



Improvement and Extension of Water Supply System in Jhelum City

Environmental and Social Impact Assessment (ESIA)

2023

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2023

PUNJAB
MUNICIPAL DEVELOPMENT FUND
COMPANY



MM Pakistan (Pvt.) Limited, Registered in Pakistan No. K-527/9363
Headquarters at Lahore,
Regional Offices at Islamabad, Karachi and Peshawar

Table of Contents

Executive Summary.....	viii
Environmentally Sensitive Receptors.....	xiii
1 INTRODUCTION.....	16
1.1 Purpose of the Report	16
1.2 Detail of Project Proponent	16
1.3 Detail of Project Consultants	17
1.4 Screening	17
1.5 Rapid environmental Assessment.....	17
1.5.1 Important Issues and Concern raised during Consultation.....	17
1.6 Brief Description	17
2 LEGAL AND POLICY FRAMEWORK	20
2.1 Introduction	20
2.2 Environmental Institutions and Administration.....	20
2.2.1 Pakistan Environmental Protection Act (PEPA), 1997.....	20
2.2.2 The Constitution (Eighteenth Amendment) Act, 2010	21
2.2.3 Punjab Environmental Protection Act (Amendment) Act, 2012	21
2.2.4 Punjab Environmental Quality Standards (PEQs), 2000	22
2.2.5 Punjab Ambient Air Quality Standards	22
2.2.6 Punjab Standards for Drinking water Quality (PDWS)	23
2.2.7 Punjab Environmental Quality Standards-Noise	23
2.2.8 National and Provincial Laws, Regulations, Procedures and Guidelines dealing with the Environmental Aspects	23
2.3 Policy Guidedlines.....	23
2.4 Policy & Regulatory Review of Social Aspects.....	24
2.4.1 National and Provincial Policies	24
2.5 Policy & Regulatory Review of Environmental Aspects.....	24
2.5.1 Policy Framework.....	24
2.5.2 Relevance of Policy and Legal Framework with Punjab Cities Program	25
2.6 International Treaties and Conventions.....	40
2.7 Institutional Framework Review for Managing Environmental and Social Impacts.....	40
2.8 World Bank Policy Core Principles and Applicability on Sub-project.....	44
2.8.1 World Bank Environmental, Health and Social Guidelines	45
2.9 PMDFC Environment Health and Safety SOPs for labor/workers (including Women)	46
2.10 COVID-19 SOPs	46
2.11 ESIA Approval Procedure	46
3 SUB-PROJECT DESCRIPTION	47
3.1 The Sub-Project Interventions.....	47
3.2 Objectives of the Sub-Project.....	47
3.3 Location of the Sub-Project.....	48
3.4 Land Availability	49
3.5 Road access	49
3.6 Vegetation Features of the Site	Error! Bookmark not defined.
3.7 Project Description	49
3.8 Process Flow Diagram	50
3.9 Technology Considerations.....	51
3.10 Hydraulic Analysis.....	52
3.10.1 Conclusions and Recommendations	52
3.11 Area of Influence (AOI).....	53
3.11.1 List of Eexpected Direct Impacts	53
3.11.2 Indirect Impacts	53
3.12 Material Disposal.....	54
3.13 Temporary Storage Area.....	54

3.14	Contractor's Camp	54
3.15	Traffic Management	55
3.16	Machinery and Equipment.....	55
3.17	Construction Scheduling	55
3.18	Manpower Requirement	55
3.19	Government approvals required by the project	55
3.20	Restoration and Rehabilitation Plan	55
3.21	Cost of the Project.....	56
4	DESCRIPTION OF ENVIRONMENT	57
4.1	City profile	57
4.2	Physical Environment.....	58
4.2.1	Topography	59
4.2.2	Climate	59
4.2.3	Soils	61
4.2.4	Water Sources.....	62
4.2.5	Sewerage System	62
4.2.6	Solid Waste Management	62
4.2.7	Ground Water.....	63
4.2.8	Surface Water	63
4.2.9	Solid Waste Management	64
4.2.10	Landfill Site Development.....	64
4.2.11	Environmental Analysis	64
4.3	Ecological Environment.....	77
4.3.1	Flora	77
4.3.2	Fauna	78
4.3.3	Environmentally Sensitive Receptors	78
4.4	Socio-Economic Environment	79
4.4.1	Administrative Setup	79
4.4.2	Economic drivers of the City.....	79
4.4.3	Industrial and Commercial Hubs	79
4.4.4	Community Structure.....	80
4.4.5	Population & Growth Rate	80
4.4.6	Health Facilities	80
4.4.7	Educational Facilities.....	80
4.4.8	Sports.....	81
4.4.9	Important Places	81
4.5	Suitability of the Site.....	82
5	SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND THEIR MITIGATION	83
5.1	General Considerations for Impact Assessment	83
5.2	Objectives	83
5.3	Impact identification.....	83
5.4	Purpose of Mitigation Measure.....	84
5.4.1	What is the problem?	84
5.4.2	When problem will occur and when it should be addressed?	84
5.4.3	Where problem should be addressed?.....	85
5.4.4	How the problem should be addressed?	85
5.5	Ways of Achieving Mitigation Measures?	85
5.5.1	Changing in Planning Design	85
5.5.2	Improved Management and Monitoring Practices	85
5.6	Impact Assessment Methodology	85
5.7	Pre-Construction Phase Impacts.....	87
5.8	Construction Phase Impacts	88
5.9	Operational Phase Impacts	90
5.10	Impacts due to Project Location	91

5.11	Impacts due to Project Design	91
5.12	Positive/Beneficial Impacts.....	91
5.12.1	Construction Phase	91
5.12.2	Operation Phase	91
5.13	Negative/Adverse Impacts	92
5.13.1	Impact on Air Quality	92
5.13.2	Significance of Impact	93
5.13.3	Impact on Soil and Geology	93
5.13.4	Significance of Impact	93
5.13.5	Noise and Vibration Emission Impacts	94
5.13.6	Impact Significance	94
5.13.7	Solid Waste Generation	94
5.13.8	Impact Significance	94
5.13.9	Visual Impacts.....	94
5.13.10	Impact Significance	95
5.13.11	Impacts on Surface Water	95
5.13.12	Impacts to Occupational Health and Safety	95
5.13.13	Impact Significance	95
5.13.14	Impacts on Community Health and Safety	95
5.13.15	Impact Significance	95
5.13.16	Impacts on Local Traffic	96
5.13.17	Public Health Diseases	96
5.13.18	Gender Based Violence	96
5.13.19	Child Protection	97
5.14	Operation Impacts	97
5.14.1	Consumption of Contaminated Water	97
5.14.2	Impact Significance	97
5.14.3	Solid Waste Generation	97
5.14.4	Mitigation of impacts related to rehabilitation of construction of pipeline.	98
5.14.5	Mitigation of impacts related to operation of pipeline.....	100
5.15	Environmental Enhancement Measures.....	101
6	ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN	103
6.1	Objective	103
6.2	Institutional Arrangements.....	103
6.2.1	MC Jhelum	103
6.2.2	PMDFC ESM Wing.....	103
6.2.3	The Contractor	103
6.3	Mitigation Plan.....	103
6.4	Monitoring Plan	104
6.4.1	Monitoring Mechanism	104
6.5	Reports.....	104
6.6	Inclusion of ESIA in Bidding/Contract Documents.....	105
6.7	Monitoring of Environmental and Social Non-Compliance	105
6.8	Environmental and Social Management and Monitoring Plan	105
6.9	Environmental Implementation Budget.....	116
7	STAKEHOLDER CONSULTATION AND CAPCITY BUILDING	117
7.1	Introduction	117
7.2	Specific Objectives of Consultation Process	117
7.3	Proponents Environmental Management Team	118
7.4	The Responsible Authority	118
7.5	Identification of Stakeholders	118
7.5.1	Direct Stakeholders	118
7.5.2	Indirect Stakeholders.....	118
7.6	Public Consultation.....	118

7.7	Affected and Wider Community	119
7.8	Concerns from the Community and Stakeholders during Consultation	120
7.9	Institutional Consultation	122
7.10	Capacity Building	125
7.11	Women Stakeholders Consultation	126
8	GRIEVANCE REDRESS MECHANISM	128
8.1	Principles.....	128
8.2	Objectives	128
8.3	Type of Complaints	128
8.4	Disclosure of GRM	129
8.5	Structure of Grievance Redress Mechanism	129
8.5.1	Community GRC (Tier-1)	129
8.5.2	Project GRC (Tier-2)	129
8.5.3	PMDFC-GRC (Tier-3).....	130
8.6	Gender Based Violence (GBV) Committee	131
8.7	Grievance Redress Procedure/Mechanism	131
8.8	Lodging of Complaint	132
8.9	Institutional Framework	133
8.10	Local Government and Community Development Department (LG&CDD)	133
8.11	Punjab Municipal Development Fund Company (PMDFC)	133
8.12	Central Program Management Team (CPMT)	133
8.13	Regional Program Management Team	134
8.14	Municipal Committee Jhelum	134
8.15	Environment Protection Department (EPD).....	134
8.16	The Contractor	134
9	CONCLUSION AND RECOMMENDATIONS	135
9.1	Conclusion	135
9.2	Recommendations	135
	REFERENCES.....	136

List of Tables

Table 2-1: National / Punjab Environmental Quality Standards Ambient Air	22
Table 2-2: Legal and Policy Framework for Social Management and Relevance with Punjab Cities Program	25
Table 2-3: Legal & Policy Framework for Environmental Management and Relevance with Punjab Cities Program	33
Table 2-4: Institutional Framework	41
Table 2-5: World Bank Policy Core Principles and Applicability on Sub-project	44
Table 3-3: Tubewells Requirements at Maximum Daily Demand for Planning Horizons	53
Table 3-4: Implementation Schedule	55
Table 5-1: Table Environmental Impact Check List	86
Table 5-2: Parameters and Examples of Criteria used to Determine Magnitude of Impact	86
Table 5-3: Pre-Construction Phase Impacts	87
Table 5-4: Construction Phase Impacts	89
Table 5-5: Operational Phase Impacts	90
Table 5-6: Mitigation of Impacts related to Rehabilitation of Consturction of Pipelines	98
Table 5-7: Mitigation of Impacts related to Operation of Pipeline	100
Table 6-1: Reports	104
Table 6-2: Environmental & Social Management & Monitoring Plan	106
Table 6-3: Environmental Implementation Budget	116
Table 7-1: Consultation with Stakeholders	119
Table 7-2: Consultation with Institutional Stakeholders	122
Table 7-3: Feedback and Concerns	124
Table 7-4: Training / Awareness and Sentization Plan	126

List of Figures

Figure 3-1: Location of the Sub-Project	48
Figure 4-1: Climate Data of Jhelum City	59
Figure 4-2: Average Rainfall data of Jhelum City	Error! Bookmark not defined.
Figure 4-3: Average Wind & Dust data of Jhelum City	Error! Bookmark not defined.
Figure 5-1: Waste disposal Hierarchy	97
Figure 8-1: Organizatgion of the GRC	131

Annexures

Annexure A: Environmental and Social Screening Checklists of the Sub-project	138
Annexure B: Aquifer Sustainability Analysis	178
Annexure C: List of Participants Consulted	189
Annexure D: EHS SOPS for Labor/Workers (including Women Labor/Worker) for Construction of Development Project (URDU)	190
Annexure E: IFC EHS Guidelines for Construction and Decommissioning	216
Annexure F: COVID-19 Pandemic and Health Safety Measures	223
Annexure G: Personal Protective Equipment According to Harzard	224
Annexure H: Water Quality Testing Reports with Geo-Tagged Map	226
Annexure I: Environmrntal Analysis testing reports	233
Annexure J: Maps & Drawings	365

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
EHS	Environment Health & Safety
ESIA	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
ESIA	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
NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
OHS	Occupational Health & Safety
OPs	Operational Policies
PAPs	Project Affected Persons
PC-I	Planning Commission Form-I
PCP	Punjab Cities Program

Acronym	Definition
PCRs	Physical Cultural Resources
PD	Project Director
PDO	Program Development Objectives
PEPA	Punjab Environment Protection Act
PHED	Punjab Health Engineering Department
PMDFC	Punjab Municipal Development Fund Company
PMU	Project Management Unit
PPEs	Personal Protective Equipment
PO	Program Officer
RoW	Right of Way
RPF	Resettlement Policy Framework
SMP	Social Management Plan
SOPs	Standard Operating Procedures
SPO	Senior Program Officer
STIs	Site Transmission Infections
TORs	Term of References
WB	World Bank

Executive Summary

Government of Punjab (Go Punjab) sought support from the World Bank for the economic growth of urban sectors in Punjab. This program would support the development of institutional and financial systems with a focus on the secondary cities, as they provide the most conducive opportunity to pilot an urban-local-government (ULG) centric model of improving urban governance and service delivery. Punjab Cities Program (PCP) Program-for-Results (PforR) will support participating Municipal Committees (MCs) to improve their urban management and service delivery performance. The operation will provide capacity-building and institutional support to 16 secondary cities in Punjab.

An Environmental and Social Management Framework (ESMF) has been prepared for Punjab Cities Program (PCP). This ESMF will facilitate and technically assist the MCs in better understanding and compliance of social and environmental management processes and procedures as per WB policies, local policies / legal framework. Under ESMF procedures, each Sub-project will be screened for the severity and extent of environmental and social impacts. All the Sub-projects will be screened through an environmental and social screening checklist and those having negligible environmental and or social impacts will require no further assessment.

This Sub project includes Improvement and Extension of Water Supply System in Jhelum City. The Sub-project has been screened to assess the environment and social anticipated impacts. As per findings of the site visit (Checklists provided in Annexure-A), discussion with officials and stakeholder consultations, the Sub-project area does not fall in any of the wildlife habitat or reserve area/ environmental sensitive areas; therefore, it will not cause any harmful impact directly or indirectly during execution of civil works. Sub-project will have no irreversible environmental and social impacts. Involuntary land acquisition is required, and therefore there will be no physical displacement or impacts on livelihoods. The Sub-project site will create some localized disturbances related to construction activities that produce noise, movement or vibration, traffic, hindrance of movement, and dust. The nuisance and disturbance related to construction activities may be mostly felt by nearby settlements. Sub-project may have temporary social impacts related to community health and safety and accessibility. Therefore, Sub-project categorized as E-1 due to the new network laying in some town in Jhelum city described below & S2 is due to the impacts on community in terms of pollution and timeframe of activity in Jhelum city, ESIA prepared under this category.

The ESIA has been prepared in accordance with provincial and national legislation, and the World Bank's Core Principles. The number of mitigations included in the ESIA is based on the scope of work. Requirements to train the contractor's staff in the implementation of all mitigation measures have also been included in ESIA.

Direct stakeholders can be defined as those stakeholders who are likely to be directly impacted by the Sub-project and have livelihood restoration measures targeted towards them. Participants of consultation 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 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 and most of the people wish to implement the Sub-project through sustainable and safety manner.

The mitigation plan, being a key component of ESMMP includes measures to mitigate potential negative impacts and enhance its positive impacts during construction phase of the Sub-project. The Contractor is responsible for implementation of ESMMP under the supervision of Punjab Municipal Funds Development Company (PMDFC), Construction Supervision Consultant (CSC)

The Contractor will ensure implementation of on-site safety measures to protect community from any mishap/incident or accidents. He 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 in addition to provision of personal protective equipment (PPEs) to workers as per nature of their jobs.

The present ESIA will be included in the bidding/contract documents and its 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.

The impacts, mitigation measures, monitoring indicators, frequency and responsibility has been discussed in Environmental and Social Management and Monitoring Plan (ESMMP). Environmental implementation budget is calculated as 1.646 million Rs.

A comprehensive program will be followed to strengthen the technical and institutional capacities of the executing agency (MC Jhelum), contractors, and laborers. Training program will be scheduled after approval of ESIA from World Bank and Labors will be trained before and during the execution of the Sub-project.

Environment & Social Management Framework (ESMF)

An Environmental and Social Management Framework (ESMF) has been prepared for Punjab Cities Program (PCP). ESMF will facilitate and technically assist the MCs in better understanding and compliance of social and environmental management processes and procedures as per WB policies, local policies and legal framework. Under ESMF procedures, each Sub-project will be screened for the severity and extent of environmental and social impacts. All the Sub-projects will be screened through an environmental and social screening checklist and those having negligible environmental and or social impacts will require no further assessment. Sub-projects having some negative but localized environmental and or social impacts will require a generic Environmental and Social & Monitoring Management Plan (ESMMP) or SMP, while those having environmental impacts of significant nature or they come under Schedule I or II of PEPA Review of IEE/ESIA Regulation, 2000 will require to conduct the detailed studies (IEE/ESIA) and further submission of reports to PEPA for review and to obtain NOC/environmental approval.

Environment & Social Assessment Categories

Environmental Categories

According to ESMF, depending on size, cost, location and the nature, each scheme will have varying impacts on city environment. The rigorousness of environmental assessment requires identifying and mitigating the impacts, largely dependent upon the complexities of scheme. To facilitate effective screening as per environmental aspects, the ESMF categorized Sub-projects into three categories viz. E-1, E-2 and E-3 describe below.

- **E-1** schemes are those wherein major environmental impacts are foreseen;
- **E-2** schemes are expected to have only moderate environmental impacts; and
- **E-3** schemes are the schemes with negligible environmental impacts and hence, these can be termed as “environmentally benign”.

Social Categories

Based on the number of households that may be affected by the scheme, i.e. Affected Households (AHs) and magnitude of impacts, schemes are categorized as S-1, S-2 and S-3.

- **S-1** schemes are those schemes that will impact more than 40 households, and are expected to have significant negative social consequences;
- **S-2** schemes are those which will impact less than 40 households and are expected to have significant social consequences affecting local inhabitants; and
- **S-3** schemes are not expected to have any significant adverse social impacts.

Environment & Social Assessment Category of the Sub-project

Sub-project has been screened to assess the environment and social impacts anticipated as per scope of work. As per findings of the first site visit conducted on 03.10.2022 to 07.10.2022 and second site visit for screening of E&S issues due to changing of scope on 14.06.2023 to 16.06.2023 discussion with officials and stakeholder consultations, Sub-project area does not fall in any of the wildlife habitat or reserve area/environmental sensitive areas; therefore, it will not cause any harmful impact directly or indirectly during execution of civil works. Sub-project will have no irreversible environmental and social impacts. There are some moderate environmental impacts (minor excavations and civil works) as per scope of work which will be minimized by following mitigation measures. Sub-project categorized as E-1, S2 and thus preparation of ESIA is considered under this category for the improvement and extension of water supply system in Jhelum City.

As regards social aspects involuntary land acquisition is not required for this project. The Sub-project site will create some localized disturbances related to construction activities that produce noise, movement or vibration, traffic, hindrance of movement, and dust. The nuisance and disturbance related to construction activities will be most felt by nearby settlements. Sub-project may have temporary social impacts related to community health and safety and accessibility. Therefore, Sub-project categorized as S-2. Accordingly, ESIA has been prepared in accordance with provincial and national legislation, and the World Bank's Core Principles. The number of mitigations included in the ESIA is based on the scope of work.

Environmental and Social Impact Assessment

As per Section 12 of the Punjab Environmental Protection Act, 2012, it is mandatory for proponents of the new projects to obtain Environmental Approval at feasibility/planning stage as no construction preliminary or otherwise, relating to project shall be undertaken until and unless the Environmental Approval has been obtained from the Punjab Environmental Protection Agency (Pb-EPA) and for getting environmental approval submission of ESIA/ESIA to Pb-EPA along with other documents is statutory requirement.

The Consultant has prepared this Environmental and Social Impact Assessment (ESIA) report by conducting the fresh studies against the Environmental and Social requirements applicable in Punjab. The Environmental and Social Impacts have been made part of the ESIA report while discussing baseline and identification of impacts of the project. Due consideration has also been given to current and future compliance of the Project with applicable national/provincial laws and regulations and AIB Environmental and Social Framework and Standards.

The location of the project is shown in Google Map given below



Location of the Project

Name of the Proponent

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

Municipal Committee Jhelum

Civil Line Road Jhelum Municipal Committee Jhelum, Civil Line Road Jhelum

municipalcommitteejhelum@gmail.com

0544-9270098

Name of the Organization preparing the Report

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.com1

Brief Outline of the Project

This sub-project will cover the replacement of contaminated/outlived pipelines and replacement of existing abandoned Tube wells within the existing network. Tube wells installed at Suleman Paras near Altaf Park, Sheesha Ground, Darbar Peer Azmat Wali, Kala Gujran and Al-Miraj Flour Mills Kala Gujran are blowing sand and need replacement. 4 Nos. new tube wells will be installed but old machinery will be used in case of tube well at Al-Miraj Flour Mills Kala Gujran because it was installed recently. All the existing house connections will be removed and new house connections will be installed.

There are some left over street where no distribution network is available and it is proposed to lay new network in Doctor Colony, Iqbal town, Karimpura, Islampura, Abbas Pura and Chishtain Mohallah. There are some areas where pipes of existing distribution network are outlived, gone deeper and passing under sewer/drain. It will be replaced in Machine Mohallah 3, Dhoke Allah Abad near Spirit School, Madani Mohallah, Gulshan Town, Mohallah Bilal Town and From City Police station to Ramzan Bazar & From Ramzan Bazar to Jadda Chowk.

The existing water supply system in Jhelum city is mainly based on groundwater. The major water supply systems were installed in 1970s to mid-1980s in 4 phases. Since then, the installation of additional tube-wells and extended distribution networks were provided with the increase of public demand for water. However, the old distribution network is outlived and need replacement. Currently, the city is divided into two zones. Zone-1 comprises main Jhelum City whereas Zone-2 consists of Kala Gujran. 36 tubewells were installed in different times in the city. The depth of water table in the city varies from 20ft to 60ft. It is shallow towards river side and deep in center of the city. The Depth of these tube wells ranges between 220 – 270 feet. The installed tube wells are of 1 cusecs capacity. However, these tube wells are not working with their hundred percent efficiency. The Table below shows zone wise water abstraction from ground in Jhelum City.

Zone	No. of Tubewell	Capacity (Cfs)	Total Capacity of (Cusecs)	No of Tubewells				Water Abstraction with 6 hours Pumping (Gins)	Water Abstract with 6 hours Pumping (MG)
				Functional	Abandoned	Dismantled	Present working hours per day		
Zone-1	27	1.0	16.0	16	8	3	6.0	2160000	2.160
Zone 2	9		5.0	5	4	0		675000	0.675
Total	36		21.0	21	12	3		2835000	2.835

Water supply lines in Zone 1 are outlived, gone deeper with the passage of time, and few are passing under drains & sewer. House connection are passing through open drains, over the drains and under the drains/sewer causing contamination. There are some streets where water supply pipes are not laid.

Currently, the city is divided into two zones. Zone-1 comprises main Jhelum City whereas Zone-2 consists of Kala Gujran. 36 tube wells were installed in different times in the city. Only 21 tube wells having capacity of 1.0 cusec each are functional. However, these tube wells are not working with their hundred percent efficiency. These are operated for 6 hours daily and producing 2.835 MGD water. It can be enhanced up to 7.560 MGD if pumping hours are increased from 6 to 16. Present demand for population of 282911 persons is 11.20 MGD. So, there is deficit of 3.64 MGD. It will be covered by installation of 4 No's tube wells in existing areas and 6 No. s new tube wells in unserved areas but due to financial constraint only 4nos tube wells are proposed to be installed to replace the abandoned existing tube wells.

The design capacity of the water supply scheme will be 31 cusecs in total. It can serve the new areas and old areas as well. It can produce 11.20 MGD water @ 16 hours pumping.

Environmentally Sensitive Receptors

Environmental sensitive areas are more prone towards human disturbance. The river Jhelum is navigable throughout the district, which forms the south-eastern portion of a rugged Himalayan spur, extending between the Indus and Jhelum to the borders of the Sind Sagar Doab. Its scenery is very picturesque, although not of so wild a character as the mountain region of Rawalpindi to the north, and is lighted up in places by smiling patches of the cultivated valley. There are some schools, Mosque, Graveyard, Janazgah and Shrine is within 100 meters of along site that can be affected during construction activities but it will be mitigate properly..

The Major Impacts

In order to identify all the activities associated with the project during construction phase with potential to cause adverse environmental impacts and harm a thorough review has been conducted. Project will not have any major adverse impacts on the nearby community and on environment. Overall, the project will have positive impacts on the local population and country as a whole. Moreover, area for plantation is also reserved for air purification within the project vicinity.

Summary of Environmental Impacts and Mitigation Measures

Pollutant	Constructional phase	Recommended Mitigation Measures
Particulate matter (PM)/dust	Particulate matter will be generated during the constructional and transportation activities at the site Due to raw materials loading/unloading	- Sprinkling of water all constructional raw material should be kept covered. - Maintain vehicle speeds Monitoring should be conducted as per EPA PEQS Rules 2001, if required
Noise	Noise will be generated due to construction machinery and vehicles transporting materials	- Vehicles to carry raw materials should be operated during night time as far as possible. Ear plugs should be provided in case of heavy noise. - Ear plugs should be provided to workers working in generator area. - Monitoring should be conducted as per EPA PEQS Rules 2001, if required
Solid Waste	Solid waste will be generated due to construction and domestic sources	- Constructional waste should be utilized for road filling and maintenance - Domestic waste should be disposed of properly at disposal site allocate by MC Jhelum. Site location added in the report along with coordinates. - Restoration and reclamation of land will be done in case of soil erosion or removal of vegetation.
Waste water	Waste water will be generated from constructional and domestic sources.	Waste water will be collected in septic tanks and then it will be disposed off properly to sewerage lines.
Health and safety issues	Health and safety issues will arise due to machinery handling and constructional activities	- PPEs should be provided to workers during constructional activities. - Training of workers should be conducted regarding health and safety. - First aid measures should be available - Adequate firefighting system & Equipment should be installed

Pollutant	Constructional phase	Recommended Mitigation Measures
		• Proper housekeeping should be ensured. Security guards should be present
Socioeconomic	Disturbance to neighbors by constructional activities	• People should be informed in advance when work is about to start at the site. Job opportunity should be provided to local people of the area. • Community wellbeing should be considered and anticipated measures are recommended to preserve the local culture and ecosystem

Proposed Environmental Monitoring

The Environmental & Social Management and Monitoring Plan (ESMMP) will be used as a management and monitoring tool for implementation of the mitigation measures identified in the ESIA report. The ESMMP matrix lists down:

- The required mitigation measures recommended in the ESIA report.
- The person/organization directly responsible for adhering to or executing the required mitigation measures and monitoring adherence to the mitigation measures.
- The parameters, which will be monitored to ensure compliance with the mitigation measures.
- The timing at which the mitigation or monitoring has to be carried out.
- Budget allocated for management practices (cost of ESMMP).
- Project will hold primary and overall responsibility for ensuring full implementation of the ESMMP.

Proposed Environmental Monitoring Program

Sr. No.	Parameters	Monitoring Schedules During Construction	Monitoring Duration	Responsible party
1	Ambient Air Monitoring	Quarterly	As per PEQS	Proponent/contractor
2	Noise Level	Quarterly	As per PEQS	Proponent/contractor
3	Drinking water quality	Quarterly	Some parameters on site Others in lab	Proponent/contractor

1 INTRODUCTION

1.1 Purpose of the Report

This report has been prepared to conform the requirements of the World Bank and Punjab Environmental Protection Act, 2012, which states that:

“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 & Social Impact Assessment, and has obtained from the Provincial Agency approval in respect thereof.”

It is of utter importance to examine the environmental impacts, both beneficial and adverse, of the proposed project, and to recommend and propose mitigating measures to prevent, minimize or mitigate such impacts. The environment related studies (ESIA/IEE) of any project are required to assess the environmental consequences of the extraction at the proposed sites and to suggest appropriate, practical and site-specific mitigation as well as enhancement measures.

The main objectives of this Project are to:

- To supply safe drinking water in sufficient quantity at doorsteps of consumers with reasonable cost.
- To encouraging personal hygiene and household cleanliness of users.
- Reduction and prompt addressal of the public complaints regarding shortage of water supply.
- Reduction in water borne diseases.
- Reduction in burden on health care budget of the people.
- Improvement in expenditure & security of certain medicine.
- Improvement in environment of the city making it better livable place.

1.2 Detail of Project Proponent

Details of the Proponent of the proposed Sub-project is under:

Municipal Committee Jhelum

Civil Line Road Jhelum Municipal Committee Jhelum, Civil Line Road Jhelum

municipalcommitteejhelum@gmail.com

0544-9270098

1.3 Detail of Project Consultants

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

1.4 Screening

As per Review of Initial Environmental Examination (IEE) and Environmental & Social Impact Assessment (ESIA) Regulations, 2000 made under Section 12 of Punjab, the project falls under Category "F" (1) of Schedule 2 (water supply, sewerage system and treatment), water supply schemes and treatment plants with total cost more than 50 million requires preparation of ESIA.

1.5 Rapid environmental Assessment

Environment, Social and involuntary checklist filled and attached in **Annexure A**.

1.5.1 Important Issues and Concern raised during Consultation

During consultation it was observed that maximum people were in favor of project but following issues and concerns were raised which have also been discussed in length in Chapter 9 Stakeholder Consultation:

- Air pollution should be controlled effectively.
- Locals should be preferred for the job opportunities.
- In case of labor camps Wastewater should be treated prior to final disposal
- Solid waste should be managed effectively by adopting the standard practices.
- Cleanliness of the area should be ensured.
- An effective EMMP should be designed and enforced with true spirit.
- Health of the workers should be ensured.
- Workers should be hired from local community.
- Indigenous trees around the facility should be planted to control air pollution.

1.6 Brief Description

This sub project will cover the replacement of contaminated/outlived pipelines and replacement of existing abandoned Tube wells within the existing network. Tube wells installed at Suleman Paras near Altaf Park, Sheesha Ground, Darbar Peer Azmat Wali, Kala Gujran and Al-Miraj Flour Mills Kala Gujran are blowing sand and need replacement of four new tube wells will be installed but old machinery will

be used in case of tube well at Al-Miraj Flour Mills Kala Gujran because it was installed recently. All the existing house connections will be removed and new house connections will be installed.

There are some left over street where no distribution network is available and it is proposed to lay new network in Doctor Colony, Iqbal town, Karimpura, Islampura, Abbas Pura and Chishtain Mohallah. There are some areas where pipes of existing distribution network are outlived, gone deeper and passing under sewer/drain. It will be replaced in Machine Mohallah 3, Dhoke Allah Abad near Spirit School, Madani Mohallah, Gulshan Town, Mohallah Bilal Town and From City Police station to Ramzan Bazar & From Ramzan Bazar to Jadda Chowk.

The existing water supply system in Jhelum city is mainly based on groundwater. The major water supply systems were installed in 1970s to mid-1980s in 4 phases. Since then, the installation of additional tube-wells and extended distribution networks were provided with the increase of public demand for water. However, the old distribution network is outlived and need replacement. Currently, the city is divided into two zones. Zone-1 comprises main Jhelum City whereas Zone-2 consists of Kala Gujran. 36 tubewells were installed in different times in the city. The depth of water table in the city varies from 20ft to 60ft. It is shallow towards river side and deep in center of the city. The Depth of these tube wells ranges between 220 – 270 feet. The installed tube wells are of 1 cusecs capacity. However, these tube wells are not working with their hundred percent efficiency. The Table below shows zone wise water abstraction from ground in Jhelum City.

Zone	No. of Tubewell	Capacity (Cfs)	Total Capacity of (Cusecs)	No of Tubewells				Water Abstraction with 6 hours Pumping (Gins)	Water Abstract with 6 hours Pumping (MG)
				Functional	Abandoned	Damaged	Present working hours per day		
Zone-1	27	1.0	16.0	16	8	3	6.0	2160000	2.160
Zone 2	9		5.0	5	4	0		675000	0.675
Total	36		21.0	21	12	3		2835000	2.835

Water supply lines in Zone 1 are outlived, gone deeper with the passage of time, and few are passing under drains & sewer. House connection are passing through open drains, over the drains and under the drains/sewer causing contamination. There are some streets where water supply pipes are not laid.

Currently, the city is divided into two zones. Zone-1 comprises main Jhelum City whereas Zone-2 consists of Kala Gujran. 36 tube wells were installed in different times in the city. Only 21 tube wells having capacity of 1.0 cusec each are functional. However, these tube wells are not working with their hundred percent efficiency. These are operated for 6 hours daily and producing 2.835 MGD water. It can be enhanced up to 7.560 MGD if pumping hours are increased from 6 to 16. Present demand for population of 282911 persons is 11.20 MGD. So, there is deficit of 3.64 MGD. It will be covered by installation of 4 No's tube wells in existing areas and 6 No.s new tube wells in unserved areas but due to financial constraint only 4nos tube wells are proposed to be installed to replace the abandoned existing tube wells.

The design capacity of the water supply scheme will be 31 cusecs in total. It can serve the new areas and old areas as well. It can produce 11.20 MGD water @ 16 hours pumping.

2 LEGAL AND POLICY FRAMEWORK

2.1 Introduction

A number of laws concerning to protection of the environment exist in Pakistan. However, the first legislation on Environmental Protection was made in 1983. The Pakistan Environmental Protection Ordinance, 1983 was the first legislation promulgated for the protection of environment.

In 1993, the Pakistan Environmental Protection Agency (Pak-EPA) was established under Section 6(d) of the Pakistan Environmental Protection Ordinance, 1983. No significant environmental policy, guidelines and regulations were carried out till early 1990's. The National Conservation Strategy (NCS) was developed and approved by the Federal Cabinet in 1992. Punjab Environmental Protection Act (PEPA), 1997 Amended 2012 was formulated and after 18th Amendment, Punjab Environmental Quality Standards (PEQS) were established in 2016.

This section discusses the federal, provincial and local policies and laws and WB policies and principles applicable for PCP to deal with the environmental and social issues.

2.2 Environmental Institutions and Administration

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 **Annexure-B**. The Federal list depicts the areas and subjects on which the Federal government has exclusive powers. The second, concurrent list contains areas and subjects on which both Federal and Provincial Governments can enact laws.

The Ministry of Climate Change is responsible to handle environmental issues at federal level. The NCS unit within the Ministry ensures implementation of the National Conservation Strategy.

The Punjab Environmental Protection Agency is responsible for administering the provisions of the Punjab Environmental Protection Act. It is responsible to ensure compliance with the Punjab Environmental Quality Standards (PEQS), develop monitoring and evaluation systems and initiate legislation when necessary.

The Punjab Environmental Protection Agency (Environmental Protection Directorate in Punjab) is responsible for environmental planning and development, approval of Initial Environmental Examination (IEE) and Environmental & Social Impact Assessments (ESIA) of new projects at provincial level. Wildlife conservation and management is also a provincial subject. Provincial Wildlife and Forestry Departments are responsible for implementation of provisions of provincial Wildlife Protection Ordinances, Acts and Regulations.

2.2.1 Pakistan Environmental Protection Act (PEPA), 1997

The Act is applicable to a broad range of issues and extends to air, water, soil, marine and noise pollution, as well as the handling of hazardous substances. Some portions from the Act are reproduced below for reference purposes.

Section-11 (1): "Subject to the provisions of this Act and the rules and regulations made there under no person shall discharge or emit or allow the discharge or emission of any effluent or

waste or air pollution or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards”.

Section-12 (1): "No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency an Initial Environmental Examination (IEE) or, where the project is likely to cause an adverse environmental effect, an Environmental & Social Impact Assessment (ESIA), and has obtained from the Federal Agency approval in respect thereof".

Section-14: "Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle or import any hazardous substance except (a) under a license issued by the Federal Agency and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party".

2.2.2 The Constitution (Eighteenth Amendment) Act, 2010

It gives Provincial Governments exclusive powers to legislate on the subject of “Environmental Pollution and Ecology”. When the Pakistan Environmental Protection Act (PEPA), 1997 operated as a federal law, any contradictory provisions in other laws, whether federal or provincial, were nullified because PEPA, 1997 had overriding effect. Prior to the enactment of the Eighteenth Amendment, PEPA, 1997 governed all operations and activities that have the potential to cause environmental damage. This included subjects such as nuclear power for which only the Federal Government may legislate. This too is no longer the case. The Federal Government retains exclusive authority over a number of subjects that should be regulated by environmental law, but the ambit of that law will now no longer extend to them.

2.2.3 Punjab Environmental Protection Act (Amendment) Act, 2012

The Act is applicable to a broad range of issues and extends to air, water, soil, marine and noise pollution, as well as the handling of hazardous waste. Some portions from the Act are reproduced below for reference purposes.

Section-11 (1): "Subject to the provisions of this Act and the rules and regulations made there under no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollution or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards”.

Section-12 (1): "No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency an Initial Environmental Examination (IEE) or, where the project is likely to cause an adverse environmental effect, an Environmental & Social Impact Assessment (ESIA), and has obtained from the Federal Agency approval in respect thereof".

Section-14: "Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle or import any hazardous substance except (a) under a license issued by the Federal Agency and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party".

2.2.4 Punjab Environmental Quality Standards (PEQs), 2000

The PEQs, 2000 specify the following standards:

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

These standards apply to the gaseous emissions and liquid effluents. Standards for ambient air quality have not been prescribed as yet.

2.2.5 Punjab Ambient Air Quality Standards

The Ministry of Environment, Government of Pakistan vide its Notification, Islamabad, the 18th October, 2010 under S.R.O. 102(1)/2010 established standards which provide the maximum allowable limits, in the ambient air, of Sulphur dioxide (SO₂), oxides of nitrogen, Suspended Particulate Matter (SPM), Respirable particulate matter-pm10, Respirable particulate matter-pm25, lead and Carbon monoxide (CO) (Table 2-1).

Table 2-1: National / Punjab Environmental Quality Standards Ambient Air

Pollutants	Time-weighted Average	Concentration in Effective from 1st July 2010	Ambient air Effective from 1st January 2013	Method of Measurement
Sulphur dioxide (SO ₂)	Annual average	80 g/m ³	80 g/m ³	Ultraviolet fluorescence
	24 hours	120 g/m ³	120 g/m ³	
Oxides of Nitrogen as (NO)	Annual average	40 g/m ³	40 g/m ³	Gas phase Chemiluminescence
	24 hours	40 g/m ³	40 g/m ³	
Oxides of Nitrogen as (NO ₂)	Annual average	40 g/m ³	40 g/m ³	Gas phase Chemiluminescence
	24 hours	80 g/m ³	80 g/m ³	
Suspended particulate matter (SPM)	Annual average	400 g/m ³	360 g/m ³	High volume sampling (average flow rate not less than 1.1 m ³ /minute)
	24 hours	550 g/m ³	500 g/m ³	
Respirable particulate matter PM ₁₀	Annual average	200 g/m ³	120 g/m ³	Beta ray absorption
	24 hours	250 g/m ³	150 g/m ³	
Respirable particulate matter PM _{2.5}	Annual average	25 g/m ³	15 g/m ³	Beta ray absorption
	24 hours	40 g/m ³	35 g/m ³	
		25 g/m ³	15 g/m ³	
Lead (pb)	Annual average	1.5 g/m ³	1.0 g/m ³	Ass method after sampling using EPM, 2000 or equivalent filter paper
	24 hours	2.0 g/m ³	1.5 g/m ³	

* Annual arithmetic means 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 in a year, 2% of the time, it may exceed but not on two consecutive days.

2.2.6 Punjab Standards for Drinking water Quality (PDWS)

The Ministry of Climate Change, Government of Pakistan vide its Notification, Islamabad, the 18th October, 2010 under S.R.O, 102(1)/2010 established standards for drinking water quality. The major quality parameters fixed depend upon bacteria, chemical and physical ones.

2.2.7 Punjab Environmental Quality Standards-Noise

The Ministry Of Climate Change, Government of Pakistan vide its Notification, Islamabad, and the 18th October, 2010 under S.R.O 102 (1)/2010 established standards for noise. These standards are based on category/zone i.e. residential area, commercial area, industrial area and silence zone. The limiting values for day and night have also been fixed for all categories/zones.

2.2.8 National and Provincial Laws, Regulations, Procedures and Guidelines dealing with the Environmental Aspects

Sr. No	Applicable Laws, Regulations, Guidelines	Relevancy/Applicability
1.	Punjab Environmental Protection Act, 2012	PEPA act require IEE or ESIA of new Sub-projects
2.	PEPA Review of IEE/ESIA Regulations, 2000	IEE/ESIA regulations require IEE or ESIA of new Sub-projects.
3.	Punjab Local Government Act, 2019	Follows the environmental and social assessment procedures state in PEPA, 2012
4.	Punjab Environmental Quality Standards for Motor Vehicle Exhaust and Noise	Applied to vehicles used by the The Contractor
5.	Punjab Environmental Quality Standards for Ambient Air	Compliance required during construction activities
6.	Punjab Environmental Quality Standards for Noise	Compliance required during construction activities
7.	Punjab Restriction of Employment of Children Act, 2016	Compliance required during construction activities
8.	Protection Against Harassment of Women at the Workplace Act, 2010	Compliance required during construction activities

2.3 Policy Guidedlines

The National Conservation Strategy (1992) is the primary document addressing environmental issues of the country. National Conservation Strategy (NCS) is duly recognized as the National Environmental Action Plan (NEAP) by various international donor agencies including the AIIB. The document identifies 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural environment.

- Biodiversity conservation;
- Restoration of rangelands;
- Pollution prevention and abatement; and
- Preservation of cultural heritage.

The Pakistan Environmental Protection Act (PEPA) 1997 is the key legislation empowering the government to frame regulations for protection of the environment. Detailed Rules, Regulations and Guidelines required to enforce the Environmental Protection Act are still in various stages of development.

2.4 Policy & Regulatory Review of Social Aspects

Several laws, regulations, procedures, and technical guidelines have been developed at the federal and provincial levels to address key social risks. The legal framework includes legislation addressing land acquisition, social analysis as part of the ESIA, and labor protections among many others. The most important of these overarching laws and regulations related to the social aspects of the program include the following:

2.4.1 National and Provincial Policies

- Punjab Labor Policy, 2018
- Pakistan Labor Policy, 2010

National and Provincial Laws, Regulations, Procedures and Guidelines

- Punjab Environmental Protection Act, 2012
- Punjab Local Government Act, 2019
- Pakistan Antiquities Act 1975 and Punjab Antiquities Act, 2012
- Punjab Restriction of Employment of Children Act, 2016
- Protection Against Harassment of Women at the Workplace Act, 2010
- Guidelines for Public Consultation, 1997
- LAA, 1894

2.5 Policy & Regulatory Review of Environmental Aspects

There is a long list of Federal and GoP Policies and Legislations that are relevant to PCP. The following criteria have been used for the selection of relevant legislations that can best describe the counterpart's system for addressing and managing the program risks:

- Federal and GoP environment and climate change policies
- Sector-specific GoP policies that are linked to PCP objectives and intervention activities
- Federal and GoP Environmental Protection Acts
- Legislations of target sectors and subsectors relevant to PCP objectives and risks and at the same time, provide relevant environmental instructions. The focus of the review is to describe the counterpart's system for managing the environmental risks attached to PCP interventions.

2.5.1 Policy Framework

Following is the list of important policies relevant to environmental management of PCP:

- Pakistan Climate Change Policy, 2012
- National Sanitation Policy, 2006
- Punjab Sanitation Policy, 2015
- Punjab Urban Water and Sanitation Policy, 2007.

2.5.2 Relevance of Policy and Legal Framework with Punjab Cities Program

Table 2-2: Legal and Policy Framework for Social Management and Relevance with Punjab Cities Program

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
Social Aspects				
	Punjab Labor Policy, 2018		Punjab Labor Policy, 2018 presents a policy document which directly addresses the child labor, bonded labor, gender discrimination, gender mainstreaming, labor protection, out of school children and lack of health facilities for the workers etc. Labor Policy of 2018 incorporates the key thematic areas regarding effective implementation of labor standards, social dialogue, improvements in workplace safety, living wages, awareness raising, excellence in labor inspections regime, imparting quality technical trainings through well-improved Training Centers, simplification of labor laws, medical facilities for secured workers even after retirement, establishment of labor colonies and schools for workers' children, improvement in the wage fixation process and strengthening the role of Punjab Minimum Wages Board, efficient disbursement of welfare grants and gradual extension of labor protection frame-work.	PCP will ensure the Punjab Labor Policy, 2018 implementation to address child labor, bonded labor, gender discrimination, labor protection, health and safety of the workers and health and safety trainings of the workers/labor. Through PCP, awareness raising of MCs of 16 cities will strengthen and improve the service delivery in key thematic areas of this policy.
	Pakistan Labor Policy, 2010		Pakistan's Labor Policy is based on the following objectives: Workers' rights to form unions and an institutional framework be made available to foster close cooperation between workers and employers at the establishment level. Adequate security of jobs should be ensured for workers and there should be expeditious redressal of their grievances. Conditions should be created such that workers and employers are committed to enhancing productivity. Promotion to higher jobs should be ensured at all levels based on suitability and merit and for this purpose, arrangements should be made for in-service training facilities. Facilities for proper matching of job opportunities and job seekers should be strengthened and standard procedures streamlined. Social insurance schemes should be further strengthened. Just and humane conditions of work should be guaranteed to all workers. Forced labor in all its forms is to be eliminated.	PCP supports Pakistan Labor Policy, 2010 and it will be used wherever it will be applicable

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			Prohibition of the employment of children to be strictly adhered to and enforced.	
		Punjab Local Government Act, 2019	As per PLGA, 2019 Functions of a Metropolitan Corporation, Municipal Corporation and Municipal Committee: Part I: - Economic and value chain development; - Management of primary, elementary and secondary education facilities; - School enrolment and universal education; - Monitoring and supervision of primary health care facilities; - Preventive health and hygiene; - Population welfare including population control; - Solid waste collection and disposal; - Births, deaths, marriages and divorce registration; - Museums and art galleries; - Open markets; - Livestock and agriculture markets; - Public parking facilities; - City roads and traffic management; - Public transport; - Abstraction of water for industrial and commercial purposes; - Emergency planning and relief; - Support to provincial agencies in prevention of crime and maintenance of public order; - Regulatory enforcement in the functions assigned under Part 1 and 2 of this Schedule; Part 2 - Establishment and management of pre-schools; - Libraries; - Drinking water supply; - Public conveniences; - Children's services:	According to Chapter XXVII of PLGA 2019 "Responsiveness to Citizen's Needs" the sub headings 212. Duties of local governments towards residents of local area: A Local Government shall take every measure within its means to consult with and promote effective participation by the residents in its affairs. Under 212, sub-sections 2,3, and 4 of Chapter XXVII will be applicable in PCP during public consultation and disclosure of information to public. Section 213 of Chapter XXVII "Requirements to Consult Residents in certain cases", makes public consultation mandatory in specific circumstances. Section 214. "Community Initiatives" also focuses on community engagement and all the sub-sections of Section 214 will be applicable on PCP. Fifteenth Schedule of PLGA 2019 serial B, F, G, H and J Municipal Offences relating to littering and spoiling, sources of water supply, maintenance of trees, plants and hedges, public nuisance and public health, and public safety respectively, will be applicable during execution of sub-projects of PCP.

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			(aa) Community safety; (bb) Arts and recreation; (cc) Public fairs and ceremonies; (dd) Sports; (ee) Environmental health, awareness and services; (ff) Parks and landscape development; (gg) Slaughtering of animals; (hh) Street lights; and Sign boards and street advertisements.	
		Punjab Tehsil/Town municipal Administration (Works) Rules, 2003 (Amendments, 2016)	Punjab Tehsil / Town Municipal Administration (Works) Rules, 2003 amendments 2016 gives detail about Classification of Works, Schemes Estimates & Plans, Annual Development Plan, Agencies for the Execution of Works, Contractors, Work Orders And Contracts, Execution and Inspection of Works, Occupational, Safety and Hazard, Completion of Works, Accounts for Works.	PCP relates to Chapter VIII-A Occupational Safety & Hazard 50 A Workplace Safety:- (1) the Contractor shall ensure that: Any hazard at the place of work, during the execution of work, shall not cause any loss of life. The work shall not loss to the property of any other person; Before commencing the work, all the safety equipment are in place and safety measures have been taken as necessarily required at the place of work: All necessary safety requirements are strictly adhere to at the place of work; and Protective safety equipment for workers, as specified by the Local Government Engineer, are functional and in working order. 50 B the Local Government Engineer shall ensure that: All the safety measures, during the operation and maintenance of existing infrastructure, according to the nature of work, have been adopted to secure life and property; All precautionary measures and use of sewer safety equipment specified in Schedule have been taken in respect of; Sanitation functions ; or Cleanliness of sewer, manholes and descending sanitary workers in the sewer manholes.

