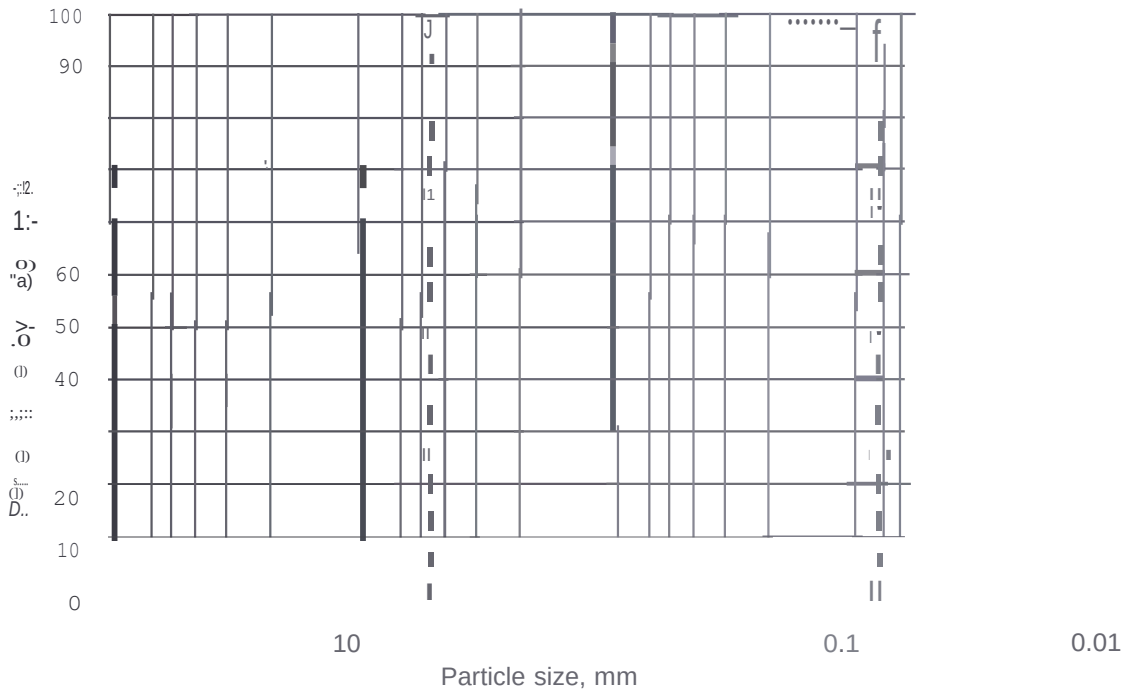
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-11	Gravel =	0 %
Sample No:	SPT-1	Sand =	5%
Depth (ft):	2.5	Silt & Clay=	95%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



GRAVEL SAND SILT & CLAY

Prepared By: Ch

PARTICLE SIZE DISTRIBUTION

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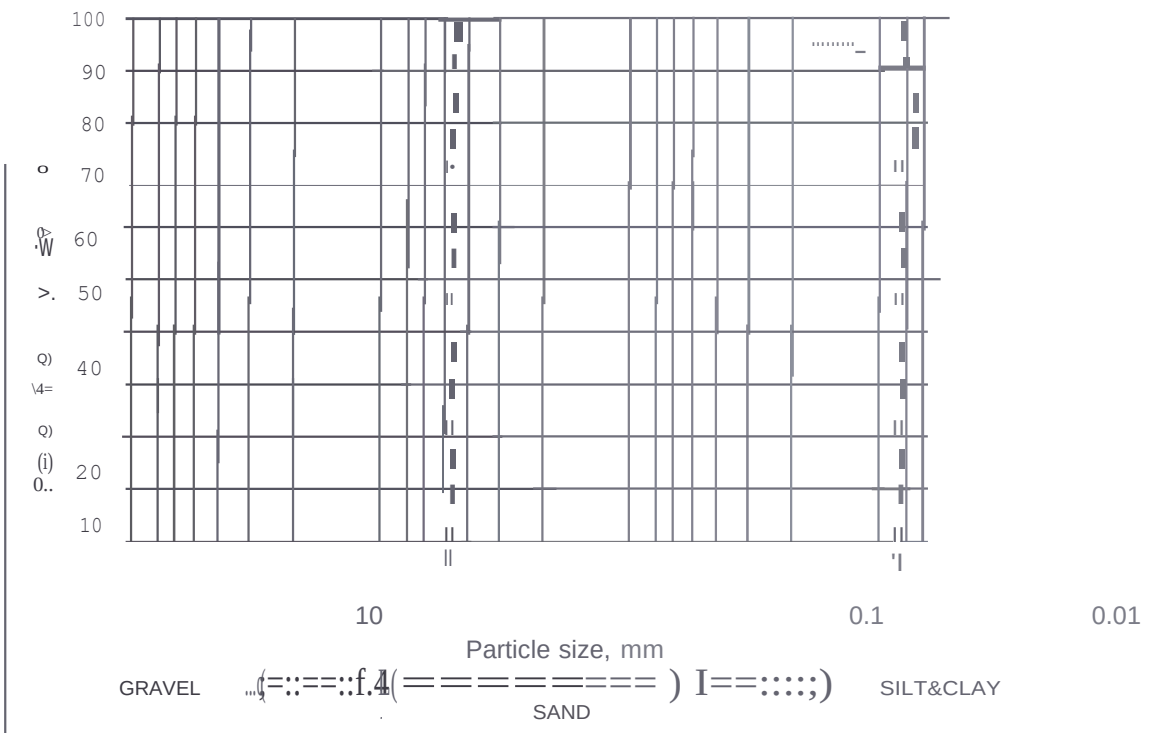
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-11	Gravel=	0%
Sample No:	SPT-5	Sand=	10%
Depth (ft):	- 15.0	Silt & Clay=	90%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