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
		The Punjab Occupational Safety and Health Act, 2019 & PMDFC EHS SOPs for Labor /Workers and Women Workers	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.	PCP relates to The Punjab Occupational Safety and Health Act, 2019 relevant sections are: 8. Safety and Health, 10. Consultation 13. Notification and investigation of accidents, dangerous occurrences and occupational illness.
		Punjab Local Government MusalihaAnjuman (Constitution and Functions) Rules, 2016	These rules define the complete procedures for settlement of disputes with defined roles and responsibilities for all stakeholders. These are helpful in guiding urban LGs on alternate dispute resolution bodies. The rules cover: 1. Domestic violence; 2. Matrimonial disputes; 3. Child abuse; vagrancy; and compelling children, females, and disabled persons to beg; 4. Exclusion of females from inheritance; 5. Marriage to Quran, WattaSatta (exchange marriage), Walwar, Swara, Wani (giving women in marriage to settle disputes); 6. Zhagh (asserting ownership over women of the enemy tribe); 7. Forced marriage and human trafficking; 8. Forced labor; 9. Public insult, assault, and degradation of females; 10. Sexual harassment; and 11. Dowry disputes arising after divorce 12. Forced labor 13. Public insult, assault, and degradation of females and 14. Sexual harassment	PCP supports these rules and will comply with these rules to restrict 12. Forced labor 13. Public insult, assault, and degradation of females and 14. Sexual harassment
		Land Acquisition Act, 1894 and Punjab Land Acquisition Rules, 1983	LAA, 1894, as amended from time to time, is the primary law for the purpose of land acquisition in the province of Punjab. The Act provides for acquisition of land for public purpose and for companies. Several other laws also authorize the acquisition of land for specific purposes in the province of Punjab. GoPunjab has also framed the Punjab Land Acquisition Rules, 1983 (1983 Rules) under Section 55 of the Act.	LAA 1894 and Punjab Land Acquisition Rules will be applicable in PCP where private land will be acquired to carry out the program activities. However, for land acquisition, compensation, livelihood restoration, and assessment and management of other social impacts, a

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			The Act and the 1983 Rules are intended to be read together. There are no regulations under the Act, nor is there any provision for framing regulations under it. Under LAA, 1894, only landowners, tenants and licensees are possible compensation recipients. The landless, agricultural and non-agricultural laborers, artisans, forest produce collectors are excluded from such compensations. Moreover, the livelihood restoration is not emphasized in the LAA 1894 and Punjab Land Acquisition Rules, 1983 The Act is broadly grouped into 8 parts comprising 55 sections. Details of LAA 1894 are presented in ESSA and Annex. 8 of ESSA.	section of Resettlement Policy Framework for PCP in line with the WB policies and PforR core principles is also prepared by PMDFC and is given at the end of this ESMF.
		Pakistan Antiquities Act 1975 and Punjab Antiquities Act ,2012	The current Antiquities Act, 1975 (amended in 1990), redefined as ‘ancient’ any object that is at least 75 years old. It requires that all accidental discoveries are reported to the federal Department of Archeology. It also makes the federal government the owner of all buried antiquities discovered from any site, whether protected or otherwise. It bans all new construction within a distance of 200 feet from protected antiquities. 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 Antiquities Act guarantees that no changes or repairs can be made to a protected monument even if it is owned privately without approval of the official agencies concerned with it. The Punjab Antiquities Amendment Act, 2012 (PAAA 2012) adopts the Act of 1975 with a few minor changes. The Antiquities Act 1975 only focused on conservation of monuments, whereas the PAAA, 2012 also includes conservation of the area surrounding it	Both laws will be applicable to the Program and the notified archeological/cultural heritage areas/sites will be screened carefully before undertaking sub-projects construction activities under the PCP. No procedures on archeological screening of sites are available to share with construction companies/projects. However, under the law, chance finds will be reported to the Archeology Department within seven days. If ruins are discovered, then all construction work must be stopped. The department will then conduct a site assessment. ESIA prepared for PCP will cover these aspects in detail and this aspect is also included in the E & S Screening Checklist.
		Punjab Restriction of Employment of Children Act, 2016	Punjab Restriction of Employment of Children Act, 2016’ deals with child labor in the commercial and industrial sectors of Punjab. Clause III “Prohibition on Employments” aims at banning children up to 15 years of age from all types of employment and forbids all types of hazardous work until achieve the age of 18 years	Both these clauses will be applicable to PCP during construction for hiring and management of labor and it has also been incorporated in the EHS SOPs.
		Labor Laws Punjab and ILO Conventions ratified by the Government	The major labor laws of Punjab province are listed below: ✓ Bonded labor system (abolition) Act, 1992 ✓ Companies' profits (workers' participation) Act, 1968 ✓ Disabled persons, (employment and rehabilitation) ordinance, 1981	PCP will comply with all the laws and ILO Conventions ratified by the Government of Pakistan. During implementation of physical infrastructure schemes, women workers are vulnerable and may face issues related to lower wages, lack of safe transportation, lack of childcare

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			✓ Employees' Cost of Living (Relief) Act, 1973 ✓ Employment (Record of Services) Act, 1951 ✓ Essential Personnel (Registration) Ordinance, 1948 ✓ Factories Act, 1934 ✓ Industrial Statistics Act, 1942 ✓ Minimum Wages Ordinance, 1961 ✓ Payment of Wages Act, 1936 ✓ Provincial Employees' Social Security Ordinance, 1965 ✓ Employees Special Allowance (Payment) Act, 1988 ✓ Fair Price Shops (Factories) Ordinance, 1971 ✓ Punjab Restriction of Employment of Children Act, 2016 ✓ Industrial Relations Act, 2010 ✓ Weights and Measures (International System) Enforcement Act, 1975 ✓ Road Transport Workers Ordinance, 1961 ✓ West Pakistan Industrial and Commercial Employment (Standing Orders) Ordinance, 1968 ✓ West Pakistan Maternity Benefit Ordinance, 1958 ✓ West Pakistan Minimum Wages for Unskilled Workers Ordinance, 1969 ✓ West Pakistan Shops and Establishments Ordinance, 1969 ✓ Workers Children (Education) Ordinance, 1972 ✓ Workers Welfare Fund Ordinance, 1971 ✓ Workmen's Compensation Act, 1923 Pakistan also ensures compliance with the 8 Core Labour Conventions which are also prerequisite for Retention of GSP + Status. Pakistan had been awarded the GSP+ Status, like all other developing countries, subject to some conditions which involve strict adherence to the 27 International Conventions on Human Rights including the following 8 Core Conventions on Labor Rights: C029 - Forced Labor Convention, 1930 (No. 29)	and toilet facilities, and sexual harassment in the work place. Contract laborers, both men and women, face issues of lower wages, and harsh working conditions such as longer hours. Such issues will be covered in Social Assessment Report and in this regard, awareness sessions with the 16 MCs will also be organized.

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			C087 - Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87) C098 - Right to Organize and Collective Bargaining Convention, 1949 (No. 98) C100 - Equal Remuneration Convention, 1951 (No. 100) C105 - Abolition of Forced Labor Convention, 1957 (No. 105) C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111) C138 - Minimum Age Convention, 1973 (No. 138) C182 - Worst Forms of Child Labor Convention, 1999 (No. 182) And Sustainable Development Goals (Goals 1, 4, 5, 8, 10 & 16); Goal 8;" Decent work and Economic Growth" requires from all the UN Members to achieve full and productive employment and decent work for women and men, including for young.	
		Guidelines for Preparation and Review of Environment Reports, 1997	Guidelines for preparation and Review of Environmental Reports were issued by Pak EPA in 1997 under Pakistan Environment Protection Act, 1997 and are adopted by Punjab Environment protection Agency after 18th Amendment. These guidelines describe the steps in IEE Preparation, format of IEE Reports, assessing impacts, mitigation and impact management, reporting, reviewing and decision making, monitoring and auditing and project management.	Guidelines for preparation and Review of Environmental Reports were issued by Pak EPA in 1997 under Pakistan Environment Protection Act, 1997 and are adopted by Punjab Environment protection Agency after 18th Amendment. These guidelines describe the steps in IEE Preparation, format of IEE Reports, assessing impacts, mitigation and impact management, reporting, reviewing and decision making, monitoring and auditing and project management.
		Guidelines for Public Consultation,1997	These guidelines address possible approaches to public consultation and techniques for designing an effective program of consultation that reaches all major stakeholders and ensures the incorporation of their concerns in any impact assessment study. The guidelines cover consultation, involvement, and participation of stakeholders; effective public consultation (planning, stages of an ESIA where consultation is appropriate); and facilitation of involvement (including the poor, women, and NGOs).	These Guidelines will be used at planning and implementation stages of sub-projects under PCP. In addition, for PCP, Public Consultation Framework has been designed and included in the ESMF.
		Guidelines for Regulation of Disclosure of Environmental Information & Citizen Engagement 2020	These guidelines give details about disclosure of environmental information. These guidelines have 2 parts: First part deals with Public Disclosure instructions regarding arrangement of public disclosure of environment information and maintenance of record in indexed form	These guidelines are relevant to PCP and will be used for public disclosure of environmental information of PCP sub-projects and relevant instruments and GRM and citizen engagement.

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			Second part is regarding Citizen Engagement, and it gives detailed information regarding citizen engagement and Grievance redress mechanism.	

Table 2-3: Legal & Policy Framework for Environmental Management and Relevance with Punjab Cities Program

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
Environmental Aspects				
	Pakistan Climate Change Policy, 2012		CCP predicts that due to climate change, extreme weather events such as heat and cold waves, heavy or too little precipitation, and strong winds will occur more frequently and will cause health impacts in urban areas, for example, diarrheal diseases because of insufficient clean water availability for drinking and personal hygiene. It is predicted that vector-borne diseases such as malaria and dengue fever may increase. Similarly, extreme weather events will express themselves in the form of natural disasters such as floods, droughts, landslides, and urban flooding. CCP recommends the following actions: develop city-specific strategic plans, prepare and enforce legislation for water resource management in industry and domestic sectors with special focus on groundwater, adopt water efficiency measures and technologies, adopt rain harvesting measures, avoid excessive groundwater pumping, reuse wastewater after treatment, take flood protection measures, assess the health vulnerabilities of communities and build their capacities, develop proper disaster management system, redesign and upgrade drainage capacity of cities, strengthen early warning systems, develop enabling mechanisms for cities' managers and residents for the adoption of climate change adaptations and mitigation measures; and conduct awareness campaigns to underscore the importance of conservation and sustainable use of water resources. Mitigations to reduce GHG. CCP recommends the following measures: Reduce carbon emissions by making consumers use energy efficient, renewable energy. Promote energy-efficient building designs, standardize building and construction codes, and legislate/create incentives for retrofitting.	It is assessed that most of the cities covered by PCP will be exposed to the climate change impacts. At present, most of the adaptations and mitigation measures as described in CCP are not in practice in Punjab's cities. Generally, the implementation of CCP is nominal due to limited interprovincial coordination; low capacity of the MoCC, provincial departments, and MCs; and low level of budgetary allocation for climate smart cities development. A few regional (most-affected districts of Punjab by climate change) and city-specific (Islamabad, Sialkot and Sahiwal) studies were conducted by LG&CD Department under ADB funded Punjab Intermediate Cities Improvement Investment Program (PICIIP) and education institutions (Lahore University of Management Sciences) in the past in collaboration with international institutions (ref). These are initial works on the issue of cities and climate change in line with CCP recommendations. However, Implementation of CCP at the action level is yet to be realized. PCP targets to strengthen the implementation of these adaptations and mitigation measures in selected 16 cities of Punjab.

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			Implement better insulation of buildings and use energy-efficient appliances and equipment (energy-efficient lights boilers, pumps, and so on). Optimize the production of biofuels without compromising the food security. PCP has included the energy efficiency of drinking water and disposal pumps and street lighting. Regarding environmental management and climate change resilience of cities, CCP recommends that cities should update town planning design principles for lowering carbon footprints, ensure proper land use planning and encourage vertical instead of horizontal expansion, install wastewater treatment plants, segregate solid waste at source, develop municipal infrastructure in the periphery of urban areas, and conduct hazard mapping and zoning of areas before construction. It is important to note that PCP covers most of these mitigation measures.	
	National Drinking Water Policy, 2009		The overall goal of the National Drinking Water Policy (NDWP) is to improve the quality of life by reducing the incidence of death and illness caused by waterborne diseases. The principles established by the NDWP are cost-effective, equitable, and sustainable water supply. The NDWP emphasizes that provincial governments and LGs—as their constitutional responsibility—should provide universal availability of safe drinking water to all the people as their basic right. It recommends that during the decision-making process of the water supply sector, all the stakeholders should be taken on board, with special inclusion of vulnerable poor and women. It emphasizes that to make drinking water safe, its treatment should be an integral part of all drinking water supply schemes.	PCP supports National Drinking Water Policy and activities for drinking water supply will be designed according to NDWP policy guidelines.
	National Sanitation Policy, 2006		The National Sanitation Policy aims at providing adequate sanitation coverage, an environment necessary for healthy life, and meeting the 2015 Millennium Development Goals (MDGs) targets. The primary focus of sanitation is on the safe containment of excreta away from dwellings and workplaces by use of sanitary latrines and the creation of an open defecation-free environment. It emphasizes safe disposal of liquid and solid wastes and	PCP supports activities for the sanitation sector are in line with the sanitation policy guidelines

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			promotes good health and hygiene practices in the country. The basic principles established by the policy are the following: sanitation should be a fundamental human right, schemes should be based on simple cost-effective technologies, and institutional coordination for the installation and O&M of schemes is required. The policy envisaged that sanitation, environment, housing, water, and city and regional planning should be evaluated under an effective institutional and financial framework. It recommends that sanitation schemes should be financed through local resources and implemented by strengthened local and community institutions with the involvement of the Government, private sector, and NGOs. It recommends that installation and O&M of sanitation schemes should be institutionally synchronized. The policy states that needs of women and children should be covered as priority.	
	Punjab Urban Water and Sanitation Policy, 2007		The Punjab Urban Water and Sanitation Policy of the Government of the Punjab provides a framework to guide and support provincial institutions, local government institutions, Water Utilities and communities for improving water and sanitation services. The policy is consistent with National Sanitation Policy, 2006 and National Environment Policy, 2005. The key policy principles of this policy related to Sanitation Sector are: ✓ To provide sustainable water and sanitation for all and provide optimum quantity and acceptable quality of water and sanitation services on a sustainable basis ✓ Provide a legal, regulatory framework and efficient institutional arrangements for sustainable water supply, sanitation and wastewater treatment services ✓ Promote Public Private Partnership for revenue collection, metering, and water supply and sanitation (WSS) services. ✓ Encourage community participation initiatives through component sharing and decision making. Gender analysis to be used to assess levels of participation of men and women in the planning process	PCP supports Punjab Urban Water and Sanitation Policy, 2007 and will use to promote the key policy principles.

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			✓ Encourage socially and environmentally sensitive investment in the sector. Through environmental and social impact assessment in order to design and implement appropriate mitigation measures and environmental management plans ✓ Provide institutional capacity building by means of human resources development and the implementation of appropriate corporate institutional arrangements ✓ Public awareness programs to develop an understanding of the importance of water and its conservation.	
		Punjab Environment Protection Act 2012	PEPA 2012 is the overriding environmental legislation in the province of Punjab. PEPA 2012, Section 30 states that the provisions of this Act shall have effect notwithstanding anything inconsistent therewith contained in any other law in force for the time being. PEPA 2012 has established the PEQS. These are discharge standards and are applicable at the point of discharges of emissions. PEQS are relevant for wastewater treatment plants and landfills activities. PEPA 2012 states that noncompliance with PEQS and not paying pollution charges will invoke implementation of punitive sections of the Environmental Protection Order and penalties to every noncomplying person, corporate body, Government agency, local authority, or local councils. Cases challenged by the parties will be settled by the Environmental Magistrates and Tribunals, and if required, the cases can also be appealed in the higher courts. PEPA 2012 under Section 11(2) for the levy of pollution charges states that, "The Provincial Government may levy a pollution charge on any person who contravenes or fails to comply with the provisions of subsection (1), to be calculated at such rate, and collected in accordance with such procedure as may be prescribed." Further to this, Section 11(3) states that, "Any person who pays the pollution charge levied under sub-section (2) shall not be charged with an offence with respect to that contravention or failure."	Ambient standards will be highly relevant to PCP activities and will be used as a tool for environmental management and best practices. PEPA 2012, under Section 6, instructs the Punjab EPA to establish ambient quality standards for air, water, and land. Punjab EPA has yet to establish the ambient standards for land and water. The PforR regarding Job and Competitiveness (J&C) project includes a component of strengthening Punjab EPA (para 194 ESSA prepared for PCP). J&C will support the establishment of Environmental Research Centre. Development of ambient standards for water and land will be covered under J&C.

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			PEPA 2012 instructs the proponents of projects to IEE or ESIA, according to the size and impacts of the sub-projects of the Program. In the context of PCP, IEEs/ESIAs will be required for new water supply and sanitation schemes, and wastewater treatment plants. Section 12 of PEPA 2012 establishes that, “no proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an IEE or where the project is likely to cause an adverse environmental effect, an ESIA, and has obtained from the Provincial Agency approval in respect thereof.” Under PEPA 2012, public participation through public hearing is essential as part of IEE/ESIA reports approval. ‘Pakistan Environmental Protection Agency Review of IEE and ESIA Regulations, 2000’, prepared by Pak-EPA, stipulate the complete approval system for IEEs and ESIAs. In the case of wastewater discharges in the canal system and use of wastewater for irrigation purposes, Section 11 of PEPA 2012 establishes that “no person shall discharge or emit or allow the discharge or emission of any effluent or waste in excess of Punjab Environmental Quality Standards” and “if the water is conforming PEQS, it can be used for irrigation purposes, otherwise not.”	
		PEPA Review of IEE/ ESIA Regulations, 2000	This document sets out the key policy and procedural requirements for conducting an IEE and ESIA. The document provides schedules for determining whether the project requires IEE or ESIA. It also provides for environmental screening of projects under Schedules I and II and lays down the procedures for Environmental Approval and for filing the case with the concerned EPA to receive the NOC.	Regulations 2000 will be used for environmental screening and IEE/ESIAs prepared under PCP will be required to submit with Punjab EPA to take NOC before commencement of the sub-projects activities as per the PEPA Review of IEE/ESIA Regulations 2000.
		Punjab Wildlife Protection, Conservation and Management Act, 1974	The Act requires the protection of wildlife species declared as endangered/threatened and rare. It gives protection to these species by declaring their natural living environment as protected and reserved, which includes areas such as national parks, wildlife sanctuaries, and game reserves.	PCP will use this Act to ensure the protection and conservation of all forms of wildlife.

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
		Punjab Environmental Quality Standards (PEQSs)	PEPA 2012, under Section 6, establishes Punjab Environmental Quality Standards (PEQS) for water, air, noise, and land. Further to this under the provisions of PEPA 2102 the Punjab EPA may establish ambient quality standards for air, water, and land in the future. For Motor Vehicle Exhaust and Noise, Ambient Air and Noise, Punjab Environmental Quality Standards have been established by Punjab Environment Protection Agency.	For PCP sub-projects activities, PEQSs will be followed in environmental assessment studies and monitoring of EMPs
		Guidelines and Checklists adopted by GOP after 18th Amendment	Punjab EPA has also designed the following Guidelines/Checklists for IEE/ESIA Projects: Check List for IEE (updated September 2020) Check List for ESIA (updated September 2020) Guidelines for Preparation of ERs of Mining projects After 18th Amendment, Punjab EPA has adopted the following sectoral Guidelines that were prepared by other provinces and were earlier adopted by Pak EPA: ✓ Poultry Farms ✓ Urban Roads ✓ Rural Schools ✓ Housing Schemes ✓ Petrol & CNG ✓ Forest Road ✓ Forest Harvesting ✓ Water Supply ✓ Tourist Facilities ✓ Sanitation Schemes ✓ Major Chemicals and Manufacturing Plants ✓ Flour Mills ✓ Carpet Manufacturing ✓ Housing Estates and New Town Development	PCP will make use of these Guidelines and Checklists where it will be sector wise required or otherwise.

Sr.No	Name of Policies	Name of National and Provincial Laws, Regulations, Procedures and Guidelines	Salient Features	Relevance and Applicability with PCP
			✓ Industrial Estate ✓ Major Roads ✓ Major Sewerage Schemes ✓ Stone Crushers ✓ Marble Units ✓ Oil & Gas Exploration	

2.6 International Treaties and Conventions

Pakistan is a signatory to a number of international environment related treaties, conventions, declarations and protocols, such as the Rio Declaration 1992, the Convention on Conservation of Migratory Species of Wild Animals, the Ramsar Convention 1971, etc., which have to be checked for their relevance to a project. In view of the low sensitivity of the project area with no habitats of wildlife, and the limited interventions of the project, no international convention or treaty is likely to be violated. The following are the relevant international treaties and conventions to which Pakistan is a party:

- Convention on Conservation of Migratory Species of Wild Animals 1979;
- International Plant Protection Convention, 1951
- Convention on Wetlands of International importance especially as Waterfowl Habitat, Ramsar, 1971 and its amending protocol, Paris, 1982
- Convention concerning the Protection of World Culture and Natural Heritage (World Heritage Convention), 1972
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington, 1973
- Vienna Convention for the Protection of the Ozone Layer, Montreal, 1987.
- Convention on Biological Diversity, Rio de Janeiro, 1992.
- United Nations Framework Convention on Climate Change, Rio de Janeiro, 1992.

2.7 Institutional Framework Review for Managing Environmental and Social Impacts

Following institutions of GoPunjab are related to the implementation of environmental and social management of PCP.

- Local Government and Community Development Department (LG&CDD)
- MCs (for selected 16 cities)
- PMDFC
- Punjab EPA
- Revenue Department
- Labor Department
- Women Development Department

Table 2-4: Institutional Framework

Sr.No.	Department	Functions and Responsibilities	Role in PCP Implementation and Execution
1.	Local Government and Community Development Department (LG&CDD)	The LG&CDD has been assigned the responsibility to implement PLGA 2019. Moreover, the LG&CDD has an overseeing role to ensure that the LGs perform their functions within the provincial framework and adhere to the federal and provincial laws. The LG&CDD's mission is to assist and guide LGs in creating environment for autonomous and responsible decision making. This will improve service delivery in the social sectors and boost socioeconomic development of the local area. The major functions and responsibilities of the LG&CDD are the following: Policy formulation. Formulation of public policy and its promulgation, updating of laws and rules, and provision of guidelines for the working of LG Department. Besides, the LG&CDD issues policy guidelines on salient issues, in the best interest of citizens. Coordination. The Department coordinates with federal/provincial government departments and allied agencies as well as all the three tiers of LGs on the issues pertaining to the new LG system. Administration. The Department is responsible for the recruitments and administration of service personnel working in its attached departments.	For PCP, the LG&CDD has the overall responsibility for Program reporting, M&E, regulation setting, and coordination with Program MCs. It will be assisted in the dispensation of its functions by the LG Board and the PMDFC. The LG Board will be responsible for human resource management, operating and maintaining the performance monitoring dashboards, implementing career learning plans and delivery partnerships for LG cadres, and ensuring new staffing standards are implemented in Program MCs. The PMDFC is the main technical lead supporting the LG&CDD in dispensing its function, including social and environmental safeguards, in addition to support in other technical matters
2.	Punjab Municipal Development Fund Company	- PMDFC was established in 1998 by GoPunjab with the technical and financial assistance of the World Bank in view of a growing realization to have a separate agency for municipal development in the province. The PMDFC, registered under the Companies Ordinance 1984 as an independent entity, is a civil society organization working for the improvement of municipal services in Punjab province. The PMDFC, being a public sector company, brings forth the expertise and efficiency of the private sector while aligning itself with the development vision of the LGs as well as that of the provincial government. Its role as a technical arm of the LG&CDD over the past few years has been well-established. - The PMDFC has an overall mandate to: - Assist LG in building the capacities for better fiscal and service delivery management; - Provide matching grants to LG for the construction, rehabilitation, and expansion of infrastructure and to act or provide consultants for M&E and advising for their institutional reforms;	For PCP, the PMDFC is the lead agency and will support the LG&CDD. The PMDFC, in addition to other responsibilities, will be tasked to provide TA to the LG&CDD and Program MCs in matters related to the social and environmental management. The PMDFC is assessed as a capable institution to ensure effective environmental and social compliance during the execution of physical sub-projects under the operation. For PCP, the PMDFC has established a central Program Management Team in Lahore, which will have overall responsibility for the above tasks. The PMDFC will also constitute three regional teams to provide support to five to six MCs each. These teams will provide continuous backstopping support to Program MCs throughout the Program in areas such as planning, procurement, safeguards, financial management, and M&E.

Sr.No.	Department	Functions and Responsibilities	Role in PCP Implementation and Execution
		- Monitor, evaluate, and ensure that funds are used properly, efficiently, and transparently; - Provide an effective management and information system for regular and proper M&E over financial and TA to LGs from the fund; and - Support, initiate, undertake, and promote research activities.	
3.	Program Municipal Committees	Punjab LGs (Conduct of Business) Rules 2017 under rule 5 and schedule II clearly describe the mandate of each of the key positions in MCs. The mandate of ensuring the implementation of the environmental and social regulations lies directly with the CO. The CO has also been tasked to arrange sports, including for disabled persons. Similarly, the municipal services section is mandated to manage graveyards, ensure safety in children's play areas, and conserve historical and cultural places. All of the municipal offices are also required to enforce all municipal laws, rules and by-laws related to their functions. For social and environmental management, most of the time, the CO is supported by the Municipal Officer infrastructure. Those MCs which have staff with experience of implementing PMSIP interventions have a better understanding of issues related to social and environmental management.	During implementation of PCP, each partner MC will be responsible for achievement of DLI Results at the MC level. The sub-project selection and approval will be done at the city council level, after involvement of citizens in the process of identification and prioritization and the established appraisal committees with heads of departments, chaired by the MC Chairman. MCs will also ensure compliance with all financial management, procurement and environmental and social safeguards and regulations. If key parts of these areas are not complied with by a city, as stated in the Program's minimum conditions (DLI 1), no Program funds will flow against DLIs to the city. MCs will be responsible for compliance with all social and environmental-related laws, regulations, guidelines, and so on, including LAA 1894, PEPA 2012, labor laws, and other legal instruments. MCs need to coordinate with the EPA district offices for regulating environmental monitoring, securing EPA approvals for ESIA/IEE, and compliance of PEQS. TA and training will be provided by the PMDFC to relevant MC staff to build requisite skills and competencies in project planning, social and environmental safeguards, scheduling, monitoring, execution, and closing, as well as contract management and supervision
4.	Environment Protection Agency	- The mandate of Punjab EPA according to the PEPA 2012 is summarized as follows: - Implement rules and regulations prepared under PEPA 2012 and prepare additional legislation according to the needs of the province, - prepare and implement provincial environmental standards, - Develop provincial systems for the implementation of pollution charges, conduct research and development for most viable environmental technologies, certify laboratories, - Engage LGs in the implementation of PEPA 2012,	To obtain NOCs, all the cases of IEEs/ESIAs of sub-projects of PCP will be submitted with Punjab EPA PCP will also target the capacity building of EPA District Environment Offices through trainings to be organized for MCs.

Sr.No.	Department	Functions and Responsibilities	Role in PCP Implementation and Execution
		- Raise environmental awareness and incorporate environmental issues in educational curriculums, - Prepare provincial-level Environmental Disaster Management Plans (DMPs), - Collaborate and coordinate with stakeholders for the effective implementation of environmental policies and PEPA 2012, - Entertain inquiries and complaints raised by stakeholders, mobilize national and international financial resources for environmental projects, develop provincial-level fiscal programs and financial incentives for environmental compliance, fix pollution charges, - Conduct investigations against polluters, assist courts by generating field-level environmental data about polluters, establish environmental laboratories, - Implementation of IEE/ESIA Rules and Regulations and Guidelines, manage hazardous waste under the Hazardous Substance Rules, and monitor vehicles for controlling air pollution.	
5.	Revenue Department	It is the controlling authority in all matters connected with the administration of land, land taxation, land revenue, preparation, updating and maintenance of records. It is the highest Revenue Court and custodian of the rights in land of all the right-holders. It exercises general superintendence and control over the Revenue Officers and Revenue Courts in the province and has suo-moto jurisdiction	The main function of the department related to the PCP is the acquisition of private land including all compulsory land acquisition proceedings for public purposes conducted by functionaries of the Revenue Department. The other functions of the Revenue Department broadly cover the maintenance of records of rights, collection of agricultural income tax and water rate, facilitation of agricultural loans, registration of deeds, and resolution of record and tenancy-related disputes
6.	Labour Department	- Distribution of Marriage Grants, Talent Scholarships, Funeral Grants, Management and Distribution of Education access - Allotments of Plots and estate management of labor colonies - Promotion of employment opportunities, collection and dissemination of labor market information and assistance to the defense forces by provision of data on skilled personnel	Labor Department designs and implements the policies related to labor and workers. In this regard SOPs of Environment, Health & Safety for construction labor/workers (including women labor) have been designed and shared with Labor Department GoP, their feedback and comments has been incorporated accordingly.
7.	Women Development Department	- Legislation, policy formulation and sectoral planning for women development; - Transformation of the government into an organization that actively practices and promotes gender equality and women empowerment	Women Development Department is a key stakeholder as women lead all policies, initiative, packages, laws design and implement. In this regard consultative session has been carried out and comments have been incorporated in the Gender framework.

Sr.No.	Department	Functions and Responsibilities	Role in PCP Implementation and Execution
		• Implementation of administrative and institutional reforms and departmental restructuring for promoting gender equality • Mainstreaming gender equality perspective across public policies, laws, programs, and projects by departments and agencies of the government with a focus on women empowerment • Promotion, coordination and monitoring of execution of national and provincial policies and commitments on gender reforms and women development • Provision of technical support and expertise for gender mainstreaming in all departments of the government and its agencies • Collection of quantitative and qualitative data and conducting of research on the status of women in the Punjab to highlight issues at appropriate forum • Building of partnership with line departments, non-governmental and civil society organizations to deliver on the rights and entitlement of women • Pursuance of means and measures to increase participation of women in political process and encouragement of effective representation of women in political and administrative spheres • Collaboration with legal, judicial, law enforcement and other relevant governmental and non-government agencies to facilitate women's access to formal legal and justice system	

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

Table 2-5: 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: • Avoid, minimize, or mitigate against adverse impacts; • Promote environmental and social sustainability in program design; and • 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. ESMP 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 triggered in this Sub-project as land acquisition is required for wastewater treatment plant and disposal station.
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 and to the needs or concerns of vulnerable groups.	No indigenous/Vulnerable groups exist in the Sub-project sites.
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.

2.8.1 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.
- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production.
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues.
- Social Analysis Sourcebook.
- WB Group Gender Strategy.

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

Environment Health and safety EHS SOPs for labor/workers (including women workers) will be applicable during the labor work which may be and made part of the agreement to be signed with the Contractor.

2.10 COVID-19 SOPs

During the construction and implementation of the Sub-project, the Standard Operating Procedures (SOPs) will be strictly followed during construction activities, stakeholder consultations or applicable in any other relevant aspect. The SOPs attached as **Annexure-E**.

2.11 ESIA Approval Procedure

The ESIA report will be submitted to the PMDFC i.e. and client will file it along with completed application form to the Punjab–EPA that is the Responsible Authority.

On receipt of the environment report and the evidence that the scheduled fee has been paid, the Responsible Authority shall notify the proponent within 10 working days of its adequacy (i.e. all the required information has been supplied). However the Responsible Authority reserves the right to request additional information as it undertakes the review.

After submission, the following review/approval schedule will be followed:

- A minimum of thirty (30) days period for public comment shall be provided. The assessment will be completed within a period of ninety days from receipt of the complete documents, and earlier than this wherever practicable.
- A notice for public hearing will be published in any English or Urdu national Newspaper and in a local Newspaper of general circulation in the area affected by the project. The notice will mention the type of the project, its exact location, the name and address of the proponent and the places at which the ESIA of the Project can be accessed.
- Following the completion of public hearing, and the provision of any further data from the proponent, the decision shall be made and conveyed after thirty days thereafter.
- This time may be extended by the Director General of the Responsible Authority in the case of unusually large projects.

The Environmental Approval will be valid for three year extendable for further three years.

3 SUB-PROJECT DESCRIPTION

3.1 The Sub-Project Interventions

- Boring and construction of tube-wells of 1.0 cusec capacity : 4 Nos
- Construction of new Pump House: 4 No.
- Installation of Pumping Machinery and allied E&M works: 3 No.
- Installation of electric connection by GEPCO/ WAPDA: 4 No
- Laying of new/ replacement of distribution network (94246 +57435 =151699) Rft from 3" dia to 10" dia HDPE pipe with allied works
- Installation of 4 hypo-chlorinators.
- Installation of 4-bulk water meter.
- Replacement House Connections 6452 Nos

3.2 Objectives of the Sub-Project

The main objectives of this Sub-Project are to:

- To supply safe drinking water in sufficient quantity at doorsteps of consumers with reasonable cost.
- To encouraging personal hygiene and household cleanliness of users.
- Reduction and prompt addressal of the public complaints regarding shortage of water supply.
- Reduction in water borne diseases.
- Reduction in burden on health care system.
- Improvement in local economy due to reduction in health care expenditure.
- Improvement in expenditure & security of certain medicine.
- Improvement in environment of the city making it better livable place.

3.3 Location of the Sub-Project



Figure 3-1: Location of the Sub-Project

3.4 Land Availability

Land required for installation of tube-wells and other infrastructure will be provided by the MC Jhelum free of cost.

3.5 Road access

The project sites are accessible.

3.6 Project Description

This sub project will cover the replacement of contaminated/outlived pipelines and replacement of existing abandoned Tube wells within the existing network. Tube wells installed at Suleman Paras near Altaf Park, Sheesha Ground, Darbar Peer Azmat Wali, Kala Gujran and Al-Miraj Flour Mills Kala Gujran are blowing sand and need replacement. 4No.s new tube wells will be installed but old machinery will be used in case of tube well at Al-Miraj Flour Mills Kala Gujran because it was installed recently. All the existing house connections will be removed and new house connections will be installed. New tube well locations marked in Geo-Tagged map is given below.

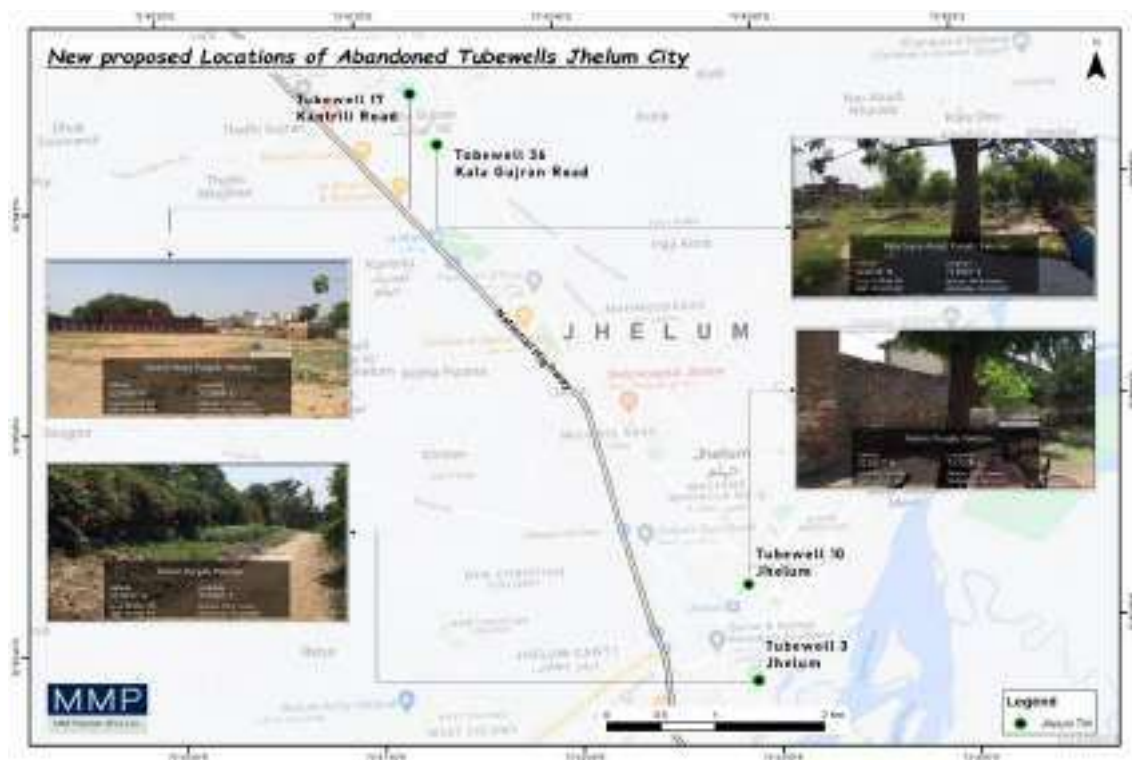


Figure 3-2: New proposed sites of the Project

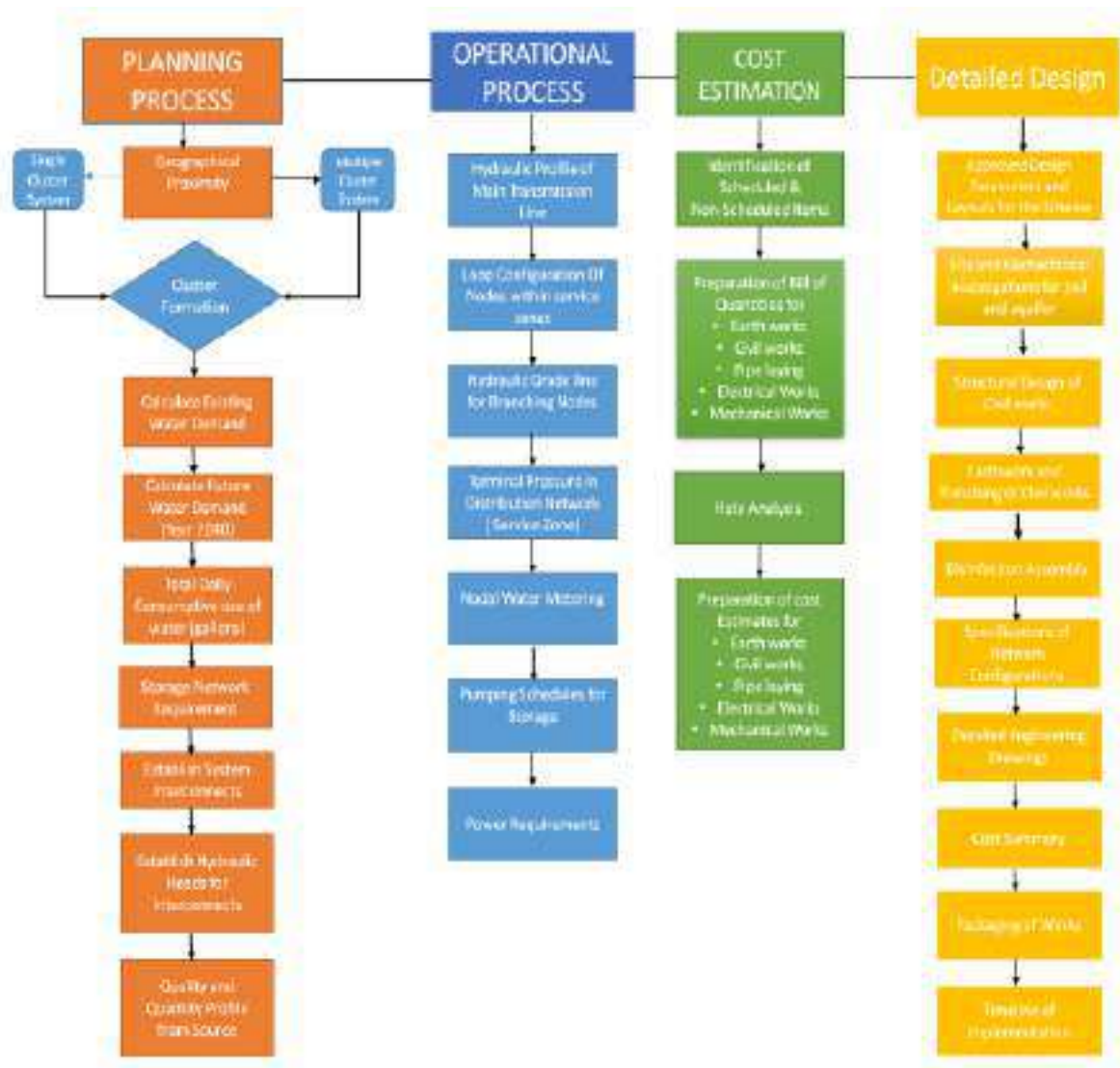
There are some left over street where no distribution network is available and it is proposed to lay new network in Doctor Colony, Iqbal town, Karimpura, Islampura, Abbas Pura and Chishtain Mohallah. There are some areas where pipes of existing distribution network are outlived, gone deeper and passing under sewer/drain. It will be replaced in Machine Mohallah 3, Dhoke Allah Abad near Spirit School, Madani Mohallah, Gulshan Town, Mohallah Bilal Town and From City Police station to Ramzan Bazar & From Ramzan Bazar to Jadda Chowk.

3.7 Process Flow Diagram

Towards understanding of the steps involved in planning and design of water supply works, the Consultants have adopted a flow chart (Figure-5-2) that illustrates the sequence of tasking as a process flow. The process begins at the planning stage with identification of the target or service regime and there onwards the service population. This establishes the upper limit of the system to be conceived. The planning would establish the system constructs that would be required at the next stage of operations for the preliminary design stage. Preliminary design would rely on hydraulic valuation of the components conceived during the planning process such that are subsequent operational requirements (in terms of delivery, energy, adequacy, and reliability of works) are met.

The third stage involves cost estimation of the components formalized under preliminary design such that the bill of quantities reflects clear separation of works under construction and procurement. It would encumber rate analysis for items of work for which scheduled rates are not established.

With preliminary costing out of the way, the final scoping of works under detailed design could begin based on robust topographic surveys and investigations assisting measured determinations of the network items and procurements under prevailing market rates. Measured determinations are based on lab tests for structural siting under approved design parameters.



Process Flow for Implementation and Operation of Water Supply Networks through Preliminary and Detailed Design Stages

3.8 Technology Considerations

Based on the scope of technical interventions and the acquired knowledge on the physiography local to each environment, the Consultants have developed conceptual insight into the girth of possible solutions that could be tailored to fit engineering interventions. For water supply, the solutions account for options based on

- trunk level connectivity of serving areas through pumping of freshwater lenses
- isolated solutions for scattered serving areas that cannot avail trunk level connects but overlie freshwater lenses
- areas with thin freshwater lenses that could only be mined with scavenger wells unlikely to cause any significant drawdown
- rainwater harvest for areas unlikely to sustain fresh groundwater harvest.

The above arrangements assume chlorinated water and delivery. Trunk level connects sponsor solutions recognized under the interpretation of 'Loop System' where all the tube-wells are recognized as a contributing service area to a collective configuration. Typical water allowance is 39.6 GPCD. The system is meant to cater to 16 hrs/day supply. The above-mentioned options are qualified against specified configurations and volumes of water use. The configurations could be modified and tailored to suit local design needs that are in turn governed by the geographic distribution of the preferred service model and concentration of population.

3.9 Hydraulic Analysis

Consultants have used the software Water Gems to calculate the pipe diameters and pressure heads at both system and Distribution level. The software models the hydraulic interconnects to evaluate pressure losses in the system and distribution heads at multiple nodes. The software output is interfaced with GIS software to portray network characteristics in map form. The model input involves uploading of network layers from the GIS software wherein components are defined towards storages, pump stations, pipe networks and junctions. Additional inputs are specified as follows:

- Water demand at nodes
- Elevation at each junction (through standard DTM layer or GPS record).
- Material specifications and coefficient of friction of pipes.

3.9.1 Conclusions and Recommendations

- Jhelum City is located in doab between Jhelum and Indus river. Geology of the area is heterogeneous.
- Under lying aquifer has fine to coarse soil with hard rocks at various depths. Jhelum river is passing through east southern boundary of the city. Aquifer is continuously being recharged from the river thus having a good water potential which is evident from the hydrogeological map.
- Based on the secondary data of groundwater quality, TDS of project area is interpolated and shown in figure 3. Map is showing overall good quality in project area. It is evident from aquifer potential data that demand for fresh water up to 2050 can be fulfilled through groundwater.
- Current abstraction from 21 operational tube wells is around 7.539 MGD (14.00 cusecs). Additional tube wells 39 Nos., 44 Nos. & 58 Nos. of 1-cusec capacity each have to be constructed to meet max daily water demand for the years 2032, 2040 & 2050.
- Reported groundwater quality in and around Jhelum MC Boundary is fresh. Based on aquifer potential and quality of groundwater, the projected maximum daily demand for year 2032 (21.5 MGD), 2040 (23.2 MGD), and 2050 (28.3 MGD) can be fulfilled from the groundwater potential.
- Groundwater quality in Jhelum is fresh in both quantity and quality. New tube wells are recommended based on aquifer potential and groundwater quality to meet the futuristic demand. Requirements of additional tube wells (1-cusec capacity) to meet maximum daily water demand of projected population in years 2022, 2032, 2040 & 2050 are given in **Table 3-3**.

Table 3-1: Tubewells Requirements at Maximum Daily Demand for Planning Horizons

Year	Maximum Daily Demand (MDD) (gallon/day)	Yield from Existing Tube wells (gallon/day)	1 Cusec Cumulative Tube wells Requirement @ 16 Hr Working (No.)
2022	16,804,913	7,539,840	26
2032	21,511,710	19,029,120	39
2040	23,203,897	21,542,400	44
2050	28,285,448	23,337,600	58

3.10 Area of Influence (AOI)

In case of tube wells installed the zone of impact would be 10 meters in the periphery of the tube well location. The construction activities are very much limited to reduce impact on the surrounding area and public.

3.10.1 List of Expected Direct Impacts

- Rapid supply of water supply the city
- Sub-project will be temporary hindrance in the movement of people of residential & commercial units.
- 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 material transport which will be mitigated by using new and well-tuned machinery by the contractor.
- Safety issues may arise during construction which will be mitigated by appointing skilled labor for the particular task and use of PPEs by labor during works.
- Tubewells installation activity may cause accidents particularly for children and elderly. Special attention will be given to remove irrelevant persons away from construction site by installation of 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.

3.10.2 Indirect Impacts

There is are some masjids, shrines, graveyards and school near the project area , 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 receptor will due to dust and noise during the construction activities.

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Sensitive Receptors

	
Existing tube well alongside graveyard, muhalla kala gujran	Shrine near tubewell no. 17
	
Machine Muhalla Tubewell new location	Machine Muhalla Tubewell Masjid in front of proposed location

3.11 Material Disposal

Contractor will utilize excavated material for refilling with the approval of the Engineer. Contractor will dispose of construction waste at designated place of the MC.

3.12 Temporary Storage Area

As, this Sub-project is of short duration, henceforth, land will be rented with mutual negotiation between owner of the land and the contractor. Contractor will be bound to pay the rent to land title holder for temporary storage of construction material. Contractor will systematically layout his construction material as per scope of work to avoid hindrance in the movement of public and transport.

3.13 Contractor's Camp

Approximately 95% of the workforce will be from the local area while remaining labor (skilled) might be hired from outside the Sub-project area. The contractor's camp may not be required due to limited scope of work/ duration of Sub-project. Contractor will provide complete health care facilities especially first aid on the Sub-project site.

3.14 Traffic Management

The contractor will disseminate information about on-going construction activities by installing safety signage for pedestrians as well as for traffic. Contractor will install diversion routes sign boards on-site (if required). Flagmen will also be deployed to direct traffic and avoid any mishaps/ accidents. Contractor will submit Traffic Management Plan to DPO-ESSs for review.

3.15 Machinery and Equipment

Contractor will use well-tuned machinery to minimize air pollution and noise. Contractor will never park their machinery on the working area to avoid obstacles in the mobility of commuters. Machinery with poor exhaust and making nuisance for community will not be allowed to work on-site.

3.16 Construction Scheduling¹

Table 3-2: Implementation Schedule

Improvement in Water Supply System Jhelum						
Sr.No.	Activity	Year 2023				
		Jul	Aug	Sep	Oct	Nov
1	Trial boring, electric resistivity survey, ground water potential investigation, boring and conversion into tubewells					
2	Construction of Pumping chamber 12'x12' size					
3	Installation of pumping machinery, bulk water meter and hypochlorinator					
4	Provision for external electric connection					
5	Providing laying jointing, testing of distribution system with allied works					
6	Replacement of existing PVC pipe with G.I pipe for drain crossing					
7	Relocation of existing water supply pipe passing through sewer manholes					
8	Commissioning and Testing					

3.17 Manpower Requirement

It is estimated that 20-25 persons will be required by the Contractor. No child labor will be hired and verification will be made through CNIC. Majority of manpower shall be hired locally that will return to their homes on daily basis.

3.18 Government approvals required by the project

All necessary approval from all concerned departments like Punjab EPA etc. will be obtained from the concerned departments by MC Jhelum

3.19 Restoration and Rehabilitation Plan

After completion of construction site will be restored and leveled. Leftover construction material will be removed from site and it will be reused in other construction activities in the city. Renovation/repairing of parts will be

¹ (Source: PC-1)

done whenever required however, at the expiration of the useful life of the project; adequate arrangements will be made to remove all movable assets. The materials capable of recycling/reuse will be either sold in the market or to be reused for other suitable purposes. While dismantling all Government rules and regulations as applicable to such activities will be strictly adhered to. Safety measures as desired under the code of demolition will be adopted to avoid any harm to humans, property around, or the environment in the project area. Generated dust will be minimized by sprinkling water on regular basis. After completion; all construction matrix, debris and garbage will be removed off immediately from the site within the minimum possible time under safe adequately.

3.20 Cost of the Project

The cost and magnitude of the project is 300.205 million and the tentative ESIA implementation cost is 1.646 Million.

S. No	Description	Year (2023-2024)
1	Trial boring, electric resistivity survey, ground water potential investigation, boring and conversion into tubewells	13.324
2	Construction of Pumping chamber 12'x12' size	3.192
3	Providing and installation of Vertical Turbine Pump with electro-mechanical work	20.165
4	Provision for external electric connection from WAPDA HT pole to LT Pole and providing, erecting of Transformer	4.518
5	Providing laying jointing, testing of rising main (pipelines).	3.859
6	Providing laying jointing, and testing of distribution system (pipe from 3" to 6" dia) in left over streets of existing system	103.119
7	Providing Installing Bulk water flow meters	1.070
8	Providing, Installing of hypo chlorinators	0.340
9	Replacement of house connections	47.601
10	Replacement of outlived /contaminated pipes Providing laying jointing, and testing of distribution system (pipe from 3" to 10" dia)	69.942
	Sub total	267.030
	ESMP Implementation and Monitoring Cost	1.131
	Contingency @ 2%	5.341
	PRA @ 5%	13.351
	Price Escalation @5%	13.351
	Grand Total	300.205

4 DESCRIPTION OF ENVIRONMENT

This section describes the baseline conditions, which cover the existing physical, ecological and socio-economic environment of the project as well as study area. Data was collected by reviewing secondary data and field survey.