Prepared By:

Checked By:

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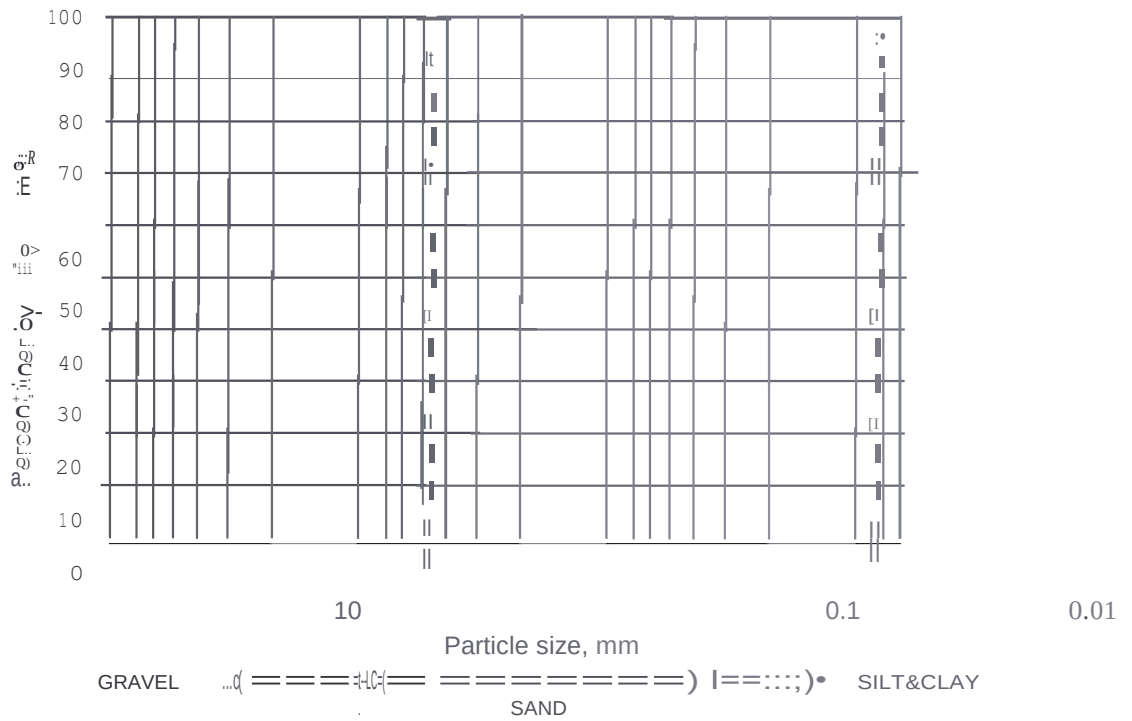
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-12	Gravel=	0%
Sample No:	SPT-6	Sand=	2%
Depth (ft):	20.0	Silt & Clay=	98%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE .



Prepared By:

Checked By:

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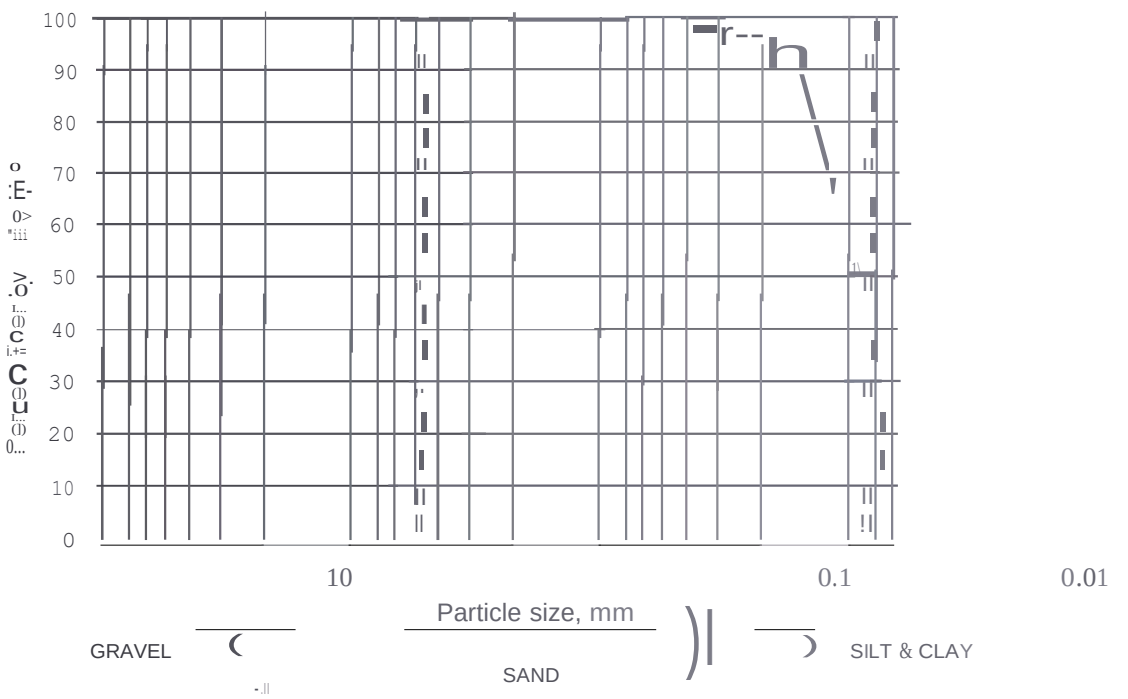
PARTICLE SIZE DISTRIBUTION

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No.	BH-12	Gravel=	0 %
Sample No:	SPT-10	Sand=	58 %
Depth (ft):	30.0	Silt & Clay=	42%

Test Method: ASTM 0422

PARTICLE SIZE DISTRIBUTION CURVE



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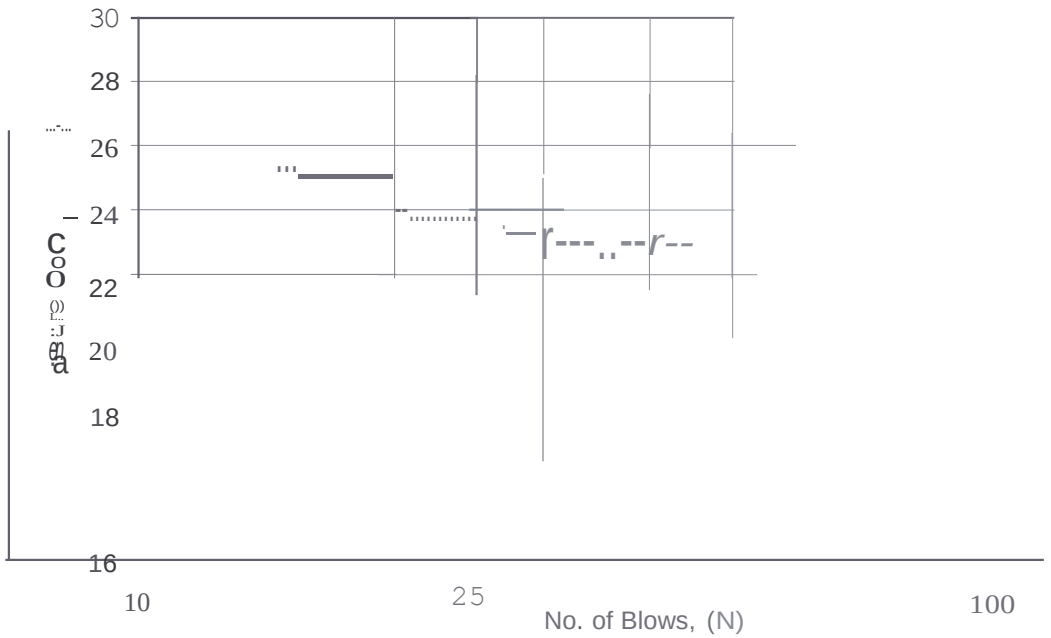
ATTERBERG LIMITS

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

		Blows	w (%)
BH/TP No.	BH-1	15	25.30
Sample No.	SPT-2	25	24.22
Depth (ft):	5.0	35	23.30