4.1 City profile²

Jhelum is a city on the east bank of the Jhelum River, which is located in the district of Jhelum in the north of Punjab province, Pakistan. It is the 44th largest city of Pakistan by population. Functionally Jhelum can be divided into three zones:

- Southern part (Old city)
- Eastern part
- Western part

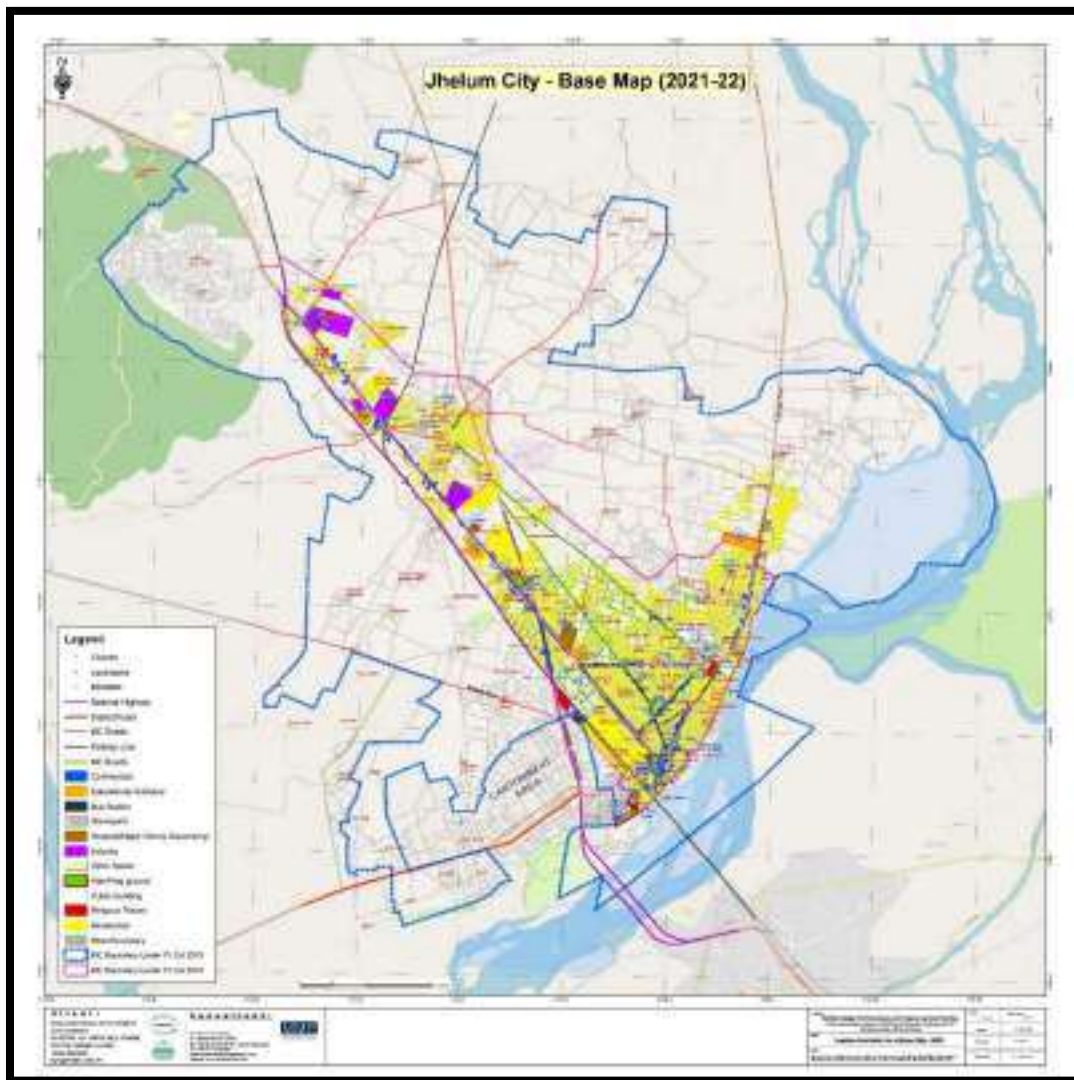
Old City (or southern Zone) is a high density zone bound by civil lines road towards south-east. River Jhelum is situated along south-east of the town. Drain is towards the south. The zone is predominantly residential, includes main commercial areas. The major commercial activities are concentrated in the southern part of the town as linear strips along the roads, which are though quiet wide, but due to encroachments and congestion create further chaos. The hub of commercial activities is the Shandar chowk. This chowk lies at the intersection of two main roads of the town i.e. Old G.T. Road and Civil Lines Road. This area has been haphazardly developed duem to the lack of systematic planning and effective development control, resulting in narrow and zigzag streets. The Mohallas that exist in this part of the town are: Mohalla Baig, Mohalla Khawaj Ghan, Mohalla Madni, Mohalla Shumali, Nia Mohalla, Machine Mohala, Dhok Juma, Mohalla Peera Ghaib. The eastern zone is bounded by Civil lines Road and River Jhelum is adjacent to the south eastern part of the town. On the south west of the town the Army Cantonment area is situated, which is mbifurcated to the entire town by a railway line. The North West of the town is sparsely developed and relatively new developments are taking place. There are many vacant pockets in between. The density is lower as compared to old city. In this zone a main hospital, District Health Quarter is situated along Old G.T. Road. The condition of the residential area is relatively better in this zone. However, the construction activity is taking place in a piecemeal fashion, resulting in many vacant parcels of land. This zone has easy access to major public and private services or facilities. Mostly the government offices and public buildings like Tehsil Municipal Administration, Police Station, Government Boys School, Hospital, parks, post office etc. have been constructed. The future expansion of Jhelum is taking place to the North-west of the city. The city's expansion is restricted in the northern side as to the South – East lies the River Jhelum and to the South- West is the Army Cantonment area. Therefore the city is mainly expanding beyond Bilal town, along Tahlianwala road, in north-east direction. Newly constructed houses can be found in this area. Other non-residential uses as educational, commercial, petrol pumps etc are being developed with the passage of time. Some more expansion is taking place to the north, along GT road. This area is sporadically developed. There are a number of vacant plots in this belt

² Detailed Design of Infrastructure Sub-Projects, Sectoral Planning & Resident Supervision in 16 Cities of Punjab-Package – 01-Inception Report-April 2022

which are mainly used for agricultural purposes, but due to rapid urbanization its use is being converted into residential.

4.2 Physical Environment

This part examines the physical resources such as topography, soil, climate, surface and ground water resources and quality, ambient air quality and geology of not only the project site but also the city as a whole to assess whether the project under assessment can or does have any impacts on any of these parameters. The description of physical environment of the city is presented in the following sub sections.



4.2.1 Topography³

The district capital, Jhelum City, is situated on the right and left bank of the Jhelum River, the left side of Jhelum is known as Sarai Alamgir and it also contains the Military College Jhelum (MCJ). The 16th-century Grand Trunk Road passes through the city. Jhelum city is near the site of the Battle of the Hydaspes between the armies of Alexander and Raja Porus. This battle took place a few miles downstream from the city center, along the river banks. Lying at 32°56' North latitude and 73°44' East longitude, Jhelum is located a 1-hour and 30 minutes drive from the Capital of Pakistan Islamabad, and 3 hours' drive from the heart of Punjab Lahore. Jhelum is linked with these cities through the National Highway N-5. Several cities are within 1 to 2 hours' drive including Gujrat, Gujranwala, Chakwal and Mirpur, Azad Kashmir.

4.2.2 Climate⁴

Lying at 32°56' North latitude and 73°44' East longitude, Jhelum is located a 1-hour and 30 minutes' drive from the Capital of Pakistan Islamabad, and 3 hours' drive from the heart of Punjab Lahore. Jhelum is linked with these cities through the National Highway N-5. Several cities are within 1 to 2 hours' drive including Gujrat (home to fan manufacturing), Gujranwala, Chakwal and Mirpur, Azad Kashmir. Jhelum has a monsoon-influenced humid subtropical climate (Köppen climate classification CWA) and is extremely hot and humid in summer, and cold and generally dry in winter. The maximum recorded temperature in the pre-monsoon season of April to June is 49.2 °C (120.6 °F), whereas in winter the minimum temperature recorded is -0.6 °C (30.9 °F). Average annual rainfall is about 850 millimeters (33 in) which is much below the required quantity given the extremely high evaporation levels. Nevertheless, in the rainy season water torrents flow from the north to the Jhelum River very rapidly and cause damage to the crops, bridges, roads. This is responsible for the soil erosion in the district. Over the years, global climate change has affected Jhelum as well as any other place on earth and below comparison charts from Weather base and NOAA show the difference in rainfall between 1990 and 2015. Below table and graphs show historical climate data, averages of Jhelum city (Figure 4-1).

Figure 4-1: Climate Data of Jhelum City⁵

³ <https://jhelum.punjab.gov.pk/geography>

⁴ www.weatherbase.com

⁵ www.weatherbase.com

Climate data for Jhelum, Punjab													[hide]
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	28.1 (79.0)	30.7 (87.3)	36.7 (96.1)	43.3 (109.9)	49.2 (120.6)	49.0 (120.2)	47.0 (116.6)	42.2 (108.0)	40.6 (105.1)	37.8 (100.0)	35.0 (85.0)	27.8 (82.0)	49.2 (120.6)
Average high °C (°F)	19.7 (67.5)	21.6 (70.9)	26.6 (79.9)	33.0 (91.4)	38.1 (100.6)	40.5 (104.9)	35.9 (95.6)	34.5 (94.1)	35.0 (95.0)	30.1 (86.2)	27.6 (81.7)	21.5 (70.7)	30.6 (87.1)
Daily mean °C (°F)	12.3 (54.1)	14.7 (58.5)	19.5 (67.1)	25.4 (77.7)	30.1 (86.2)	33.2 (91.8)	30.9 (87.6)	29.9 (85.8)	29.0 (84.2)	24.9 (76.8)	18.7 (65.7)	13.6 (56.5)	23.5 (74.3)
Average low °C (°F)	5.0 (41.0)	7.7 (45.9)	12.5 (54.5)	17.7 (63.9)	22.0 (71.6)	25.8 (78.4)	25.8 (78.4)	26.8 (77.5)	23.0 (73.4)	16.6 (61.9)	9.9 (49.8)	5.7 (42.3)	16.4 (61.5)
Record low °C (°F)	-0.6 (30.9)	0.0 (32.0)	4.0 (39.2)	8.6 (47.5)	13.0 (55.4)	18.0 (64.4)	19.4 (66.9)	19.4 (66.9)	15.0 (59.0)	8.9 (48.0)	1.1 (34.0)	0.0 (32.0)	-0.6 (30.9)
Average rainfall mm (inches)	33.8 (1.33)	50.0 (1.97)	60.6 (2.38)	36.6 (1.44)	31.8 (1.25)	51.9 (2.04)	237.3 (9.34)	221.2 (8.71)	77.7 (3.06)	12.2 (0.48)	9.9 (0.39)	30.4 (1.20)	853.3 (33.59)
Mean monthly sunshine hours	212.6	202.9	225.3	256.6	312.7	284.7	247.0	243.6	257.0	287.5	251.9	215.3	2,997.5

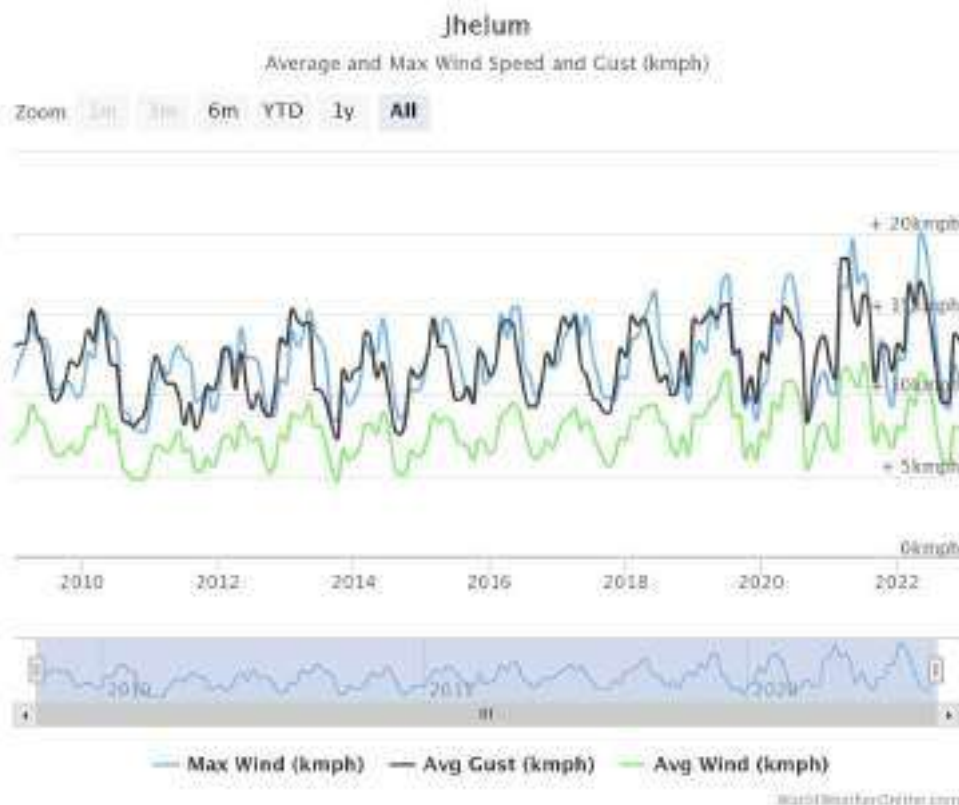


Figure 2 Average and Max Wind Speed and Gust (kmph)

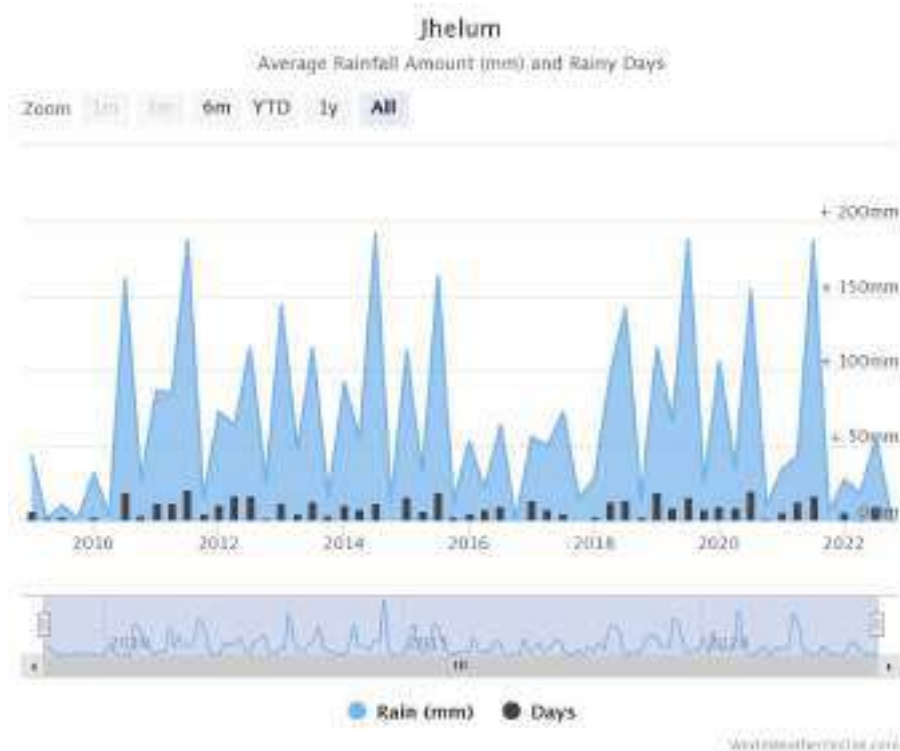


Figure 3 Average Rain fall amount (mm) and rainy days

4.2.3 Soils⁶

Soils form major relation with environment. They influence environment by their special qualities and more so through fertility. Soil should not be taken as a lifeless residual layer but it is a very dynamic element of environment in which very complicated physical, chemical and biological activities are constantly proceeding. In this way it is a dynamically changing and developing body. Soil scientists restrict the word soil or solum merely to the surface material, which has come to have distinct layers or horizon over the extended period of time. The soil of the proposed site is sandy clay in nature. Sandy soil has its good points. It is easy to dig and can be worked earlier in the spring than other soil types. It is not as susceptible to frost heave as clay soils. This is a condition where the soil is lifted up when the water inside the soil freezes, and it can push plants out of the ground. With the addition of some organic matter, the light texture and open structure of sandy soil is good for growing many varieties of vegetables and flowers, and is well suited to annual root crops, especially potatoes (*Solanum tuberosum*).

⁶ [https://www.researchgate.net/figure/Basic-characteristics-of-soil-and-land-cover-data-in-the-Jhelum-River-basin_tbl1_303860110#:~:text=Cambisols%20and%20Leptosols%20are%20two,basin%2C%20respectively.%20...&text=...%20glacier%20patches%20\(less,upper%20parts%20of%20the%20basin](https://www.researchgate.net/figure/Basic-characteristics-of-soil-and-land-cover-data-in-the-Jhelum-River-basin_tbl1_303860110#:~:text=Cambisols%20and%20Leptosols%20are%20two,basin%2C%20respectively.%20...&text=...%20glacier%20patches%20(less,upper%20parts%20of%20the%20basin)

4.2.4 Water Sources⁷

Jhelum River is flowing at the eastern and southern periphery of the city. Tube wells have been installed at different points in the city to harness the deep underground fresh water. Water from some tube wells is being pumped into overhead reservoirs constructed at different locations of the city wherefrom it is fed to the distribution system. Three overhead reservoirs are currently non-functional. In these cases the water is directly being supplied into distribution system. Some areas are being supplied with contaminated water. Main source of contamination is old and substandard consumer connections because of rusted and perforated GI service pipe resulting in ex-filtration and infiltration. Substandard PVC or lawn piping used in the consumer connections. Pipes frequently burst and cause water contamination. The city has sweet sub soil water which is fit for human consumption. Ground water quality is fresh (defined as acceptable in terms of its salinity). Raw water abstracted from the deep tube wells is believed to be essentially bacteria free. The water quality in the upper 50 meters zone of subsoil is generally brackish. For city's drinking purposes water is abstracted from groundwater aquifer by means of tube wells located throughout the city. The quality of water is generally adequate for direct consumption. About 83% of city population is consuming groundwater for drinking purposes. Groundwater is available at a depth ranging between 24 to 30m below the natural surface level. Deep groundwater from a depth of about 210m in the vicinity of the Project Area is being extracted for meeting the domestic and commercial water demands in nearby areas.

4.2.5 Sewerage System⁸

The existing sewerage system of Jhelum city encompasses area under jurisdiction of Municipal Committee (MC). The existing sewerage system caters for about 0.13 million people which are about 70% of the MC's present population (188,348 persons, year 2022). At present, the increased population and improved socio-economic conditions have exerted immense pressure on the city sewerage system. A part of the system is outlived and its capacity has decreased due to additional built up area and with little capacity available in sewers due to saturation of population for which it was designed. As a result, sewer chocking causing unhygienic conditions are evident in the city. This situation warrants to improve existing sewerage system as well as to enhance the sewerage coverage in unserved areas. The existing sewerage system in Municipal Area consists of two sewerage zones namely Zone A and Zone B. Zone A mainly comprises main city area and Kala Gujran and is spread over an area of 15 km². This zone has a combined system collecting domestic, industrial and storm water. The sewerage network comprises trunk, sub main and lateral sewers. This zone comprises areas including Shadab colony, Nia Mohallah, Machine Mohallah 1, Machine Mohallah 2, Machine Mohallah 3, Mestrian Mohalla etc. which spreads over an area of 2 Km².

4.2.6 Solid Waste Management⁹

Jhelum city is observing poor state of Solid Waste Management. Open heaps along the road and nullah are common in the city. The reason for this poor condition rests on the inadequate Human Resource and Equipment. Due to insufficient machinery, lifting frequency of containers is usually once a week. This piled up waste causes the nuisance and is a potential health hazard to the community.

⁷ <https://pmdfc.punjab.gov.pk/system/files/Jhelum-Situation-GAR.pdf>

⁸ <https://pmdfc.punjab.gov.pk/system/files/Jhelum-Situation-GAR.pdf>

⁹ Ibid

4.2.7 Ground Water¹⁰

At present, in the Jhelum major water supply source is groundwater for domestic purpose. The tube-wells have been used, the number of which has increased with the increased demand, Presently, tube-wells in the city are installed by Public Health Engineering Department (PHED) and then handed over to Municipal Committees (MCs) to run these tube-wells and maintain operations of the same to meet the demand of consumers. At present, there are about 36 tube-wells in the city. The depth of water table in the city varies from 20ft to 60ft. It is shallow towards riverside and deep in center of the city. The city has been divided into two zones i.e., Zone-1 comprising main Jhelum City & Zone-2 consisting of Kala Gujran. Based on working hours and capacity of tube wells, the total water abstraction from 21 operational tube-wells is about 1.832 MGD. The Depth of these tube-wells ranges between 220-270 feet. The installed tube-wells are of 1.00 cusecs capacity. However, these tube-wells are not working with their hundred percent efficiency. The ground water monitoring locations have been marked in figure-5.

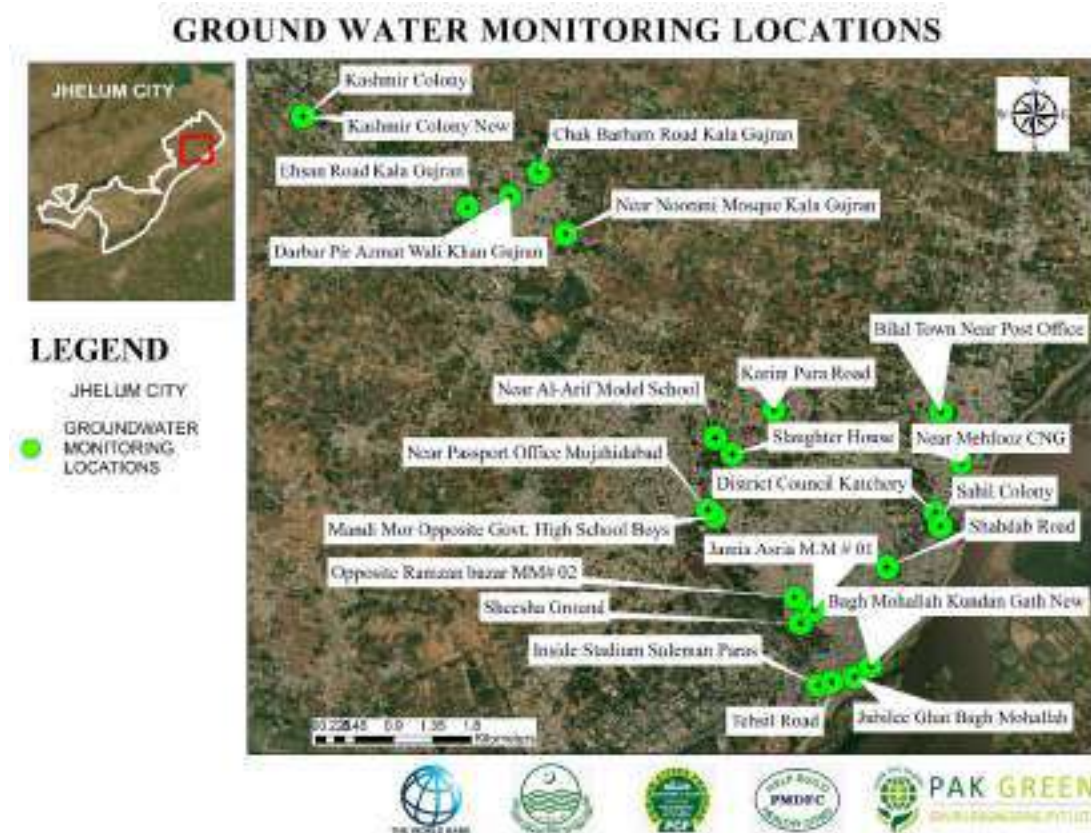


Figure 4 Ground water Monitoring Locations

4.2.8 Surface Water¹¹

The Jhelum River is the main surface water source in the city, which flows through eastern and southern boundary of the city. The river is also a source of recharge of the groundwater.

¹⁰ Feasibility Study Report for Water Supply System of Jhelum - Volume-I: Main Report-October, 2022

¹¹ Feasibility Study Report for Water Supply System of Jhelum - Volume-I: Main Report-October, 2022

4.2.9 Solid Waste Management¹²

Jhelum city is observing poor state of Solid Waste Management. Open heaps along the road and nullah are common in the city. The reason for this poor condition rests on the inadequate Human Resource and Equipment. Due to insufficient machinery, lifting frequency of containers is usually once a week. This piled up waste causes the nuisance and is a potential health hazard to the community.

4.2.10 Landfill Site Development¹³

Presently, there is a rental open dumping site that is being used by MC Jhelum. It covers 20 kanal of area and is excavated 25 feet deep below NSL. The site is adjacent to Kala gujran village and near to rescue 1122 office and Pakistan Tobacco Company along with the abandoned railway line. This site was rented in April 2021 and is actively being used for open dumping of solid waste under MC. The monthly rent paid is 30,000 PKR per month and is paid by the MC. With the current pace this site is progressing, and solid waste being generated the maximum life of this site will last up to the next 10 years. The road that is used by the vehicles to reach this dumping site is in very poor condition does not function properly, hence the drivers are reluctant to drive this path and there is no alternative route to reach the site. The condition of the road needs complete resurfacing and proper maintenance to be efficiently used by the vehicles for solid waste management. The suitability of the landfill sites will be determined after detailed surveys and design of the Sub-project in compliance with PEPA 2012.

4.2.11 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. All environmental analysis reports are attached as annexure I.

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.

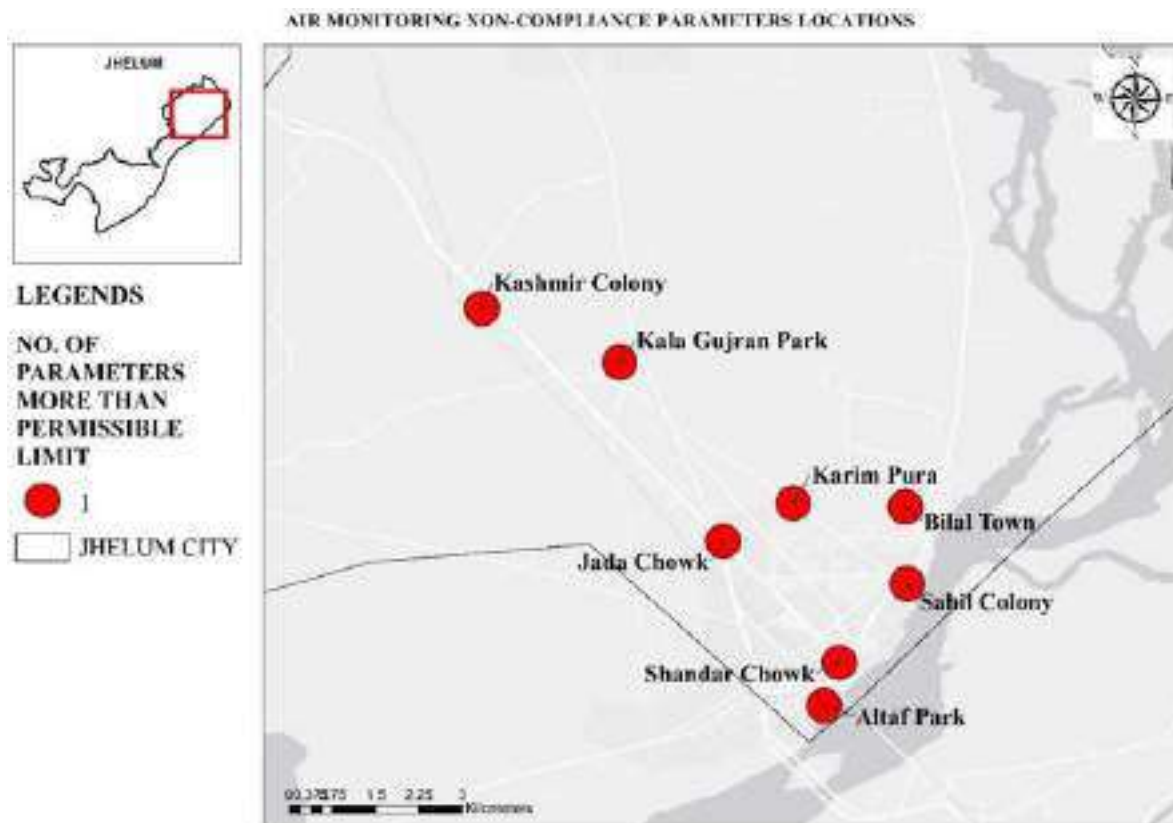
Calibrated AQMS was utilized to carry out Ambient Air analysis from the advised 10 Locations on the below set of parameters for 24 hours. The monitoring was carried out for continuous 24 hours as per Punjab Environmental Quality standards. The pictorial evidence of sampling of ambient air is shown in Figure-5. The ambient air & noise monitoring locations have been marked in figure-9.

¹² Detailed Design of Infrastructure Sub-Projects, Sectoral Planning & Resident Supervision in 16 Cities of Punjab-Package – 01-Inception Report-April 2022

¹³ Detailed Design of Infrastructure Sub-Projects, Sectoral Planning & Resident Supervision in 16 Cities of Punjab-Package – 01-Inception Report-April 2022



Figure 5: Pictorial Evidence of Air Monitoring Sampling in Jhelum, Pakistan



The Parameters CO, NO, NO₂, SO₂, PM₁₀, SPM and O₃ are within permissible limits of PEQs at all sampling locations. Particulate Matter (PM_{2.5}) found exceeded the limits of PEQs at all sampling locations.

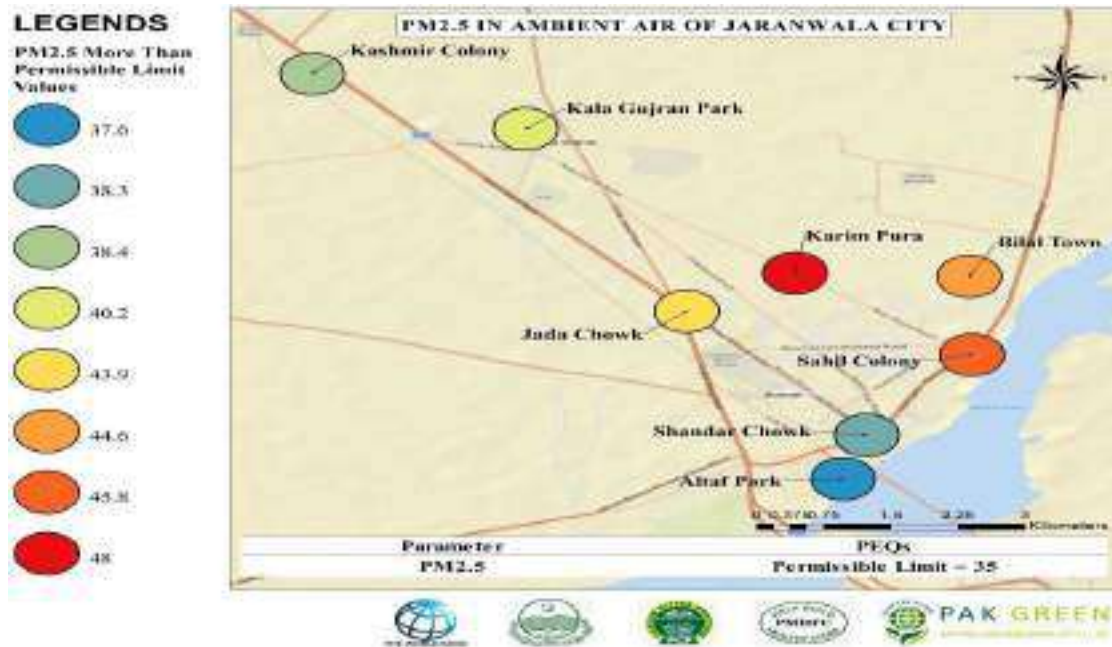


Figure 6: PM 2.5 in Ambient Air of Jaranwala City

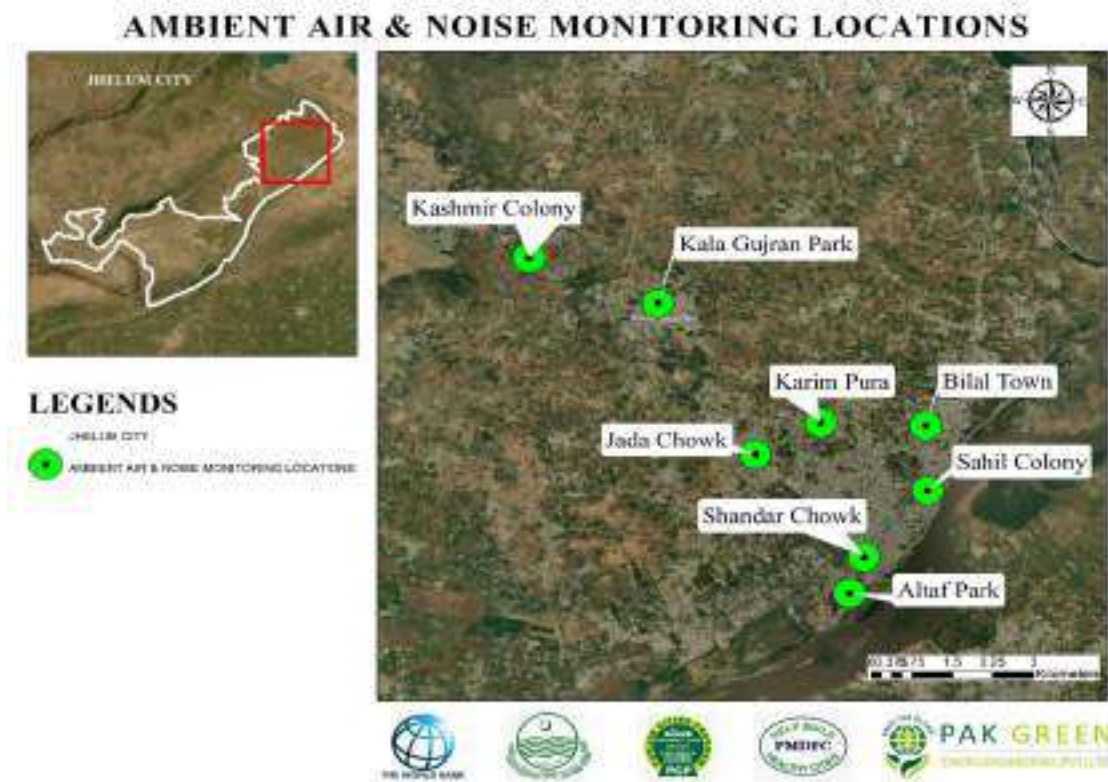


Figure 7 Ambient Air & Noise Monitoring Locations

Noise Level Analysis

Noise Level Monitoring was conducted at different locations at 10 points for 24 hours. The detailed locations & coordinates are given in Table 6. All noise measurements were carried out in the day and night time the noise level monitoring is carried out in order to check the current status of noise level. The monitoring was executed by using calibrated Land Tek SL 5868 P according to standard guidelines. The pictorial evidence of sampling of noise level is shown in Figure-8.



Table 3: Noise Level Monitoring Results of the studied sites of Jhelum, Pakistan

Figure 9: pictorial evidence of sampling

Comparison Sheet for Noise Level									
	Site-1	Site-2	Site-3	Site-4	Site-5	Site-6	Site-7	Site-8	Permissible Limit dB (A)
	Kashmir Colony	Altaf Park	Kala Gujran Park	Jada Chowk	Shandaur Chowk	Bilal Town	Karim Pura	Sahil Colony	
	N	N	N	N	N	N	N	N	
	32.984271°	32.922429°	32.975889°	32.948029°	32.929126°	32.953333°	32.953889°	32.941389°	
	E	E	E	E	E	E	E	E	

	73.67566	73.72897	73.69709	73.71328	73.73137	73.74166	73.72416	73.74194	
	1°	4°	1°	3°	3°	7°	7°	4°	
Day Time	62.8	63.6	62	64.9	66.3*	64.1	60.9	65.3*	65
Night Time	54.2	53.9	50.5	51.5	52.8	56*	53.7	55.6*	55



Figure 9: The Noise level map of non-compliance parameters of Jhelum, Pakistan

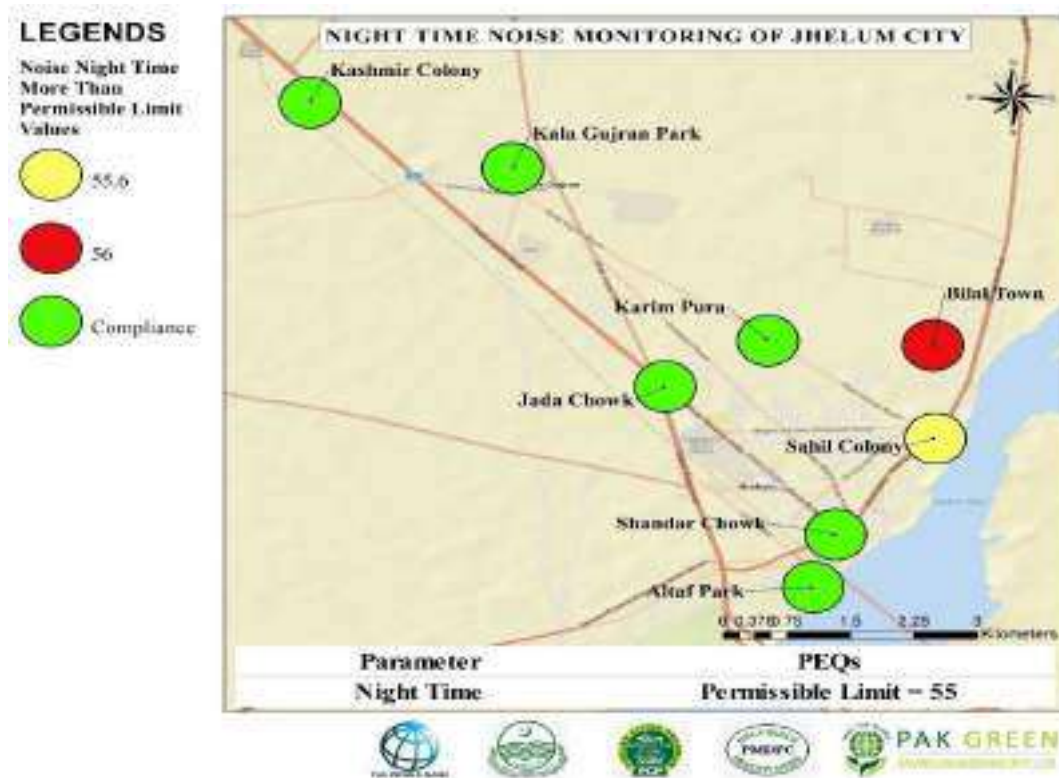
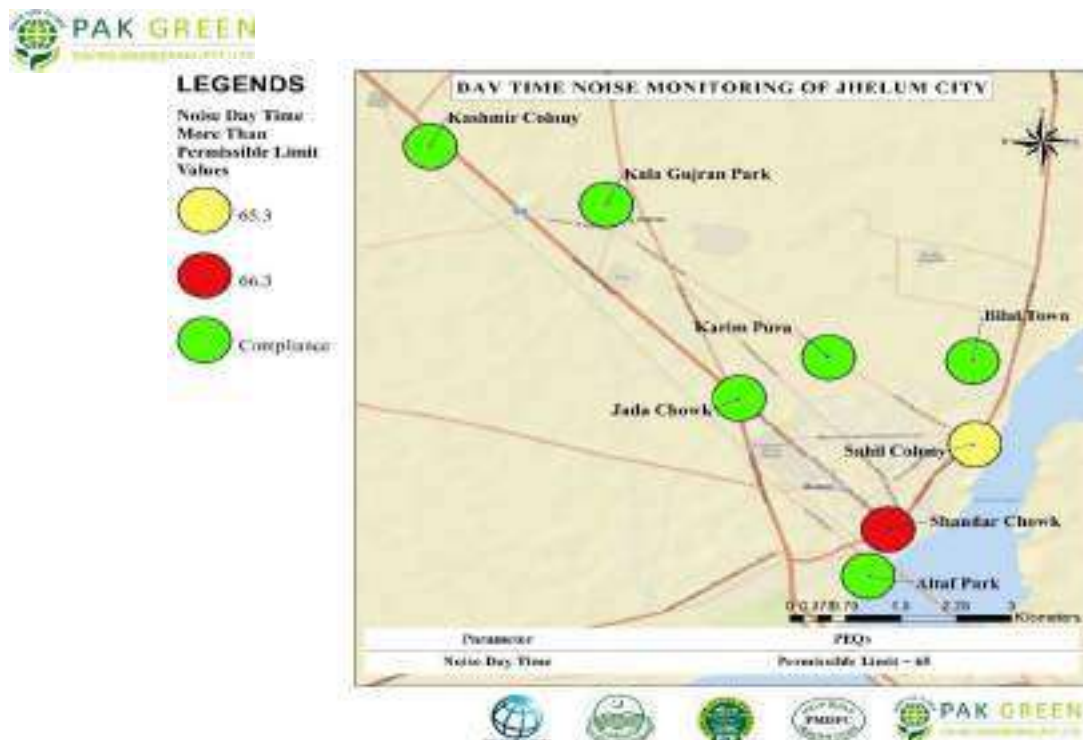


Figure 10: The Noise level map of night time of Jhelum, Pakistan



Noise level map of day time of Jhelum, Pakistan

Figure 11:The

Wastewater Quality Analysis

Waste water samples were collected from different locations inside the vicinity of city. Sampling was conducted following APHA sampling procedures and protocols for sampling collection and preservation. The bottles were the labeled and chain of custody of forms were filled out and signed to keep track of collected sample. The composite sample were taken from 2 different sampling locations for wastewater quality analysis for proposed project vicinity i.e.Suleman Paras (Main nala), Peer Hara Sahil Colony (Disposal). The pictorial evidence of sampling of waste water is shown in Figure-12. The waste water monitoring locations have been marked in figure-14.

WASTE WATER MONITORING LOCATIONS



Figure 12 Waste water Monitoring Locations



Figure 13: Pictorial Evidence of Waste water Sampling in Jhelum, Pakistan

The results showed that both physical and chemical parameters were in compliance with PEQs standards at Sulaman Paras. For Peer Hara sampling location, physical parameters were in compliance while BOD and COD were found exceeding than the permissible limits of PEQs.

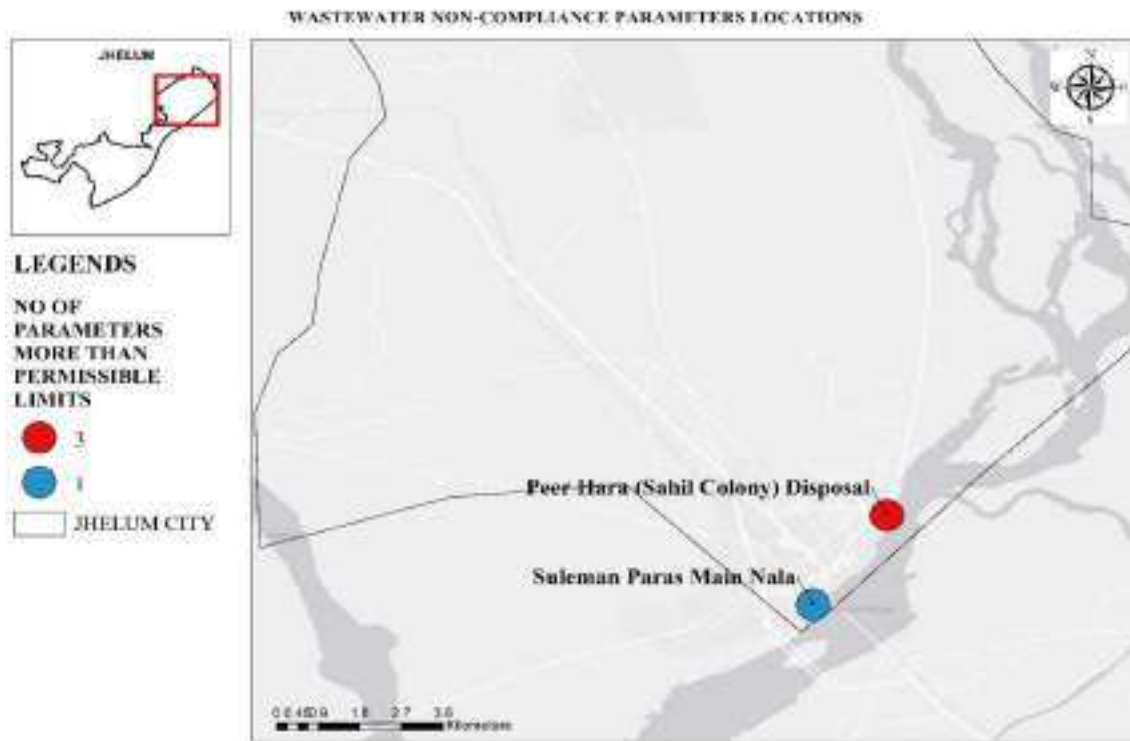


Figure 14: The Base map of non-compliance parameters of Waste Water of Jhelum, Pakistan

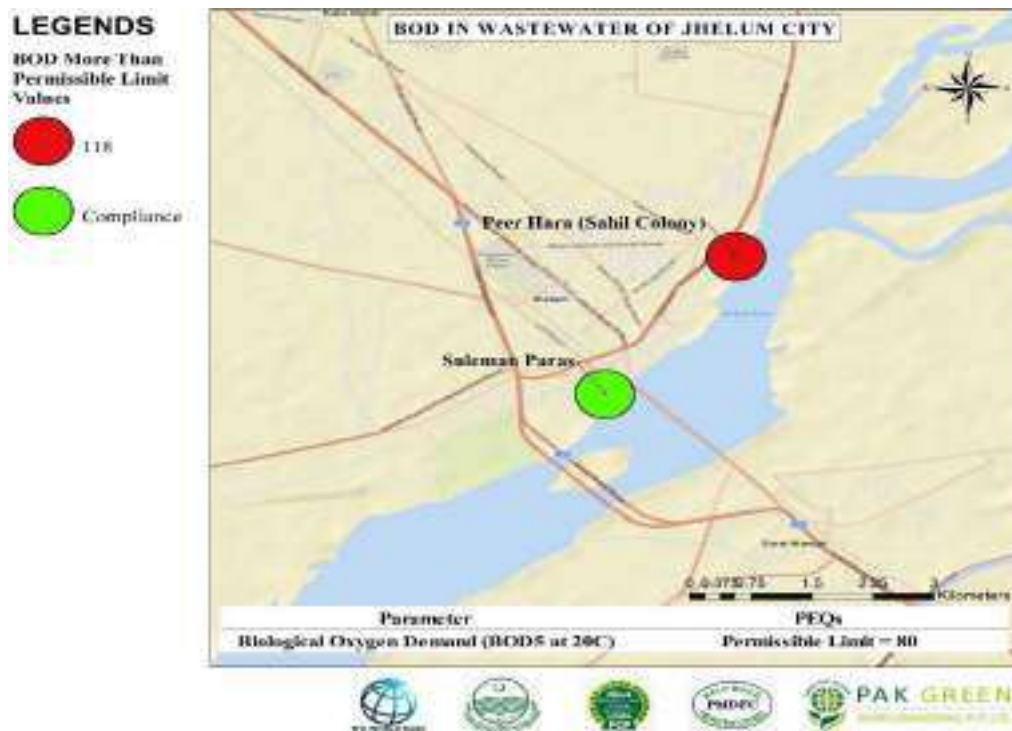


Figure 15: The map of BOD Level in Waste Water of Jhelum, Pakistan

Water Quality Analysis

Ground water quality around the project vicinity is evaluated from the different location and sources. For this purpose, 08 ground water samples were collected from different locations of Jhang city. The bottles were the labeled and chain of custody (COC) of forms were filled out and signed to keep track of collected sample. The sampling was carried out in accordance to the SOP based on the recognized methods of American Public Health Administration (APHA). These samples were collected from different sources of ground water including tube well, hand pumps and turbine. The pictorial evidence of sampling of ground water is shown in Figure-15.



Figure 16: Pictorial Evidence of Drinking/Ground Water Sampling in Jhelum, Pakistan

For Drinking Water, drinking water quality was assessed for eight (8) different locations of proposed project vicinity i.e., Altaf Park, Kala Gujran Park, Jada Chowk, Shandar Chowk, Bilal Town, Karim Pura, Sahil Colony, Kashmir Colony. At all sampling points, physical and biological parameters for drinking water were in compliance within the permissible limits of PEQs. Chemical Parameters i.e., total hardness was found exceeded than permissible limits of PEQs for 6 sampling locations. The drinking water monitoring locations have been marked in figure - 17.

Figure 17: The map of total hardness in Drinking Water of Jhelum, Pakistan



DRINKING WATER MONITORING LOCATIONS



For groundwater quality, sampling location were Near Mehfooz CNG, Jamia Asria M.M #01, Shahdab Road, Opposite Ramzan Bazar MM # 02, Jubilee Ghat Bagh Mohallah , Mandi Mor Opposote Govt High School Boys, Karim Pura Road, Near Al-Arif Model School, Near Passport Office Mujahidabad, Ehsan Road Kala Gujran, Chak Barham Road Kala Gujran, Kashmir Colony new, Bagh Mohallah Kundan Gath New, Inside Sadtium Suleman Paras, Tehsil Road, Disrict Council Katchery, Sheesha Ground, Slaughter House, Darbar Pir Azmat Ali Khan Gujran, Near Noorani Mosque Kala Gujran, Kashmir Colony, Bilal Town near Post Office, Sahil Colony. (23 points)

At all sampling points, physical, chemical and biological parameters for groundwater ere found within the permissible limits of PEQs



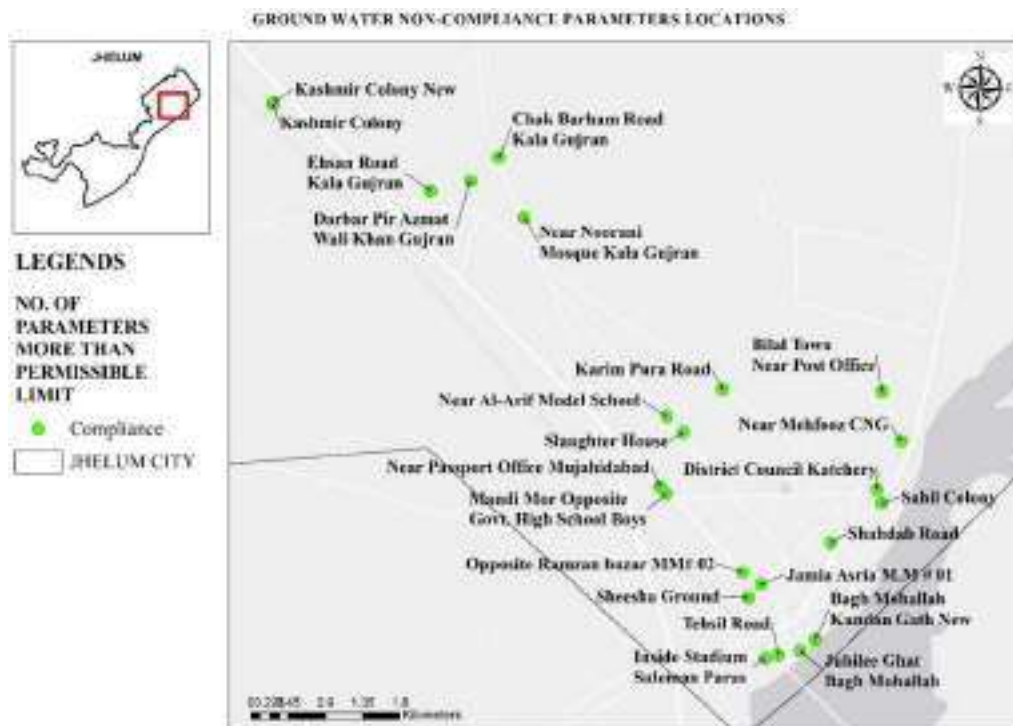


Figure 19: The Base map of non-compliance parameters of Ground Water of Jhelum, Pakistan

4.3 Ecological Environment

City is enriched with the presence of natural flora and fauna; although with the growing population and development activities, the presence of some has been somewhat affected. There are however no significant or well-shaped trees and shrubs on the proposed tube well locations.