Test Method: ASTM 04318



Liquid Limit (%)		24
Plastic Limit (%)	=	20
Plasticity Index	=	4

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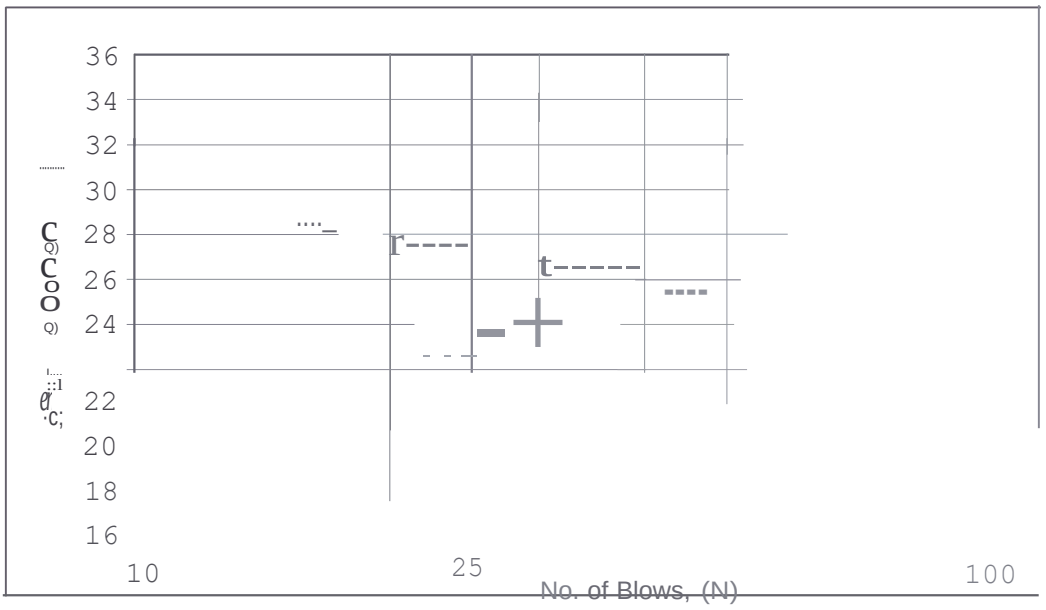
ATTERBERG LIMITS

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

		Blows	w (%)
BH/TP No.	BH-3	16	28.30
Sample No.	SPT-7	26	27.33
Depth (ft):	25.0	37	26.20

Test Method: ASTM 04318



Liquid Limit(%) = 27

Plastic Limit(%) = 21

Plasticity Index = 6

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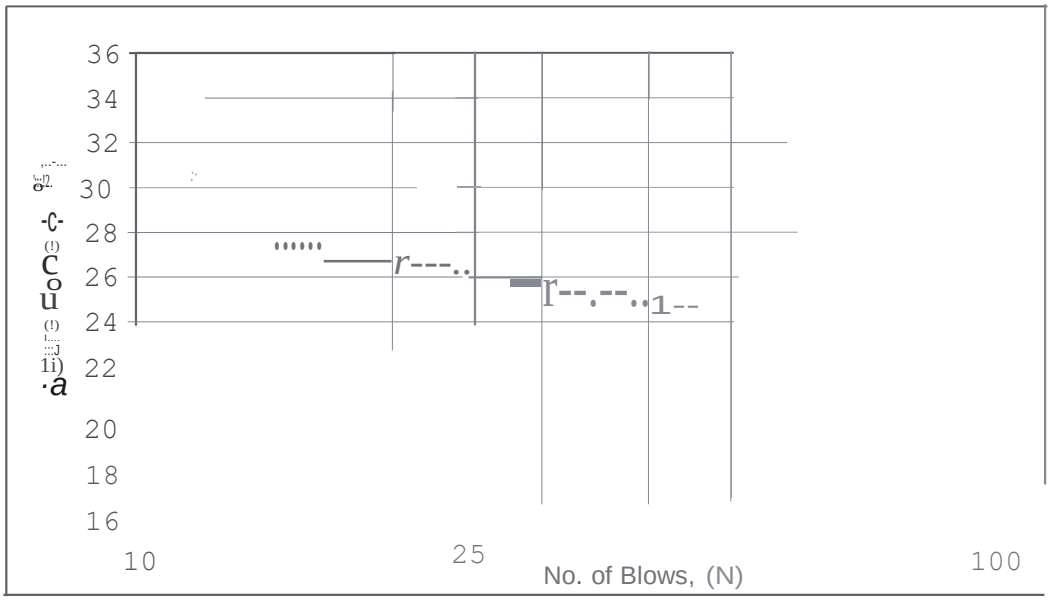
ATTERBERG LIMITS

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant

		Blows	w (%)
BH/TP No.	BH-5	15	27.30
Sample No.	SPT-10	25	26.33
Depth (ft):	40.0	35	25.10