4.3.1 Flora¹⁴

Vegetation of the forests of Jhelum Forest Division is dry, deciduous shrub type, phulai, kahu (wild olive) and sanatha are the main species. The stocking on the whole is poor and the forests are open. The southern slopes are often devoid of vegetation while north western slopes carry good forests. The forests of Jhelum Forests Division are burdened with right of grazing, browsing and firewood. The southern slopes are often devoid of vegetation while northwestern slopes carry good forests. The forests of Jhelum Forests Division are burdened with the right of grazing, browsing, and firewood. Under settlement out of total area 93,566 acres (378.65 km²) only 5,468 acres (22.13 km²) about (45%) are right free. The remaining 55% are open to grazing.

¹⁴ <https://jhelum.punjab.gov.pk/flora>



19: Kahu

Figur 20: Sanatha

4.3.2 Fauna¹⁵

Some scattered birds and other animals exists in surrounding of the site. The fauna of the District is mostly indigenous restricted, like the vegetation, but similarly varied and interesting. The rugged and rough terrain, low rainfall, the scanty cover of vegetation and the burning passions of the increasing number of hunters, all have their share in limiting the animal kingdom in the District. The river Jhelum flowing near to the Jhelum city a better environment than elsewhere though the hills support a more interesting wildlife. Urial (an animal from deer family) and chinckara are spot aids while wild bores are found in the Salt Range. Wolves, foxes and wild cats are also found. Hare is fairly common. Chikor grey and black Partridge are also found in the parts of the district. Migratory ducks like Teal Pin tail and mallard and some geese visit during winter.



Figure 21: Mallard



Figure 22: Hare

4.3.3 Environmentally Sensitive Receptors

Environmental sensitive areas are more prone towards human disturbance. The river Jhelum is navigable throughout the district, which forms the south-eastern portion of a rugged Himalayan spur, extending between the Indus and Jhelum to the borders of the Sind Sagar Doab. Its scenery is very

¹⁵ <https://jhelum.punjab.gov.pk/>

picturesque, although not of so wild a character as the mountain region of Rawalpindi to the north, and is lighted up in places by smiling patches of the cultivated valley. There are some schools, Mosque, Graveyard, Janazgah and Shrine is within 100 meter of along site that can be effected during construction activities but it will be mitigate properly.

4.4 Socio-Economic Environment

4.4.1 Administrative Setup¹⁶

Under the PLGO 2021, The Municipal Corporation Jhelum has been converted into District Council, which consists of the Chief Officer, Council Officer, 5 District Officers and other officials of the Local Council Service and officials of the offices delegated to the Municipal Corporation. The Chief Officer is acting as coordinating and administrative officer in-charge of the District Officers.

4.4.2 Economic drivers of the City¹⁷

There are a numbers of industries located in and around Jhelum City. Major industries include a Tobacco factory, wood, marble, glass and flour mills. The major crop is wheat, annual average production of which during the period 2017-18 was 144.56 thousand Metric Tons. There are 12 flour mills in district Jhelum. Fruit and vegetables are grown in small quantities which are not sufficient to meet the overall requirement of the district. Therefore, there exists very good potential for cold storage in the district, so that the vegetables/fruit purchased from other district would be preserved for short period to maintain regular supply in the local markets. As per Punjab Development Statistics 2008, there exists good scope for organized dairy farms, cattle/goats/sheep fattening farms, and cattle/poultry feed mills. Leather shoes and leather products unit can be established in the district. District Jhelum is quite rich in minerals, Rock Salt, Brine, gypsum, coal are being excavated in the district. There are already three cement and one soda ash manufacturing units operating in the district. The existing chip-Board/Ply-Wood Units suggest good prospects for Flush Door /Panels and Furniture Units.

4.4.3 Industrial and Commercial Hubs¹⁸

According to study of available resources it was determined that the following industrial potentials exists in the city that include Pollywood, Glass Works, Tobacco industry, Textile, marble and flour Mill. The Small Industrial Estates also present in Jhelum is the potential (Interior factory, Pet Crushing Flour mills and other small scale industries) along the old G.T. Road and the railway network. Agricultural sector has great prospective for future expansion that can be a booster for the development of the city and its economy. Jhelum's one of the strength is that it is rich in minerals including Rock salt and coal mining. CBD is located along the major road network old G.T. Road which is the major commercial activity corridor. This corridor is hub of commercial activity and catering the need of whole of the city by provisioning of basic facilities i.e. commercial centers or shopping plazas.

¹⁶ <https://mcjhelum.lgpunjab.org.pk/about-us/administrative-setup/>

¹⁷ <http://www.pmdfc.org.pk/content/uploads/planning-report-jhelum.pdf>

¹⁸ <https://punjab.gov.pk/node/1004>

4.4.4 Community Structure

According to MMP's socio-economic survey, the main ethnic communities in the Sub-project area are Rajput, Jat, Kyani. 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 cast systems.

4.4.5 Population & Growth Rate¹⁹

The available population data for MC Jhelum is as per 2017 census for the MC boundary notified in 2013. Total population of Jhelum tehsil in urban area as per 2017 census is 190,471, which comprises of 97,586 male, 92,853 female and 32 transgenders. Sex ratio within urban area of Jhelum Tehsil is 105.10. average annual growth rate is 1.36.

4.4.6 Health Facilities²⁰

Jhelum has some hospitals in the area which including hospital in the cantonment area of the city managed by the Pakistan Army. One such hospital is the Combined Military Hospital Jhelum.

4.4.7 Educational Facilities²¹

Jhelum has an average educational infrastructure. The overall literacy rate for Jhelum is 35 percent, somewhat a lower literacy in Punjab province (58 percent). Jhelum district has 6 Degree Colleges for Women, 6 Degree Colleges for Men, 6 Co-education Colleges, 6 Commerce Colleges, and one Law College, with numerous higher secondary schools and over 150 high schools. Name of some institutions established in the Jhelum city are as following;

- Punjab University Jhelum campus
- Air Foundation School System Jhelum (Boys & Girls).
- Air Foundation School System Junior Branch (Near Al-Bilal Hotel)
- Army Public School and College Jhelum Cantt.
- FG Intermediat College Jhelum Cantt.
- Fauji Foundation Model School & College, Jhelum Cantt.
- Govt. Postgraduate College, Jhelum.
- Govt. College. G.T. Road, Jhelum.
- Govt. College for Women, Jhelum.
- Govt. College of Commerce, Bilal Town, Jhelum.
- Research Girls College Kala Gujran, Jhelum
- Jinnah Law College Near Kutcheri, Jhelum.

¹⁹ <https://www.pbs.gov.pk/sites/default/files/population/2017/results/04101.pdf>

²⁰ <https://healthwire.pk/hospitals/jhelum>

²¹ <https://www.punjab.gov.pk/node/605>

- M.A. Jinnah College of Commerce & Computer Science, Jhelum.
- PICS, Bilal town, Jhelum.
- Jhelum Homeopathic Medical College, GT Road Jada, Jhelum
- SLS College, Jhelum.
- Govt. College of Technology Chak Daulat, Jhelum

4.4.8 Sports²²

Located within the city is a golf course called the River-View Golf Club, where national golf tournaments are held regularly there is also a Cricket + football Stadium Zamir Jaffri Cricket Stadium where District level tournaments are held. In October 2008, Pakistan Cricket Board upgraded this stadium for Regional events. Besides the mainstream sports like football, cricket, hockey, and squash, a lot of other sports are also played in the rural areas around the city. These, which are equally popular, include tent pegging, volleyball, stone-lifting and Kabaddi. Thousands of people flock to these local grand sporting events as keenly as the average sports fan anywhere in the world. These events are usually sponsored by the UK and foreign based Pakistani diaspora.

Jhelum is not only rich in natural resources, industry, and agriculture, but it is also rich in intellectual capital. Throughout the city, a network of academic institutions is in place, ranging from primary education to higher education institutions. According to the Government of Punjab, there are 803 academic institutions.

4.4.9 Important Places²³

Important Places Include Adventure Park, Altaf Park Jhelum, Jhelum Bridge, Family Park, Rohtas Fort, NMC Glow Park, and Citi Land Theme Park.



Figure 24: Jhelum Bridge



Figure 24: Khewera Salt mine

²² IEE report Zohan plastics

²³ Primary data



Figure 27: Mangla Dam

24



Figure 26: Rohtas Fort

4.5 Suitability of the Site

The site selected for installation of tube wells does not fall in environmental sensitive area and all commodities are at a suitable distance from project site as they will not have impacted by the construction activities even locals will get more benefits and job opportunities. No replacement, relocation and rehabilitation are required for the development of proposed project.

5 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND THEIR MITIGATION

This chapter presents the assessment of the issues likely to arise as a result of implementation of the proposed project. For each issue, the analysis is based on its nature, the predicted impact, extent, duration, intensity and probability, and the stakeholders and/or values affected. In accordance with best practice, the analysis includes issues relating to the project's environmental and social sustainability. The anticipated positive and negative impacts associated with the different phases of proposed water supply project are outlined below:

5.1 General Considerations for Impact Assessment

The assessment of impacts is an iterative process that considers several key questions:

- Identification – how can the Project interfere with the environment and people, considering both the specific project-related activities that will be carried out, and the existing baseline conditions;
- Prediction – what will happen to the environment and people as a consequence of the potential impacts associated to the Project?
- Evaluation – does this impact matter? How important or significant is it? If it is not significant it is not considered further for mitigation.
- Mitigation – if it is significant can anything be done about it?

Where significant residual impacts remain further options for mitigation may be considered and impacts re-assessed until they are as low as is technically and financially feasible for the Project and would be deemed to be within acceptable levels.

5.2 Objectives

The objective of screening is identification of the adverse as well as beneficial impacts and then mitigating the effect of adverse impacts up to acceptable limits or within PEQS. Following are the objectives of screening out all significant environmental and social impacts:

- To find different alternatives and ways of carrying out the project activities which may cause adverse impacts
- To enhance the Environmental and Social benefits of project
- To avoid, minimize and remediate adverse impacts
- To ensure that residual adverse impacts are kept within acceptable limits

5.3 Impact identification

A logical and systematic approach needs to be undertaken to impact identification, in order to see that the key issues are identified and classified into impact categories for further study. It aims to take account of the important environmental/project impacts and interactions, making sure that indirect and cumulative effects, which may be potentially significant, are not inadvertently omitted. For the Project,

impact identification was carried out, as described above, during the scoping stage, based on the initial site visits and stakeholder consultation and the professional judgement of the people involved: The specific Project-related activities that will be carried out in order to build and operate the Project were reviewed and potential sources of impact on each E&S topic were identified in relation to extraction from groundwater, the following topics were considered:

Environmental

- Biodiversity and ecology
- Air quality
- Archaeology and cultural heritage
- Landscape and visual impacts
- Noise
- Geology and soil
- Water and hydrology
- Waste
- Traffic

Social

- Social conflicts over access to water because of groundwater extraction
- Water availability for current users of the Jhelum city
- Sustainability of the water supply service enterprises
- Impacts on community health and safety
- Improved water quality and quantity.

5.4 Purpose of Mitigation Measure

The basic purpose of mitigation measures is to reduce the magnitude of adverse impacts of the construction and extension of water supply on the socio-environment up to the maximum possible extent. The mitigation measures are suggested based on the following parameters:

5.4.1 What is the problem?

The proposed project is of construction and extension of water supply. In addition, to the noise and fugitive dust emissions during the development phase solid waste management and disposal issues may arise along with wastewater disposal issues. There are few minor impacts associated with the operation tube wells.

5.4.2 When problem will occur and when it should be addressed?

The impacts from the construction and extension of water supply will occur during the construction due to the civil work involved and the people residing in the project area. These issues included; noise generation, fugitive dust emissions, solid waste management, wastewater disposal, top-soil removal, Health and Safety issues and change in the geographic features of the area. These all problems should be addressed on-site where they are being generated, to avoid the residual or adverse impacts.

5.4.3 Where problem should be addressed?

The problem will be generated from site development, insalttion operation of the tube wells . So, it should be addressed on source i.e. at site within the same timeframe.

5.4.4 How the problem should be addressed?

Proper mitigations measures will be provided according to the nature of the impacts/problems. For example, against dust emissions sprinkling of water may be done on regular basis, for solid waste proper solid waste management and disposal practices may be adopted, to manage liquid waste proper treatment may be made before discharging into the receiving body.

5.5 Ways of Achieving Mitigation Measures?

Following ways will be adopted to reduce the impacts of the water supply project:

5.5.1 Changing in Planning Design

There is no endangered and threatened species present in the project area. Moreover, there is not any human settlement or infra-structure that will be dislocated or dismantled due to the proposed project development.

5.5.2 Improved Management and Monitoring Practices

The impact of anticipated impacts had been reduced significantly by adopting better management activities, as it will be carried out for betterment of the society. While environmental monitoring will be conducted on the regular basis to keep the sources of the air pollution, wastewater generation, noise and public nuisances in-check.

5.6 Impact Assessment Methodology

The impact assessment methodology for the construction and extension of water supply project is given below:

Impacts Assessment Procedure

In order to describe the significance of an impact, it is important to distinguish between two concepts, sensitivity and magnitude. The impact sensitivity and magnitude are described with reference to, legal requirements, accepted scientific standards or accepted impact assessment practice, and/or social acceptability.

Sensitivity

Sensitivity is generally site specific (With respect to environmental and social receptors) and criteria are developed from gathered baseline information. The sensitivity of a receptor is determined based on review of the population (proximity/numbers/vulnerability), presence of biological features of the site or the surrounding area, soil type, agricultural suitability, geology and geomorphology, existing air quality, presence of any architectural and historic heritage, landscape, etc.

Sensitivity Categorization

Sensitivity can be categorized as high, medium, low, and negligible to the valuation of receptor sensitivity as provided in **Table 5-1**.

Table 5-1: Table Environmental Impact Check List

Environment Component	Environmental Issues	Environmental Component	Environmental Issues
Water	Water Availability Water Quality Erosion Sedimentation Floods River Bed Morphology	Economic	Income Employment Land Value Resettlements
Climate	Climate Change Micro-Climate	Cultural	Lifestyle Historical/Archaeological Sites
Atmosphere	Dust Noise Air Quality	Fauna	Wildlife Fish Bird Reptiles
Social	Population, Demography Land Ownership Social Cohesion Social Attitude Gender and Age Health Safety	Flora	Forests/Trees Other Terrestrial Vegetation Aquatic Vegetation

Magnitude

The magnitude of the impacts associated with the construction and extension of water supply unit include the type of impact project commencement will cause to its immediate environment and social structure. It could be direct, indirect and cumulative.

Immediacy

Immediacy of the impact focus on the following parameters:

- Temporal Extent (during construction and operation)
- Spatial Extent (local or widespread)

In order to make this ESIA report as meaningful and useful as possible, an attempt has been made to describe each impact in the following terms: Positive impacts refer to beneficial effects and Negative impacts refer to harmful effects on human beings, nature or economy, etc. In addition magnitude of impacts is identified according to categories outlined in **Table 5-2**.

Table 5-2: Parameters and Examples of Criteria used to Determine Magnitude of Impact

Parameter	Major	Moderate	Minor	Negligible
Duration of Impact	Long term (more than 35yrs)	Lifespan of the project Medium term (15 Yrs.)	Less than project lifespan	Temporary with no detectable impact
Spatial extent of the impact	Widespread far beyond project component site boundaries (e.g. powerhouse site, dam site, borrow pit area, etc. as applicable) boundary	Beyond immediate project components site boundaries local area	With project components site boundary	Specific location within project component site boundaries with no detectable impact
				[86]

Parameter	Major	Moderate	Minor	Negligible
	regional/national/ international			
Reversibility of impacts	Impact is effectively permanent, requiring considerable intervention to return to baseline	Baseline requires a year or so with some interventions to return to baseline	Baseline returns naturally or with limited intervention within a few months	Baseline remains constant
Legal Standard and established professional criteria	Breaches national limits and or international guidelines	Compiles with national standards limit but breaches international lender guidelines in one or more parameters	Meets minimum national standard limits or international guidelines	N/A
Likelihood of impacts occurring	Occurs under typical operating/construction conditions	Occurs under worst case) negative impact) or best case (Positive impact)operating conditions	Occurs under abnormal / exceptional / emergency conditions	Unlikely to occur

Impact	Criteria
No Impact	When the proposed activity will have no impact
Critical Risk	When the impact is of high intensity with high spread and high duration or of high intensity with medium spread and medium duration
Significance Risk	When the impact is of moderate intensity with high spread and high duration or of high intensity with low/ moderate spread and low duration
Medium Risk	When the impact is of low intensity but with moderate spread and moderate duration or of moderate intensity
Low Risk	When the impact is of low intensity, low spread and low duration
Adverse	When the impact is of large intensity, spread easily and long-term
Beneficial	When the impacts are positive and improve the environmental conditions

5.7 Pre-Construction Phase Impacts

Screening of potential impacts during the pre-construction phase is provided in **Table 5-3**.

Table 5-3: Pre-Construction Phase Impacts

Impacts		Consequences	Risk Level	Residual Impact
Permits, NOCs, Clearances		Moderate	Medium	Low
Lack of E&S Capacity with MC and Contractors		Major	Significant	Low
Planning for Traffic Management		Major	Medium	Low
Location of Worker Camps		Major	Medium	Low
Community Awareness Program		Overall Positive		
ESMMP Implementation Training		Overall Positive		

-  Critical Risk Level
-  Significant Risk Level
-  Medium Risk Level
-  Low Risk Level

5.8 Construction Phase Impacts

Screening of potential impacts during the construction phase of the project are provided in **Table 5-4**.

Table 5-4: Construction Phase Impacts

Environmental Sensitivities	Intensity of Impact						Impact Nature		Impact Significance				
	Low Intensity	Moderate Intensity	High Intensity	Local	Moderate	Regional	Beneficial	Adverse	Insignificant	No Impact	Short Term	Moderate	Long Term
Physical Parameters													
Air Quality		✓		✓									
Noise		✓			✓								
Water Quality		✓			✓								
Biological Parameters													
Land Environment													
Flora													
Fauna													
Physical Parameters													
Local Economy	✓												
Social Impacts	✓												
Health & Safety	✓												

5.9 Operational Phase Impacts

Screening of potential impacts during the operational phase of the project are provided in **Table 5-5**.

Table 5-5: Operational Phase Impacts

Environmental Sensitivities	Intensity of Impact						Impact Nature		Impact Significance				
	Low	Moderate	High	Local	Moderate	Regional	Beneficial	Adverse	Insignificant	No Impact	Short Term	Moderate	Long Term
Physical Parameters													
Seepage /water spill			✓										
ground water quality			✓										
Soil degradation			✓										

5.10 Impacts due to Project Location

The subject project is to construct and extend water supply system in Jhelum city. The project execute by collaboration of MC Jhelum & LG & CD Department. Water supply issues in Jhelum city due to area expansion and increase of population day by day and also due to choked existing bores. on the basis of socio-economic survey and consultations with public and concerned departments like public health engineering Jhelum.

5.11 Impacts due to Project Design

Design of the proposed project can have impact on the environment if it is not prepared accordingly. It is necessary to consider a sustainable project approach. Sustainability is an important issue to consider in design, not only due to environmental concerns but also due to economic and social matters, promoting architectural quality and economic advantages.

Mitigation Measures

- The design process should be carried out in recognition of identified hazards and risks assessment. Accepted design solutions should focus on maximum possible opportunity for risks reduction.
- Carry out engineering surveys including environmental and social surveys depending on the level of complexity and potential hazards of the planned facilities in the area of construction.
- Integrate within the existing environmental infrastructure at site to facilitate sharing of services and amenities (e.g. power, water, solid refuse collection and roads), safety arrangements and waste management systems among others.
- Minimize risks to health and impacts to external environment. Suitable anti-pollution facilities (solid waste containment and organized removals, waste water purification) should be part of the design.

5.12 Positive/Beneficial Impacts

5.12.1 Construction Phase

Creation of employment opportunities

During the process of excavation, laying of pipes and back filling, in addition to the skilled personnel unskilled staff may be required. However, this will only be for a few days for a number of locals who will be involved. As a measure of enhancement, the unskilled personnel should be sourced locally.

5.12.2 Operation Phase

Impacts to Water Supply

The proposed project will result in increase in water supply and improvement of water quality in the project area. This will consequently, minimize exposure to unsafe water and reduce attendant health risks.

Significance of Impact

Improvement in water supply and water quality is considered positive impact of high significance. Implementation of the proposed project will enable the local community to access clean and improved water supply.

Time and Resource Management

Availing a reliable water supply will save them the time used in search for water from other alternative sources. This time can be used to engage in other economic activities.

Improved Health Standards

The lack of adequate safe water supply and low economic status usually increases facilitates water related diseases and reduces hygiene levels because one has to use the little available sparingly. Availability of clean, portable and reliable water supply will improve hygiene levels and reduce cases of water-borne diseases.

5.13 Negative/Adverse Impacts

Even though the project has many positive impacts that will lead to social economic development in project area, it also will come with negative impacts that need to be mitigated during the construction, operation and decommissioning phases. The categorization of impacts has been based on the severity of the potential impact using predefined impact rating criteria as minor, moderate or major according to the definitions below:

Minor impact – an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.

Moderate impact – an impact that will be within accepted limits and standards. They may vary from a threshold below which the impact is minor up to a level that might be just short of breaching an established regulatory limit.

Major impact – is where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. Extent: within limited area (<200m from site), local (up to 10 km) or wide (regional or global > 10 kms.); Duration: temporary (1 year), short term (1–5 years), medium term (5–10 years) long term (> 10–50 years) or permanent.

The environmental impacts resulting from implementation of civil works are expected to be minor and short-term since the improvement works are principally for the laying of buried pipelines and works at existing above ground structures.

5.13.1 Impact on Air Quality

The impact on air quality is expected within the area of the working place. The impact on air quality is expected as a result of construction works which will generate dust with motorized equipment also generating gases. The processes which will generate pollutants emission are: transport of material, movement of machinery and vehicles on site and excavation works. It is not expected that significant impact will occur on local residents or that emissions will exceed regulatory permissible ground-level concentrations. All air emission impacts will be of temporary nature, location specific and reversible. The impact on air quality is considered to be insignificant if appropriate mitigation measures are implemented such as dust suppression techniques, regular maintenance of vehicles, use of high-quality

fuel, etc. Further, the project will be implemented through the significant use of manual labour and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery. Trenches will be about 1metre in depth and therefore the amount of spoil material will be minimal with the backfilling using the same spoil material undertaken within 3-5 days of excavating. Sources of air pollutants from the construction works will include traffic in and out of the site emitting and earth works at site during the excavation of trenches.

5.13.2 Significance of Impact

The impact on air quality is regarded as low even without mitigation and limited within the footprint due to the minimal use of motorized equipment with respect to gaseous emissions and particulate matter with respect to dust emissions. The project will be implemented through the use of manual labour and mostly through manual equipment for digging the trenches. The difficulties in isolating air pollution originating from construction works and air pollution from the surrounding sources are expected, which will have impact on monitoring programme.

5.13.3 Impact on Soil and Geology

The installation of tube wells of trenches to lay the transmission and distribution pipeline are not anticipated to significantly impact on soil and geology of the project site other than disturbances to soil which could subsequently resulting in erosion and soil contamination by oil leaks from excavation and construction equipment. The works on construction including removal of topsoil and digging, as well as presence of machinery and workers at site will have minor negative impact on soil quality. The identified impacts are the following: Mechanical impact on soil during trench excavation; Stimulation of water and wind erosion; Soil pollution by spilling or discharge of oil and oil derivatives, motor oil, and similar wastes originating from machinery and vehicles on site; Soil pollution due to uncontrolled deposition of solid waste (spoil material) on the land; Soil pollution due to uncontrolled discharge from on-site toilets for workers on the land; In the areas where steep slopes are to be crossed, construction can have potential to cause soil erosion and sediment run-off. Soils in the area are sandy and not clay which are known to be particularly prone to erosion. Reinstating the land is standard practice and will be carried out above a pipeline once it is buried in the ground. The objectives of restoration are twofold: In the shorter term, to reinstate the land contours, drainage patterns, stabilize the soils by installing permanent erosion control and redistribute the topsoil to allow vegetation to grow; and In the longer term, to establish sufficient vegetation cover to reinstate the local plant species and ecology. The delay in reinstatement can cause deterioration in topsoil quality, dissatisfaction by land owners and can increase the cost of later reinstatement. Where required, the seed of species remaining in the preserved topsoil will be supplemented with equivalent materials (seeds, bulbs, and plants) and/or by the re-planting of species removed from project area before construction. During construction, the correct preservation of topsoil to maintain fertility will be carried out. The topsoil will be carefully stripped and stockpiled at all sites. Reinstating activities will take place immediately after pipe is buried in order to preserve quality of topsoil removed. With implementation of these measures, the residual impacts are not considered significant.

5.13.4 Significance of Impact

The impact on soil and geology is regarded as low even without mitigation and limited within the project footprint. The depth of the trenches will be shallow (1-metre-deep and 2 metres wide) and the excavated soil (spoil) will be used as backfill thereby reducing potential run off associated with spoil wastes. The use of motorized equipment likely to lead to soil contamination from oil leaks is also expected to be minimal as a result of little or no use of motorized equipment during construction.

5.13.5 Noise and Vibration Emission Impacts

During the construction phase of the project it is expected that elevated levels of noise will be produced in the construction area. Pipeline construction would progress along the route and, as a result, all noise impacts would be temporary. During excavation activities (trenching), noise sources will include, vehicles used to transportation of materials and equipment to the site. The construction and more specifically excavation of the trenches for the pipelines will be through the use of hand-held equipment (manual labor) with very limited use of mechanized machinery which would be sources of noise and vibration. This impact is therefore expected to be low in nature and short term experienced only in cases where motorized equipment is used. The works will mainly be carried out during the daylight working hours with no night working expected. Mitigation measures will prescribe daylight working hours in the most affected zones.

5.13.6 Impact Significance

The significance of this impact will be low with mitigation measures in place as described in the mitigation measures section. In undertaking the construction activities described above, the Contractor will comply with the following national regulatory noise quality emission standards and that of WBG, whichever is stringent. Regular monitoring to determine compliance will be done by the Supervision Consultant and corrective/ mitigation measures applied where necessary.

5.13.7 Solid Waste Generation

- Solid wastes will mainly emanate from the construction activities and will include among others:
- Excavated soil
- Cement storage bags and other packets from materials used during construction.
- Spillage of oil and grease from machines used in excavation, repair and maintenance and transportation activities may also encompass solid wastes.

The occurrence of these wastes is expected to be minimal because of the expected use of manual equipment and labor which would reduce wastes associated with oil spills, repair and maintenance. The soil excavated will be used as backfill and thereby reducing the generation of spoil material and related waste pollution concern. There will be limited hazardous wastes generated from this project including the cement bags, grease and oil. All wastes including will be disposed in an approved EPD waste disposal site. The contractor will develop a Waste Management Plan (WMP) to guide the disposal of all types of wastes emanating from the project

5.13.8 Impact Significance

The impact significance is expected to be low in nature as a result of the low quantities of solid wastes that will be generated during construction and use of excavated soil and backfill material.

5.13.9 Visual Impacts

Visual related impacts mainly include open trenches excavated to lay the pipelines which could be an eye-sore and a health hazard. The pipelines will be 2 metres wide and 1 metre deep. The trenches are therefore not deep and wide depressions which would scar the earth surface and lead to significant visual impacts. This impact is therefore not considered to be significant and will be experienced for a short period of time because of the immediate backfilling of the trenches by the excavated soil/spoil.

The laying of a pipeline is expected to last for a period of 3-5 days at the most in an area including excavation and laying of pipelines. Further, the contractor is required to only excavate areas where there are already existing pipelines procured and ready to be laid. This will minimise the problem of open trenches.

5.13.10 Impact Significance

The impact significance is expected to be low in nature, short term and reversible if the trenches are backfilled immediately and excess spoil material is disposed of as soon as possible.

5.13.11 Impacts on Surface Water

The excavation activities (trenching) and associated run-off, oil leaks and proximity to surface water bodies may lead to contamination of surface water bodies. In the project area and pipeline routes, the only surface water body is a small lagga (seasonal). This is actually a water body that has been created through increased tide from the Indian Ocean which leads to a backflow when tidal currents are experienced and recede when the tide is low.

5.13.12 Impacts to Occupational Health and Safety

Construction activities including excavations, backfilling involve inherent occupation health risks related to operation of equipment and machineries. In the absence of sufficient management of Health and Safety (H&S) issues, the workforce may suffer injury or death. In this project, the use of manual labour is envisaged and will account for over 90% of the construction activities. This is because the project area is peri-urban and congested with little room to employ mechanized equipment.

5.13.13 Impact Significance

Occupational health and safety impacts during construction is considered to be of moderate in significance due to the expected use of non-mechanized equipment and machinery. The construction activities will use hand held tools in digging the trenches with very limited use of excavators. Experienced and trained personnel will be engaged in operating equipment.

5.13.14 Impacts on Community Health and Safety

No specific serious adverse impacts on community health and safety are expected as a result of construction and operation of the Jhelum Water Supply System. There is potential hazard risk from open trenches in the vicinity of populated areas during the construction phase that should be mitigated by appropriate warnings and fencing. Health impacts associated with air and dust emissions on the community is also expected to be very insignificant, short term and localized. The contractor will prepare an Occupational Health and Safety Plan for minimizing occupational and community health and safety impacts.

5.13.15 Impact Significance

The health and safety impacts during construction is considered to be of moderate in significance due to the expected use of non-mechanized equipment and machinery.

5.13.16 Impacts on Local Traffic

The construction activities will occur in certain sections in densely populated areas and along the existing Right of Way (ROW) where there is motorised and non-motorised traffic especially in the residential areas due to blockage of the road could lead to traffic as well as potential

risk for accidents especially where construction is on-going with little room for pedestrian access. The construction method will mainly be through manual equipment which will reduce the potential for traffic blockages that would be caused when using motorised equipment like excavators. The contractor will prepare a detailed traffic management plan (TMP) which will elaborate how traffic will be managed during construction, including need for diversions (if necessary).

5.13.17 Public Health Diseases

There is a potential induced impact during construction causing increased incidence of HIV/AIDS and communicable diseases due to new entrants in communities for employment. There is a potential induced impact when increased income in the communities, from construction worker salaries, leads to domestic abuse in the home. Both these impacts can be mitigated by the HIV/AIDS and sensitivities awareness programs set out in the ESIA.

5.13.18 Gender Based Violence

Gender-Based Violence (GBV) is an umbrella term for any harmful act that is perpetrated against a person's will and that is based on socially ascribed (i.e. gender) differences between males and females. It includes acts that inflict physical, sexual or mental harm or suffering, threats of such acts, coercion, and other deprivations of liberty. These acts can occur in public or in private. The construction of the highway is likely to exacerbate any of the various forms of GBV described below and could be perpetrated between workers themselves, between bosses and workers and between workers and the community members. The term GBV is used to underscore systemic inequality between males and females (which exists in every society in the world) and acts as a unifying and foundational characteristic of most forms of violence perpetrated against women and girls. The nine core types of GBV are:

- Rape
- Sexual Assault
- Sexual Harassment
- Sexual Exploitation and Abuse
- Sexual favours
- Physical Assault
- Forced Marriage
- Denial of Resources, Opportunities or Services
- Psychological / Emotional Abuse

The Contractor will ensure the relevant Code of Conduct already included as part of the bidding documents is signed at the corporate and individual workers levels in regard to observing GBV aspects of the project.

5.13.19 Child Protection

Violence Against Children (VAC) is defined as physical, sexual, emotional and/or psychological harm, neglect or negligent treatment of minor children (i.e. under the age of 18), including exposure to such harm that results in actual or potential harm to the child's health, survival, development or dignity in the context of a relationship of responsibility, trust or power. This includes using children for profit, labor, sexual gratification, or some other personal or financial advantage.

5.14 Operation Impacts

5.14.1 Consumption of Contaminated Water

Consumption of (untreated) contaminated domestic water could lead to health impacts on the consumers of the water from the pipeline. The maintenance of the pipelines requires excavations and unblocking the pipe which could lead to contamination of the water during the process. The water will emanate from an already existing source.

5.14.2 Impact Significance

The impact is considered low in significance due to the expected treatment of water **Figure 5-1**.

5.14.3 Solid Waste Generation

Solid wastes will mainly emanate from the operation activities related to maintenance operations and will include among others.

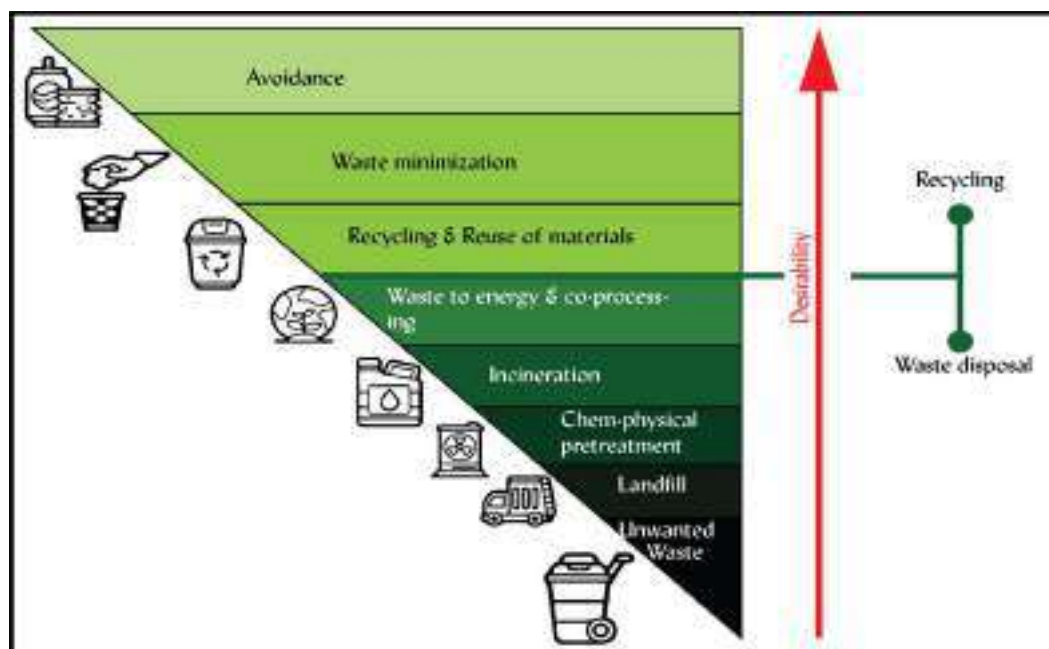


Figure 5-1: Waste disposal Hierarchy

5.14.4 Mitigation of impacts related to rehabilitation of construction of pipeline.

Table 5-6: Mitigation of Impacts related to Rehabilitation of Construction of Pipelines

Construction phase	
Impact type	Description of mitigation measures
Air pollution	Maintain vehicle and equipment according to manufacturers' specifications. Use standard fuel and lubricants. Avoid unnecessary car idling and switch off engines of vehicles and machinery while not in use. Sprinkle water to work areas to reduce and prevent dust during dry weather periods. Clean access routes in surrounding area on a daily basis to prevent dust. Collect and hold cleaning wastes (e.g. rags) in appropriate containers. Workers who may unavoidably have to work in dusty workplaces should be provided with nose and ear masks to protect them from excessive dust.
Noise pollution	Minimise noise according to Punjab EPA, and World Bank guidelines. Control noise and vibration on site. Work programmes should be provided to local communities (e.g. through the local radio (FM) stations) and strictly followed. Maintain vehicle and equipment according to manufacturers' specifications. Install adequate noise prevention devices, e.g. mufflers on noise generating sources. Switch off engines of vehicles and machinery while not in use. Workers who may unavoidably have to work with noise generating equipment, e.g. earthmoving equipment should be provided with ear plugs and advised to put them on.
Water and soil pollution	No solid waste, fuels or oils should be discharged into surface water bodies. The contractor following the guidelines for management of materials and wastes during construction and operation should take care of preventing the project from damaging the surface water bodies. Hold and store cleaning wastes in appropriate containers to be disposed of at approved sites. Vehicles should preferably be parked on paved platforms. Fuel storages should not leak, and should be periodically monitored, and repaired or replaced when necessary. Maintain fuel and clean vehicles and equipment at workshops/sites with adequate leakage prevention (e.g. impermeable surface, settlers and oil separator).
Soil erosion and contamination	Remove and store topsoil in separate piles and reinstate after refilling of trenches, to enable natural re-vegetation. The Contractor(s) should present procedures for, and ensure implementation of measures to protect soils from any accidental or structural contamination. These include: Storing all hazardous, sanitary and cleaning wastes in facilities approved by Punjab EPA. Installing leak-proof fuel storages on concrete platform with gutters and grease separators, which are monitored periodically and repaired or replaced when required. Strict enforcement and monitoring standard procedures for storing and handling hazardous wastes and raw material (e.g. fuel or chemicals). Placing strong drums for oil storage on impermeable floors in the stores. Parking vehicles on paved platforms whenever possible. Ensuring that sites for cleaning, fuelling and maintaining equipment and vehicles should be able to prevent leakage (e.g. paved or with settlers). Isolating contaminated soil and treating/disposing it off in a way that will depend on the contaminant type.
Solid waste generation	The Contractor should prepare a Solid Waste Management Plan, which should contain: An inventory of the types and quantities of waste to be produced. The most appropriate waste management approach for each type of waste including details on (temporary) storage, transport and final destination of the waste. An assessment of any opportunities for reducing solid waste generation, in particular of hazardous and undesirable (persistent and non-reusable) types of wastes. The Contractor should maintain records of types, quantities, origin, (temporary) storage, transport and elimination/reuse of solid waste, and make these available to the works supervisor upon his request, as proof of proper waste management practices. Any waste including excess soil should be disposed of at gazetted sites. The solid waste shall not accumulate on site, to cause odour, fly, or rodent problems. species similar

Impact type	Construction phase
	Description of mitigation measures
	to those destroyed in order to re-establish the natural local ecology. Excavated soils should be reused as much as possible as filling material and should be contained after excavation. Provisional material storage on site should be designed and undertaken in such a way as to ensure that soils and underground water are not polluted. Use licensed recycling companies to externally recycle, recover or dispose of waste.
Public Safety	Ensure that work sites (especially excavation works), have proper protection with clear marking of safety borders and signals and fence off all dangerous areas. Inform neighbours about the construction programme in advance and adhere to it. Confine access to restricted work sites (including those with operation of mechanical and electric equipment) to persons with permits. Implement appropriate traffic plans with the help of local police when (partial) closure of roads is required.
Public health problems Including increased vehicular traffic	Fill up all depressions to avoid pools of stagnant water may form in pits, holes and excavated ditches which can create suitable habitats for insect disease vectors such as mosquitoes which cause malaria. Inform local communities about the construction programme in advance. In case access roads have to be closed, inform local communities and road users in advance. Use reflective signature to direct traffic to designated areas. Use flag men/women to give directions to traffic. Sensitise drivers to observe speed limits
Raw material use	Consider environmental performance of suppliers of raw material in the selection process. Explore ways of reducing raw material use. Special emphasis should be made on raw materials that may be reused and/or recycled/recovered
Occupational health and safety	Ensure that work sites (especially excavation works), especially in the night have proper protection with clear marking of safety borders and signals and fence off all dangerous areas. Carry out training of staff in EH&S monitoring and evaluation. The contractor should recruit H&S person during construction. Inform neighbours about the construction programme in advance and adhere to it. Confine access to restricted work sites (including those with operation mechanical and electric equipment) to persons with permits.
Disturbance and interruption of commercial and social activities	Inform local communities about the construction programme in advance and adhere to it. In case access roads have to be closed, inform local communities in advance. Clean and maintain access roads in the neighbourhood of earth and sand on a daily basis. Provide temporary access ways with the approval of local authorities where access roads are closed. Carry out work under mild weather; avoid strong rains or winds. Reduce obstruction of access to and use and occupation of roads, footpaths and bridges. Protect any items and/or sites of archaeological or cultural value discovered during works with the aid of the appropriate authorities. Where livelihoods and property are affected, valuation and prompt compensation be undertaken for the PAPs
Disruption of social order and prevention of HIV/AIDS and othersexually transmitted diseases	Sensitise all workers to ensure awareness of and sensitivity to the local cultures, traditions and lifestyles, Implement the HIV/AIDS impact mitigation plan that will involve providing a comprehensive range of services including the identification of possible HIV/AIDS cases, testing with pre- and post-counselling, the treatment of associated infections, referral of appropriate cases, education to promote better quality of life and promotion of precautions, provision of condoms and the application of HIV/AIDS occupational exposure policies.
Visual amenities	Do not pile excavated soil to form high stockpiles or long durations, Clean up the site upon completion of the work.

5.14.5 Mitigation of impacts related to operation of pipeline

Table 5-7: Mitigation of Impacts related to Operation of Pipeline

Project component: Pipeline Operation phase	
Impact type	Description of mitigation measures
Water and soil pollution	No solid waste, fuels or oils should be discharged into surface water bodies. The contractor following the guidelines for management of materials and wastes during construction and operation should take care of preventing the project from damaging the surface water bodies. Hold and store cleaning wastes in appropriate containers to be disposed of at approved sites. Vehicles should preferably be parked on paved platforms. Fuel storages should not leak, and should be periodically monitored, and repaired or replaced when necessary. Maintain fuel and clean vehicles and equipment at workshops/sites with adequate leakage prevention (e.g. impermeable surface, settlers and oil separator).
Soil erosion and contamination	Remove and store topsoil in separate piles and reinstate after refilling of trenches, to enable natural re-vegetation. The Contractor(s) should present procedures for, and ensure implementation of measures to protect soils from any accidental or structural contamination. These include: Storing all hazardous, sanitary and cleaning wastes in facilities approved by Punjab EPA. Installing leak-proof fuel storages on concrete platform with gutters and grease separators, which are monitored periodically and repaired or replaced when required. Strict enforcement and monitoring standard procedures for storing and handling hazardous wastes and raw material (e.g. fuel or chemicals). Placing strong drums for oil storage on impermeable floors in the stores. Parking vehicles on paved platforms whenever possible. Ensuring that sites for cleaning, fuelling and maintaining equipment and vehicles should be able to prevent leakage (e.g. paved or with settlers). Isolating contaminated soil and treating/disposing it off in a way that will depend on the contaminant type.
Solid waste generation	The Contractor should prepare a Solid Waste Management Plan, which should contain: An inventory of the types and quantities of waste to be produced. The most appropriate waste management approach for each type of waste including details on (temporary) storage, transport and final destination of the waste. An assessment of any opportunities for reducing solid waste generation, in particular of hazardous and undesirable (persistent and non-reusable) types of wastes. The Contractor should maintain records of types, quantities, origin, (temporary) storage, transport and elimination/reuse of solid waste, and make these available to the works supervisor upon his request, as proof of proper waste management practices. Any waste including excess soil should be disposed of at gazetted sites. The solid waste shall not accumulate on site, to cause odour, fly, or rodent problems. Excavated soils should be reused as much as possible as filling material and should be contained after excavation. Provisional material storage on site should be designed and undertaken in such a way as to ensure that soils and underground water are not polluted. Use licensed recycling companies to externally recycle, recover or dispose of waste.
Public Safety	Ensure that work sites (especially excavation works), have proper protection with clear marking of safety borders and signals and fence off all dangerous areas. Inform neighbours about the construction programme in advance and adhere to it. Confine access to restricted work sites (including those with operation of mechanical and electric equipment) to persons with permits. Implement appropriate traffic plans with the help of local police when (partial) closure of roads is required.
Occupational health and safety	Ensure that work sites (especially excavation works), especially in the night have proper protection with clear marking of safety borders and signals and fence off all dangerous areas. Carry out training of staff in EH&S monitoring and evaluation. The contractor should recruit H&S person during construction. Inform neighbours about the construction programme in advance and adhere to it. Confine access to

Impact type	Project component: Pipeline
	Operation phase
Description of mitigation measures	
	restricted work sites (including those with operation mechanical and electric equipment) to persons with permits.
Disturbance and interruption of commercial and social activities	Inform local communities about the construction programme in advance and adhere to it. In case access roads have to be closed, inform local communities in advance. Clean and maintain access roads in the neighbourhood of earth and sand on a daily basis.
	Provide temporary access ways with the approval of local authorities where access roads are closed. Carry out work under mild weather; avoid strong rains or winds. Reduce obstruction of access to and use and occupation of roads, footpaths and bridges. Protect any items and/or sites of archaeological or cultural value discovered during works with the aid of the appropriate authorities.
Disruption of social order and prevention of HIV/AIDS and other sexually transmitted diseases	Sensitise all workers to ensure awareness of and sensitivity to the local cultures, traditions and lifestyles, Implement the HIV/AIDS impact mitigation plan that will involve providing a comprehensive range of services including the identification of possible HIV/AIDS cases, testing with pre- and post-counselling, the treatment of associated infections, referral of appropriate cases, education to promote better quality of life and promotion of precautions, provision of condoms and the application of HIV/AIDS occupational exposure policies.
Disturbance to ground water quality	Before start the project activity it is necessary to ensure either the proposed location for installataion of new tube well, the aquifer life and its capacity and its water quality by water testing from Punjab EPA and PNAC certified laboratory. Make planning and startrgies for ground water aquifer recharge systems.

5.15 Environmental Enhancement Measures

The proposed project will be installed with all precautionary measures to enhance and safe the environment. Following necessary measures will be adopted during construction and operation:

- Sprinkling of water will be done on dusty road and tracks.
- PPEs will be provided during construction activity.
- Constructional waste and domestic solid waste will be disposed-off or utilized properly.
- Local people will be informed in advance when work is about to start in an area.
- Machinery will never be left unattended.
- Efforts should also be made to discuss traffic conditions so that regular traffic is not disturbed. Transporters engaged for the project would be forced to adhere to the load specifications of the access road. No overloading would be allowed in any case.
- Safety signs and boards will be placed during construction.
- Air pollution controlling devices will be installed within the project during operation.
- Machinery will be kept maintained.
- Waste water will be treated through waste septic tank.
- Proper SOPs will be followed with proper schedule along with the HSE conditions.
- Area will be restored with native plants. A proper tree plantation plan will be formulated to save the environment.

- Solid waste will be handed over to local sanitary workers.
- Noise will be controlled by adopting proper measures.
- PPEs will be provided to workers during working.
- Firefighting equipment's and system will be installed.
- Safety signs will be placed at all locations where required.
- Hygienic conditions will be ensured and proper quality will be maintained by quality control testing.
- First aid facilities will be made available.

6 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

6.1 Objective

The purpose of Environmental and Social Management and Monitoring Plan (ESMMP) for improving water system in Jhelum city is to ensure that all necessary identified measures have been adopted in order to protect the environment and social situations and to comply with country environmental legislation and applicable World Bank Core Principles. After the preparation of ESMF, PMDFC ESM Wing outlined site-specific ESMMP for the Contractors and executing agency. Environmental and social checklist was prepared by MMP and PMDFC ESM Wing with the help of the field teams and was used to assess the potential impacts of Sub-project on the basis of its scale/size, nature and significant negative impacts.

6.2 Institutional Arrangements

6.2.1 MC Jhelum

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

6.2.2 PMDFC ESM Wing

MC will be responsible for implementation of ESIA 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.

6.2.3 The Contractor

The Contractor will be responsible for on-field implementation of the ESIA 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 ESIA provisions keeping in view his contract with the MC. The Contractor will train his crews in all aspects for implementation of the ESIA.

The ESIA 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. Contractor will also be responsible for implementation of social and environmental guidelines for Contractors prepared by PMDFC ESM Wing during execution of work. Contractor will engage environmental and social officers to fulfill the above requirements.

6.3 Mitigation Plan

The mitigation plan, being a key component of ESIA includes measures to mitigate potential negative impacts and enhance its positive impacts during construction phase of the Sub-project. The Contractor is responsible for implementation of ESIA with the co-operation of executing and implementing agencies and local community of the Sub-project.

6.4 Monitoring Plan

Monitoring Plan is also associated with mitigation plan during the different stages of the Sub-project. It ensures that mitigation measures are being effectively implemented. The monitoring of the Sub-project is very imperative for implementation of the ESIA. The ESFPs will carry out the monitoring at the field level on a continuous basis. The DPO ESSs will perform periodic monitoring during their site visits.

6.4.1 Monitoring Mechanism

Safeguards implementation monitoring is an essential tool for testing whether the adopted environmental and social management measures are meeting their stated objectives. Two complementary methodology approaches are being applied to monitor the proposed actions under the ESIA:

- **Compliance monitoring;** which checks whether the actions proposed by the ESMMP have been carried out by visual observation, photographic documentation and the use of checklists prepared for the ESMMP;
- **Effects monitoring;** which records the consequences of program activities on the biophysical and social environment; as applicable, these effects are repeatedly measured by applying selected indicators.

The plan also defines the monitoring mechanism and identifies a set of verifiable monitoring parameters to ensure that all proposed mitigation measures laid down in the ESMMP are completely and effectively implemented.

Monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be performed at two levels. At the PMDFC, the environmental team will do ESIA compliance monitoring to ensure that the mitigation plans are being effectively implemented. At Contractor's level, the Environmental monitoring checklist will be filled on weekly basis by their Environmental Manager.

6.5 Reports

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 6-1**.

Table 6-1: Reports

Distribution of Periodic Reports Report	Prepared by	Reviewed by	Distribution
Weekly	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 ESIA in Bidding/Contract Documents

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.

6.7 Monitoring of Environmental and Social Non-Compliance

Any environmental and social non-compliance during first half of the reporting month will be considered as a "minor deviation". In case the non-compliance attains the status of "non-mitigation" during the second half of the reporting month, it would be considered a "moderate non-compliance". In case non-compliance continues in the second month, it will fall in the category of "undone" and as such would be considered as a major non-compliance and eventually leading to serious punitive action including the suspension of Contractor's payment or any other penalty as may be considered appropriate with the recommendation of the DPO ESSs/Engineer. No payment will be made to Contractor against non-compliance and no arrears will be paid thereof.

6.8 Environmental and Social Management and Monitoring Plan

The impacts, mitigation measures, monitoring indicators, frequency and responsibility has been discussed in Environmental and Social Management and Monitoring Plan (ESMMP) **Table 6-2**.

Table 6-2: Environmental & Social Management & Monitoring Plan
Sub-project: Improvement and Extension of Water Supply System in Jhelum City

Proposed Sub-project activities	Potential Env./Social Impacts	Magnitude of Impact	Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency
Construction Phase						
Dismantling, Excavation (Old pipelines)	a) Environmental Issues: - Dust which may affect visibility - Noise from machineries/ equipment - Contamination of nearby surface water source - Vibration (Shock waves can be produced due to heavy machinery working) - Construction waste may be generated due these activities - Safety hazards to labor and nearby resident population. - Worse House Keeping b) Social Issues: - Solid waste may cause disturbance in mobility - Temporary blockage of road may restrict mobility - Conflict with public and public complaints - Economic losses - Livelihood's loss. - Temporary loss of structures and private property - Economic loss of permanent and mobile vendors due to obstruction of passage - Presence of Physical Cultural Resources (PCRs) of Archeological importance	Medium	- Solid waste will be properly disposed off at designated place of MC Jhelum. - Updated and tuned machinery will be used to control noise. - Avoiding construction activities during nights. - Removal of excess matter/ debris from the site immediately. - Provide PPEs (See Annex-VI). - Provide appropriate signage near the construction activities to sensitize the communities and minimize accidents. - Public must be informed about project major activities, duration of scheme, time and schedule, anticipated impacts and their proposed Mitigation Measures. The contact Nos. of focal person of Grievance Redress Committee will be displayed at different locations and residents will also be informed about it. - Construction work will be scheduled in such a way that business of the shopkeepers will not be affected. Alternate road will be provided. Contractor will make sure that labor must not damage the property and	Visual/ Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction phase	- ESFPs - DPO ESSs - SPO ID/PD

Proposed Sub-project activities	Potential Env./Social Impacts	Magnitude of Impact	Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency
			structures of the communities. In case of damage compensation will be provided as per entitlements. o If there will be any PCR found during excavation; Contractor will follow guidelines (Annex-VIII) of chance find procedure.			
Construction material storage, handling and use	a) Environmental Issues: - o Ground water may also be contaminated due to the any oil spillages from machinery. - o Health risk to workers and local inhabitants. - o Poor Housekeeping b) Social Issues: - o Land acquisition for storage of construction material - o Accidents/Injuries expected if neglected - o Blockage of passage for pedestrians - o Haphazard arrangement of construction material	Medium	- o Material will be appropriately secured to ensure safe passage between the destinations during transportation. - o Loads/heaps will have appropriate cover to prevent spillage and contractor should be responsible for any clean up resulting from any failure. - o Materials will not be loaded to a higher level than the side and tail boards and shall be covered with a good quality tarpaulin; - o If land acquired for storage of machinery & materials on temporarily basis: Contractor is liable to compensate the land owner according to agreement/negotiations/voluntarily - o Contractor will lay/utilize construction materials as per work requirement from his storage site. - o Contractor will use night vision reflective signboards/ reflective tapes to cordon off the area during construction/demolition activities.	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • DPO ESSs • SPO ID/PD
Temporary disturbances in water	Social Issues:		o Timely Public Consultation	During sub-project activities	During the course of project	MCs will have alternate

Proposed Sub-project activities	Potential Env./Social Impacts	Magnitude of Impact	Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency
supply due to maintenance activities	- Water shortage will be faced by local community during laying new water lines or rehabilitation. - Water disturbance is the main issue in that areas where water consumption is from nearby filtration plants.	Medium	- Water users of that area will be informed timely about the temporary interruptions in water supply - If water supply has to discontinue for more than 24 hours then alternate arrangements of safe water supply should be made			arrangements of water supply tanks
Impacts on Women (privacy and <i>pardah</i> issues) Children (restricted movements) and overall restricted mobility	Social Issues: - Socially effected women privacy and children mobility to schools, tuitions or madrassa. - Parda issues for women's when construction activity starts.	High	- It will be ensured that the sub-projects do not have any negative impacts on women, children and vulnerable groups. - Labour will be trained not to interfere with the local community - Local community (especially women and children) will be informed before construction activities and entry of labour at site areas	Inspect during construction activities	During the course of project	Contractor
Civil work, Laying of water distribution network/Pipes	Environmental Issues - Solid wastes - Noise and vibration disturbances to residents and businesses - Road side visibility can be reduced and dusty environment leads to respiratory diseases. - Safety issues - Health problems or immediate risk may take place - Spillage of fuel and oil - Traffic jams and congestion may take place and cause inconvenience to the people where the construction of interchanges will take place. Social Issues :	Medium	- Immediately transport the accumulated construction waste to a site - Broken Pipes will be disposed of properly - removal of excess materials - Cleaning of sites upon completion of schemes. - Establish schedule - and others specific restrictions - Cordon off construction area - The Private Contractor should ensure provision of appropriate housing, water supply, and sanitation facilities to construction labor. They should also provide for adequate access to medical facilities (First Aid Boxes)	Visual/ Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction phase	- ESFPs - DPO ESSs - SPO ID/PD

Proposed Sub-project activities	Potential Env./Social Impacts	Magnitude of Impact	Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency
	- o Reduced pedestrian access to residences and businesses - o Temporary water supply interruption - o Conflicts Dissatisfaction for the project		- o The Private Contractor should ensure provision of appropriate housing, water supply, and sanitation facilities to construction labor. The PC should also provide for adequate access to medical facilities. - o Availability of safe drinking water and food for the workers. - o Traffic management plan should be prepared in advance of start of work on-site and communicated to the field staff. - o Efforts should be made to accommodate the traffic along the road/interchanges as far as practically possible. - o Provision of signboards directing the drivers about the diversion. - o Construction should start from middle of the street and later on from either right or left side - o Wooden blocks/ramps will be provided at door step of each house - o Establish work sequence and methods to alternative safe access as possible - o Establish coordination procedures for cut-off - o Minimize time for replacement operations appropriate scheduling as necessary. - o Alternate water supply line will be make sure and public will be informed about it.			
Air Quality	a) Environmental Issues:		o At the site immediately adjoining areas, water will be sprinkled every three hours	Visual/ Pictures	• Quarterly Air quality	• ESFPs • DPO ESSs

Proposed Sub-project activities	Potential Env./Social Impacts	Magnitude of Impact	Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency
	- o Ground-level ozone can lead to reductions in agricultural crop and commercial forest yields. - o reduced growth and survivability of tree seedlings - o increased plant susceptibility to disease, pests and other environmental stresses (such as harsh weather) - o b) Social Issues: - o Dust which may affect visibility - o Air Pollution Can Lead To A Wide Range Of Diseases, Including Stroke, Chronic Obstructive Pulmonary Disease, Trachea, Bronchus And Lung Cancers, Aggravated Asthma And Lower Respiratory Infections. - o Exposure to air pollution during pregnancy can increase your risk of premature birth and low birthweight	High	- o and at a higher frequency if felt necessary, at all construction sites to suppress dust emissions. - o Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions. - o Fuel-efficient and well-maintained haulage trucks shall be employed to minimize exhaust emissions - o Limitations to speeds of such vehicles as felt necessary. Transport through densely populated area should be avoided. - o Vehicles transporting soil, sand and other construction materials shall be covered with tarpaulin. - o Project traffic will maintain maximum speed limit of 20 km/hr on all unsealed roads within project area. - o A minimum distance of 300 meters will be ensured between batching plant(s) and the nearest community. - o It shall be ensured that the following measures are taken to control emissions from vehicles being used in the construction activity: - o Periodically check and conduct maintenance of the construction machinery and haul vehicles. - o Training of the technicians and operators of the construction machinery and drivers of the vehicles.		monitoring at the project site during the construction phase.	• SPO ID/PD

Proposed Sub-project activities	Potential Env./Social Impacts	Magnitude of Impact	Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency
Soil Contamination	change in the rain cycle and this is a contributing factor to global warming and loss of ecosystems	Medium	- Fuels, lubricants and chemicals will be stored in covered bounded areas, underlain with impervious lining. Appropriate arrangements, including shovels, plastic bags and absorbent materials will be available near fuel and oil storage areas. - Regular inspections will be carried out to detect leakages in construction vehicles and equipment and all vehicles will be washed in external commercial facilities	Visual/ Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction phase	- ESFPs - DPO ESSs - SPO ID/PD
Labor Camp (if established by Contractor)	- Health impacts due to absence of housing and sanitation facilities in labor camp. - Security of labor - Unhygienic conditions	Medium	- Contractor will ensure provision of appropriate housing, water supply, and sanitation facilities to construction labor. - 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. - Better accommodation will be ensured by the Contractor. - It's better to accommodate labor in Containers Camps/houses with all amenities. - Contractor will submit Campsite Management Plan and approve from DPO-ESSs before the execution of work.	Visual/ Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction phase	- ESFPs - DPO ESSs - SPO ID/PD
Vehicle Movements	- Traffic congestion - Conflicts	Medium	- Alternative routes will be provided. - Sign boards and posters will also be displayed at project site and adjacent areas	Visual/ Pictures	Daily site visit during construction phase	- ESFPs - DPO ESSs - SPO ID/PD

Proposed Sub-project activities	Potential Env./Social Impacts	Magnitude of Impact	Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency
			- as well. Inform the residents about timing, schedule and construction work duration. - o Work will be done in portions so that the alternate road may be used safely and vehicles movement will not be disturbed. - o Contractor will submit Traffic Management Plan and approve from DPO-ESSs before the execution of work.		- Fortnightly/Weekly - Once during the construction phase	
Restoration of Water Supply	Environmental Issues: - o Accidents/Injuries/Health issues expected if neglected - o Emission of dust and fumes from asphalt /Concrete - o Solid waste (left over materials) Social issues: - o Conflict with public	High	- o Immediately restoration of Water Supply lines after R&M - o Labor will be provided with PPEs - o Ensure Workers use wear appropriate clothing during asphalt laying - o Left over materials will be removed immediately - o Public will be informed about activities	Visual/Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction phase	- ESFPs - DPO ESSs - SPO ID/PD
Site Safety Issues	o Accidents	High	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 - DPO ESSs - SPO ID/PD
Public access	Problems for pedestrians. Normal mode of transport may be disturbed during Sub-project execution.		- o Alternate access route will be made sure. - o Cordon off construction zone.	Visual/Pictures	Daily site visit during	- ESFPs - DPO ESSs

Proposed Sub-project activities	Potential Env./Social Impacts	Magnitude of Impact	Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency
		Medium			- construction phase - Fortnightly/Weekly - Once during the construction phase	SPO ID/PD
Occupational Health & Safety	Injuries to workers/LTI	High	- 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. - ESMF has prepared SOPs for Environment, Health & Safety for construction workers/labor (including women labor) following the WB and IFC Environment, Health and Safety (EHS) Guidelines will be implemented. Moreover, in the current scenario of COVID-19, Go Punjab Primary and Secondary Healthcare Department has issued Health Safety SOPs for construction workers for COVID-19 and they will be used during pandemic situation. - Avoid stagnation of water and initiate drainage/clean-up of stagnant water.	Visual/Pictures	- Daily site visit during construction phase - Fortnightly/Weekly - Once during the construction phase	- ESFPs - DPO ESSs - SPO ID/PD

Proposed Sub-project activities	Potential Env./Social Impacts	Magnitude of Impact	Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency
			o Provide for the provision of appropriately stocked first-aid equipment at work sites;			
Sexual Harassment- Labor Influx- Child Labor	o Social Conflicts	Medium	- o Contractor will give behavioral training to the workforce. - o Contractor will hire local labor for un-skilled works. - o No child labor is allowed onsite below 14 years.	Visual/ Pictures/ Reported/ Complaints by public during visit	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • DPO ESSs • SPO ID/PD
CoViD-19 SOPs implementation	o Spread of Corona among the labor	Low	- o Contractor will provide face masks to the labor on daily basis to reduce Corona impact. - o Contractor will follow CoViD-19 guidelines during construction works	Visual/ Pictures	• Daily site visit during construction phase • Fortnightly/Weekly • Once during the construction phase	• ESFPs • DPO ESSs • SPO ID/PD
Operational Phase						
Seepage/Spill water	a) Environmental issues: o Increase moisture content in soil which affects the structures / foundation of	Medium	- o Ensure proper technical design to minimize, the seepage and chances of possible failure of the structure. - o Ensure proper design, construction and operation of the structure and system to	Visual/ Pictures	•	• MC Officials

Proposed Sub-project activities	Potential Env./Social Impacts	Magnitude of Impact	Mitigation Measures	Mitigation Implementation Responsibility	Monitoring Indicators	Monitoring Frequency
	buildings in nearby areas. Contaminate the water b) Social issues No significant impacts will arise		minimize seepage and appropriate implementation techniques. In case of failure of nearby building structures, foundation, monetary compensation shall be provided			
Water quality	a) Environmental Issues: - Accidents/Injuries/Health issues expected if neglected b) Social issues: - Conflict with public	Medium	- Control of sewerage water with Sucker machines to avoid Ground water contamination. Call plumbers for immediate repair. - Contact Nos. of concerned department help line will be displayed at project site and public may contact on these Nos. in case of any emergency. - Minor leakage control with tapes. Disposal of broken sewerage pipes along with sludge in environment friendly way.	Visual/Pictures	•	• MC Officials

6.9 Environmental Implementation Budget

Sub-project: Improvement and Extension of Water Supply System in Jhelum City

Table 6-3: Environmental Implementation Budget

Tentative ESIA Implementation Cost Improvement of Water Supply System in Jhelum City			
Item	Quantity	Tentative Cost/Item-Rs./-	Total Cost
A-PPEs			
Face Masks (3 PLY) - box	30	300	9000
Safety Hard Helmets	20	3,000	60000
Safety Shoes	20	3,000	60000
Hand Gloves	20	1,000	20000
Ear Plugs	20	500	10000
Reflective Safety Vest	20	1,000	20000
Safety Goggles	20	500	10000
B-Community Health and Safety			
First Aid Box Complete	1	10,000	10000
Infrared Thermometer (Benetech GM-2200 or equivalent)	1	40,000	40000
Safety Signs	5	15,000	75000
Safety Cones	10	1,000	10000
Safety Tapes	20	1,500	30000
Emergency Portable Lights	2	3,000	6000
Fire Fighting Equipment Purchase and refilling	1	10,000	10000
Pole Hanging Waste Bins	1	12,000	12000
Labor Campsite Management	Lump sum		100,000
Water Sprinkling	Lump sum		100,000
Training sessions with contractor labour force and with local communities at site on code of ethics and GRM	Lump sum		200,000
C- Environment Quality Testing			
Ambient Air Quality-during & After construction	8	85000	680,000
Noise Quality-one sample during & After construction	8	1000	8000
Water Quality-one sample during & after instllation of tube well	8	22000	176,000
Total (PKR)-A+B+C			1,646,000 PKR

7 STAKEHOLDER CONSULTATION AND CAPACITY BUILDING

7.1 Introduction

This Chapter 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 any development Sub-project. The logic behind the consultation is that a Sub-project proponent has shared with all stakeholders' relevant information on the Sub-project interventions and to get feedback and 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 with local communities and concerned government departments/ organizations to ensure that their views and concerns about Sub-project have been taken into account in the study.

7.2 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 "Feedback Study" 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 has 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

7.3 Proponents Environmental Management Team

Consultation regarding Improvement and Extension of Water Supply System in Jhelum City was done with Proponent's Environmental management Team and anticipated impacts were discussed. Concerns of locals, Environmental Practitioners & experts and Government departments were discussed and asked to consider them while construction of above-said project. Locals will be preferred for employment after Mitigations measures mentioned in EMP will be truly implemented.

7.4 The Responsible Authority

Overall responsibility for the implementation of ESMMP will be that of project proponent. He will appoint environmental manager with relevant qualification. Environmental manager will be responsible to ensure either the contractor will comply all the ESMMP conditions & HSE aspects.

7.5 Identification of Stakeholders

7.5.1 Direct Stakeholders

Direct stakeholders can be defined as those stakeholders who are likely to be directly impacted by the Sub-project and have livelihood restoration measures targeted towards them. Direct stakeholders groups are include:

- Physically and economically impacted people
- People living in communities close to the Sub-project area
- Local women's groups
- Local business owners, such as shop owners,
- Local governmental bodies related to public welfare, environmental protection and permitting for the Sub-project

7.5.2 Indirect Stakeholders

Indirect stakeholders can be defined as those persons or organisations that may, be interested in or able to influence the outcome of the Sub-project, either because they can contribute knowledge or improve Sub-project design or mitigate social and/or environmental impacts, or because they have political influence in the Sub-project that needs to be considered. All of these stakeholders are considered to be 'interest-based'.

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 (water supply). It was important to provide meaningful input for the public into the decision-making process through consultation. It was helpful to create a strong foundation for long-lasting and trustful relationships between the Sub-project and the stakeholders. Representatives of the communities, potential vulnerable groups such as women and youth has been consulted to understand their specific issues and concerns. This will enable meaningful participation. The findings and recommendations has been discussed and disclosed in an open and transparent manner with the communities in order to solicit their comments and suggestions in the studies.

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 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 through sustainable and safety manner. The digest of major issues raised by communities during meetings are given below:

The complete settlement wise list of participants and their contact numbers are provided in Annex A.

7.7 Affected and Wider Community

Social survey was conducted to consult with local community. Their concerns were noticed and discussed with proponent and their team. Majority was in favor of project their details are given in **Table 7-1**.

Table 7-1: Consultation with Stakeholders

Sr. No	Community	Person	City	Occupation	Cell No.
1.	Madni Mohalla	Masood Ahmad	Jhelum	Shopkeeper	0324-8763498
2.	Madni Mohalla	Pervaiz Iqbal		Laborer	0334-9641791
3.	Al-Miraj Colony	Imran Azhar		-	03175771219
4.	Al-Miraj Colony	Mudassar Khan		-	03325173728
5.	Al-Miraj Colony	Shahid Naeem		-	03213763558
6.	Iqbal Town/Madina Town	Raja Munawar		-	0332-5848399
7.	Iqbal Town/Madina Town	M. Mushtaq		-	0321-5325119
8.	Iqbal Town/Madina Town	M. Shehbaz		-	031-4804296
9.	Nawab Colony	M. Khadim		-	0307-5400238
10.	Nawab Colony	Sagir Irfan		-	03068167569
11.	Nawab Colony	Arshad Mehmood		-	0333-5809544
12.	Nawab Colony	Javed Akhtar		-	03015800169
13.	Muhalla Dhok	Raja Pervaiz		-	0321-5417138
14.	Makhdombabad	M. Danish		-	0321-5482947
15.	Al-Miraj Colony	Shakir Ali		-	0308-8965389
16.	Machine Mohalla 3	M Sadiq		-	0300-5416077
17.	Bilal Colony/Behari Colony	Abdul Rasheed		-	-
18.	Bilal Colony/Behari Colony	Nazar Hassan		-	0301-5829286
19.	Bilal Colony/Behari Colony	Mukhtar Hussain		-	0336-8150215
20.	Bilal Colony/Behari Colony	M. Iqbal		-	0347-4982513
21.	Bilal Colony/Behari Colony	Nabeel Akhtar		-	0335-5807263
22.	Bilal Colony/Behari Colony	M. Toseef		-	0306-0843098
23.	Bilal Colony/Behari Colony	Bilal Ahmad		-	0333-5870626
24.	Bilal Colony/Behari Colony	Jamil Khokhar		-	0316-5351502
25.	Bilal Colony/Behari Colony	Ali Raza		-	0303-5658532

Pictorial View of Public Consultation



7.8 Concerns from the Community and Stakeholders during Consultation

Participants were first briefed about the project objectives, proposed rehabilitation, main design parameters and major interventions associated with the project construction. Afterward, people were asked to express their views regarding the proposed project. In general participants appreciated the project and offered comments & suggestions to enhance the expected environmental and social benefits. The community perception of the project is good and most of the people wish to see immediate implementation of the project, but they are worried of compensation rates of their high valuable land and other properties. They require fairness throughout the whole process. Here are some of their views:

ISSUE & CONCERNS	FEEDBACK & ESMMP MITIGATION
- The participants requested that concerned authorities should enhance the quality of health and education facilities in the area. - The residents of doctor colony mentioned that the propose Sub-project will generate employment opportunities for the local community during the construction phase of the Sub-project.	- Sprinkling of water will be necessary during rehabilitation of the project and tunned machinery will be better use for the sub project. - In case of blockage of any walkway alternative routes will be provided - Appropriate signage near the construction activities will be displayed to sensitize the community and minimize accidents.
When people were asked about their satisfaction level on the facilities provided by MC Jhelum, most of the respondents were happy about the facilities provided; however, some of the residents feel that improvements are required.	- Public will be informed about project major activities, anticipated impacts and their proposed Mitigation Measures. - The contact Nos. of focal person of Grievance Redress Committee will be displayed at different locations and residents will also be informed about it.
Availability of safe drinking water is big challenge for the communities and they want to request the concerned authorities to provide safe drinking water through filtration plants in this Sub-project.	- Cleaning of sites upon completion of schemes. Excess debris from the site be removed will immediately - The machinery and equipment with low noise (less than 65dB) will be used. All the mitigations mentioned in ESMMP.
Some participants expressed that the relevant Government departments must ensure that their staff is cooperative with the general public and maintain the right attitude and try to facilitate them instead of being confrontational during Sub-project activities.	Ground water quality testing will be done before and after the project activity to ensure the water quality during and after construction.
The one of the participant requested to raise awareness of pollution and how to mitigate.	There will be top most priority to save flora and fauna of the area. If any flora / tree including in RoW of the project, design or location change will be the preference rather than any damage or loss.
The participants expressed the desire to receive regular updates on the Sub-project development from the relevant government departments.	
One of the educated participant said that there is a need to help mohallas understand, participate in all activities related to this Sub-project and also there is a need to work to increase civic engagement in addressing their concerns and facilitate collaboration among local and regional entities to address their problems.	
Participants told us that the current Sub-project is good and it is not create huge problem for the residents.	
The all participants agreed that the dust and noise generation during the construction activities will be the major issue for the residents.	
Damage to flora and fauna must be avoided or minimized.	
Local people in the study area believed that there would be an increase in population due to construction work. Most seemed to feel this would be positive since it would bring increased economic opportunities. Any land or property should not be occupied by the project unless compensation is fully completed.	

ISSUE & CONCERNS	FEEDBACK & ESMMP MITIGATION
Although well-intended and well-developed, the PEQS drinking water regulations do not fully assure the quality of tap water to prevent either short-term or long-term illness from drinking it. Improving upon water treatment technologies is a way to help remove contaminants.	
Sewerage will be also part of this project.	

7.9 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 and efforts 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 7-2**.

Table 7-2: Consultation with Institutional Stakeholders

Sr. No	Department	Official	Designation	Cell No.
1.	MC Jhelum	Raheel Kayani	MO(S)	0331-6662000
2.		Sardar Zubair	Supervisor (WS)	0313-5579125
3.	Forest Department	Waqas Shah	SDFO	0332-9087620
4.		Mudassar Mehmood	In charge	0345-5703533
5.	Housing & Town Planning Department	Ali Imran	DD	0313-7600626
6.	Public Health Engineering	Muhammad Imran	SDO	-
7.		Saleem Anwar Kasani	Community Development Officer	-
8.		Mirza Zubair	Water testing counter	0344-6113879
9.	Agriculture Department	Miss.Farwa Nasir	Agriculture Officer	0544-920333
10.	Soil Conservation	Ejaz		0343-4362730
11.	Public Health Engineering	Ghulam Shabir	Sub-Engineer	0300-7934407
12.	EPA Jhelum	M.Habib	Inspector	0322-4388076
13.		Izhar Ul Haq	AD	0332-8009695

Pictorial View of Institutional Consultation



**Information Discloser and Consultation with
MC Jhelum**



**Information Discloser and Consultation
with Official of the Agriculture Department**



**Information Discloser and Consultation with
official of Social Department**



**Information Discloser and Consultation
with official of EPD**



**Information Discloser and Consultation with
official of Forest Department**



**Information Discloser and Consultation
with official of C&W Department**

Table 7-3: Feedback and Concerns

Settlement/Village	Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
Environment Protection Department	- He said that environmental awareness in Pakistan is very low therefore raising awareness among the general public about the importance of environment is necessary. - Wastewater should be transported through trunk sewers to the main sewerage lines. - Operational budget for water lines and tube wells will be allocate for minimum 5 years. - The Sub-positive project's impact will be that urban growth will occur as a result of it. This will have a favourable overall influence on the Sub-project area's local economy. - To make the Sub-project environment friendly, more trees should be planted and whenever possible cut down of trees during the construction phase should be minimized.	- Sewerage project will be dealt separately accordingly to the intervention. - Operational budget for this project includes in PC-1. - Yes, it is suggested that plantation of native trees are considered after the construction activities and it is mentioned - The suggestion has been forwarded to the design team and MC officials. - Comment has been incorporated in the ESIA report. - The risks and impacts of the sub-project have been summarized in the chapter 7 Environment and social impact assessment and covers all impacts and their mitigation.
Public Health Engineering	- The proposed project is essential for the improvement of public health and socio-economic development. - Traditionally in this proposed project, improvements in water supply and sanitation have been promoted as essential public health measures to improve the population's health status and reduce the burden of disease. - However water supply a beneficiary project for present and future needs but focused also on critical condition of sewerage system of Jhelum. - Solid waste should be dumped on the MC specified dumping sites and wastewater generated during both construction and operational phase should be treated before releasing in the sewerage line.	- Put in place measures to minimize impacts and provide regular information local residents on construction activities and their impacts. - Comment has been incorporated in the ESIA report.
Agriculture Department	- There are no agriculture fields near the proposed project. - The representative of Agriculture Department further commented that the decreasing of water continues to be one of the most important threats to land eco-systems around the study area. Water is vital for all anthropogenic activities. The quality of water is getting vastly deteriorated due to industrial waste and carelessness to the environment. - The official said that it is good opportunity for the local people in the surrounding of the proposed Sub-project as this Sub-project will create employment opportunities.	- Yes definitely this project will create the new opportunities for the local residents and will boost their economy. - Comment has been incorporated in the ESIA report. - An Environment Social Management Plan has been prepared to ensure the adequacy and effectiveness of the identified impacts and proposed mitigation protocol by clearly identifying the roles and responsibilities of the agencies responsible for implementation, monitoring and auditing of ESIA activities, existing and suggested framework. The information regarding the project will be disclosed accordingly through

Settlement/Village	Feedback and Concerns	Proposed Measures to address the Stakeholders' Concerns
		consultation and information will be accessed to everyone.
Forest Department	- There is no protected area around the proposed project. - The official of Wildlife Department said that these kind of projects invariably result in many far-reaching ecological changes. Some of these benefit human population, and the long-term productivity of the drinking water sectors. The benefits cover the entire range of environmental components, such as soil, water, air, energy, and the socio-economic system. - The positive impact of the Sub-project will be that urban development will take place due to the Sub-project. This will have overall positive impact on the local economy of the Sub-project area.	
Community Development and Social Welfare Department	- The project coordinator had said that the water scarcity is not up to that extent that someone has reported to be died. But the scarcity is because peoples are not getting water as per their needs and requirements - The water born disease are observed mostly stomach relevant problems and hepatitis B and C are mostly observed. - To reduce the chances of health and safety risks medical kits should be installed at the Sub-project area during the construction phase.	Health risks and work safety problems may result at the workplace if the working conditions provide unsafe and/or unfavourable working environment. It is proposed that the health and safety for everyone is the priority and it's the responsibility of the contractor. All medical facilitation will be available at site and the labour camp.
MC, Jhelum	- The official said that the division of responsibilities and its allied work among all stakeholders needs clear definition. - Occupational health and safety measures should be adopted by the contractor during construction works for the safety of workers. - The positive impact of the Sub-project will be that urban development will take place due to the Sub-project. This will have overall positive impact on the local economy of the Sub-project area. - The Sub-project will spur the local economy and create many jobs in the Sub-project area. Such Sub-projects are much needed particularly after the slump in economy caused by COVID-19.	- Yes, the OHS plan will be established during the construction work. Occupational Health and Safety standard (OHS) shall be adopted during the execution of the project. - Definitely, this project attract residents and businesses, increase revenue for cities, spur private investment, and increase job opportunities. - Comment has been incorporated in the ESIA report
Punjab housing and town planning department	- Training programs should be included in the ESIA for staff and community. - Community participation is a necessary support for every water supply programme. - Research and development to use local materials, equipment and methods help to reduce cost and support economic development. - Many projects were engineering-led and involved no or limited community participation. - The positive impact of the Sub-project will be that urban development will take place due to the Sub-project. This will have overall positive impact on the local economy of the Sub-project area.	

7.10 Capacity Building

A comprehensive program will be followed to strengthen the technical and institutional capacities of the executing agency (MC Jhelum), contractors, and laborers (**Table 7-3**).

Table 7-4: Training / Awareness and Sentization Plan

Sr. No.	Components	Audience	Level	Modality	Frequency	Responsibility	
1	ESMF Site Specific requirements and E&S Management and Mitigation Plan	MO-1 MC and staff	MO-P field	Training	Briefing Presentations Mock Activities	Before execution of sub-project and time to time instructions	PMDFC ESM team
2	ESIA Implementation and Monitoring Plan	MO-1 MC staff	MO-P 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	Briefing and 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 construction area	Throughout the cycle of execution of sub-project	MC DPO-ESM

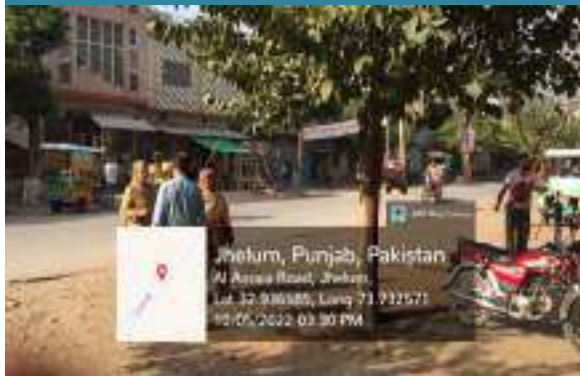
7.11 Women Stakeholders Consultation

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:

- Physical inactivity is more prevalent among women than men and is related to poor health outcomes.
- The proposed Project of the World Bank aimed to reduce the "burden of girls who were traditionally involved in fetching water, where this activity applied, in order to improve their school attendance.
- At the same time, convenient access to safe water reduced time spent collecting water by women and young girls.
- Women are under-represented in the 'water sector', with careers and training in water management dominated by men. If water management is to be democratic and transparent -- and represent the needs of the people -- both men and women must have equal opportunities.
- Conflicts and emergencies that exacerbate water scarcity can lead to a double hardship for women. When water is scarce, women and girls may have to travel longer distances to obtain water, and conditions are more dangerous.

- Open, public spaces can be the heartbeat of communities. But in many cases, those spaces are unsafe for the women.
- Drinking water in the area is contaminated and people have to use this contaminated water.
- Drinking water in the area is contaminated and people have to use this contaminated water.

Pictorial View of Gender Consultation



8 GRIEVANCE REDRESS 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 project affectees 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.

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 project affectees 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 Objectives

The objectives of the GRM are to:

- Develop an organizational framework to address and resolve the grievances of individual(s) or community(s), fairly and equitably;
- Provide enhanced level of satisfaction to the aggrieved;
- Provide easy accessibility to the aggrieved/affected individual or community for immediate grievance redress;
- Ensure that the targeted communities and individuals are treated fairly at all times;
- Identify systemic flaws in the operational functions of the project and suggest corrective measures; and
- Ensure sustainability of the project.

8.3 Type of Complaints

The major complaints that may arise during the execution of the proposed project at site include but not limited to:

- E&S issues (dust, noise, air pollution, social and cultural issues);
- Damage and blockage of public utilities;
- Traffic inconvenience;
- Gender based violence (GBV) and harassment;
- Resettlement issues including loss of livelihood; and

- Issues related to compensation of resettlement impacts.

8.4 Disclosure of GRM

The GRM will be disclosed at PMDFC, and MC office, and concerned project engineers, as well as at project sites.

8.5 Structure of Grievance Redress Mechanism

The project will establish a three-tier GRM comprising Community GRC, project GRC; and PMDFC-GRC. These tiers are described below.

8.5.1 Community GRC (Tier-1)

The community-GRC will provide a platform for project affectees or community members to raise and discuss their concerns, resolve the E&S including resettlement issues at the community level and coordinate with project management to communicate these issues and concerns. Community-GRC will be established to maintain a close rapport and coordination with affected persons and community members throughout the project implementation. The social development specialist (SDS) of PMDFC with the assistance of SC will facilitate the establishment of community-GRC that is representative of the ethno-cultural and gender diversity within the community. The community-GRC will comprise the following six members with one as the committee convener:

- Three female members (from the project affectees or community members); and
- Three male members (from project affectees or community members).
- The project E&S and engineering staff will coordinate with community-GRC to review and resolve the issue or concern related to resettlement planning or implementation as well as environmental and social concerns preferably within five (05) working days from receipt of the grievance. Any complaints that cannot be resolved at community-GRC will be forwarded to the next tier.

8.5.2 Project GRC (Tier-2)

KWSSIP will constitute a GRC headed by concerned Project Manager (PM) at each project site to resolve all grievances and complaints of the project affectees or community members received either directly or through the Tier-1. The project GRC will comprise of the following members:

- 1) Project Manager (PM), as Head/Convener of sub-project GRC;
- 2) Environment, SDS and Gender Specialists of PMDFC;
- 3) E&S specialists of Supervision Consultant (SC)
- 4) Resident Engineer of Supervision Consultant;
- 5) A representative (E&S Specialist) of Contractor (if required); and
- 6) A representative of Local Community.

Representative from any other district government department may be called as and when required by the sub-project GRC. Environmental Specialists of PMDFC and SC will join sub-project GRC meeting related to environmental issues only.

The project GRC will meet once a month and when the need arises. The sub-project GRC will review grievances involving all E&S issues including resettlement issues that may arise due to project implementation. Sub-project GRC will perform the following functions:

- Record, categorize and prioritize the grievances that need to be resolved by the committee and resolve them within ten (10) working days;
- Invite and hear aggrieved persons/parties to produce evidence of their claims and record their view point;
- Communicate its decisions and recommendations on all resolved issues to PIU and the aggrieved persons for smooth implementation;
- Forward the unresolved cases/ complaints to PMDFC-GRC within an appropriate time frame with reasons recorded and its recommendations;
- Develop an information dissemination system and acknowledge the aggrieved persons/parties about the development regarding their grievance;
- Maintain a complaint register accessible to the project affectees or community members with brief information about complaints and sub-project GRC decision with status report; and,
- Maintain complete record of all complaints received by the sub-project GRC with actions taken.
- Any complaint that cannot be resolved by the sub-project GRC, will be forwarded to the next tier – the PMDFC-GRC.

8.5.3 PMDFC-GRC (Tier-3)

At the third tier, the PMDFC has already constituted a GRC (PMDFC-GRC). The PMDFC GRC will receive complaints either directly or through the Tier-2 GRC. The Committee has the following composition:

- 1) Project Director PCP, (Chairman of PMDFC-GRC);
- 2) SDS, Member
- 3) Gender Specialist, Member;
- 4) Concerned Project Manager – PMDFC, Member;
- 5) SDS of CSC, Member; and
- 6) Representative of Civil Society.

Representative from any other district government department may be called as and when required by the PMDFC-GRC. Environmental Specialists of PMDFC and SC will join PMDFC-GRC meeting related to environmental issues only.

The PMDFC-GRC through authorized representative, will acknowledge the complainant about his/her complaint, scrutinize the record, investigate the remedies available and request the complainant to produce any record in favor of his/her claim. After thorough review and scrutiny of the available record on the complaint, field visit will be conducted to collect additional information, if required. Once the investigations are completed, the PMDFC-GRC will give decision within twenty (20) working days of receipt of the complaint. If the complainant is still dissatisfied with the decision, he/she can go to the Court of law, if he/she wishes so. Organization of the GRC is shown in **Figure 8-1**.

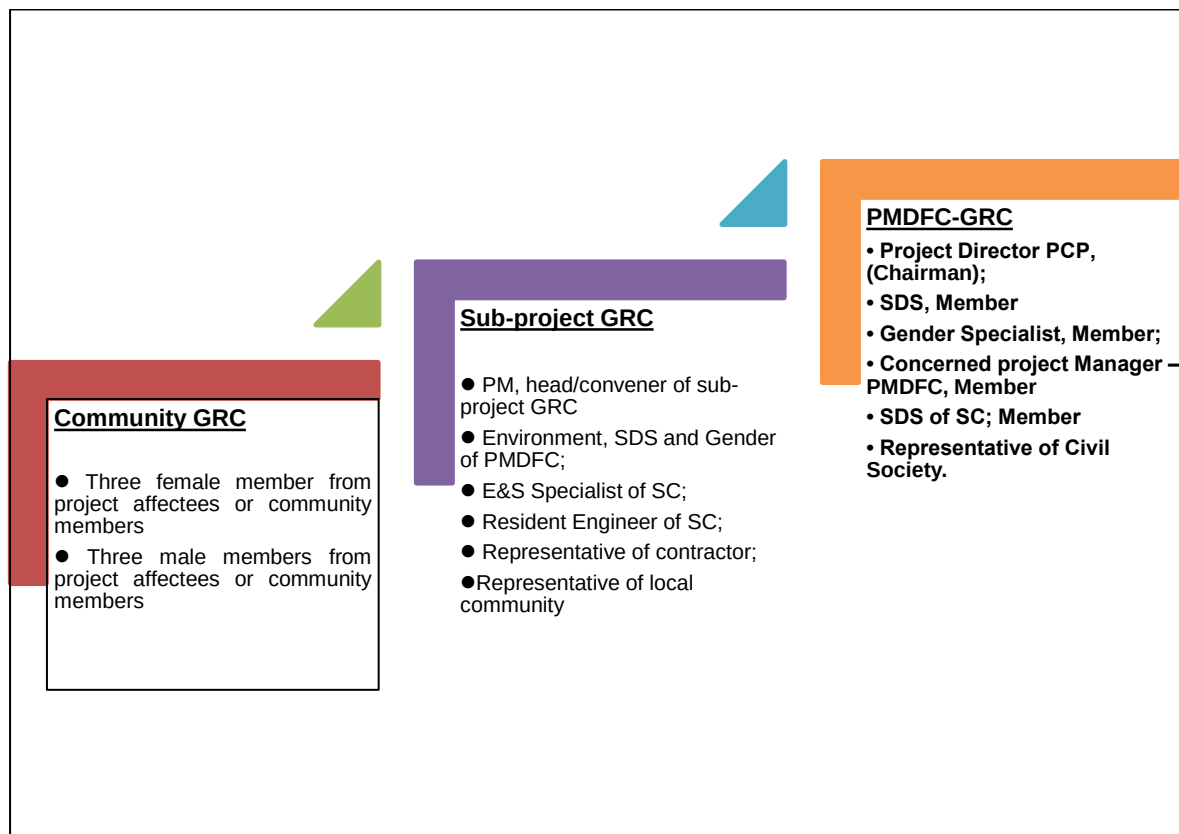


Figure 8-1: Organization of the GRC

Gender representation will be ensured by inducting a female member in all GRCs. The mechanism will ensure the access of project affectees or community members to a GRM that openly and transparently deals with the grievances and makes decision in consultation with all concerned that are consistent with the WB ESF requirements.

8.6 Gender Based Violence (GBV) Committee

Besides PMDFC-GRC, a GBV committee has also been established and notified within PMDFC consisting of the following members:

- 1) Concerned Project Manager, Head/ Convener of GBV Committee;
- 2) Gender Expert, PMDFC, Secretary; and
- 3) SDS PMDFC, Member.

The GBV Committee will address the gender related issues caused by the project activities during ESIA and project implementation.

8.7 Grievance Redress Procedure/Mechanism

The intention of GRM is to resolve a complaint as quickly and at as low a level as possible to avoid a minor issue becoming a significant grievance. Irrespective of the stage of the process, a complainant has the option to pursue the grievance through the court as is his/her legal right in accordance with law.

The GRCs will work at site, sub-project and PMDFC levels. The E&S and engineering staff of PPMDFC, in coordination with site staff will inform the project affectees and community members about the GRCs and its mechanism through consultations and by posting at prominent places. The complaints received through any media will be screened by type and category. These complaints will be registered in Community Complaints Register (CCR), where the name and address of complainant, date, description of complaint and action taken will be recorded. The following procedure will be used to redress the grievances:

- First, complaint resolution will be attempted to be addressed at community-GRC through the involvement of the field E&S/engineering staff. The community-GRC shall give decision within five working days of receipt of the complaint. If unsettled, grievance can be lodged to the sub-project GRC by the complainant or by the GRC;
- Sub-project GRC will acknowledge the receipt within two working days of lodging of complaint. Initial review and consultation with the sub-project GRC will be conducted within five working days of receipt of complaint. If required, sub-project GRC will advise the E&S/engineering specialists to conduct field visits in consultation with the aggrieved persons/parties and local community and submit a fact-finding report. Preferably, the fact finding will be completed within eight working days from receipt of complaints. Sub-project GRC shall give decision within 10 working days of receipt of the complaint. If unresolved, a grievance will be lodged to the (PMDFC-GRC) by the complainant or by the GRC; and
- The PMDFC-GRC shall give decision within 20 working days of receipt of the complaint. If the complainant is still not satisfied, he/she can pursue further by submitting the case to the appropriate court of law.
- All E&S issues will be dealt according to the above GRM procedures. The GRCs will hear and clarify with the complainant (if required so) about the E&S issue and shall conclude and communicate their recommendations for further implementation in due course of time. Complainant will be kept informed during the process and the GRC decision will be communicated to him/her accordingly. In case of any delay, the complainant will be informed on the progress and process about his/her grievance. The GRC proceedings will be documented step by step and all records will be maintained and summarized in the project progress and internal monitoring reports.

8.8 Lodging of Complaint

The complainant(s) can lodge their grievances through a number of ways/channels including online, mail, phone, and WhatsApp, e-mail and complaint box. Moreover, PMDFC has established an e-Portal for filing and tracking progress of the application online; the details are provided below.

- It is an electronic complaint lodging system (application) that will be accessible through a link on the PMDFC website;
- The focus of the e-portal is the quick complaint lodging for all types of primary stakeholders;
- Any project affectee or community member with internet access can lodge a complaint with option for anonymous complaints. Uploading of photos for better understanding of the problem will also be an option;
- Each complainant will get a unique Grievance Number to track their complaints through the e-portal;

- Each complaint will go through a quick resolution mechanism being managed by a dedicated team at the PMDFC. Each complainant will be contacted to ensure that his/her issue is resolved;
- The portal will differentiate between types of complaints for targeted decision-making and action on behalf of PMDFC; and
- The portal will allow a quick and easy method for monitoring of the entire complaint lodging and resolution mechanism.

8.9 Institutional Framework

Following institutions of Govt. of Punjab/others are related to the implementation of environmental and social management of PCP.

8.10 Local Government and Community Development Department (LG&CDD)

LG&CDD with assistance from the Punjab Local Government Board (PLGB) and PMDFC will have overall responsibility for Program reporting, monitoring and evaluation (M&E), regulation setting, and coordination with Program MCs. LG & CDD will also take up Annual Performance Assessment (APA) of the MCs by appointing an independent Agency.

8.11 Punjab Municipal Development Fund Company (PMDFC)

PMDFC will act as the lead technical agency and will be tasked to:

- Provide capacity building support to partner MCs to achieve DLI results.
- Deployment and maintenance support for e-governance and improved judiciary systems, and training of MC staff on new systems.
- Consolidate information related to service delivery, finances and accounts, expenditure, and complaint resolution, and communicate the compiled information to finance department FD and LG via reporting dashboards set up at these agencies.
- Conduct procurement of consultancies for capacity building of MCs and for design and supervision consultants. The mode of procurement of goods and works for the partner municipal committees will however be decided by Program Steering Committee (PSC). Provide technical assistance in areas such as service delivery standards, and own source revenue mobilization, manage regular M&E processes and provide consolidated information to LG&CDD on progress of activities per M&E requirements.
- Assist with Program reporting, including the mid-year and annual program reports. Assist with day to-day coordination of the Program.

8.12 Central Program Management Team (CPMT)

PMDFC has Central Program Management Team in Lahore, which will have overall responsibility for the above tasks. This ESM team comprise of:

- Senior Program Officer Environment & Social Management
- Program Officer Environment & Social Management

8.13 Regional Program Management Team

PMDFC has Regional Program Management Team in Faisalabad, Gujranwala and Khanewal regions, which will have overall responsibility for the ESM tasks. This ESM team comprise of:

- Deputy Program Officer, Environment & Social Management (Faisalabad)
- Deputy Program Officer, Environment & Social Management (Gujranwala)
- Deputy Program Officer, Environment & Social Management (Khanewal)

8.14 Municipal Committee Jhelum

Environment & Social Focal Persons (ESFPs) will play a key role in true implementation of E&S prospects of ESIA. ESFP are following nominated officials;

- Municipal Officer Infrastructure (for Environmental Aspects)
- Municipal Officer Planning (for Social Aspects)

8.15 Environment Protection Department (EPD)

Environment Protection Department (EPD) will play key role towards making Sub-project environmentally sustainable and socially acceptable. EPD will assign focal persons to give their part in making PCP a success story.

8.16 The Contractor

The Contractor will ensure implementation of ESIA provisions in its true essence. The Contractor will ensure site safety, occupational safety, use of best equipment's and machinery and public convenience during the course of the Sub-project. The Contractor team will be comprised off following personal for E&S management onsite;

- Environmental Manager
- HSE Supervisor

9 CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

The present report presents the Environment & Social Impact Assessment (ESIA) of the Improvement of Water Supply System in Jhelum City. During the preparation of ESIA report for the proposed developmental project, it is observed and established that the negative environmental impacts are temporary and low to moderate 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 to address negative impacts arising from the project.

9.2 Recommendations

The Environment & Social Impact Assessment (ESIA) as well as survey results are finally evaluated to recommend the following:

- Adherence to the Environment Social & Management Monitoring Plan (ESMMP) as proposed in this report.
- During the construction phase of this project, all the required PPEs should be provided to the workers.
- Proper housekeeping in and around the site must be given consideration.
- The fire safety precautions must be considered to prevent or reduce the likelihood of fire. Placing and maintaining fire extinguishers at easily accessible points is highly recommended.
- Proper indication of exit points must be there for emergency situation.
- Proper safety and information sign boards must be placed at required places.
- Adequate training of workers must be done to deal with the emergency situations

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Annexures

Annexure A: Environmental and Social Screening Checklists of the Sub-project
Environmental & Social Screening Checklist

Instructions:

Environmental and Social Focal Persons (ESFPs)²⁵ 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 document²⁶ 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:	Mr. Zeeshan (MO-I&S)
Name of MC Official	Jhelum
Sub-Project Sector:	water supply
Sub-Project Title:	Improvement of water supply system in Jhelum city
Sub- Project Categorization:	E-1 S-2
Date of Screening:	14-06-2023
Anticipated Project Activities	✓ Boring and construction of tube-wells of 1.0 cusec capacity : 4 Nos ✓ Construction of new Pump House: 4 No. ✓ Installation of Pumping Machinery and allied E&M works: 3 No. ✓ Installation of electric connection by GEPCO/ WAPDA: 4 No ✓ Laying of new/ replacement of distribution network (94246 +57435 =151699) Rft from 3" dia to 10" dia HDPE pipe with allied works ✓ Installation of 4 hypo-chlorinators. ✓ Installation of 4-bulk water meter. ✓ Replacement House Connections 6452 Nos ✓ Proposed to lay new network in Doctor Colony, Iqbal town, Karimpura, Islampura, Abbas Pura and Chishtain Mohallah
Estimated Cost of Sub-projects	300.205 million
Completion Time/Duration	6 Months
Estimated Labor for Subproject	15-20

²⁵ 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.

²⁶ 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		✓	Legally protected area not recorded nearby to the city.
Any surface water body (river, canal, stream, lake, wetland) within 250 meter of the proposed sub project ²⁷		✓	Not observed
Estuarine		✓	Not applicable
Special area for protecting biodiversity		✓	Biodiversity protected area not recorded nearby to the city.
Buffer zone of protected area		✓	Not applicable
Mangroves Forest		✓	Not applicable
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	Not observed
Socially sensitive /important areas/communities/ people?			
PCRs and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, <i>Gordwarah</i> , Temple, Fort, archeological/historical site) within 100 m of the proposed subproject ²⁸	✓		9 mosques and 1 graveyard observed in respective unserved water supply colonies.
Sensitive receptors (Schools, colleges, hospitals and clinics) within 100 meter of the proposed sub project ²⁹	✓		12 school, 2 colleges observed in respective unserved water supply colonies.
Any graveyard of local community (Muslims or Christians)	✓		Graveyard and Janazgah observed in the colony.
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 ³⁰ of the society and women or children)?		✓	No such type of demographic or socio-economic aspects of the sub-project area observed.
Already existing infrastructure ³¹ (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	No such type of activity like dismantling required for this sub-project.
B. Potential Environmental Impacts Will the Sub-Project cause...			
Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	Not applicable
Cutting of trees?		✓	No trees will be cut during this sub project.
Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	Not applicable
Generation of wastewater during construction or operation?	✓		The domestic wastewater collected from the septic camp of labor camp will be disposal in the nearby sewerage lines.
Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of waste water?	✓		Domestic waste water will be produced during construction but the waste will be collected in septic tanks.
Alteration of surface water hydrology of waterways resulting in increased sediment in streams/rivers or due to increased soil erosion at construction site?	✓		Unserved areas will be connected by those areas or colonies where water supply lines are already operational.

			There are some areas which identified in PC-1 marked as unserved. A combined visit by MMP team, MC Jhelum & PMDFC officials it has been witnessed that some areas
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		✓	No deterioration in surface water quality is anticipated
Over pumping of ground water, leading to salinization and ground subsidence?	✓		If ground water quality is marginal then over pumping of ground water would lead to salinization and ground subsidence. Water quality analysis reports will be attached with the ESIA and contractor will ensure to carry out water quality analysis during and after execution of the sub-project
Serious contamination of soil due to construction works?		✓	No serious contamination of soil is foreseen
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 recommended by supervision engineer.
Generation of hazardous waste?		✓	No hazardous chemicals will be used in project activities.
Increased air pollution due to sub-project construction and operation?	✓		Increased air pollution due to smoke and dust generated by the movement of vehicles and construction machinery at project site is expected. The mitigation measures include control on speed limit of project vehicles and use of construction machinery in good working condition and regular sprinkling of water at dust prone roads/site.
Noise and vibration due to sub-project construction or operation?	✓		The noise pollution during construction phase because of project vehicles and construction machinery is expected. The mitigation includes use of tuned vehicles and machinery will be ensured. Vibration abating devices will be used. Use PPEs by labor will be ensured. The working hours will be scheduled and restricted in school, colleges and prayers timings in daytime only.
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?	✓		The stagnant water in construction areas may create temporary breeding habitat for mosquitoes and resulting in dengue

²⁷ Ibid.

²⁸ According to Environmental Assessment Guidelines adopted by Punjab EPA

²⁹ Ibid.

³⁰ due to caste, creed, religion or gender e.g. transgender

³¹ Sewerage /Drainage system, Water supply lines, tube-wells, WAPDA/Telephone transmission lines/electric poles, Railway tracks, Gas pipelines, Roads, Shops/Plazas, Banks, Industry, Disposal stations etc.

			issue. Proper housekeeping and tidy conditions will avoid the creation of breeding habitats. Use of anti-mosquito spray will be ensured
Use of chemicals during construction?		✓	The use of chemicals in construction phase is not expected.
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 damage or loss to PCR's due to this sub project.		
Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	No displacement required for this project
Disproportionate impacts on the poor, women and children and or other vulnerable groups ³² (mentioned above)?	✓		Pardah issues for women and children's (vulnerable group) will be managed by supervision of labor or say hiring of local labor to manage this concern
Temporary impediments in movements of people/transport and animals?	✓		As the construction activities will be confined within the boundary wall of existing water supply facility of MC so there will be no impediment in the movement of people, transport or animals. Traffic management Training will be provided to drivers. Alternative routes will be provided to community.
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 labor will be hired who will return to their houses after day's work and the sub-project will not cause burden on social infrastructure and services
Social conflicts if workers from other areas are hired?		✓	To avoid social conflicts local labor will be hired
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		There may be safety and health issues during material transportation and pipe boring. Contractor will be required to provide PPEs
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?	✓		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 will be there. Avoid over speeding and set speed limit to avoid any incident and dust pollution.
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	✓		There may be safety issues during material transportation and Construction activities. Health and safety SOPs will have to be implemented

³² Women, Children, Women headed households, People in old age, people having disabilities, socially isolated community groups and or people living below the poverty line

community throughout project construction, operation and decommissioning?			
Any impact on sensitive receptors (mentioned above)	✓		Air Pollution including dust, foul/smell and noise will affect the receptors like graveyard, mosque and college, hospitals. Sprinkling of water will be done to avoid dust pollution. Tuned machinery will be used at site and maintained speed limit to avoid noise pollution. When dustbins are full to avoid odor and foul smell in area also ensure cleanliness and housekeeping of site during laying water supply lines or constructing.
Any impact of negative nature on already existing infrastructure including public amenities		✓	No public amenities or infrastructure within RoW of the subproject area. There will be no impact on temporary land acquisition for material storage

Pictures of Project Site





Prepared By: Name: M. Hannan Yousaf Designation: Env. Specialist Signature	Reviewed By: Name: Designation: Signature	Endorsed By: Name: Muhmmad Zeeshan Designation: MOI&S Signature

INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of City/MC/LG: Jhelum

Sub-Project Sector: water supply

Sub-Project Title: Improvement of water supply system in Jhelum city

Sub- Project Categorization: S-2

Date of Screening: 14-06-2023

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		No land acquisition required for this project.
If yes, then describe the type of land being acquired from the categories below:				
Has any AED been conducted at the proposed location by the government ¹ ? Yes/No		✓		No AED has been conducted at proposed location
Land (Quantify and describe types of land being acquired in "remarks column".		✓		Not applicable
Government and LG owned land free of occupation (agriculture or settlement)		✓		Not applicable
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		Not applicable
Private land		✓		Not applicable
Residential		✓		Not applicable
Commercial		✓		Not applicable
Agricultural		✓		Not applicable
Communal		✓		Not applicable
Others (specify in "remarks").		✓		Not applicable
Name of owner/owners and type of ownership document if available.		✓		Not applicable
If land is being acquired, describe any structures constructed on it		✓		Not applicable
Land-based assets:				
Residential structures		✓		Not applicable
Commercial structures (specify in "remarks")		✓		Not applicable
Community structures (specify in "remarks")		✓		Not applicable
Agriculture structures (specify in "remarks")		✓		Not applicable
Public utilities (specify in "remarks")		✓		Not applicable
Others (specify in "remarks")		✓		Not applicable
If agricultural land is being acquired, specify the following:				
Agriculture related impacts		✓		Not applicable

SECTION 1	Yes	No	Expected	Remarks
Crops and vegetables (specify types and cropping area in "remarks").		✓		Not applicable
Trees (specify number and types in "remarks").		✓		Not applicable
Others (specify in "remarks").		✓		Not applicable
Affected Persons (APs)		✓		Not applicable
Will any people be displaced from the land when acquired? Yes/No		✓		Not applicable
Number of APs		✓		Not applicable
Males		✓		Not applicable
Females		✓		Not applicable
Titled landowners		✓		Not applicable
Tenants and sharecroppers		✓		Not applicable
Leaseholders		✓		Not applicable
Agriculture wage laborers		✓		Not applicable
Encroachers and squatters (specify in remarks column)		✓		Not applicable
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".		✓		Not applicable
Others (specify in "remarks")		✓		Not applicable
How will people be affected?		✓		Not applicable

Prepared By: Name: Nasir Altaf Designation: Sociologist Signature	Reviewed By: Name: Designation: Signature	Endorsed By: Name: Muhmmad Zeeshan Designation: MOI&S Signature

Tube well # 3 (Salman Paras near Altaf park) Environmental & Social Screening Checklist

Instructions:

Environmental and Social Focal Persons (ESFPs)³³ 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 document³⁴ 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 Zeeshan
Name of MC:	Jhelum
Sub-Project Sector:	water supply
Sub-Project Title:	Improvement of water supply system in Jhelum city
Sub- Project Categorization:	E-2 S-2
Date of Screening:	14-06-2023
Anticipated Project Activities	✓ Boring and construction of tube-wells of 1.0 cusec capacity : 4 Nos ✓ Construction of new Pump House: 4 No. ✓ Installation of Pumping Machinery and allied E&M works: 3 No. ✓ Installation of electric connection by GEPCO/ WAPDA: 4 No ✓ Laying of new/ replacement of distribution network (94246 +57435 =151699) Rft from 3" dia to 10" dia HDPE pipe with allied works ✓ Installation of 4 hypo-chlorinators. ✓ Installation of 4-bulk water meter.
Estimated Cost of Subprojects	300.205 million
Completion Time/Duration	6 Months
Estimated Labor for Subproject	15-20

³³ 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.

³⁴ 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		✓	Legally protected area not recorded nearby to the city.
Any surface water body (river, canal, stream, lake, wetland) within 250 meter of the proposed sub project ³⁵		✓	No surface water body exist within 250 meters of the proposed sub project
Estuarine		✓	Not applicable
Special area for protecting biodiversity		✓	Biodiversity protected area not recorded nearby to the city.
Buffer zone of protected area		✓	Not applicable
Mangroves Forest		✓	Not applicable
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	Not observed
Socially sensitive /important areas/communities/ people?			
PCRs and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, <i>Gordwarah</i> , Temple, Fort, archeological/historical site) within 100 m of the proposed subproject	✓		Recorded shrines within 100 m of the proposed subproject
Sensitive receptors (Schools, colleges, hospitals and clinics) within 100 meter of the proposed sub project		✓	Not observed
Any graveyard of local community (Muslims or Christians)		✓	Not 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 ³⁶ of the society and women or children)?		✓	No such type of demographic or socio-economic aspects of the sub-project area observed
Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	No such type of activity like dismantling required for this sub-project.
B. Potential Environmental Impacts			
Will the Sub-Project cause...			
Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	There is no habitats/biodiversity of environmentally sensitive or protected areas adjacent to the proposed road
Cutting of trees?		✓	No Cutting Of Trees Involved In This Intervention.
Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	There is no habitats/biodiversity of environmentally sensitive or protected areas adjacent to the proposed road
Generation of wastewater during construction or operation?	✓		The domestic wastewater collected from the septic camp of labor camp will be disposal in the nearby sewerage lines.

³⁵ Ibid.

³⁶ due to caste, creed, religion or gender e.g. transgender

Screening Questions	Yes	No	Remarks
Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of waste water?	✓		Domestic waste water will be produced during construction but the waste will be collected in septic tanks.
Alteration of surface water hydrology of waterways resulting in increased sediment in streams/ivers or due to increased soil erosion at construction site?	✓		Unserved areas will be connected by those areas or colonies where water supply lines are already operational. There are some areas which identified in PC-1 marked as unserved. A combined visit by MMP team, MC Jhelum & PMDFC officials it has been witnessed that some areas
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		✓	No deterioration in surface water quality is anticipated
Over pumping of ground water, leading to salinization and ground subsidence?	✓		If ground water quality is marginal then over pumping of ground water would lead to salinization and ground subsidence. Water quality analysis reports will be attached with the ESIA and contractor will ensure to carry out water quality analysis during and after execution of the sub-project
Serious contamination of soil due to construction works?		✓	No serious contamination of soil is foreseen
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 recommended by supervision engineer.
Generation of hazardous waste?	✓		No hazardous waste will be generated.
Increased air pollution due to sub-project construction and operation?	✓		Increased air pollution due to smoke and dust generated by the movement of vehicles and construction machinery at project site is expected. The mitigation measures include control on speed limit of project vehicles and use of construction machinery in good working condition and regular sprinkling of water at dust prone roads/site.
Noise and vibration due to sub-project construction or operation?	✓		The noise pollution during construction phase because of project vehicles and construction machinery is expected. The mitigation includes use of vehicles and machinery in good running condition. The working hours shall be restricted during daytime only.
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?	✓		The stagnant water in construction areas may create temporary breeding habitat for mosquitoes and resulting in dengue issue. Proper housekeeping and tidy conditions will avoid the creation of breeding habitats. Use of anti-mosquito spray will be ensured

Screening Questions	Yes	No	Remarks
Use of chemicals during construction?		✓	The use of chemicals in construction phase are not expected.
C: Potential Social Impacts			
Will the Sub-Project cause...			
1. 2. 3. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?			No damage or loss to PCR's due to this sub project.
Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	No displacement required for this project
Disproportionate impacts on the poor, women and children and or other vulnerable groups ³⁷ (mentioned above)?	✓		Pardah issues for women and children's (vulnerable group) will be managed by supervision of labor or say hiring of local labor to manage this concern
Temporary impediments in movements of people/transport and animals?	✓		As the construction activities will be confined within the boundary wall of existing water supply facility of MC so there will be no impediment in the movement of people, transport or animals. Traffic management Training will be provided to drivers. Alternative routes will be provided to community.
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 labor will be hired who will return to their houses after day's work and the sub-project will not cause burden on social infrastructure and services The contractor to establish construction camp at appropriate place at open place sufficiently away from the populated area
Social conflicts if workers from other areas are hired?		✓	In ESIA, the contractor will be bound to prefer local labor to avoid social conflicts.
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		Vulnerable people especially elderly and handicap may be affected for some days during construction.
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 construction work. The SOPs for health and safety must be followed by the contractors
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	✓		There would be some safety issues for commuters and people living in adjoining areas during construction phase. The SOPs for health and safety have been

³⁷ 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
or where their failure could result in injury to the community throughout project construction, operation and decommissioning?			included in the PC-I that have to be followed by the contractors
Any impact on sensitive receptors (mentioned above)	✓		Air Pollution including dust, foul/smell and noise will affect the receptors like graveyard, mosque and college, hospitals. Sprinkling of water will be done to avoid dust pollution. Tuned machinery will be used at site and maintained speed limit to avoid noise pollution. When dustbins are full to avoid odor and foul smell in area also ensure cleanliness and housekeeping of site during laying water supply lines or constructing.
Any impact of negative nature on already existing infrastructure including public amenities	✓		As this project beneficent for local community but little impacts like difficulty in access for roads, mosques, schools etc, but it improves water supply in the area.

Prepared By: Name: Muhammad Hannan Designation: Env. Specialist Signature	Reviewed By: Name: Designation: Signature	Endorsed By: Name: Muhmmad Zeeshan Designation: MOI&S Signature

Pictures of Project Site



INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of City/MC/LG: Jhelum

Sub-Project Sector: water supply

Sub-Project Title: Improvement of water supply system in Jhelum city

Sub- Project Categorization: S-2

Date of Screening: 14-06-2023

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		Not applicable
If yes, then describe the type of land being acquired from the categories below:		✓		Not applicable
Has any AED been conducted at the proposed location by the government ¹ ? Yes/No		✓		Not applicable
Land (Quantify and describe types of land being acquired in "remarks" column).		✓		Not applicable
Government and LG owned land free of occupation (agriculture or settlement)		✓		Not applicable
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		Not applicable
Private land		✓		Not applicable
Residential		✓		Not applicable
Commercial		✓		Not applicable
Agricultural		✓		Not applicable
Communal		✓		Not applicable
Others (specify in "remarks").		✓		Not applicable
Name of owner/owners and type of ownership document if available.		✓		Not applicable
If land is being acquired, describe any structures constructed on it		✓		Not applicable
Land-based assets:		✓		Not applicable
Residential structures		✓		Not applicable
Commercial structures (specify in "remarks")		✓		Not applicable
Community structures (specify in "remarks")		✓		Not applicable
Agriculture structures (specify in "remarks")		✓		Not applicable
Public utilities (specify in "remarks")		✓		Not applicable
Others (specify in "remarks")		✓		Not applicable
If agricultural land is being acquired, specify the following:				
Agriculture related impacts		✓		Not applicable

SECTION 1	Yes	No	Expected	Remarks
Crops and vegetables (specify types and cropping area in "remarks").		✓		Not applicable
Trees (specify number and types in "remarks").		✓		Not applicable
Others (specify in "remarks").		✓		Not applicable
Affected Persons (APs)		✓		Not applicable
Will any people be displaced from the land when acquired? Yes/No		✓		Not applicable
Number of APs		✓		Not applicable
Males		✓		Not applicable
Females		✓		Not applicable
Titled landowners		✓		Not applicable
Tenants and sharecroppers		✓		Not applicable
Leaseholders		✓		Not applicable
Agriculture wage laborers		✓		Not applicable
Encroachers and squatters (specify in remarks column)		✓		Not applicable
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".		✓		Not applicable
Others (specify in "remarks")		✓		Not applicable
How will people be affected?		✓		Not applicable

Prepared By: Name: Nasir Altaf Designation: Sociologist Signature	Reviewed By: Name: Designation: Signature	Endorsed By: Name: Muhammad Zeeshan Designation: MOI&S Signature

Tube well # 10 (Sheesha Ground, machine Muhalla #1) Environmental & Social Screening Checklist

Instructions:

Environmental and Social Focal Persons (ESFPs)³⁸ 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 document³⁹ 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 Zeeshan
Name of MC:	Jhelum
Sub-Project Sector:	water supply
Sub-Project Title:	Improvement of water supply system in Jhelum city
Sub- Project Categorization:	E-2 S-2
Date of Screening:	14-06-2023
Anticipated Project Activities	✓ Boring and construction of tube-wells of 1.0 cusec capacity : 4 Nos ✓ Construction of new Pump House: 4 No. ✓ Installation of Pumping Machinery and allied E&M works: 3 No. ✓ Installation of electric connection by GEPCO/ WAPDA: 4 No ✓ Laying of new/replacement of distribution network (94246 +57435 =151699) Rft from 3" dia to 10" dia HDPE pipe with allied works ✓ Installation of 4 hypo-chlorinators. ✓ Installation of 4-bulk water meter. ✓ Replacement House Connections 6452 Nos
Estimated Cost of Subprojects	300.205 million
Completion Time/Duration	6 Months
Estimated Labor for Subproject	15-20

³⁸ 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.

³⁹ 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		✓	Legally protected area not recorded nearby to the city.
Any surface water body (river, canal, stream, lake, wetland) within 250 meter of the proposed sub project ⁴⁰		✓	No surface water body exist within 250 meters of the proposed sub project
Estuarine		✓	Not applicable
Special area for protecting biodiversity		✓	Biodiversity protected area not recorded nearby to the city.
Buffer zone of protected area		✓	Not applicable
Mangroves Forest		✓	Not applicable
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	Not observed
Socially sensitive /important areas/communities/people?			
PCRs and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, <i>Gordwarah</i> , Temple, Fort, archeological/historical site) within 100 m of the proposed subproject	✓		Recorded mosque within 100 m of the proposed subproject
Sensitive receptors (Schools, colleges, hospitals and clinics) within 100 meter of the proposed sub project		✓	Not observed
Any graveyard of local community (Muslims or Christians)		✓	Not 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 ⁴¹ of the society and women or children)?		✓	No such type of demographic or socio-economic aspects of the sub-project area observed
Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	No such type of activity like dismantling required for this sub-project.
B. Potential Environmental Impacts Will the Sub-Project cause...			
Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	There is no habitats/biodiversity of environmentally sensitive or protected areas adjacent to the proposed road
Cutting of trees?		•	.
Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	There is no habitats/biodiversity of environmentally sensitive or protected areas adjacent to the proposed road

⁴⁰ Ibid.

⁴¹ due to caste, creed, religion or gender e.g. transgender

Screening Questions	Yes	No	Remarks
Generation of wastewater during construction or operation?	✓		The domestic wastewater collected from the septic camp of labor camp will be disposal in the nearby sewerage lines.
Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of waste water?	✓		Domestic waste water will be produced during construction but the waste will be collected in septic tanks.
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 activity is foreseen
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	✓		No deterioration in surface water quality is anticipated
Over pumping of ground water, leading to salinization and ground subsidence?	✓		If ground water quality is marginal then over pumping of ground water would lead to salinization and ground subsidence. Water quality analysis reports will be attached with the ESIA and contractor will ensure to carry out water quality analysis during and after execution of the sub-project
Serious contamination of soil due to construction works?		✓	No serious contamination of soil is foreseen
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 recommended by supervision engineer.
Generation of hazardous waste?	✓		No hazardous waste will be generated.
Increased air pollution due to sub-project construction and operation?	✓		Increased air pollution due to smoke and dust generated by the movement of vehicles and construction machinery at project site is expected. The mitigation measures include control on speed limit of project vehicles and use of construction machinery in good working condition and regular sprinkling of water at dust prone roads/site.
Noise and vibration due to sub-project construction or operation?	✓		The noise pollution during construction phase because of project vehicles and construction machinery is expected. The mitigation includes use of vehicles and machinery in good running condition. The working hours shall be restricted during daytime only.

Screening Questions	Yes	No	Remarks
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?	✓		The stagnant water in construction areas may create temporary breeding habitat for mosquitoes and resulting in dengue issue. Proper housekeeping and tidy conditions will avoid the creation of breeding habitats. Use of anti-mosquito spray will be ensured
Use of chemicals during construction?		✓	The use of chemicals in construction phase are not expected.
C: Potential Social Impacts			
Will the Sub-Project cause...			
4. 5. 6. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?	No damage or loss to PCR's due to this sub project.		
Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	No displacement required for this project
Disproportionate impacts on the poor, women and children and or other vulnerable groups ⁴² (mentioned above)?	✓		Pardah issues for women and children's (vulnerable group) will be managed by supervision of labor or say hiring of local labor to manage this concern
Temporary impediments in movements of people/transport and animals?	✓		As the construction activities will be confined within the boundary wall of existing water supply facility of MC so there will be no impediment in the movement of people, transport or animals. Traffic management Training will be provided to drivers. Alternative routes will be provided to community.
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 labor will be hired who will return to their houses after day's work and the sub- project will not cause burden on social infrastructure and services The contractor to establish construction camp at appropriate place at open place sufficiently away from the populated area
Social conflicts if workers from other areas are hired?		✓	In ESIA, the contractor will be bound to prefer local labor to avoid social conflicts.

⁴² 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
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		Vulnerable people especially elderly and handicap may be affected for some days during construction.
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 construction work. The SOPs for health and safety must be followed by the contractors
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 some safety issues for commuters and people living in adjoining areas during construction phase. The SOPs for health and safety have been included in the PC-I that have to be followed by the contractors
Any impact on sensitive receptors (mentioned above)	✓		Air Pollution including dust, foul/smell and noise will affect the receptors like graveyard, mosque and college, hospitals. Sprinkling of water will be done to avoid dust pollution. Tuned machinery will be used at site and maintained speed limit to avoid noise pollution. When dustbins are full to avoid odor and foul smell in area also ensure cleanliness and housekeeping of site during laying water supply lines or constructing.
Any impact of negative nature on already existing infrastructure including public amenities	✓		As this project beneficent for local community but little impacts like difficulty in access for roads, mosques, etc, but it improves water supply in the area.

Prepared By: Name: Muhammad Hannan Designation: Env. Specialist Signature	Reviewed By: Name: Designation: Signature	Endorsed By: Name: Muhammad Zeeshan Designation: MOI&S Signature

Pictures of Project Site



INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of City/MC/LG: Jhelum

Sub-Project Sector: water supply

Sub-Project Title: Improvement of water supply system in Jhelum city

Sub- Project Categorization: S-2

Date of Screening: 14-06-2023

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		Not applicable
If yes, then describe the type of land being acquired from the categories below:		✓		Not applicable
Has any AED been conducted at the proposed location by the government ¹ ? Yes/No		✓		Not applicable
Land (Quantify and describe types of land being acquired in "remarks column".		✓		Not applicable
Government and LG owned land free of occupation (agriculture or settlement)		✓		Not applicable
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		Not applicable
Private land		✓		Not applicable
Residential		✓		Not applicable
Commercial		✓		Not applicable
Agricultural		✓		Not applicable
Communal		✓		Not applicable
Others (specify in "remarks").		✓		Not applicable
Name of owner/owners and type of ownership document if available.		✓		Not applicable
If land is being acquired, describe any structures constructed on it		✓		Not applicable
Land-based assets:		✓		Not applicable
Residential structures		✓		Not applicable
Commercial structures (specify in "remarks")		✓		Not applicable
Community structures (specify in "remarks")		✓		Not applicable
Agriculture structures (specify in "remarks")		✓		Not applicable
Public utilities (specify in "remarks")		✓		Not applicable
Others (specify in "remarks")		✓		Not applicable
If agricultural land is being acquired, specify the following:				
Agriculture related impacts		✓		Not applicable

SECTION 1	Yes	No	Expected	Remarks
Crops and vegetables (specify types and cropping area in "remarks").		✓		Not applicable
Trees (specify number and types in "remarks").		✓		Not applicable
Others (specify in "remarks").		✓		Not applicable
Affected Persons (APs)		✓		Not applicable
Will any people be displaced from the land when acquired? Yes/No		✓		Not applicable
Number of APs		✓		Not applicable
Males		✓		Not applicable
Females		✓		Not applicable
Titled landowners		✓		Not applicable
Tenants and sharecroppers		✓		Not applicable
Leaseholders		✓		Not applicable
Agriculture wage laborers		✓		Not applicable
Encroachers and squatters (specify in remarks column)		✓		Not applicable
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".		✓		Not applicable
Others (specify in "remarks")		✓		Not applicable
How will people be affected?		✓		Not applicable

Prepared By: Name: Nasir Altaf Designation: Sociologist Signature	Reviewed By: Name: Designation: Signature	Endorsed By: Name: Muhammad Zeeshan Designation: MOI&S Signature

Tube well # 17 (Pir Azmat Darbar) Environmental & Social Screening Checklist

Instructions:

Environmental and Social Focal Persons (ESFPs)⁴³ 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 document⁴⁴ 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 Zeeshan
Name of MC:	Jhelum
Sub-Project Sector:	water supply
Sub-Project Title:	Improvement of water supply system in Jhelum city
Sub- Project Categorization:	E-2 S-2
Date of Screening:	14-06-2023
Anticipated Project Activities	✓ Boring and construction of tube-wells of 1.0 cusec capacity : 4 Nos ✓ Construction of new Pump House: 4 No. ✓ Installation of Pumping Machinery and allied E&M works: 3 No. ✓ Installation of electric connection by GEPCO/ WAPDA: 4 No ✓ Laying of new/ replacement of distribution network (94246 +57435 =151699) Rft from 3" dia to 10" dia HDPE pipe with allied works ✓ Installation of 4 hypo-chlorinators. ✓ Installation of 4-bulk water meter. ✓ Replacement House Connections 6452 Nos
Estimated Cost of Subprojects	300.205 million
Completion Time/Duration	6 Months
Estimated Labor for Subproject	15-20

⁴³ 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.

⁴⁴ 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		✓	Legally protected area not recorded nearby to the city.
Any surface water body (river, canal, stream, lake, wetland) within 250 meter of the proposed sub project ⁴⁵		✓	No surface water body exist within 250 meters of the proposed sub project
Estuarine		✓	Not applicable
Special area for protecting biodiversity		✓	Biodiversity protected area not recorded nearby to the city.
Buffer zone of protected area		✓	Not applicable
Mangroves Forest		✓	Not applicable
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	Not observed
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	✓		Recorded Shrine within 100 m of the proposed subproject
Sensitive receptors (Schools, colleges, hospitals and clinics) within 100 meter of the proposed sub project	✓		1 school observed within 100 meter of the proposed sub project
Any graveyard of local community (Muslims or Christians)		✓	Not 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 ⁴⁶ of the society and women or children)?		✓	No such type of demographic or socio-economic aspects of the sub-project area observed
Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	No such type of activity like dismantling required for this sub-project.
B. Potential Environmental Impacts Will the Sub-Project cause...			
Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	There is no habitats/biodiversity of environmentally sensitive or protected areas adjacent to the proposed road
Cutting of trees?		✓	Not applicable
Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	There is no habitats/biodiversity of environmentally sensitive or protected areas adjacent to the proposed road

⁴⁵ Ibid.

⁴⁶ due to caste, creed, religion or gender e.g. transgender

Screening Questions	Yes	No	Remarks
Generation of wastewater during construction or operation?	✓		The domestic wastewater collected from the septic camp of labor camp will be disposal in the nearby sewerage lines.
Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of waste water?	✓		Domestic waste water will be produced during construction but the waste will be collected in septic tanks.
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 activity is foreseen
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	✓		No deterioration in surface water quality is anticipated
Over pumping of ground water, leading to salinization and ground subsidence?	✓		If ground water quality is marginal then over pumping of ground water would lead to salinization and ground subsidence. Water quality analysis reports will be attached with the ESIA and contractor will ensure to carry out water quality analysis during and after execution of the sub-project
Serious contamination of soil due to construction works?		✓	No serious contamination of soil is foreseen
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 recommended by supervision engineer.
Generation of hazardous waste?	✓		No hazardous waste will be generated.
Increased air pollution due to sub-project construction and operation?	✓		Increased air pollution due to smoke and dust generated by the movement of vehicles and construction machinery at project site is expected. The mitigation measures include control on speed limit of project vehicles and use of construction machinery in good working condition and regular sprinkling of water at dust prone roads/site.
Noise and vibration due to sub-project construction or operation?	✓		The noise pollution during construction phase because of project vehicles and construction machinery is expected. The mitigation includes use of vehicles and machinery in good running condition. The working hours shall be restricted during daytime only.
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?	✓		The stagnant water in construction areas may create temporary breeding habitat for mosquitoes and resulting in dengue issue. Proper housekeeping and tidy conditions will avoid the creation of breeding habitats. Use of anti-mosquito spray will be ensured
Use of chemicals during construction?		✓	The use of chemicals in construction phase are not expected.
C: Potential Social Impacts Will the Sub-Project cause...			

Screening Questions	Yes	No	Remarks
Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?	No damage or loss to PCR's due to this sub project.		
Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	No displacement required for this project
Disproportionate impacts on the poor, women and children and or other vulnerable groups ⁴⁷ (mentioned above)?	✓		Pardah issues for women and children's (vulnerable group) will be managed by supervision of labor or say hiring of local labor to manage this concern
Temporary impediments in movements of people/transport and animals?	✓		As the construction activities will be confined within the boundary wall of existing water supply facility of MC so there will be no impediment in the movement of people, transport or animals. Traffic management Training will be provided to drivers. Alternative routes will be provided to community.
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 labor will be hired who will return to their houses after day's work and the sub-project will not cause burden on social infrastructure and services The contractor to establish construction camp at appropriate place at open place sufficiently away from the populated area
Social conflicts if workers from other areas are hired?		✓	In ESIA, the contractor will be bound to prefer local labor to avoid social conflicts.
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		Vulnerable people especially elderly and handicap may be affected for some days during construction.
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 construction work. The SOPs for health and safety must be followed by the contractors
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 some safety issues for commuters and people living in adjoining areas during construction phase. The SOPs for health and safety have been included in the PC-I that have to be followed by the contractors
Any impact on sensitive receptors (mentioned above)	✓		Air Pollution including dust, foul/smell and noise will affect the receptors like graveyard, mosque and college, hospitals. Sprinkling of water will be done to avoid dust pollution.

⁴⁷ 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
			Tuned machinery will be used at site and maintained speed limit to avoid noise pollution. When dustbins are full to avoid odor and foul smell in area also ensure cleanliness and housekeeping of site during laying water supply lines or constructing.
Any impact of negative nature on already existing infrastructure including public amenities	✓		As this project beneficent for local community but little impacts like difficulty in access for roads, shrines, etc, but it improves water supply in the area.

Prepared By: Name: Muhammad Hannan Designation: Env. Specialist Signature	Reviewed By: Name: Designation: Signature	Endorsed By: Name: Muhammad Zeeshan Designation: MOI&S Signature

Pictures of Project Site



INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of City/MC/LG: Jhelum

Sub-Project Sector: water supply

Sub-Project Title: Improvement of water supply system in Jhelum city

Sub-Project Categorization: S-2

Date of Screening: 14-06-2023

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		Not applicable
If yes, then describe the type of land being acquired from the categories below:		✓		Not applicable
Has any AED been conducted at the proposed location by the government? Yes/No		✓		Not applicable
Land (Quantify and describe types of land being acquired in "remarks column".		✓		Not applicable
Government and LG owned land free of occupation (agriculture or settlement)		✓		Not applicable
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		Not applicable
Private land		✓		Not applicable
Residential		✓		Not applicable
Commercial		✓		Not applicable
Agricultural		✓		Not applicable
Communal		✓		Not applicable
Others (specify in "remarks").		✓		Not applicable
Name of owner/owners and type of ownership document if available.		✓		Not applicable
If land is being acquired, describe any structures constructed on it		✓		Not applicable
Land-based assets:		✓		Not applicable
Residential structures		✓		Not applicable
Commercial structures (specify in "remarks")		✓		Not applicable
Community structures (specify in "remarks")		✓		Not applicable
Agriculture structures (specify in "remarks")		✓		Not applicable
Public utilities (specify in "remarks")		✓		Not applicable
Others (specify in "remarks")		✓		Not applicable
If agricultural land is being acquired, specify the following:				
Agriculture related impacts		✓		Not applicable
Crops and vegetables (specify types and cropping area in "remarks").		✓		Not applicable
Trees (specify number and types in "remarks").		✓		Not applicable
Others (specify in "remarks").		✓		Not applicable
Affected Persons (APs)		✓		Not applicable
Will any people be displaced from the land when acquired? Yes/No		✓		Not applicable
Number of APs		✓		Not applicable
Males		✓		Not applicable
Females		✓		Not applicable
Titled landowners		✓		Not applicable

SECTION 1	Yes	No	Expected	Remarks
Tenants and sharecroppers		✓		Not applicable
Leaseholders		✓		Not applicable
Agriculture wage laborers		✓		Not applicable
Encroachers and squatters (specify in remarks column)		✓		Not applicable
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".		✓		Not applicable
Others (specify in "remarks")		✓		Not applicable
How will people be affected?		✓		Not applicable

Prepared By: Name: Nasir Altaf Designation: Sociologist Signature	Reviewed By: Name: Designation: Signature	Endorsed By: Name: Muhammad Zeeshan Designation: MOI&S Signature

Tube well # 36 (Al Miraj Floor Mills Kala Gujran) Environmental & Social Screening Checklist

Instructions:

Environmental and Social Focal Persons (ESFPs)⁴⁸ 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 document⁴⁹ 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 Zeeshan
Name of MC:	Jhelum
Sub-Project Sector:	water supply
Sub-Project Title:	Improvement of water supply system in Jhelum city
Sub- Project Categorization:	E-2 S-2
Date of Screening:	14-06-2023
Anticipated Project Activities	✓ Boring and construction of tube-wells of 1.0 cusec capacity : 4 Nos ✓ Construction of new Pump House: 4 No. ✓ Installation of Pumping Machinery and allied E&M works: 3 No. ✓ Installation of electric connection by GEPCO/ WAPDA: 4 No ✓ Laying of new/ replacement of distribution network (94246 +57435 =151699) Rft from 3" dia to 10" dia HDPE pipe with allied works ✓ Installation of 4 hypo-chlorinators. ✓ Installation of 4-bulk water meter. ✓ Replacement House Connections 6452 Nos
Estimated Cost of Subprojects	300.205 million
Completion Time/Duration	6 Months
Estimated Labor for Subproject	15-20

⁴⁸ 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.

⁴⁹ 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		✓	Legally protected area not recorded nearby to the city.
Any surface water body (river, canal, stream, lake, wetland) within 250 meter of the proposed sub project ⁵⁰		✓	No surface water body exist within 250 meters of the proposed sub project
Estuarine		✓	Not applicable
Special area for protecting biodiversity		✓	Biodiversity protected area not recorded nearby to the city.
Buffer zone of protected area		✓	Not applicable
Mangroves Forest		✓	Not applicable
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	Not observed
Socially sensitive /important areas/communities/ people?			
PCRs and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, <i>Gordwarah</i> , Temple, Fort, archeological/historical site) within 100 m of the proposed subproject	✓		Tube well exist in the premises of graveyard. Mosque observed within 100 m of the proposed subproject
Sensitive receptors (Schools, colleges, hospitals and clinics) within 100 meter of the proposed sub project		✓	Not observed
Any graveyard of local community (Muslims or Christians)	✓		Tube well exist in the premises of graveyard
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 ⁵¹ of the society and women or children)?		✓	No such type of demographic or socio-economic aspects of the sub-project area observed
Already existing infrastructure (including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	No such type of activity like dismantling required for this sub-project.
B. Potential Environmental Impacts			
Will the Sub-Project cause...			
Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	There is no habitats/biodiversity of environmentally sensitive or protected areas adjacent to the proposed road
Cutting of trees?		✓	
Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	There is no habitats/biodiversity of environmentally sensitive or protected areas adjacent to the proposed road
Generation of wastewater during construction or operation?	✓		The domestic wastewater collected from the septic camp of labor camp will be disposal in the nearby sewerage lines.
Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of waste water?	✓		Domestic waste water will be produced during construction but the waste will be collected in septic tanks.
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 activity is foreseen

⁵⁰ Ibid.

⁵¹ due to caste, creed, religion or gender e.g. transgender

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?	✓		No deterioration in surface water quality is anticipated
Over pumping of ground water, leading to salinization and ground subsidence?	✓		If ground water quality is marginal then over pumping of ground water would lead to salinization and ground subsidence. Water quality analysis reports will be attached with the ESIA and contractor will ensure to carry out water quality analysis during and after execution of the sub-project
Serious contamination of soil due to construction works?		✓	No serious contamination of soil is foreseen
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 recommended by supervision engineer.
Generation of hazardous waste?	✓		No hazardous waste will be generated.
Increased air pollution due to sub-project construction and operation?	✓		Increased air pollution due to smoke and dust generated by the movement of vehicles and construction machinery at project site is expected. The mitigation measures include control on speed limit of project vehicles and use of construction machinery in good working condition and regular sprinkling of water at dust prone roads/site.
Noise and vibration due to sub-project construction or operation?	✓		The noise pollution during construction phase because of project vehicles and construction machinery is expected. The mitigation includes use of vehicles and machinery in good running condition. The working hours shall be restricted during daytime only.
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?	✓		The stagnant water in construction areas may create temporary breeding habitat for mosquitoes and resulting in dengue issue. Proper housekeeping and tidy conditions will avoid the creation of breeding habitats. Use of anti-mosquito spray will be ensured
Use of chemicals during construction?		✓	The use of chemicals in construction phase are not expected.
C: Potential Social Impacts			
Will the Sub-Project cause...			
7. 8. 9. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?	No damage or loss to PCR's due to this sub project.		
Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	No displacement required for this project
Disproportionate impacts on the poor, women and children and or other vulnerable groups ⁵² (mentioned above)?	✓		Pardah issues for women and children's (vulnerable group) will be managed by supervision of labor or say hiring of local labor to manage this concern
Temporary impediments in movements of people/transport and animals?	✓		As the construction activities will be confined within the boundary wall of existing water supply facility of MC so there will be no impediment in the movement of people,

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
			transport or animals. Traffic management Training will be provided to drivers. Alternative routes will be provided to community.
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 labor will be hired who will return to their houses after day's work and the sub-project will not cause burden on social infrastructure and services The contractor to establish construction camp at appropriate place at open place sufficiently away from the populated area
Social conflicts if workers from other areas are hired?		✓	In ESIA, the contractor will be bound to prefer local labor to avoid social conflicts.
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		Vulnerable people especially elderly and handicap may be affected for some days during construction.
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 construction work. The SOPs for health and safety must be followed by the contractors
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 some safety issues for commuters and people living in adjoining areas during construction phase. The SOPs for health and safety have been included in the PC-I that have to be followed by the contractors
Any impact on sensitive receptors (mentioned above)	✓		Air Pollution including dust, foul/smell and noise will affect the receptors like graveyard, mosque and college, hospitals. Sprinkling of water will be done to avoid dust pollution. Tuned machinery will be used at site and maintained speed limit to avoid noise pollution. When dustbins are full to avoid odor and foul smell in area also ensure cleanliness and housekeeping of site during laying water supply lines or constructing.
Any impact of negative nature on already existing infrastructure including public amenities	✓		As this project beneficent for local community but little impacts like difficulty in access for roads, mosque, graveyard etc, but it improves water supply in the area.

Prepared By: Name: Muhammad Hannan Designation: Env. Specialist Signature	Reviewed By: Name: Designation: Signature	Endorsed By: Name: Muhammad Zeeshan Designation: MOI&S Signature

Pictures of Project Siting



INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of City/MC/LG: Jhelum

Sub-Project Sector: water supply

Sub-Project Title: Improvement of water supply system in Jhelum city

Sub- Project Categorization: S-2

Date of Screening: 14-06-2023

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		Not applicable
If yes, then describe the type of land being acquired from the categories below:		✓		Not applicable
Has any AED been conducted at the proposed location by the government? Yes/No		✓		Not applicable
Land (Quantify and describe types of land being acquired in "remarks column".		✓		Not applicable
Government and LG owned land free of occupation (agriculture or settlement)		✓		Not applicable
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		Not applicable
Private land		✓		Not applicable
Residential		✓		Not applicable
Commercial		✓		Not applicable
Agricultural		✓		Not applicable
Communal		✓		Not applicable
Others (specify in "remarks").		✓		Not applicable
Name of owner/owners and type of ownership document if available.		✓		Not applicable
If land is being acquired, describe any structures constructed on it		✓		Not applicable
Land-based assets:		✓		Not applicable
Residential structures		✓		Not applicable
Commercial structures (specify in "remarks")		✓		Not applicable
Community structures (specify in "remarks")		✓		Not applicable
Agriculture structures (specify in "remarks")		✓		Not applicable
Public utilities (specify in "remarks")		✓		Not applicable
Others (specify in "remarks")		✓		Not applicable
If agricultural land is being acquired, specify the following:				
Agriculture related impacts		✓		Not applicable
Crops and vegetables (specify types and cropping area in "remarks").		✓		Not applicable
Trees (specify number and types in "remarks").		✓		Not applicable
Others (specify in "remarks").		✓		Not applicable
Affected Persons (APs)		✓		Not applicable
Will any people be displaced from the land when acquired? Yes/No		✓		Not applicable
Number of APs		✓		Not applicable
Males		✓		Not applicable
Females		✓		Not applicable

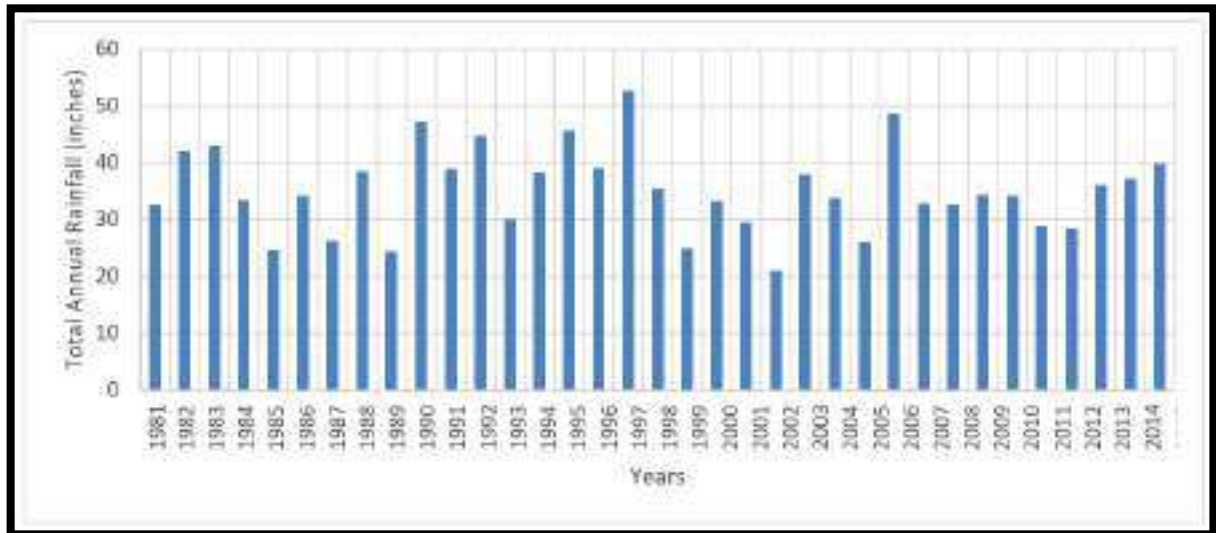
SECTION 1	Yes	No	Expected	Remarks
Titled landowners		✓		Not applicable
Tenants and sharecroppers		✓		Not applicable
Leaseholders		✓		Not applicable
Agriculture wage laborers		✓		Not applicable
Encroachers and squatters (specify in remarks column)		✓		Not applicable
Vulnerable APs (e.g. women headed households, minors and aged, orphans, disabled persons, and those below the poverty line). Specify the number and vulnerability in "remarks".		✓		Not applicable
Others (specify in "remarks")		✓		Not applicable
How will people be affected?		✓		Not applicable

Prepared By: Name: Nasir Altaf Designation: Sociologist Signature	Reviewed By: Name: Designation: Signature	Endorsed By: Name: Muhammad Zeeshan Designation: MOI&S Signature

Annexure B: Aquifer Sustainability Analysis

Rainfall Trend for Jhelum

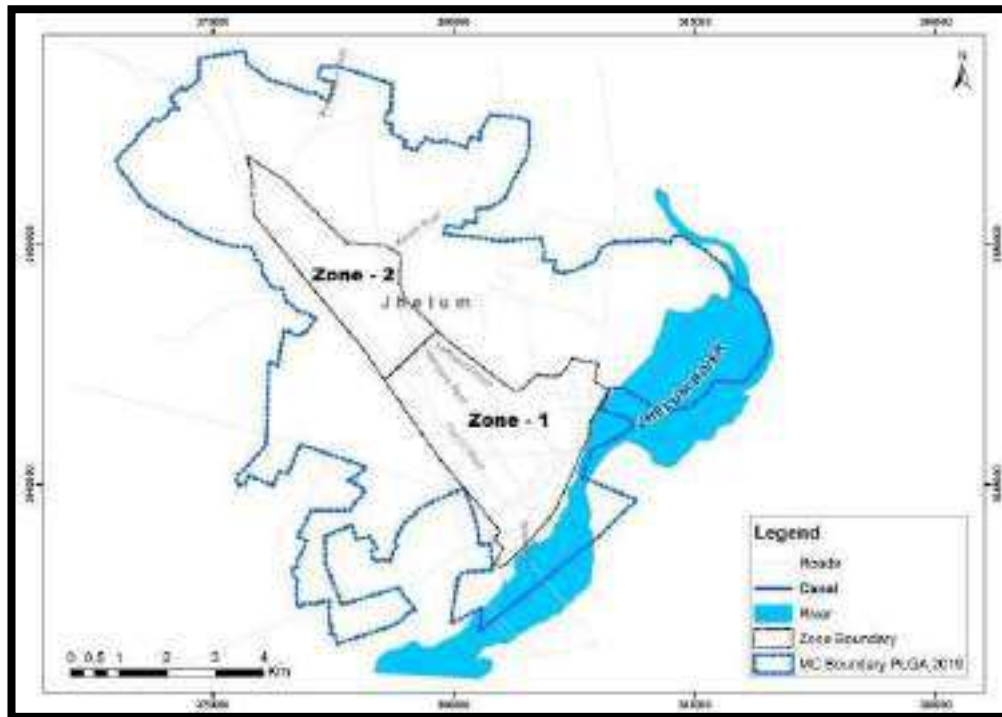
Jhelum rainfall data have been collected from Pakistan Meteorological Department (PMD). From the processed rainfall data, it is evident that for Jhelum station June, July, August, and September are months of high rainfall. Total annual maximum and minimum rainfall were observed to be 52.64 inches (1997) and 20.85 inches (2002), respectively (**Figure**).



Total Annual Rainfall of Jhelum (Source: PDM)

Surface Water Channels

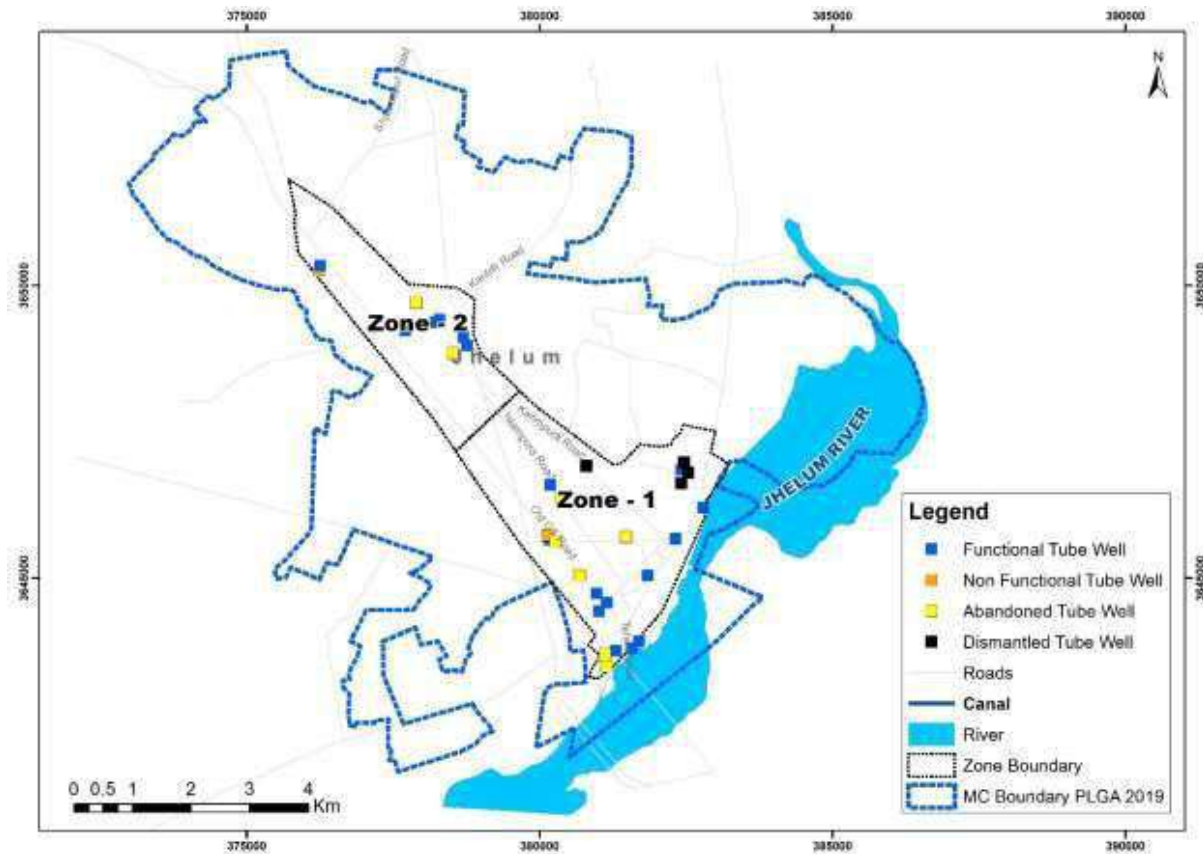
The city has sweet sub soil water which is fit for human consumption. Jhelum River is flowing at the eastern and southern periphery of the city. Tube wells have been installed at different points in the city to harness the deep underground fresh water. Water from some tube wells is being pumped into overhead reservoirs constructed at different locations of the city wherefrom it is fed to the distribution system. Three overhead reservoirs are currently non-functional and hence water is directly being supplied into distribution system (**Figure**).