Test Method: ASTM 04318



Liquid Limit (%)	=	26
Plastic Limit (%)	=	18
Plasticity Index		8

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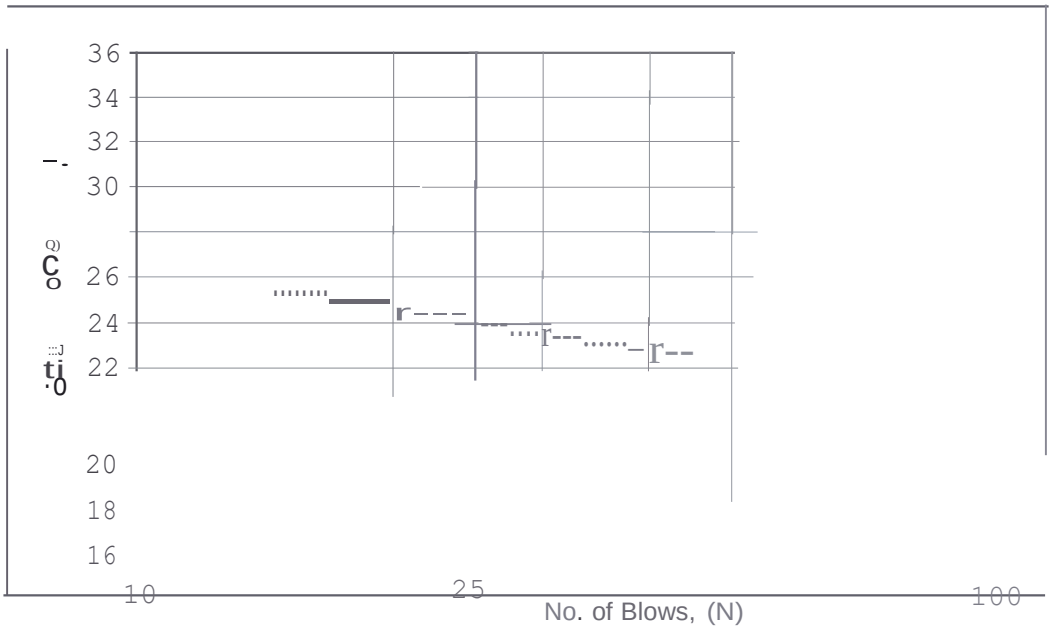
ATTERBERG LIMITS

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

		Blows	w(%)
BH/TP No.	BH-12	15	25.30
Sample No.	SPT-6	25	24.05
Depth (ft):	20.0	35	23.06

Test Method: ASTM 04318



Liquid Limit (%)		24
Plastic Limit (%)	=	20
Plasticity Index	=	4

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DIRECT SHEAR BOX TEST

Project: Geotec,hnicalInvestigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No. BH-1

Sample No: SPT-6

Remoulded Dry Density 17.00

Depth (ft): 20.0

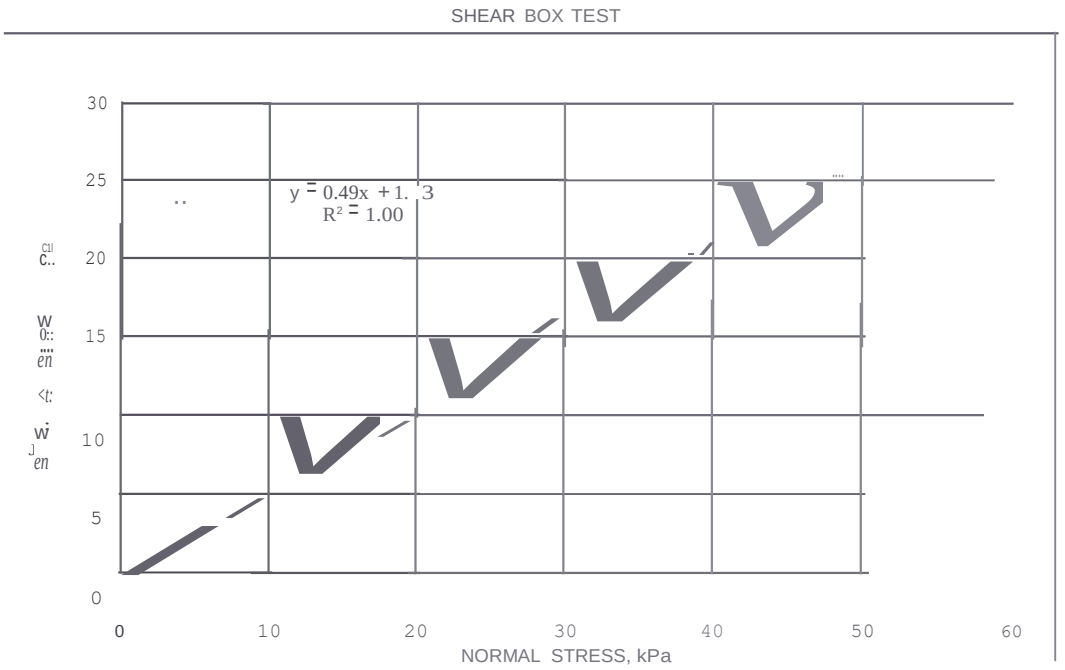
Test Condition = Soaked

Test Method: ASTM D3080

Test Data

Box width	6 em	Dry Density	17.00	kN/m^3
Box length	6 em	Wt of hanger	8.94	lb
Box height	2 em	PR Factor	0.8	lb/Division