Surface Water Bodies in MC Jhelum

Hydro-geologic Conditions of Aquifer

Jhelum city is located in doab between Indus river and Jhelum river. Jhelum block is geologically lies in Upper Indus Basin (East Potwar sub-basin) of Pakistan. Stratigraphy of the area ranges from Pre-cambrian Paleocene. An unconformity lies in Paleocene (Lokhart formatin). Soil in Jhelum city ranges between fine to coarse sand and hard rocks **(Figure)**.



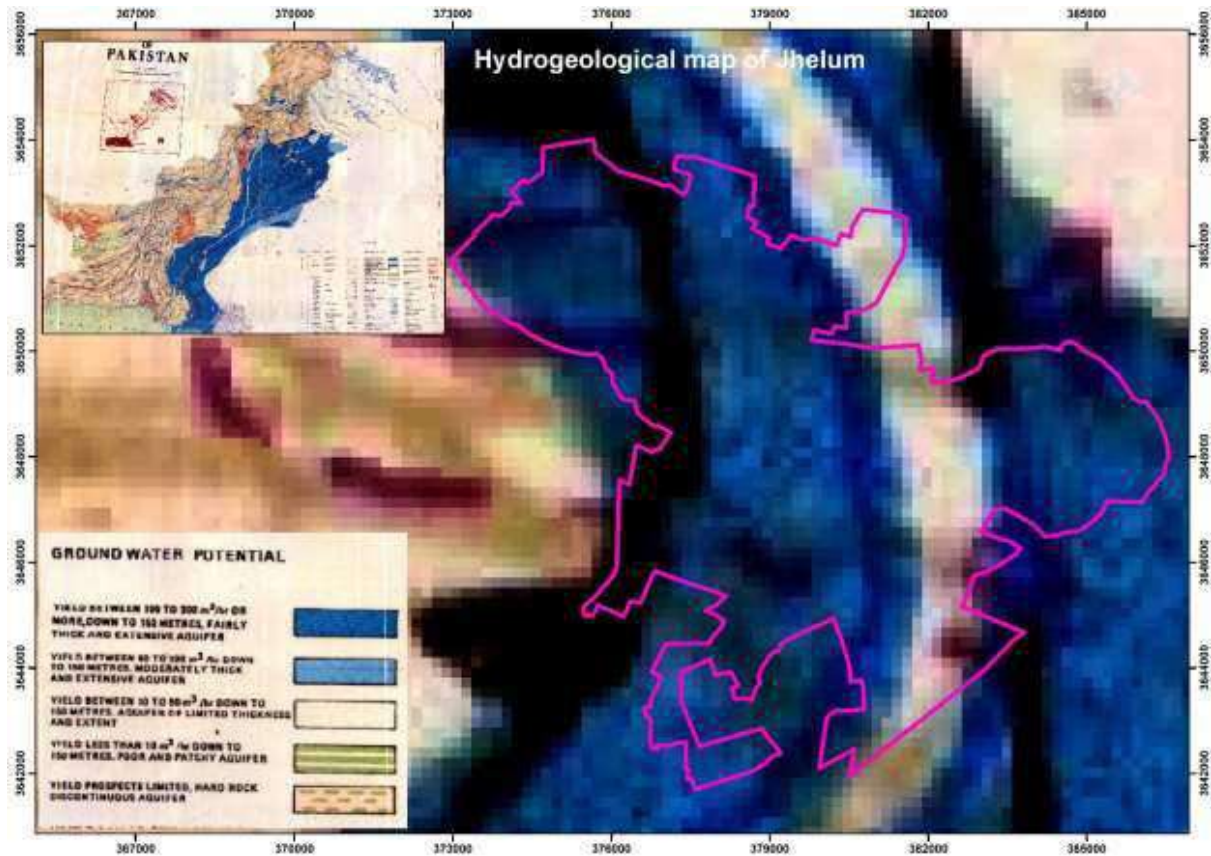
Location of Existing Tubewells Map for MS Jhelum

Aquifer Yield

Hydrogeological survey map was prepared under the supervision of WAPDA, by sponsorship of Ministry of Housing and Works, Environment and Urban Affairs Division, Government of Pakistan, Islamabad in 1984.

Number of hydrogeological features has been marked on the map i.e. lithology, groundwater yield and quality, hydrogeological structures, hydrogeological features, climatology and tectonic features.

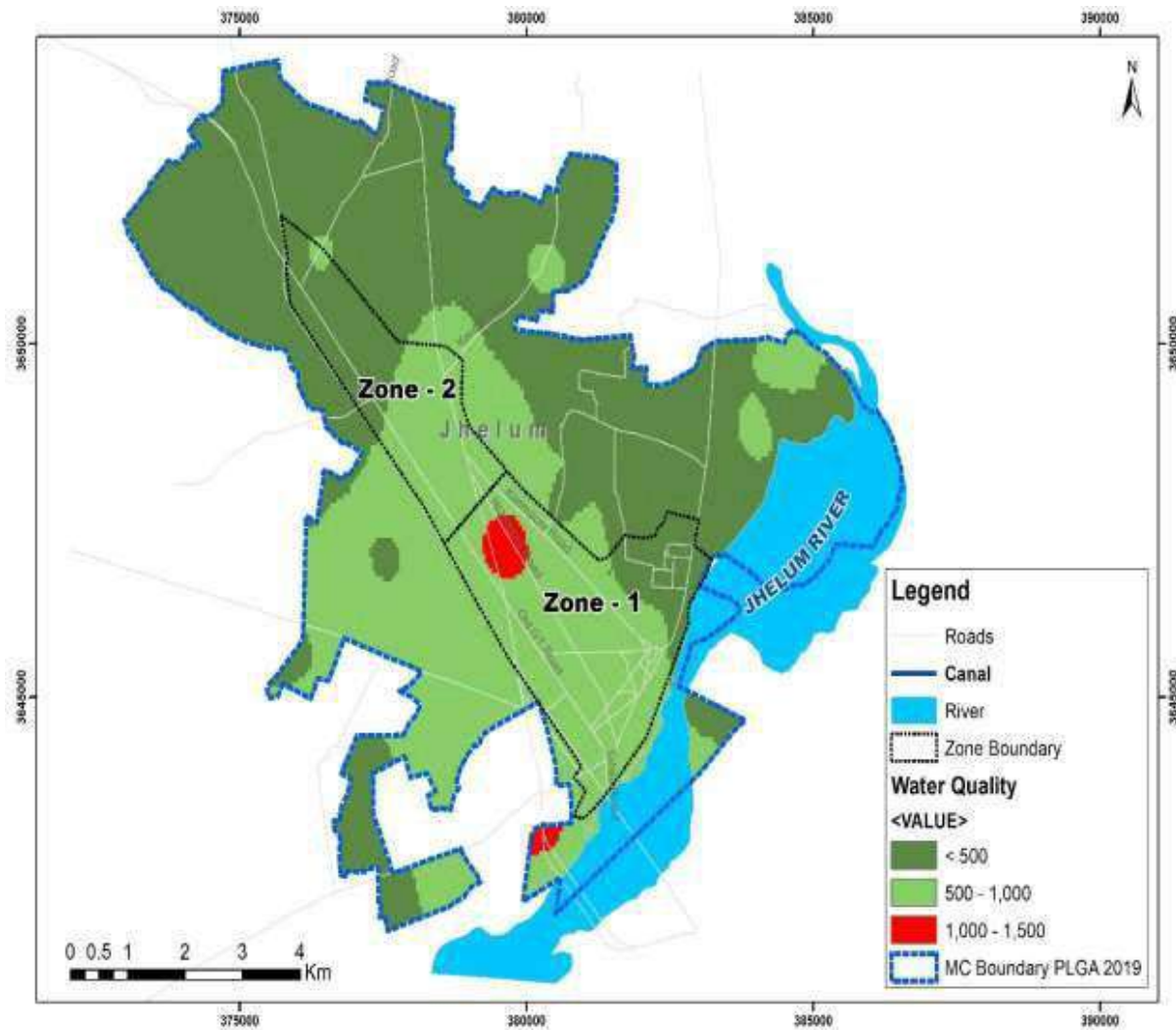
Based on given map, groundwater potential of aquifer lying under Jhelum MC boundary has been identified. Jhelum is located in alluvial zone of Indus and Jhelum river and have varied groundwater potential. In Jhelum, there are many areas where hard rocks are present at various depths and locations (Figure).



Hydro-geological Map of Jhelum

Groundwater Quality

Reported groundwater quality in and around the Jhelum MC boundary has been collected and interpolated. Different interpolation techniques have been applied and the kriging was found most appropriate. Total observation points in and around the project area are 114. Minimum observed value of TDS is 200 mg/l and maximum is 1400 mg/l. Water level in Jhelum city is at maximum 200 ft. and minimum at 30-50 feet depth. Interpolation results are shown in figure below. It can be seen that water quality is fresh in Jhelum City due to constant recharge from Jhelum river. Only at few sites there are TDS value more than standard limits.



Water Quality Map of Jhelum City

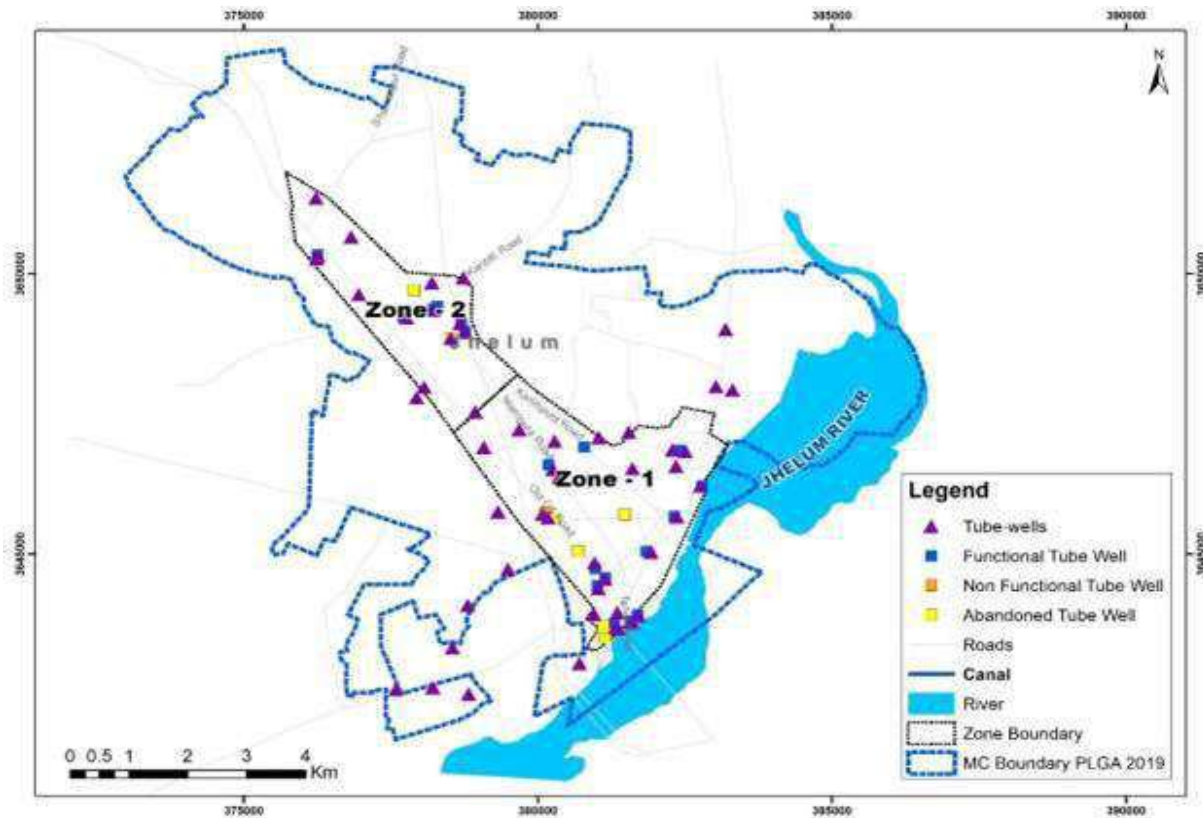
Location of Quality Points in Jhelum

Village	Water Source	Physical Characteristics	TDS (mg/l)	Water level ft	Latitude	Longitude
Kashmir Colony	Motor pump	Odorless	280	145	32.98468	73.67552
Raiya	Motor pump	Odorless	390	80	32.92701	73.68439
Janowal	Motor pump	Odorless	520	55	33.00296	73.73753
Pholayan	Motor pump	Odorless	880	65	32.96273	73.71098
Jandila	Motor pump	Odorless	300	55	33.00087	73.72099
Phagwal Raja	Motor pump	Odorless	730	65	32.99156	73.7534
Sheikha Barlab Darya	Motor pump	Odorless	490	45	33.02869	73.74646
Jhangheer	Motor pump	Odorless	390	80	33.01414	73.73671
Rakhnawa	Motor pump	Odorless	360	65	33.00256	73.72521
Bilal Town	Motor pump	Odorless	380	80	32.95328	73.7461
Haji	Motor pump	Odorless	470	85	32.96289	73.72305
Pind ratuwal	Motor pump	Odorless	650	55	32.9778	73.76388
Porilla	Motor pump	Odorless	420	70	33.03283	73.70513

Village	Water Source	Physical Characteristics	TDS (mg/l)	Water level ft	Latitude	Longitude
Makhdoompur Dhoke	Toba/Well	Odurless	240	65	32.98853	73.78806
Kalar	Motor pump	Odurless	400	35	33.01336	73.74368
Chuntra	Motor pump	Odurless	350	130	32.96623	73.74798
Kantrila	Motor pump	Odurless	890	70	32.9587	73.69673
Bagga	Motor pump	Odurless	350	90	32.9107	73.68315
Taas Pathana	Motor pump	Odurless	550	55	33.01944	73.7323
Chittan	Motor pump	Odurless	770	100	32.94405	73.6968
Phagwal	Motor pump	Odurless	400	70	32.98545	73.75327
Chippiar	Motor pump	Odurless	630	55	32.92493	73.67414
Chak Braham	Motor pump	Odurless	370	70	32.99532	73.7044
Garden Town	Motor pump	Odurless	340	150	32.98891	73.68494
Chak Tasaa	Motor pump	Odurless	580	70	33.01861	73.73185
Depot Kala	Motor pump	Odurless	300	95	33.02213	73.68981
Dhok Munnawar	RWSS Source	Odurless	380	90	32.96399	73.63335
Mashuper	Motor pump	Odurless	670	30	33.01071	73.75329
Pindi Khaira	Motor pump	Odurless	500	40	33.03838	73.74232
Pindboona	Motor pump	Odurless	370	70	33.05535	73.73326
Aima Jattan	Motor pump	Odurless	1410	65	32.95615	73.71234
Monan	Motor pump	Odurless	600	80	32.94732	73.68693
Rakhrnwan	Motor pump	Odurless	240	65	33.00351	73.72403
Diara Rajgaan	Toba/Well	Odurless	410	100	32.90525	73.66678
Fazaliya Colony	Motor pump	Odurless	300	75	32.94524	73.74511
Kothe	Motor pump	Odurless	470	60	33.04518	73.72542
Sheikh Qureshian	Motor pump	Odurless	460	50	33.02621	73.71436
Aima ilyas	Motor pump	Odurless	350	70	33.00027	73.73108
Zilaa Kacheari	Motor pump	Odurless	700	60	32.94453	73.74024
Chitti	Motor pump	Odurless	460	55	32.97922	73.73604
Kotla	Motor pump	Odurless	390	70	32.97293	73.72138
Jhelum Cantt.	Motor pump	Odurless	1340	70	32.92433	73.71689
Kotha Purana	Motor pump	Odurless	590	85	32.95067	73.69869
Kazei Abad	Motor pump	Odurless	200	154	32.98656	73.67611
Noor Pur Bali	Motor pump	Odurless	920	35	32.99613	73.76909
Munur Pur Bali	Motor pump	Odurless	740	45	32.99863	73.77106
Kalajuraan	Motor pump	Odurless	350	100	32.95391	73.69019
Dheenda	Motor pump	Odurless	270	130	32.96252	73.64637
Thathi Mughlan	Motor pump	Odurless	330	80	32.96932	73.67798
Aima Afghana	Motor pump	Odurless	420	60	33.02236	73.74389
Tahlianwala	Motor pump	Odurless	460	60	32.96077	73.7464
Chak Daulat	Motor pump	Odurless	510	40	33.01524	73.74852

Village	Water Source	Physical Characteristics	TDS (mg/l)	Water level ft	Latitude	Longitude
Matiyal	Motor pump	Odurless	460	50	33.03991	73.72959
Gharmaala	Motor pump	Odurless	250	90	32.89573	73.67917
Gharmala	Motor pump	Odurless	660	100	32.95017	73.68474
KDC ply WoodFactory	Motor pump	Odurless	580	150	32.99254	73.67704
Aima	Motor pump	Odurless	460	85	32.96091	73.72178
Dhok Munnawar	Motor pump	Odurless	340	150	32.9642	73.63335
Bhloola	Motor pump	Odurless	350	55	32.94617	73.65166
Fazalabad	Motor pump	Odurless	420	130	32.98117	73.68117
Chak Jamal	Motor pump	Odurless	230	90	33.02139	73.69007
Chokara	Motor pump	Odurless	400	50	33.0344	73.70233
Awana Sareef	Motor pump	Odurless	390	70	33.02094	73.71011
Fazealpur	Motor pump	Odurless	390	40	33.00583	73.75162
Guhman	Motor pump	Odurless	340	60	33.02272	73.72905
Chak Hafizan	Motor pump	Odurless	340	75	33.01048	73.73972
Chak Eesa	Motor pump	Odurless	390	35	32.93085	73.65609
Dhoke Barkat Ali	Motor pump	Odurless	470	60	32.97644	73.74486
Diara Rajgaan	Motor pump	Odurless	360	75	32.90515	73.66704
Kharala	Motor pump	Odurless	490	60	32.97157	73.75291
Kalaar	Motor pump	Odurless	290	50	32.97449	73.76334
Hassnaabad	Motor pump	Odurless	570	70	32.9437	73.71048
Jakkar	Motor pump	Odurless	390	50	33.03382	73.72365
Muraj Pur Bali	Motor pump	Odurless	530	45	32.99712	73.76981
Rasheedabad	Motor pump	Odurless	720	70	32.94067	73.70852
Sarfaraz Town	Motor pump	Odurless	440	55	32.9764	73.75011
Kala Gujran	Motor pump	Odurless	780	70	32.97784	73.70103
Aima Ilyas	Toba/Well	Odurless	320	150	32.99856	73.73371
Mianna Chak	Motor pump	Odurless	760	70	32.93365	73.67239
Bhumble	Motor pump	Odurless	370	60	32.93163	73.67936
Karaai Afgahan	Motor pump	Odurless	460	40	33.00009	73.75271
Pasraali	Motor pump	Odurless	510	45	33.02328	73.73159
Chak Mughlan	Motor pump	Odurless	280	65	32.98442	73.71504
Kotli	Motor pump	Odurless	370	45	32.97048	73.73618
Kotha	Motor pump	Odurless	870	80	33.01476	73.72585
Paswal	Motor pump	Odurless	390	55	33.04136	73.73892
Chak Nasir Ud Din	Motor pump	Odurless	420	60	33.02123	73.70634
Nougran	Motor pump	Odurless	660	55	32.89815	73.65025
Bala Gujarn	Motor pump	Odurless	490	200	32.99195	73.6737
Railway Conlony	Motor pump	Odurless	800	60	32.93039	73.72438
Baigpur	Motor pump	Odurless	510	40	32.94678	73.65899

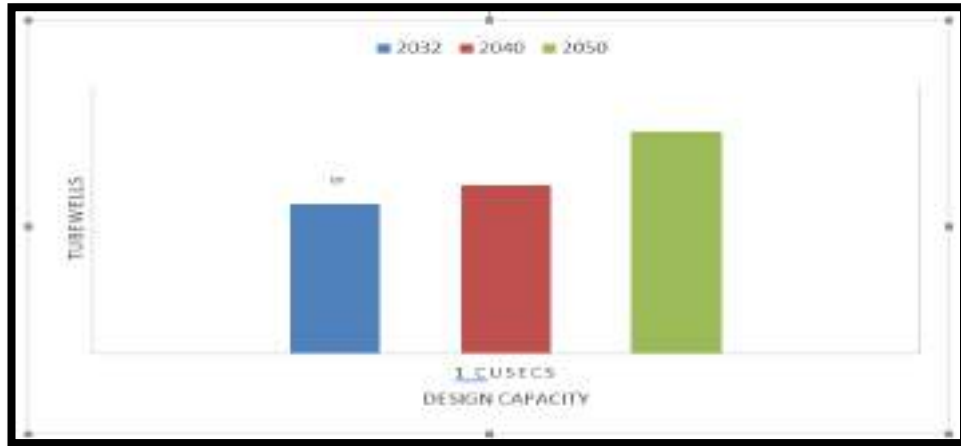
Village	Water Source	Physical Characteristics	TDS (mg/l)	Water level ft	Latitude	Longitude
Dhoke Qasir	Motor pump	Odurless	270	35	32.99511	73.77062
Lengar Pur	Motor pump	Odurless	480	140	32.96582	73.65483
Muftian Ismail	Motor pump	Odurless	490	60	33.00647	73.73759
Mona Pind	Motor pump	Odurless	380	45	33.00452	73.70601
Kantrili	Motor pump	Odurless	650	85	32.9914	73.71947
Motian	Motor pump	Odurless	420	70	33.00888	73.71891
Kothara	Motor pump	Odurless	410	50	33.01912	73.72432
Nai Abadi	Motor pump	Odurless	370	65	32.97111	73.74733
Jinnah Town	Motor pump	Odurless	550	65	32.92467	73.70014
Bajar	Motor pump	Odurless	350	130	32.96026	73.65136
Bokan	Motor pump	Odurless	370	55	33.02185	73.72413
Bilal Town	Any Other	Odurless	290	100	32.95228	73.74481
Dhok Daswandi	Motor pump	Odurless	300	130	32.97395	73.66228
Aima Chachrali	Motor pump	Odurless	420	80	33.00087	73.7296
Tahli	Motor pump	Odurless	410	75	32.99483	73.72711
Thekari Chak Abdullaha	Motor pump	Odurless	700	46	32.95653	73.69746
Rathian	Motor pump	Odurless	390	200	32.98791	73.67058
Thati Gujran	Motor pump	Odurless	470	110	32.97277	73.68228
Langarpur	Motor pump	Odurless	260	30	32.98711	73.78148
Bhattia	Motor pump	Odurless	390	60	32.94032	73.67126
Loda	Motor pump	Odurless	390	60	32.92073	73.68184
Khokhar	Motor pump	Odurless	610	50	32.97174	73.75897
Aima Ilyas	Motor pump	Odurless	300	120	32.99886	73.73424



Location of Existing and Proposed Tubewells for MC Jhelum

Future Sustainable Groundwater Abstraction

- Based on groundwater quality results and available groundwater yield in project area, number of tube wells has been calculated for year 2032. The cumulative number of 1 cusecs capacity tube wells for the year of 2032, 2040 & 2050 are 39, 44 & 58, respectively.
- Projected water demand for MC urban area of Jhelum for years 2032, 2040 & 2050 based upon 39.6 gallons per capita per day is about 14.3 MGD, 15.5 MGD and 18.9 MGD, respectively.
- Projected maximum daily demand for MC urban area of Jhelum for years 2032, 2040 & 2050 is about 21.5 MGD, 23.2 MGD and 28.3 MGD, respectively (Figures 3-8 to 3-11).
- Tube wells abstraction is suggested to be intermittent, that is 16 hours per day. Tube wells are proposed for 2032 based on the projected water demand.
- In the year 2040 & 2050, the cusecs projected water demand may be altered depending on the influx of population.
- Existing water abstraction in Jhelum city was observed to be 7.539 MGD (14.00 cusecs). Out of total 36 tube wells for the city, 21 tube wells are functional in which each tube well of capacity 1.0 cusec.



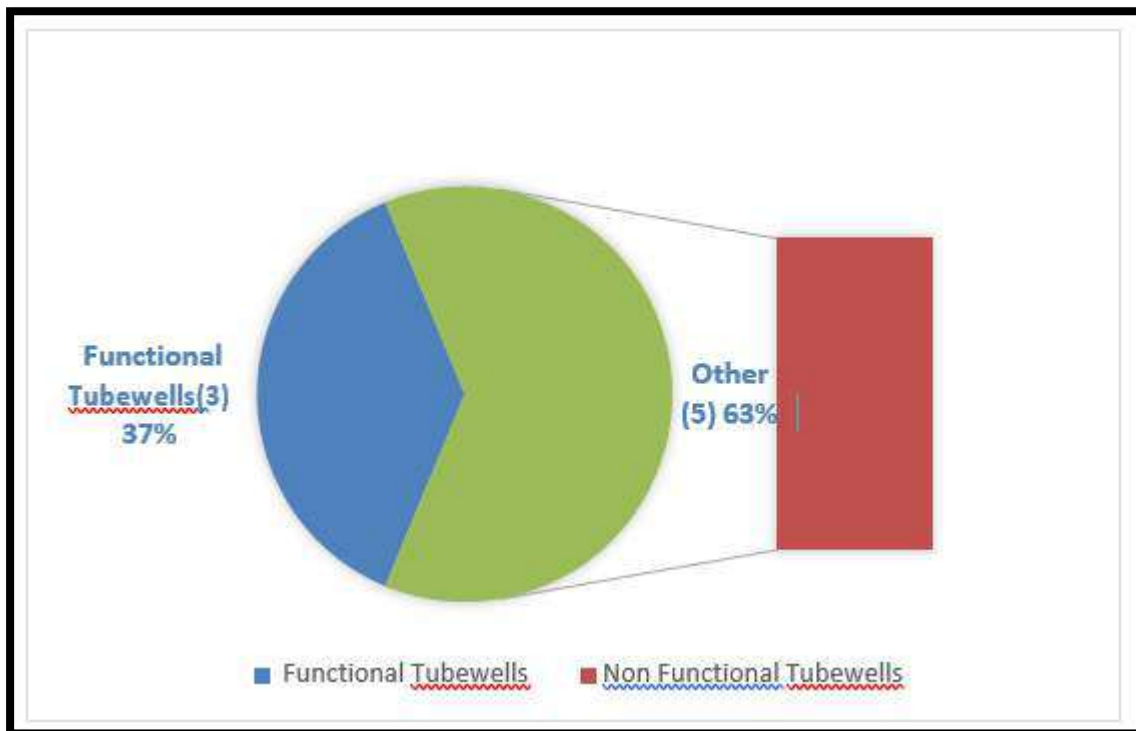
Proposed Tubewells for MC Jhelum



Average Daily Demand & Maximum Daily Demand (MGD) Map for MC Jhelum



Average Daily & Maximum Daily Demand (Cusecs) Map for MC Jhelum



Number of Existing Tubewells for MC Jhelum

At present, number of wells for 2040 & 2050 are calculated based on the population scenarios/increase. It is recommended that in years 2040 & 2050, the no. of wells may be recalculated based on actual population in these years. These wells are proposed in three packages for 2032, 2040 and 2050. Based on the rate of withdrawal standard minimum distance between wells is given in **Table**

Minimum Distance between Wells

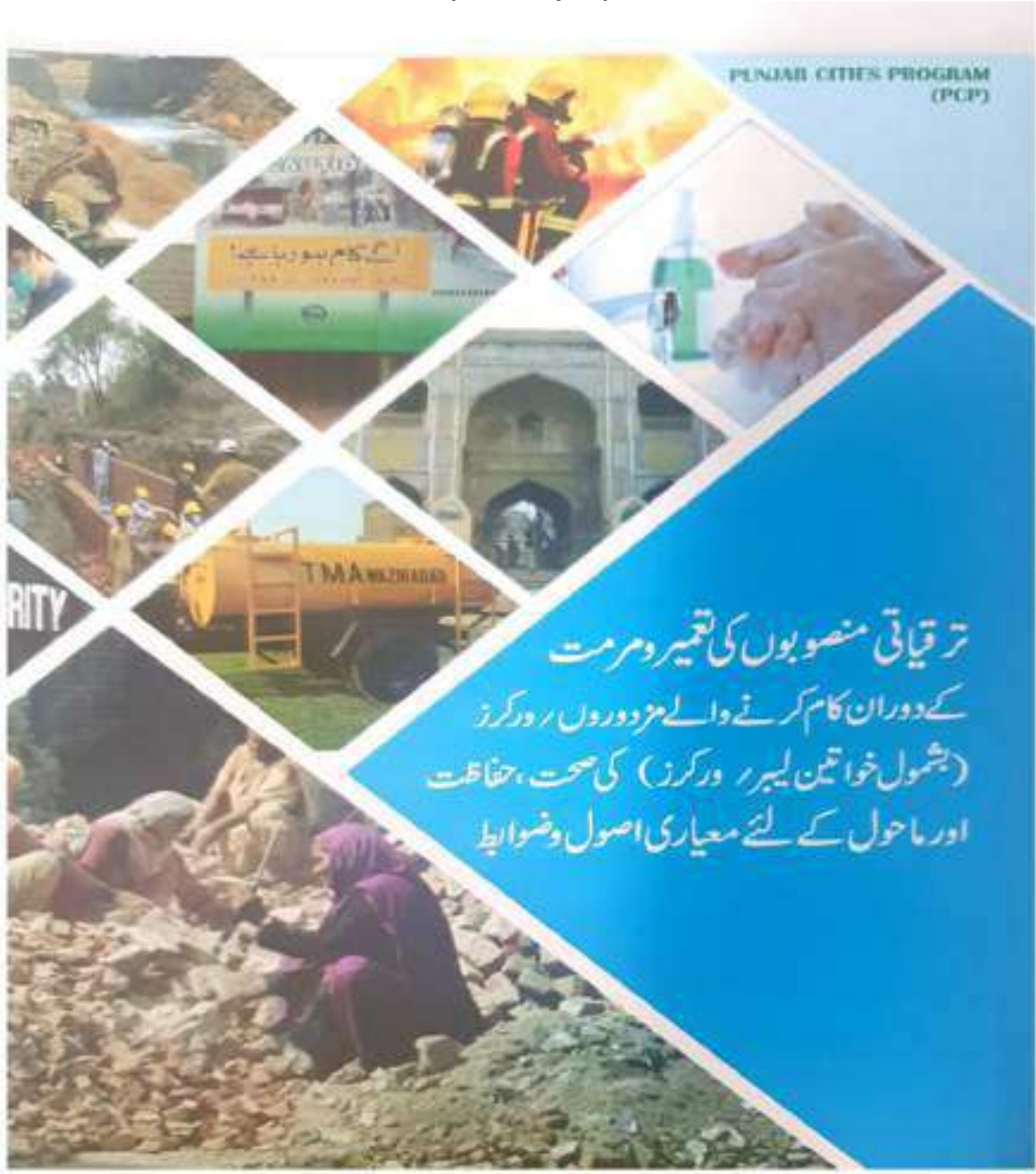
Rate of Withdrawal in (cusecs)	Minimum Distance between Wells (ft.)
0.50	1312
0.50 – 0.75	1968
0.75 – 1.00	3280

(Source: .fao.org/III GROUNDWATER DEVELOPMENT AND CONSERVATION)

Annexure C:List of Participants Consulted

Sr. No	Community	Person	City	Occupation	Cell No.
Consultation With Institutional Stakeholders					
1	Mc Jhelum	Raheel Kayani	Jhelum	MO(S)	0331-6662000
2	Mc Jhelum	Sardar Zubair	Jhelum	Supervision water supply	0313-5579125
3	Forest Department	Waqas Shah	Jhelum	SDFO	0332-9087620
4	Forest Department	Mudassar Mehmood	Jhelum	In charge	0345-5703533
5	Punjab Housing & Town Planning	Ali Imran	Jhelum	DD	0313-7600626
6	Public Health Engineering	M.Imran	Jhelum	SDO	-
7	Public Health Engineering	Saleem Anwar Kasani	Jhelum	Community Dev. officer	-
8	Public Health Engineering	Mirza Zubair	Jhelum	Water testing counter	0344-6113879
9	Agriculture Department	Farwa Nasir	Jhelum	Agriculture Officer	0544-920333
10	Soil Conservation	Ejaz	Jhelum	Agriculture Officer	0343-4362730
11	Public Health Engineering	Ghulam Shabir	Jhelum	Sub-Engineer	0300-7934407
12	EPA Jhelum	M.Habib	Jhelum	Inspector	0322-4388076
13	EPA Jhelum	Izhar Ul Haq	Jhelum	AD	0332-8009695
14	Madni Mohalla	Masood Ahmad	Jhelum	Shopkeeper	0324-8763498
15	Madni Mohalla	Pervaiz Iqbal	Jhelum	Laborer	0334-9641791
16	Al-Miraj Colony	Imran Azhar	Jhelum	-	03175771219
17	Al-Miraj Colony	Mudassar Khan	Jhelum	-	03325173728
18	Al-Miraj Colony	Shahid Naeem	Jhelum	-	03213763558
19	Iqbal Town/Madina Town	Raja Munawar	Jhelum	-	0332-5848399
20	Iqbal Town/Madina Town	M. Mushtaq	Jhelum	-	0321-5325119
21	Iqbal Town/Madina Town	M.Shehbaz	Jhelum	-	031-4804296
22	Nawab Colony	M.Khadim	Jhelum	-	0307-5400238
23	Nawab Colony	Sagir Irfan	Jhelum	-	03068167569
24	Nawab Colony	Arshad Mehmood	Jhelum	-	0333-5809544
25	Nawab Colony	Javed Akhtar	Jhelum	-	03015800169
26	Muhalla Dhok	Raja Pervaiz	Jhelum	-	0321-5417138
27	Makhdombad	M. Danish	Jhelum	-	0321-5482947
28	Al-Miraj Colony	Shakir Ali	Jhelum	-	0308-8965389
29	Machine Mohalla 3	M Sadiq	Jhelum	-	0300-5416077
30	Bilal Colony/Behari Colony	Abdul Rasheed	Jhelum	-	-
31	Bilal Colony/Behari Colony	Nazar Hassan	Jhelum	-	0301-5829286
32	Bilal Colony/Behari Colony	Mukhtar Hussain	Jhelum	-	0336-8150215
33	Bilal Colony/Behari Colony	M. Iqbal	Jhelum	-	0347-4982513
34	Bilal Colony/Behari Colony	Nabeel Akhtar	Jhelum	-	0335-5807263
35	Bilal Colony/Behari Colony	M.Toseef	Jhelum	-	0306-0843098
36	Bilal Colony/Behari Colony	Bilal Ahmad	Jhelum	-	0333-5870626
37	Bilal Colony/Behari Colony	Jamil Khokhar	Jhelum	-	0316-5351502
38	Bilal Colony/Behari Colony	Ali Raza	Jhelum	-	0303-5658532

Annexure D:EHS SOPS for Labor/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، فوٹوکاپی،
ریکارڈنگ یا کسی اور طرح سے دوبارہ بنایا یا منتقل نہیں کیا جاسکتا۔



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پیش لفظ

ملکی گورنمنٹ اینڈ کمیونٹی ڈویلپمنٹ ڈیپارٹمنٹ اور پنجاب میونسپل ڈویلپمنٹ فنڈ کمیٹی (PMDFC) نے ورلڈ بینک کے اشتراک سے پنجاب سٹیٹس پروگرام (PCP) کا کامیابی سے اجرا کروایا ہے۔ اس منصوبے کے تحت صوبہ پنجاب کے 16 چھوٹے شہروں (MDCs) بشمول برائٹنر، روبریوالا، خانہوال، کوٹ او، وہاڑی، گوجرہ، جھنگ، مکالیہ، وکٹریا، ڈسکہ، حافظ آباد، جہلم، کاموہی، بہاولپور، ترقیاتی کاموں پر کامیابی سے کام جاری ہے۔ ان ترقیاتی منصوبوں میں ویسٹ مینجمنٹ، پانی کی فراہمی، ٹرانسپورٹ، سڑکیں، برسات کی پانی کی پارکس کی بحالی اور قدرتی آفات کی روک تھام کے منصوبہ جات شامل ہیں۔

پنجاب سٹیٹس 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 (بشمول خواتین) کی صحت اور کام کرنے کے دوران حفاظت بہت اہمیت رکھتی ہے۔ اس اہم مسئلہ کو ملحوظ خاطر رکھتے ہوئے، پی ایم ڈی ایف سی کے زیر اہتمام پنجاب سٹیٹس 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 و ضوابط" مرتب کیے ہیں تاکہ متعلقہ میونسپل کمیٹی/کارپوریشنز (MCS) کے مہدیداران اور ٹھیکیداران کو آگاہی فراہم کی جائے۔



اغراض و مقاصد

۱۔ مجوزہ معیاری اصول و ضوابط پنجاب سینیئر پروگرام (PCP) کے تحت پنجاب میونسپل ڈیپارٹمنٹ فنڈنگ (PMDFC) کے ماتحت ماحولیات سے پروگرام (PCP) اور ڈی پی پروگرام (PCP) کی زیر نگرانی تشکیل دیئے ہیں۔

۲۔ شہری ترقی کے ترقیاتی منصوبہ جات کی تعمیر و مرمت میں مزدور ورکرز بنیادی کردار ادا کرتے ہیں۔ ان (SOPs) کا بنیادی مقصد مزدور ورکرز (بشمول خواتین لیبر ورکرز) کو تعمیراتی جگہوں (Construction 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 سینیئر پروگرام کے تحت 16 شہروں کی میونسپل کمیٹیز/کارپوریشنز میں تعمیر و مرمت کے تمام پراجیکٹس پر لاگو ہوں گے۔

۴۔ یہ SOPs مزدوروں/کام کرنے والوں کو پہاڑی دار (بشمول خواتین) پر بلا تخصیص لاگو ہوں گے۔

۵۔ ان SOPs کو موثر اور یقینی بنانے کے لئے انھیں تصدیق اوروں کے کنٹرول کا حصہ بنانا اور ان پر عمل درآمد کرنا 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 والے مزدور ملحقہ
لہذا بہت اہمیت کا حامل ہے اور ان کے صحت و تندرستی سے متعلق مسائل کا
مؤثر حل اپنا ہی ضروری ہے۔ "مؤثر ترقیاتی منصوبوں کی تعمیر و مرمت کے
دوران کام کرنے والے مزدوروں (ورکرز) (بشمول ٹوائین لیبر ورکرز)
کی صحت و حفاظت اور ماحول کیلئے بنیادی اصول و ضوابط کی اشاعت و
ترویج اور ان پر بروقت عمل درآمد سے مدد 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 تخلیقہ کار 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 مد نظر رکھتے ہوئے ہر سطح پر ہم اس بات کو یقینی بنانے کی کوشش کریں گے
گے کہ ہماری پالیسیاں اور طریقہ عمل فعال ہوں۔ ماحولیات و 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 و ضوابط کی روشنی میں
مزدور ورکرز (بشمول ٹوائین لیبر) کے حقوق کی پاسداری کو ایک بنیادی رشتے کا اور حکومتی عہدیداران اور
تخلیقہ کاران بھی اپنی ذمہ داریوں کا احساس کریں گے۔ اور اس سلسلے میں پی ایم ڈی ایف سی اور پنجاب سلیٹ
پروگرام کی انوائزمنٹ اینڈ سوشل سیفٹی گارڈز (ESSs) ٹیم بلاشبہ مہارکھادی مستحق ہے اور یہ توقع کی جا
سکتی ہے کہ وہ مستقبل میں ان قواعد و ضوابط کی نگرانی کے لئے بھرپور اقدامات کریں گے۔

محمد عامر نذیر

پروگرام ڈائریکٹر
پنجاب سلیٹ پروگرام (PCP)



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(1) 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 مسائل پر مبنی پر
- مقامی آبادی سے تنازعات کا پیش
- مقامی مذہبی اور سکولری کے مسائل

حفاظتی اقدامات

تویکدہ لیبر کیمپس کے قیام کے وقت مندرجہ ذیل باتوں کا خیال رکھیے 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 لئے آبادی سے دور جگہ کا انتخاب کیا جائے
- لیبر کیمپ جگہ اور سہولیات سے متعلق ایک تفصیلی نقشہ تیار کر کے متعلقہ میونسپل کمیٹی / کارپوریشن میں جمع کرایا جائے۔
- دیگر مقامی ادارے جیسے صحت، سکول، وغیرہ کو لیبر کیمپ کے مقام اور مدت کے بارے میں مطلع کیا جائے تاکہ کسی ناگہانی صورتحال سے بچا جاسکے۔
- لیبر کیمپس کے قیام کیلئے عارضی جگہ زمین کا حصول زمین کے مالک کی مرضی اسطے کر دیا جائے اور باقاعدہ تحریری معاہدے کی صورت میں کیا جائے۔
- لیبر کیمپس سے ملحقہ بنیادی سہولیات جیسے پینے کا پانی اور بجلی آپ کے انتظامات سے ماحولیاتی آلودگی میں اضافہ نہ ہو



پی ایم ڈی ایف سی

انوائٹمنٹ اینڈ سوشل سیف گارڈن ٹیم



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 دشواری کی سہولیات اور کھانسی آب کی فراہمی

حفاظتی اقدامات

تھیکیدار کیمپ سائٹس پر درج ذیل باتوں کا خیال رکھیں گے:

- ♦ ہوا دار اور صاف سٹری رہائش گاہ
- ♦ عارضی کمروں کیلئے ایسے مشین کا استعمال جو جلد آگ نہ پکڑیں۔
- ♦ تھانے، دھوئے اور پانی پینے کیلئے صاف اور مناسب پانی کی فراہمی۔
- ♦ تمام مزدور کیلئے مناسب جگہ کی موجودگی اور محفوظ ماحولیاتی معیار۔
- ♦ صاف سٹریسٹ واش روڈ اور کھانسی آب کا مناسب انتظام۔
- ♦ خواتین لیبر کیلئے پروتے اور پرائیویسی کا انتظام اور الگ کمروں کا قیام مزید برآں خواتین لیبر کی موجودگی کی صورت میں ان کے لیے علیحدہ دواخانے۔
- ♦ روٹیشن روڈ کا انتظام۔
- ♦ بین الاقوامی معیار کے مطابق پردے اور کھیلنے والے آلات کی سہولت کی تعداد ایک ہے۔
- ♦ اگر لیبر کیمپ طویل مدت کیلئے لگایا جائے تو پارکوں، سیلاب کے پانی سے بچنے کیلئے مناسب انتظامات کا ہونا اور کھانسی آب کی فراہمی سے مدد ملے گی۔
- ♦ ٹوبکس اور عارضی رہائش گاہوں میں بجلی کی فراہمی کو یقینی بنایا جائے۔

سرگرمیاں

۳. لیبر کیمپ سے پیدا ہونے والا سالت اور لیکونڈ ویسٹ

مسائل

- ♦ خلیق اور پردہ
- ♦ صحت کے لیے نقصان
- ♦ ماحولیات کے لیے نقصان
- ♦ مقامی آبادی کے لیے نقصان
- ♦ بیماریاں پھیلنے والے بیکٹیریا اور وائرس کا ذریعہ

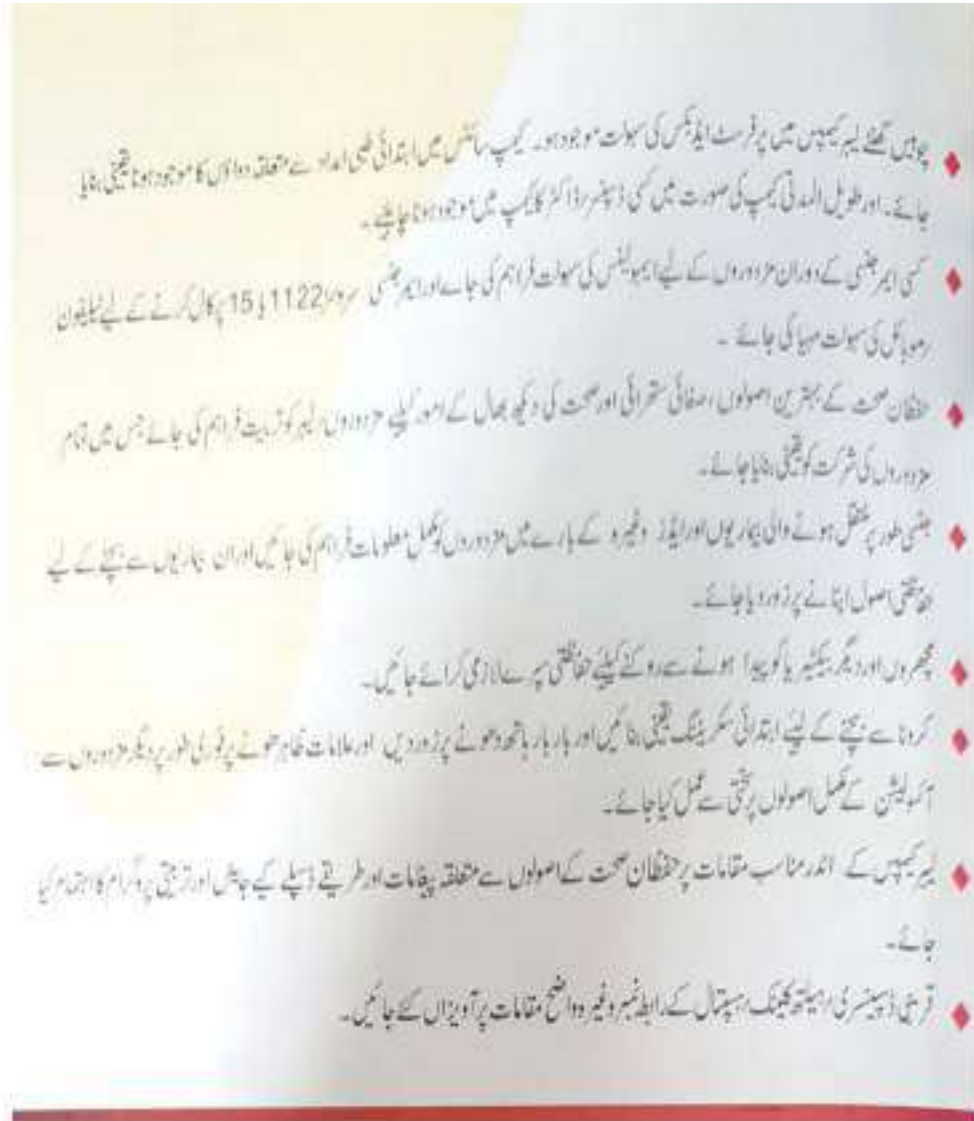
انوائسمنٹ اینڈ سوشل سیف گارنٹی ٹیم

پس ایم ڈی ایف سی





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سرگرمیاں

در حفظان صحت کے اصولوں پر مبنی خوراک Food Safety

مسائل

● نوزاد اور بچہ کا خدشہ

● بیماری کا ذریعہ

حفاظتی اقدامات

● غزوہ رواں 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 نا اہلی اور مذہبی خیالات میں شدت پسندی یا لڑائی جھگڑا وغیرہ

حفاظتی اقدامات

● مزدوروں اور 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 متعصبانہ 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 تکنیکی 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۔





سرگرمیاں
۱. تمام قسم کے تعمیراتی سرگرمیاں اور کام

مسائل

- انگریز اور چوکیس وغیرہ
- نامناسب دیگر ہمال اور بروقت امداد ملنے کا باعث ہلاکت
- دہشت گردی اور سکیورٹی سے متعلق خطرات

حفاظتی اقدامات

- تمام مزدوروں رلیبر سے مقامی رہین الاقوامی معیار کے مطابق مناسب حفاظتی اور قانونی ضوابط کی پیروی کروائی جائے۔
- کام کی جگہ پر ارد گرد کے علاقوں میں موجود دہشت گردی اور سکیورٹی کے خطرات کے مطابق ملکوتی عملی کی بروقت تیاری اور ایک محفوظ و صحت مند ماحول مہیا کیا جائے۔
- مزدوروں رلیبر کیلئے ذاتی حفاظت کے سامان (PPES) کی فراہمی مثلاً حفاظتی جوتے، ہیلمٹ، ماسک، دستاں، حفاظتی لباس، چشمے، چہرے اور کان کی حفاظت کے سامان وغیرہ کی فراہمی
- تمام مزدوروں رلیبر کو ذاتی حفاظت کے ساز و سامان کے بارے میں مکمل آگاہی اور استعمال کے طریقے کار کے بارے میں تربیت کا انتظام۔
- اگر تعمیراتی کام ایک ماہ سے زائد عرصہ کیلئے جاری رہتا ہو تو تمام مدت کے لیے صحت، صفائی اور تربیت یافتہ ماحولیات کی تعمیراتی کی جائے جو مزدوروں کی صحت، صفائی اور ماحولیات کے امور کی نگرانی کرے اور انھیں تربیت و آگاہی فراہم کرے۔
- تعمیراتی کاموں کے دوران کسی پوٹ گرنے یا نچرے کی صورت میں مزدور رلیبر کے علاج معالجے کی سہولت مہیا کرنا اور بروقت اسپتال یا ڈسپنسری وغیرہ پہنچانا، طبیکیاری کی ذمہ داری ہے۔
- مزید برآں دوران تعمیراتی کام کی وجہ سے گرنے والی پوٹ یا نچرے کے نتیجے میں ہلاکت ہو جانے کی وجہ سے مزدور رلیبر کی انشورنس اور اس کی بروقت ادائیگی کو یقینی بنایا جائے۔
- ایمرٹنی رابطہ نمبر مثلاً 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 آغاز 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، رکارپوریشن کے تعاون سے موثر سنگت عملی تشکیل دی جائے۔

ہی ایم ڈی ایف سی

الوانٹمنت اینڈ سوشل سیف گارڈز ٹیم

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 متعلق خطرات

حفاظتی اقدامات

- ◆ دی ہنجاب ریسٹرکشن آن ایمپلائمنٹ آف چلڈرن ایکٹ 2016 کے مطابق 15 سال سے کم عمر بچوں کو مزدوری یا کسی سرگرمی کے لیے کام پر نہیں رکھا جاسکتا۔
- ◆ ویسٹ پاکستان میٹرنٹی بلیفٹ آرڈیننس 1958 کے مطابق حاملہ خواتین یا ایسی خواتین جنہوں نے بچے کو جنم دیا ہو، کو مزدوری یا کسی سرگرمی کے لیے کام پر نہیں رکھا جاسکتا۔
- ◆ دی ہنجاب ریسٹرکشن آن ایمپلائمنٹ آف چلڈرن ایکٹ 2016 کے مطابق 18 سال اور اس سے کم عمر کے بچوں کو محنت مزدوری کے ایسے کام کے لیے نہیں رکھا جاسکتا جن میں صحت کو نقصان پہنچنے یا بچہ کو گھنے یا کسی کیمیائی زہریلے مادے سے نقصان پہنچنے یا جہاں بڑی ٹوٹنے کا اندیشہ ہو۔