Normal Load lb.	Normal Stress kPa	Peak Shear Stress	
		divisions	kPa
18.94	23.41	13.2	13.1
28.94	35.77	19	18.8
38.94	48.13	25.4	25.1



Cohesion= 1.5 kPa Angle of Internal Friction,<!>= 26 degrees

Checked By:

Prepared by:

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DIRECT SHEAR BOX TEST

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No. BH-2

Sample No: SPT-10

Remoulded Dry Density 17.00

Depth (ft): 40.0

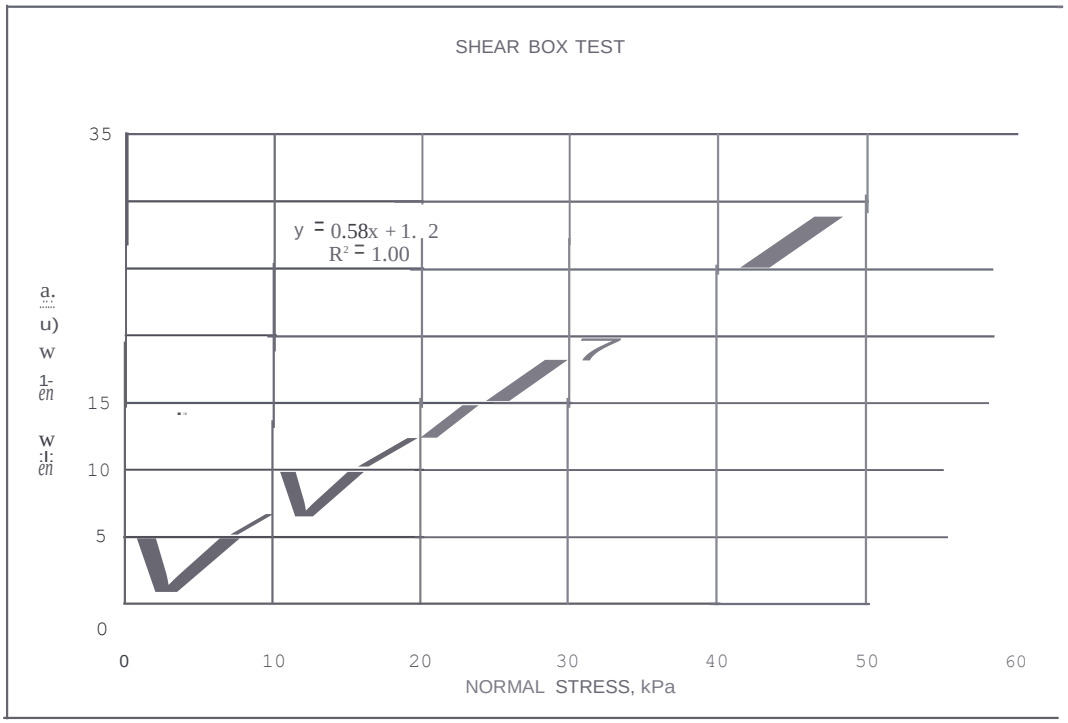
Test Condition = Soaked

Test Data

Test Method: ASTM D3080

Box width	6 em	Dry Density	17.00	kN/m^3
Box length	6 em	Wt of hanger	8.94	lb
Box height	2 em	PR Factor	0.8	lb/Division

Normal Load lb.	Normal Stress kPa·	Peak Shear Stress	
		divisions	kPa
18.94	23.41	14.6	14.4
28.94	35.77	22	21.8
38.94	48.13	29	28.7



Cohesion= 1.0 kPa Angle of Internal Friction,<!>= 30 degrees

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DIRECT SHEAR BOX TEST

Project : Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No. BH-4

Sample No: SPT-6

Remoulded Dry Density 17.00

Depth (ft): 20.0

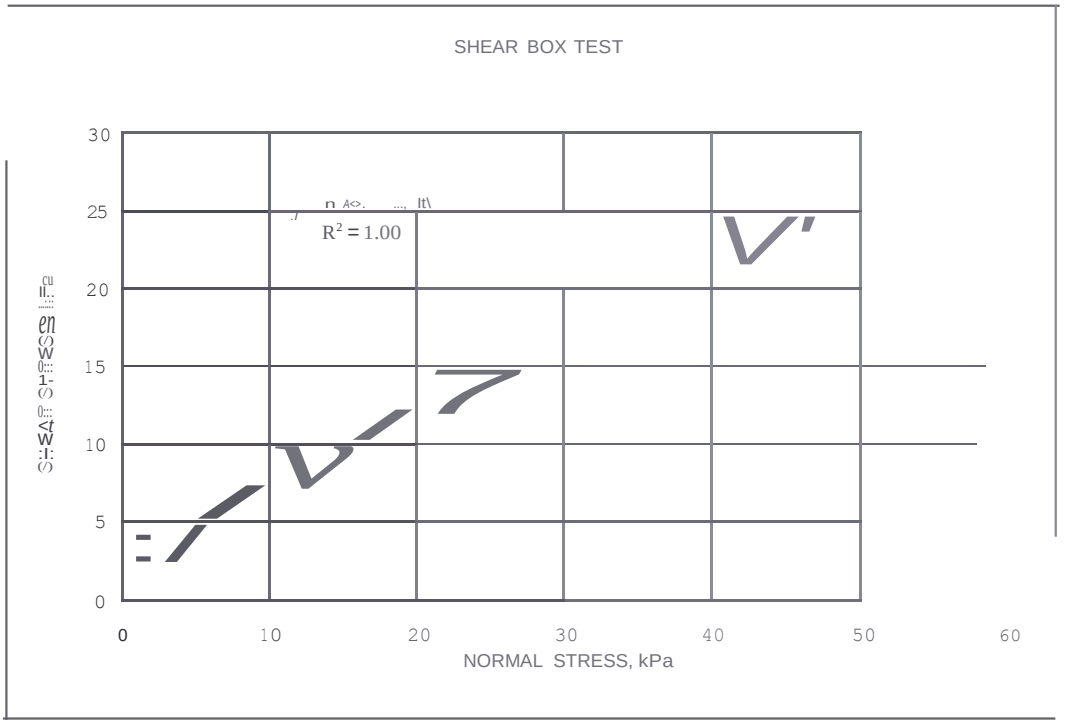
Test Condition = Soaked

Test Data

Test Method: ASTM D3080

Box width	6 em	Dry Density	17.00	kN/m^3
Box length	6 em	Wt of hanger	8.94	lb
Box height	2 em	PR Factor	0.8	lb/Division

Normal Load lb.	Normal Stress kPa	Peak Shear Stress	
		divisions	kPa
18.94	23.41	14	13.8
28.94	35.77	20	19.8
38.94	48.13	26.1	25.8



Cohesion = 2.5 kPa

Angle of Internal Friction, = 26 degrees

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DIRECT SHEAR BOX TEST

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No. BH-9

Sample No: SP"I-5

Remoulded Dry Density 17.00

Depth (ft): 15.0

Test Condition = Soaked

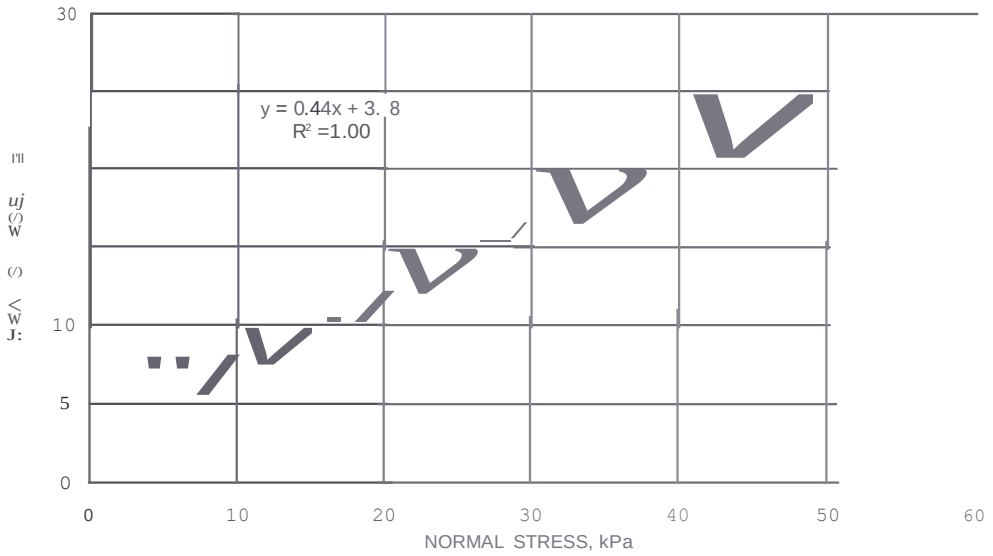
Test Data

Test Method: ASTM D3080

Box width	6 em	Dry Density	17.00	kN/m^3
Box length	6 em	Wt of hanger	8.94	lb
Box height	2 em	PR Factor	0.8	lb/Division

Normal Load lb.	Normal Stress kPa	Peak Shear Stress	
		divisions	kPa
18.94	23.41	14	13.8
28.94	3'5.77	19	18.8
38.94	48.13	25	24.7

SHEAR BOX TEST



Cohesion= 3.4 kPa Angle of Internal Friction, = 24 degrees

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DIRECT SHEAR BOX TEST

Project : Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No. BH-10

Sample No: SPT-6

Remoulded Dry Density 17.00

Depth (ft): 20.0

Test Condition = Soaked

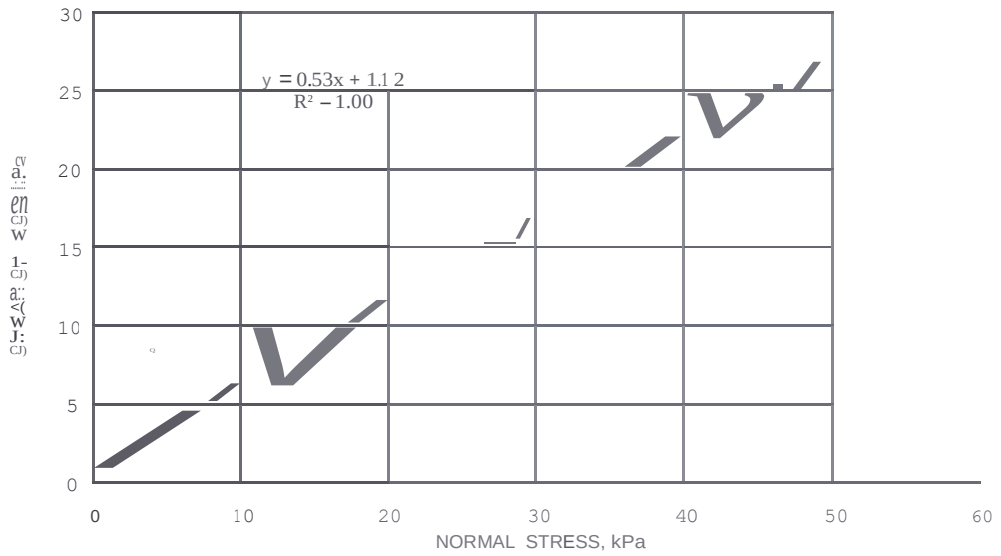
Test Method: ASTM D3080

Test Data

Box width	6 em	Dry Density	17.00	kN/m^3
Box length	6 em	Wt of hanger	8.94	lb
Box height	2 em	PR Factor	0.8	lb/Division

Normal Load lb.	Normal Stress kPa	Peak Shear Stress	
		divisions	kPa
18.94	23.41	13.6	13.4
28.94	35.77	20	19.8
38.94	48.13	26.8	26.5

SHEAR BOX TEST



Cohesion= 1.0 kPa Angle of Internal Friction,= 28 degrees

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DIRECT SHEAR BOX TEST

Project: Geotechnical Investigation for Improvement of Sewerage System Jaranwala and Construction of Wastewater Treatment Plant.

BH/TP No. BH-12

Sample No: SPT-10

Remoulded Dry Density 17.00 kN/m^3

Depth (ft): 40.0

Test Condition = Soaked

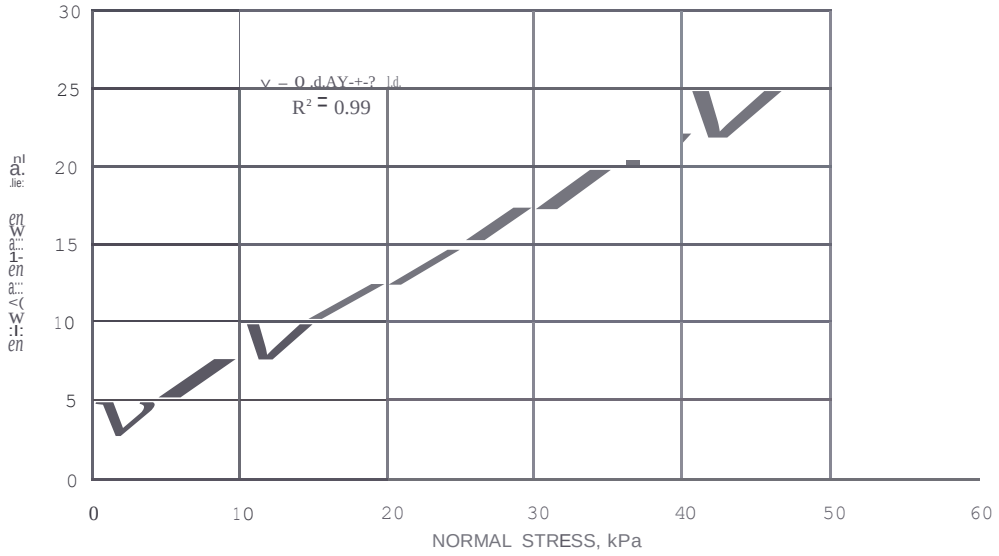
Test Method: ASTM D3080

Test Data

Box width	6 em	Dry Density	17.00	kN/m;
Box length	6 em	Wt of hanger	8.94	lb
Box height	2 em	PR Factor	0.8	lb/Division

Normal Load lb.	Normal Stress kPa	Peak Shear Stress	
		divisions	kPa
18.94	23.41	14	13.8
28.94	35.77	21	20.8
38.94	48.13	26	25.7

SHEAR BOX TEST



Cohesion= 2.9 kPa Angle of Internal Friction, Φ = 26 degrees

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