انوائٹمنٹ اینڈ سوشل سیف گارنٹی ٹیم

پی ایم ڈی ایف سی

۱۵



سرگرمیاں

۳۔ دوران تعمیر حادثات کا ہمیش آنا

مسائل

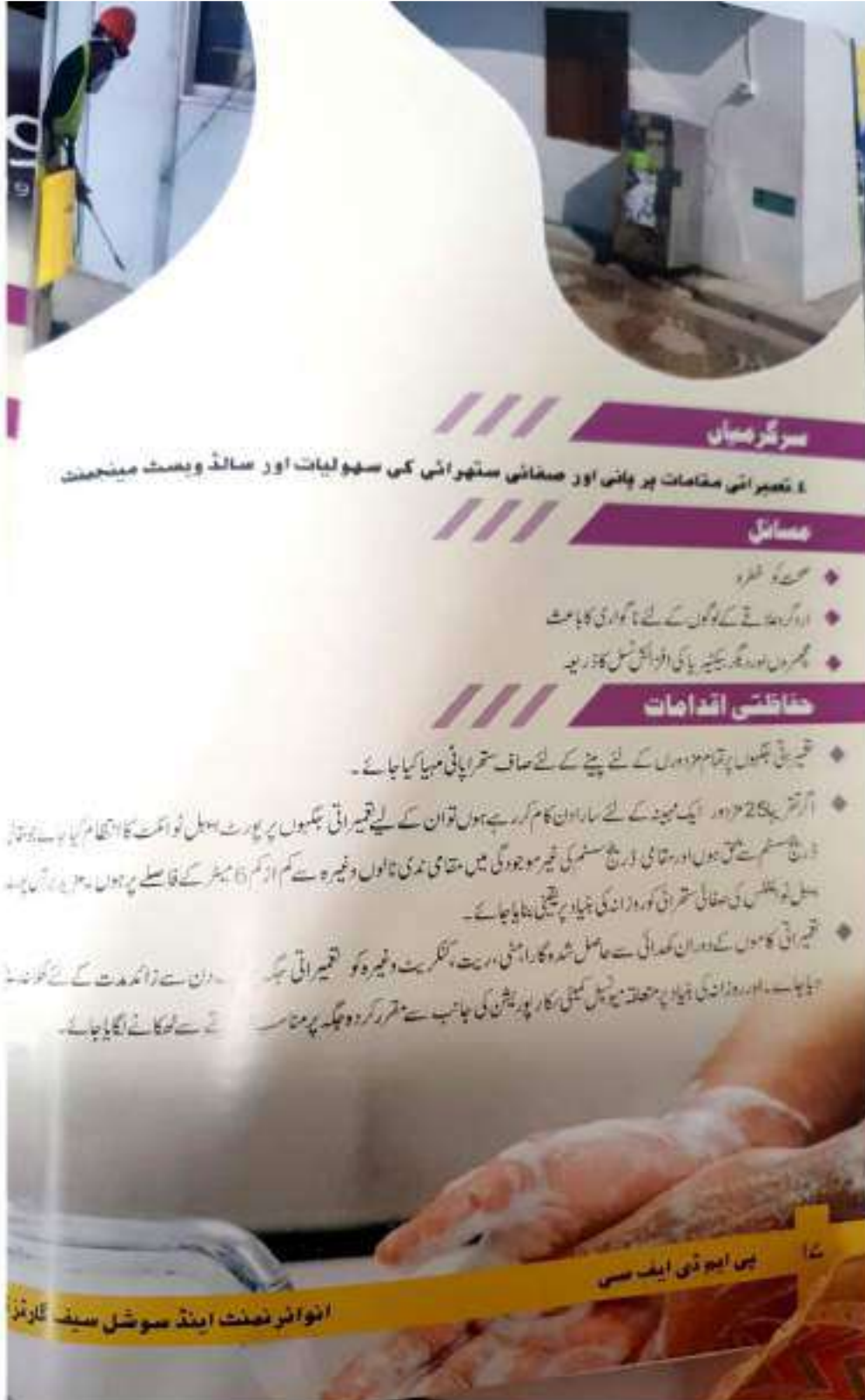
- فوری طبی امداد کی کمی
- حادثہ کے علاقوں میں ابتدائی طبی سہولیات اور صحت عامہ کا فقدان

حفاظتی اقدامات

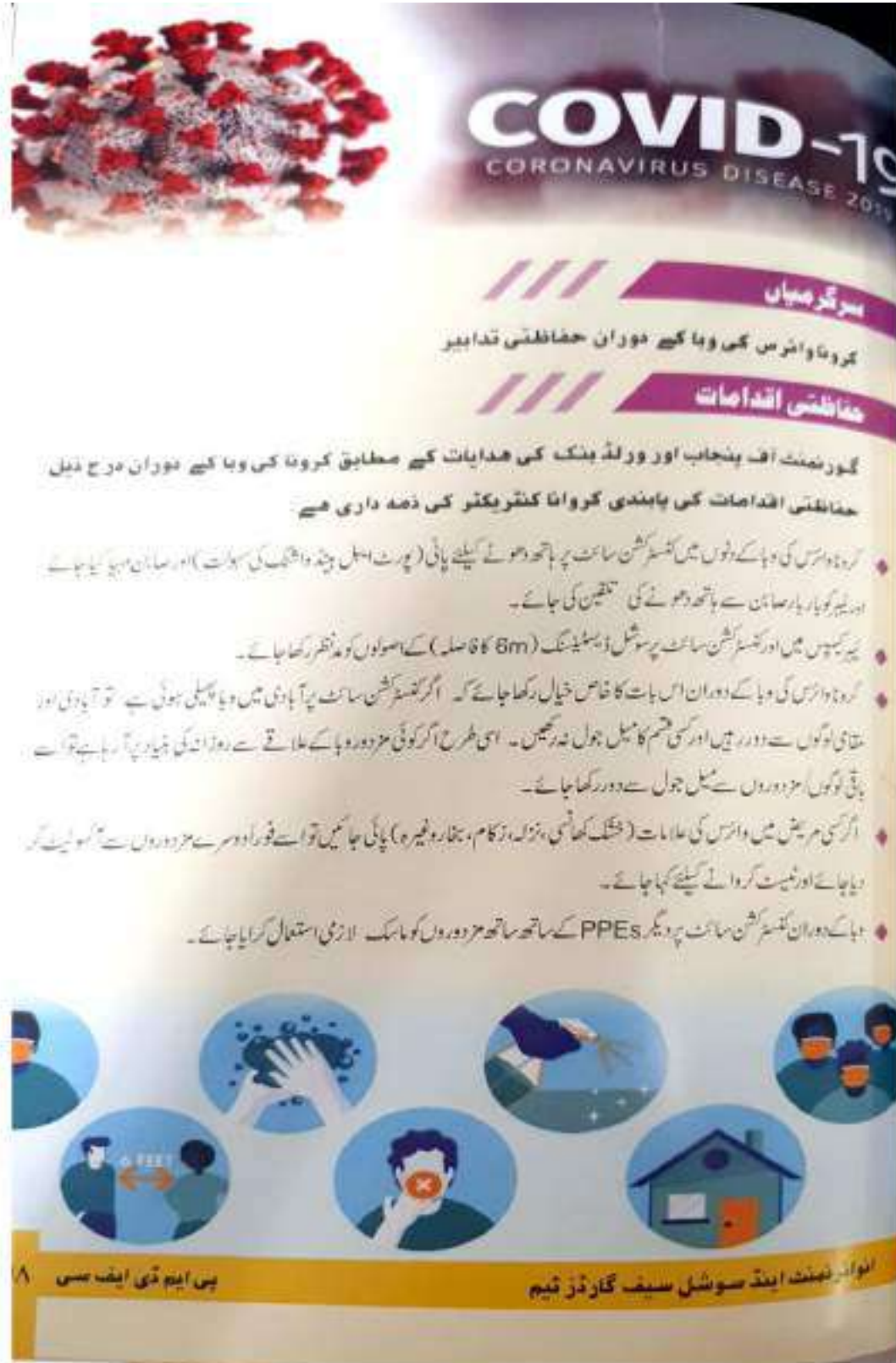
- تعمیراتی جگہ پر فرسٹ ایڈ کیمپ کی موجودگی کو یقینی بنایا جائے اور فرسٹ ایڈ کیمپ میں تمام ضروری اشیاء اور طبی امداد کا ضروری سامان موجود ہو۔
- تعمیراتی کاموں کے دوران غرض آئے والے حادثات پیدائیں اور واقعات کا مکمل ریکارڈ رکھا جائے۔ اسی طرح حادثات کی نوعیت و وجوہات کا مکمل ریکارڈ موجود ہو۔
- مزدوروں کی صحت و سکورٹی 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 کے جائیں۔
- تعمیراتی کاموں سے متعلق مشینری چلانے والے ڈرائیوروں کو دوران ڈرائیونگ قواعد و ضوابط پر سختی سے عملدرآمد کرانے کے لئے آگاہی فراہم کی جائے۔
- تعمیراتی علاقوں اور سڑکوں کے ساتھ ساتھ روشنی کا معقول انتظام ہو۔

انوائٹمنٹ اینڈ سوشل سیف گارنٹی قیم

پی ایم ڈی ایف سی ۱۶



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[illegible]

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,	

*No general use of PPE is required for any height of 6 ft or more. Ref: OSHA standards

۲۰ پی ایم ڈی ایف سی

انجمن ایف ڈی سوشل سیف گارڈز ٹیم



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قریبی علاقہ میں واقع ہوا سب کر دیے جائیں جن پر پانی کی پمپنگ اور پمپنگ کے کاموں کے لئے ہوں اور پانی کی پمپنگ کے لئے ہوں۔

100 ایکڑ سے زیادہ کی صورت میں متبادل راستے کا نشان اور عارضی رکاوٹ کا بیظام
100 ایکڑ سے زیادہ کی صورت میں متبادل راستے کا نشان اور عارضی رکاوٹ کا بیظام

(PMDFC) کی جانب سے جاری کردہ ملکی و ماہولیاتی پیمائش پیمانی پر مبنی۔

قریبی کام کی جگہ کے ارد گرد 100 میٹر تک کی حدود میں موجود ثقافتی، سماجی، مذہبی ورثہ، تاریخی عمارتوں اور مذہبی مقامات جیسے
نورین سہیل، احمد، گرچہ، و غیرہ کو کسی قسم کا نقصان نہ پہنچایا جائے اور ان کی حدود میں کوڑا کرکٹ، الٹے یا ٹوٹی ہوئی چیزوں سے گریزا
ہو۔ جب وہاں تبدیلی کے دوران کسی نئے آجودانہ کے لئے کی صورت میں متعلقہ مقامی محکمے سے رجوع کیا جائے اور تبدیلی کا کام بند کر کے
قریبی کام کیا جائے۔

سرگرمیاں

تعمیراتی کام اور اس سے متعلقہ کام اور نالیوں کی صفائی اور اس سے حاصل شدہ بھل وغیرہ

مسائل



تعمیراتی کام اور اس سے متعلقہ کام اور نالیوں کی صفائی اور اس سے حاصل شدہ بھل وغیرہ
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پی ایم ڈی ایف سی ۲۲

سوسائٹی اینڈ سوشل سیفٹ گارنٹی ٹیم



حفاظتی اقدامات

- تعمیر کے دوران کھدائی کے تمام مقامات کے ارد گرد حفاظتی سپر این رکائی جائے اور کھدائی کی جگہ کو عارضی طور پر بند کر دیا جائے جس کے دوران پھر سے دہریہ کھینے والے پیمانے لگے ہوں۔
- کھدائی سے حاصل شدہ مٹی، انگرہ پتھر وغیرہ کو ایک دن سے زیادہ اس جگہ پر موجود نہ رہنے دیا جائے بلکہ روزانہ کی بنیاد پر منتقل کر دیا جائے۔
- ناؤں کی صفائی سے حاصل شدہ فضلہ ریت وغیرہ کو ایک دن سے زیادہ اس جگہ پر موجود نہ رہنے دیا جائے بلکہ روزانہ کی بنیاد پر منتقل کر دیا جائے اور ایک جگہ سے دوسری جگہ منتقلی کے دوران ٹریکٹر مڑائی کوڑیال کی مدد سے احاطہ کر کے چلایا جائے۔

سوگرمیاں

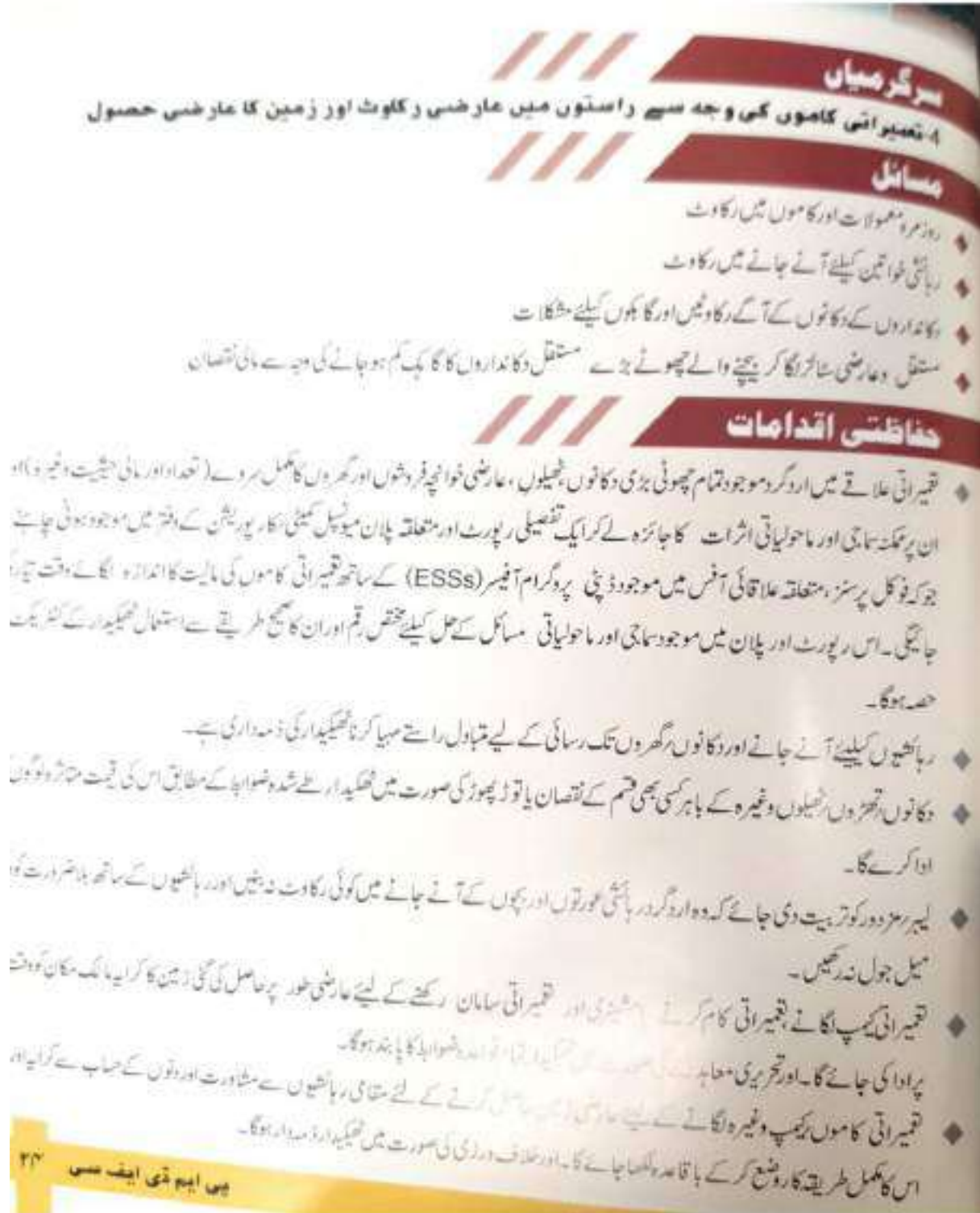
3- تعمیراتی مشینری، تعمیراتی سٹیریل اور تعمیراتی کاموں کی وجہ سے عارضی بندش

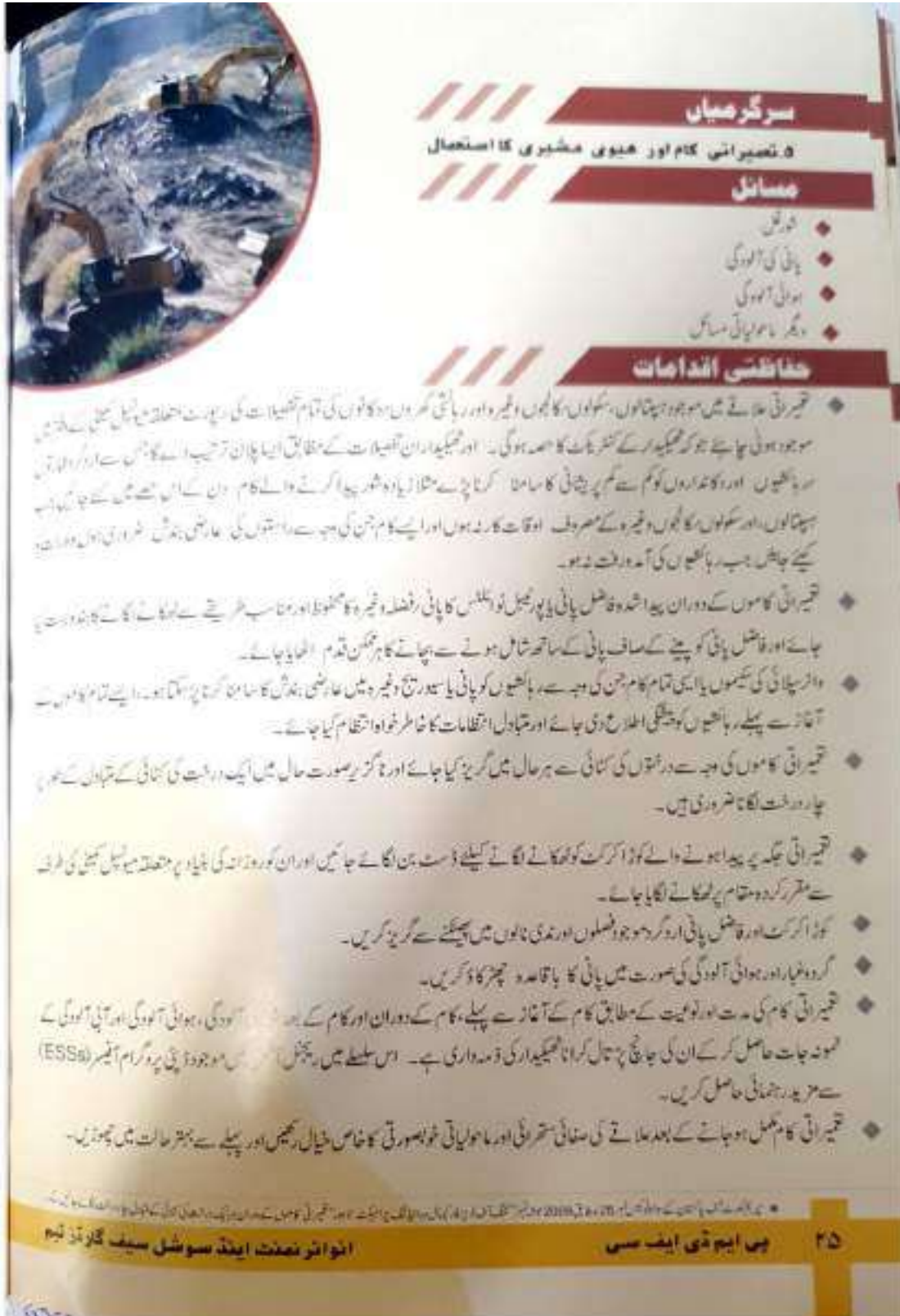
مسائل

- ٹرینک میں کھردھوت۔

حفاظتی اقدامات

- ٹرینک میں کھردھوت کے پیش نظر متبادل راستے کا انتخاب اور اس کی نشاندہی کیلئے پیمائش والے وسیع وسیع کیے جائیں۔
- ٹرینک کون (cones) کی مدد سے رکاوٹ والی جگہ کو الگ کر دیا جائے تاکہ حادثات سے بچا جاسکے۔
- ٹرینک میں زیادہ اونوں تک مسلسل رکاوٹ کی صورت میں مقامی ٹریفک پولیس کو آگاہ کیا جائے اور ان کے ساتھ مل کر ٹریفک منجست پلان پیش کیا جائے جس کو وضع مقام پر نصب کیا جائے اور مقامی آبادی مرد ہاتھیوں کو اس کے بارے میں مکمل آگاہی دی جائے۔





Annexure E: IFC EHS Guidelines for Construction and Decommissioning

General EHS Guidelines [Complete version] at: www.ifc.org/ehsguidelines		
	Environmental, Health, and Safety (EHS) Guidelines GENERAL EHS GUIDELINES: CONSTRUCTION AND DECOMMISSIONING	

4.0 Construction and Decommissioning

4.1 Environment	89
Noise and Vibration	89
Soil Erosion	89
Air Quality	90
Solid Waste	90
Hazardous Materials	91
Wastewater Discharges	91
Contaminated Land	91
4.2 Occupational Health and Safety	92
4.3 Community Health and Safety	94
General Site Hazards	94
Disease Prevention	94
Traffic Safety	95

Applicability and Approach

This section provides additional, specific guidance on prevention and control of community health and safety impacts that may occur during new project development, at the end of the project life cycle, or due to expansion or modification of existing project facilities. Cross referencing is made to various other sections of the General EHS Guidelines.

4.1 Environment{ TC "4.1 Environment" \FC \1 "2" }

Noise and Vibration

During construction and decommissioning activities, noise and vibration may be caused by the operation of pile drivers, earth moving and excavation equipment, concrete mixers, cranes and the transportation of equipment, materials and people. Some recommended noise reduction and control strategies to consider in areas close to community areas include:

- Planning activities in consultation with local communities so that activities with the greatest potential to generate noise are

planned during periods of the day that will result in least disturbance.

- Using noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, and exhaust muffling devices for combustion engines.
- Avoiding or minimizing project transportation through community areas.

Soil Erosion

Soil erosion may be caused by exposure of soil surfaces to rain and wind during site clearing, earth moving, and excavation activities. The mobilization and transport of soil particles may, in turn, result in sedimentation of surface drainage networks, which may result in impacts to the quality of natural water systems and ultimately the biological systems that use these waters.

Recommended soil erosion and water system management approaches include:

Sediment mobilization and transport

- Reducing or preventing erosion by:
 - Scheduling to avoid heavy rainfall periods (i.e., during the dry season) to the extent practical.
 - Contouring and minimizing length and steepness of slopes.
 - Mulching to stabilize exposed areas.
 - Re-vegetating areas promptly.
 - Designing channels and ditches for post-construction flows.
 - Lining steep channel and slopes (e.g., use jute matting).
- Reducing or preventing off-site sediment transport through use of settlement ponds, silt fences, and water treatment, and modifying or suspending activities during extreme rainfall and high winds to the extent practical.



Environmental, Health, and Safety (EHS) Guidelines
GENERAL EHS GUIDELINES: CONSTRUCTION AND DECOMMISSIONING



Clean runoff management

- Segregating or diverting clean water runoff to prevent it mixing with water containing a high solids content, to minimize the volume of water to be treated prior to release

Road design

- Limiting access road gradients to reduce runoff-induced erosion
- Providing adequate road drainage based on road width, surface material, compaction, and maintenance

Disturbance to water bodies

- Depending on the potential for adverse impacts, installing fish-spawning structures (e.g., single span bridges) for road watercourse crossings
- Restricting the duration and timing of in-stream activities to lower flow periods, and avoiding periods critical to biological cycles of valued flora and fauna (e.g., migration, spawning, etc.)
- For in-stream works, using isolation techniques such as berms or diversion during construction to limit the exposure of disturbed sediments to moving water
- Consider using trenchless technology for pipeline crossings (e.g., suspended crossings) or installation by directional drilling

Structural (slope) stability

- Providing effective short term measures for slope stabilization, sediment control and subsidence control until long term measures for the operational phase can be implemented
- Providing adequate drainage systems to minimize and control infiltration

Air Quality

Construction and decommissioning activities may generate emission of fugitive dust caused by a combination of on-site excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. A secondary source of emissions may include exhaust from diesel engines of earth moving equipment, as well as from open burning of solid waste on-site. Techniques to consider for the reduction and control of air emissions from construction and decommissioning also include:

- Minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house, or cyclone)
- Minimizing dust from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content
- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements
- Selectively removing potential hazardous air pollutants, such as asbestos, from existing infrastructure prior to demolition
- Managing emissions from mobile sources according to Section 1.1
- Avoiding open burning of solid (refer to solid waste management guidance in Section 1.6)

Solid Waste

Non-hazardous solid waste generated at construction and decommissioning sites includes excess fill materials from grading and excavation activities, scrap wood and metals, and small concrete spills. Other non-hazardous solid wastes include office, kitchen, and dormitory wastes when these types of operations are part of construction project activities. Hazardous solid waste includes contaminated soils, which could potentially be encountered on-site due to previous land use activities, or small



Environmental, Health, and Safety (EHS) Guidelines
GENERAL EHS GUIDELINES: CONSTRUCTION AND DECOMMISSIONING



amounts of machinery maintenance materials, such as oily rags, used oil filters, and used oil, as well as spill cleanup materials from oil and fuel spills. Techniques for preventing and controlling non-hazardous and hazardous construction site solid waste include those already discussed in Section 1.6.

Hazardous Materials

Construction and decommissioning activities may pose the potential for release of petroleum-based products, such as lubricants, hydraulic fluids, or fuels during their storage, transfer, or use in equipment. These materials may also be encountered during decommissioning activities in building components or industrial process equipment. Techniques for prevention, minimization, and control of these impacts include:

- Providing adequate secondary containment for fuel storage tanks and for the temporary storage of other fluids such as lubricating oils and hydraulic fluids;
- Using impervious surfaces for refueling areas and other fluid transfer areas;
- Training workers on the correct transfer and handling of fuels and chemicals and the response to spills;
- Providing portable spill containment and cleanup equipment on site and training in the equipment deployment;
- Assessing the contents of hazardous materials and petroleum-based products in building systems (e.g., PCB-containing electrical equipment, asbestos-containing building materials) and process equipment and removing them prior to initiation of decommissioning activities, and managing their treatment and disposal according to Sections 1.5 and 1.6 on Hazardous Materials and Hazardous Waste Management, respectively;
- Assessing the presence of hazardous substances in or on building materials (e.g., polychlorinated biphenyls, asbestos-containing flooring or insulation) and decontaminating or properly managing contaminated building materials.

Wastewater Discharges

Construction and decommissioning activities may include the generation of sanitary wastewater discharges in varying quantities depending on the number of workers involved. Adequate portable or permanent sanitation facilities serving all workers should be provided at all construction sites. Sanitary wastewater in construction and other sites should be managed as described in Section 1.3.

Contaminated Land

Land contamination may be encountered in sites under construction or decommissioning due to known or unknown historical releases of hazardous materials or oil, or due to the presence of abandoned infrastructure formerly used to store or handle these materials, including underground storage tanks. Actions necessary to manage the risk from contaminated land will depend on factors such as the level and location of contamination, the type and risks of the contaminated media, and the intended land use. However, a basic management strategy should include:

- Managing contaminated media with the objective of protecting the safety and health of occupants of the site, the surrounding community, and the environment post-construction or post-decommissioning;
- Understanding the historical use of the land with regard to the potential presence of hazardous materials or oil prior to initiation of construction or decommissioning activities;
- Preparing plans and procedures to respond to the discovery of contaminated media to minimize or reduce the risk to health, safety, and the environment consistent with the approach for Contaminated Land in Section 1.6;
- Preparation of a management plan to manage obsolete, abandoned, hazardous materials or oil consistent with the approach to hazardous waste management described in Section 1.6.



Environmental, Health, and Safety (EHS) Guidelines
GENERAL EHS GUIDELINES: CONSTRUCTION AND DECOMMISSIONING



Successful implementation of any management strategy may require identification and cooperation with whoever is responsible and liable for the contamination.

4.2 Occupational Health and Safety { TC "4.2 Occupational Health and Safety" \FC \I "2" }

Over-exertion

Over-exertion, and ergonomic injuries and illnesses, such as repetitive motion, over-exertion, and manual handling, are among the most common causes of injuries in construction and decommissioning sites. Recommendations for their prevention and control include:

- Training of workers in lifting and materials handling techniques in construction and decommissioning projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary
- Planning work site layout to minimize the need for manual transfer of heavy loads
- Selecting tools and designing work stations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable work stations
- Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks

Slips and Falls

Slips and falls on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground, are also among the most frequent cause of lost time accidents at construction and decommissioning sites. Recommended methods for the prevention of slips and falls from, or on, the same elevation include:

- Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths
- Cleaning up excessive waste debris and liquid spills regularly
- Locating electrical cords and ropes in common areas and marked corridors
- Use of slip retardant footwear

Work in Heights

Falls from elevation associated with working with ladders, scaffolding, and partially built or demolished structures are among the most common cause of fatal or permanent disabling injury at construction or decommissioning sites. If fall hazards exist, a fall protection plan should be in place which includes one or more of the following aspects, depending on the nature of the fall hazard²⁶:

- Training and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 200 pounds, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface
- Training and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support 5000 pounds (also described in this section in Working at Heights above), as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. The tie in point of the fall arresting system should also be able to support 5000 pounds
- Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones, as well as

²⁶ Additional information on identification of fall hazards and design of protection systems can be found in the United States Occupational Health and Safety Administration's (US OSHA) web site: <http://www.osha.gov/SLTC/fallprotection/index.html>



Environmental, Health, and Safety (EHS) Guidelines
GENERAL EHS GUIDELINES: CONSTRUCTION AND DECOMMISSIONING



securing, marking, and labeling covers for openings in floors, roofs, or walking surfaces

Struck By Objects

Construction and demolition activities may pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities. Techniques for the prevention and control of these hazards include:

- Using a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels
- Conducting sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable
- Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap
- Use of temporary fall protection measures in scaffolds and cut edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged
- Excavating work areas during blasting operations, and using blast mats or other means of deflection to minimize fly rock or ejection of demolition debris if work is conducted in proximity to people or structures
- Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes

Moving Machinery

Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, emissions, and noise. Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of

a turn while moving. Techniques for the prevention and control of these impacts include:

- Planning and segregating the location of vehicle traffic, machine operation, and walking areas; and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag people wearing high-visibility vests or outer clothing covering to direct traffic
- Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle
- Ensuring moving equipment is outfitted with audible back-up alarms
- Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations

Dust

- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements
- PPE, such as dust masks, should be used where dust levels are excessive

Confined Spaces and Excavations

Examples of confined spaces that may be present in construction or demolition sites include: silos, vats, hoppers, utility vaults, tanks, sewers, pipes, and access shafts. Ditches and trenches may also be considered a confined space when access or egress is limited. In addition to the guidance provided in Section 2.8 the occupational hazards associated with confined spaces and excavations in construction and decommissioning sites should be prevented according to the following recommendations:



Environmental, Health, and Safety (EHS) Guidelines GENERAL EHS GUIDELINES: CONSTRUCTION AND DECOMMISSIONING



- Controlling site-specific factors which may contribute to excavation slope instability including, for example, the use of excavation dewatering, side-walls support, and slope gradient adjustments that eliminate or minimize the risk of collapse, entrapment, or drowning
- Providing safe means of access and egress from excavations, such as graded slopes, graded access route, or stairs and ladders
- Avoiding the operation of combustion equipment for prolonged periods inside excavations areas where other workers are required to enter unless the area is actively ventilated

Other Site Hazards

Construction and decommissioning sites may pose a risk of exposure to dust, chemicals, hazardous or flammable materials, and wastes in a combination of liquid, solid, or gaseous forms, which should be prevented through the implementation of project-specific plans and other applicable management practices, including:

- Use of specially trained personnel to identify and remove waste materials from tanks, vessels, processing equipment or contaminated land as a first step in decommissioning activities to allow for safe excavation, construction, dismantling or demolition
- Use of specially trained personnel to identify and selectively remove potentially hazardous materials in building elements prior to dismantling or demolition including, for example, insulation or structural elements containing asbestos and Polychlorinated Biphenyls (PCBs), electrical components containing mercury²⁶
- Use of waste-specific PPE based on the results of an occupational health and safety assessment, including

respirators, clothing/protective suits, gloves and eye protection

4.3 Community Health and Safety { TC "4.3 Community Health and Safety" \f C \1 "2" }

General Site Hazards

Projects should implement risk management strategies to protect the community from physical, chemical, or other hazards associated with sites under construction and decommissioning. Risks may arise from inadvertent or intentional trespassing, including potential contact with hazardous materials, contaminated soils and other environmental media, buildings that are vacant or under construction, or excavations and structures which may pose falling and entrapment hazards. Risk management strategies may include:

- Restricting access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community
- Removing hazardous conditions on construction sites that cannot be controlled effectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials

Disease Prevention

Increased incidence of communicable and vector-borne diseases attributable to construction activities represents a potentially serious health threat to project personnel and residents of local communities. Recommendations for the prevention and control of communicable and vector-borne diseases also applicable to

²⁶ Additional information on the management and removal of asbestos containing building materials can be found in ASTM Standard E2556 and E 1385



Environmental, Health, and Safety (EHS) Guidelines
GENERAL EHS GUIDELINES: CONSTRUCTION AND DECOMMISSIONING



construction phase activities are provided in Section 3.6 (Disease Prevention).

Traffic Safety

Construction activities may result in a significant increase in movement of heavy vehicles for the transport of construction materials and equipment increasing the risk of traffic-related accidents and injuries to workers and local communities. The incidence of road accidents involving project vehicles during construction should be minimized through a combination of education and awareness-raising, and the adoption of procedures described in Section 3.4 (Traffic Safety).

Annexure F:COVID-19 Pandemic and Health Safety Measures

Given the unprecedented nature of the COVID-19 pandemic, contractors are bound to take all necessary precautions to maintain the health and safety related measures at site and to ensure suitable arrangements regarding hygiene requirements for the prevention of pandemic.

Following are the measures that should be implemented at the construction site to avoid the spread of Covid-19:

Activities	Adaptive Measures
Pre- Execution Phase	
A. Profile preparation	- Detail profile of project workforce - Enlist the names, addresses and contact # - Breakdown of the workforce (workers from local communities and those who have on site accommodation) - Assigning the task against each person - Schedule the key activities and their duration at site
B. Initial Screening	- All enlisted workforce should go through initial screening process - Ensuring the availability of Thermogun at site - Record keeping against initial screening - Identifying all workers who are initially at more risk of contracting Covid-19
During Execution Phase	
A. Preliminary Screening	Regular Screening: - Regular screening by using Thermogun on daily basis before starting civil work at site - Checking and recording temperatures of workers and other people entering the site or requiring self-reporting prior to or on entering the site. - If a worker has symptoms of COVID-19 (e.g. fever, dry cough, fatigue) the worker should be removed immediately from work activities and isolated on designated site. - Co-workers (i.e. workers with whom the sick worker was in close contact) should be required to stop work, and to quarantine themselves for 14 days, even if they have no symptoms. Sequential Screening: Concerned DHQ medical staff is requested for screening at regular intervals. List should also be shared with DHQ for avoiding future inconvenience or hire health safety officer on weekly basis.
B. Special Arrangements regarding PPEs	- Ensuring availability of handwashing facilities (sanitizers/soaps) at site - Presence of closed waste bins at key places throughout site, including at entrances/exits to work areas (toilet, canteen or food distribution, or provision of drinking water; in worker accommodation; at waste stations; at stores; and in common spaces). - Special arrangements regarding PPEs and sanitation at site - Record keeping of stock availability on daily basis
C. Restricted Movement/ Demobilization of staff	- Encourage employees to wash their hands at least for 20 seconds with soap and stay at least one meter away from people who are coughing or sneezing - Breakdown of workers who reside at home (i.e. workers from the communities), workers who lodge within the local communities and workers in on-site accommodation. Workers accommodated on site should be required to minimize contact with people near the site, and in certain cases be prohibited from leaving the site for the duration of their contract, so that contact with local communities is avoided. - Workers from local communities, who return home daily, weekly or monthly, will be more difficult to manage. They should be subject to health checks at entry to the site (as set out above) and at some point, circumstances may make it necessary to require them to either use accommodation on site or not to come to work. - All workers should be provided separate accommodation.

Activities		Adaptive Measures
D. Training sessions		- Health and safety training for Contractor's Personnel (which include project workers and all personnel that the Contractor uses on site, including staff and other employees of the Contractor and Subcontractors and any other personnel assisting the Contractor in carrying out project activities). - Sessions related to safety procedures, use of construction PPEs, occupational health and safety issues, and code of conduct specially privacy issues including social distancing. - Arranging daily briefings with workforce, reminding workers to self-monitor for possible symptoms (fever, cough) and to report to their supervisor or the COVID-19 focal point if they have symptoms or are feeling unwell. - Placing posters and sign boards around the site in local languages. - Appointing one person on daily basis among the workforce who will serve as trainer for conducting awareness session and encouraging the rest to take preventive measures.
E. Operationalization of Grievance Mechanism	of Redress	- Effective implementation of GRM at site - Encouraging to report any COVID-19 related health issue and concerns about the health of their co-workers and other staff as well. - In case of unavailability of the PPEs at site, grievance would be lodged directly to PMU.
F. Role of PMU		- PMU is required to arrange regular meetings with Contractors and workforce to monitor all procedural implementation of COVID-19 prevention related mechanism. - Arrange meeting with concerned DHQs for immediate support and guidance in case of emergency. - During inspection visit by PMU Staff, if a worker is found to has symptoms of COVID-19, the worker should be removed immediately from work activities and isolated on designated site.
Post Execution Phase		
A. Post Screening		Screening should be done at the end of the day on daily basis, if a worker is found to have any symptoms of COVID-19, he should be immediately reported to concerned health department.
B. Cleaning and waste disposal		All waste (PPEs and sanitation related) shall be disposed properly at designated sites.

Annexure G:: Personal Protective Equipment According to Harzard

Objective	Workplace Hazards	Suggested PPE
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 lines). On-site rescue equipment.
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration.	Insulating clothing, body suits, aprons etc. of appropriate materials.

Annexure H:Water Quality Testing Reports with Geo-Tagged Map

SGS		ANALYTICAL REPORT		LHR-22-0744/10		
Sample No.		CRP-LHR-22-0744/10-01				
Client ID:		Tata Water Supply Scheme				
Submitted By:		SWS				
Purpose:		USE	ICW	Results	Limit as per IS 10500 for Drinking Water	Remarks
Turbidity - based on APHA 2130 B 22 nd Edition						
Turbidity		NTU	1.0	14	<5 NTU	NC
pH - based on APHA 2540 C 22 nd Edition						
pH @ 25°C		pH unit	6.1	7.04	6.5-8.5	0
Color - based on APHA 2120 B 22 nd Edition (Standard 15 Pt. 201)						
Color		PCU	5.0	10	≤15 PCU	0
Total Dissolved Solids - based on APHA 2550 C 22 nd Edition						
Total Dissolved Solids (TDS)		mg/L	5.0	305	<1000	0
Total Hardness - based on APHA 2540 C 22 nd Edition						
Hardness, Total as CaCO ₃		mg/L	1.0	205	<500	0
Alkalinity, Total as CaCO ₃ - based on APHA 2220 B 22 nd Edition						
Alkalinity, Total as CaCO ₃		mg/L	1.0	595	-	-
Nitrite Nitrogen (NO ₂ -N) - based on APHA 450-NO ₂ -B 22 nd Edition						
NO ₂ -N		mg/L	1.0	<1.0	≤0.1	0
Chlorides, based on APHA 4520 B 22 nd Edition						
Chlorides (Cl ⁻)		mg/L	1.0	<1.0	-	-
Hardness, Bicarbonate - based on APHA 2540 C 22 nd Edition						
Hardness, Bicarbonate		mg/L	1.0	<1.0	-	-
Sulfate - based on APHA 800 SO ₄ C 22 nd Edition						
Sulfate (SO ₄ ²⁻)		mg/L	5.0	28.51	-	-
Chloride, based on APHA 4520 B 22 nd Edition						
Chloride		mg/L	0.5	13.85	<250	0
Conductivity, Electrical - based on APHA 2510 B 22 nd Edition						
Conductivity, Electrical		µS/cm	2.0	5305	-	-
Fluoride - based on APHA 800 F ED 22 nd Edition						
Fluoride F		mg/L	1.0	<1.0	≤1.5	0
Anions by ICS/ICF-055 - based on APHA 9110 2120 B 22 nd Edition						
Antimony (As)		mg/L	0.005	<0.005	≤0.05	0
Iron (Fe)		mg/L	0.005	0.080	-	-
Selenium (Se)		mg/L	1.0	21.30	-	-
Phosphorus (P)		mg/L	0.2	3.15	-	-
Calcium (Ca)		mg/L	0.05	18.80	-	-
Magnesium (Mg)		mg/L	0.05	21.80	-	-
Total coliform - Membrane Filtration Technique - APHA 9220 B 22 nd Edition						
Total coliform		CFU/100ml	-	Absent	≤CFU / 100ml	0
Fecal coliform (E. coli) - Membrane Filtration Technique - APHA 9220 D 22 nd Edition						
Fecal coliform (E. coli)		CFU/100ml	-	Absent	≤CFU / 100ml	0



ANALYTICAL REPORT

LHR-22-0744/10

Sample No.		LHR-22-0744/10-02 Kasimabad PMWS-2 Sample Results				
Client ID		Drinking Water Samples				
Sampled By		SGS				
Parameter	Unit	LOD	Results	Limit as per ISIRI for Drinking Water	Remarks	
Turbidity based on APHA 2120 B 22 nd Edition						
Turbidity	NTU	1.0	86	<5 NTU	MC	
pH based on APHA 4000 ⁺ B 22 nd Edition						
pH @ 25°C	pH unit	0.1	7.93	6.5-8.5	C	
Color based on APHA 2120 B 22 nd Edition (Lambert-Beer's law)						
Color	PCU	5.0	85	≤15 PCU	C	
Total Dissolved Solid based on APHA 2540 C 22 nd Edition						
*Solids, Total Dissolved (TDS)	mg/L	5.0	46	<1000	C	
Total Hardness based on APHA 2540 C 22 nd Edition						
*Hardness, Total as CaCO ₃	mg/L	1.0	328	<500	C	
Alkalinity, Total as CaCO ₃ based on APHA 2220 B 22 nd Edition						
*Alkalinity, Total as CaCO ₃	mg/L	1.0	320	-	-	
Nitrate Nitrogen (N) based on APHA 4500-NO ₃ -B 22 nd Edition						
[N-(N)]	mg/L	1.0	1.44	≤2.0	C	
Carbonates based on APHA 2220 B 22 nd Edition						
*Carbonates (CO ₃)	mg/L	1.0	<1.0	-	-	
Hardness, Bicarbonate based on APHA 2540 C 22 nd Edition						
*Hardness, Bicarbonate	mg/L	1.0	<1.0	-	-	
Sulfate based on APHA 4500-SO ₄ ²⁻ B 22 nd Edition						
*Sulfate (SO ₄)	mg/L	5.0	36.23	-	-	
Chloride based on APHA 4500-CL B 22 nd Edition						
*Chloride	mg/L	0.5	37.58	<250	C	
Conductivity Electrical based on APHA 2510 B 22 nd Edition						
*Conductivity Electrical	µS/cm	5.0	746.8	-	-	
Fluoride based on APHA 4500-F B 22 nd Edition						
Fluoride ⁻	mg/L	1.0	<1.0	≤1.5	C	
Metals by AAS/ICP-OES based on APHA 3110-3130 B 22 nd Edition						
*Arsenic (As)	mg/L	0.005	<0.005	≤0.05	C	
*Cadmium (Cd)	mg/L	0.005	0.27	-	-	
*Copper (Cu)	mg/L	1.0	21.18	-	-	
*Manganese (Mn)	mg/L	0.2	0.39	-	-	
*Nickel (Ni)	mg/L	0.02	80.78	-	-	
*Selenium (Se)	mg/L	0.02	20.68	-	-	
Total Coliforms Membrane Filtration Technique APHA 8222 B 22 nd Edition						
*Total coliforms	CFU/100ml	-	None	<5 CFU / 100ml	C	
Fecal Coliform (E. coli) Membrane Filtration Technique APHA 8222 B 22 nd Edition						
*Fecal coliform (E. coli)	CFU/100ml	-	None	<5 CFU / 100ml	C	



ANALYTICAL REPORT

LHR-22-0744/10

Sample No.		ESP LHR-22-0744/10-06				
Client ID:		Tina Mat / T. Oka, Item				
Sample By		Groundwater Sample				
Reference		Unit	LOE	SGS Results	Compliance with Sinking Water	Remarks
Turbidity - based on APHA 2100 B 22° scatter						
Turbidity	NTU	TD	10	10	<3 NTU	MC
pH - based on APHA 4500 H 22° scatter						
pH @ 25°C	pH unit	0.1	7-8	7.11	6.5-8.5	C
Color - based on APHA 2120 B 22° scatter (after 2 hrs. No. 20)						
Color	PCU	5.0	15	15	≤100	C
Total Dissolved Solids - based on APHA 2540 C 22° scatter						
TDS (mg/L) (TDS)	mg/L	0.0	44	44	<1000	C
Total Hardness - based on APHA 2540 C 22° scatter						
Hardness, Total (mg/L)	mg/L	1.0	30	30	<300	C
Alkalinity, Total CaCO₃ - based on APHA 2220 B 22° scatter						
Alkalinity, Total (mg/L CaCO ₃)	mg/L	1.0	200	200	-	-
Nitrate, Nitrogen (NO₃-N) - based on APHA 4500 NO ₃ -N 22° scatter						
(NO ₃ -N)	mg/L	1.0	145	145	≤20	C
Carbonate, based on APHA 2220 B 22° scatter						
Carbonate (CO ₃)	mg/L	1.0	<1.0	<1.0	-	-
Hardness, Bicarbonate - based on APHA 2540 C 22° scatter						
Hardness, Bicarbonate	mg/L	1.0	<1.0	<1.0	-	-
Sulfate - based on APHA 4500 SO ₄ 22° scatter						
(Sulfate) (SO ₄)	mg/L	5.0	36.25	36.25	-	-
Chloride - based on APHA 4500 Cl 22° scatter						
Chloride	mg/L	0.5	37.28	37.28	<250	C
Conductivity Electrical - based on APHA 2510 B 22° scatter						
Conductivity Electrical	µS/cm	0.0	300.0	300.0	-	-
Fluoride - based on APHA 4500 F 22° scatter						
Fluoride F	mg/L	1.0	<1.0	<1.0	≤1.0	C
Metals by AAS/ICP-OES - based on APHA 3111/3120 B 22° scatter						
Arsenic (As)	mg/L	0.005	<0.005	<0.005	≤0.05	C
Cadmium (Cd)	mg/L	0.005	0.40	0.40	-	-
Copper (Cu)	mg/L	1.0	22.00	22.00	-	-
Iron (Fe) (mg/L)	mg/L	0.5	5.99	5.99	-	-
Chromium (Cr)	mg/L	0.01	87.20	87.20	-	-
Nickel (Ni)	mg/L	0.01	20.20	20.20	-	-
Total Coliform - Membrane Filtration Technique - APHA 9223 B 22° scatter						
Total Coliform	CFU/100mL	-	40000	40000	<1000 / 100mL	C
Total Coliform at 22°C - Membrane Filtration Technique - APHA 9223 B 22° scatter						
Total Coliform at 22°C	CFU/100mL	-	40000	40000	<1000 / 100mL	C



ANALYTICAL REPORT

LHR-22-0744/10

Sample No.	CSP & PH-02-0744-1000		Mushkara Machine		Mushkara (Drinking Water Sample)	
Client ID						
Collected By			SGS		Results	
Parameter	Unit	LOE	Results		Compliance per PCDT for Drinking Water	Remarks
Turbidity - based on APHA 2100 B 23 rd Edition						
Turbidity	NTU	1.0	87		<3 NTU	MC
pH - based on APHA 4500 ^H 23 rd Edition						
pH @ 25°C	pH unit	0.1	8.88		6.5-8.5	C
Color - based on APHA 2100 B & C 23 rd Edition (Standard Method No. 203)						
Color	PCU	50	95		≤15 PCU	C
Total Dissolved Solid - based on APHA 2540 C 23 rd Edition						
Total Dissolved Solid (TDS)	mg/L	50	368		<1000	C
Total Hardness - based on APHA 2540 C 23 rd Edition						
Hardness, Total as CaCO ₃	mg/L	10	328		<500	C
Alkalinity, Total as CaCO ₃ - based on APHA 2220 B 23 rd Edition						
Alkalinity, Total as CaCO ₃	mg/L	18	306		-	-
Nitrite, Nitrogen (NO ₂ -N) - based on APHA 4500-NO ₂ -B 23 rd Edition						
(NO ₂ -N)	mg/L	18	<1.0		≤0.06	C
Chloride - based on APHA 2220 B 23 rd Edition						
Chloride (CL)	mg/L	18	<1.0		-	-
Hardness, Sulfate - based on APHA 2540 C 23 rd Edition						
Hardness, Sulfate	mg/L	10	<1.0		-	-
Sulfate - based on APHA 4500 SO ₄ 23 rd Edition						
Sulfate (SO ₄ ²⁻)	mg/L	50	42.68		-	-
Chloride - based on APHA 4500-CL 23 rd Edition						
Chloride	mg/L	0.5	39.34		<250	-
Conductivity Electrical - based on APHA 2510 B 23 rd Edition						
Conductivity Electrical	µS/cm	50	763		-	-
Fluoride - based on APHA 4500 F 23 rd Edition						
Fluoride F	mg/L	1.0	<1.0		≤1.5	C
Metals by AA510F-CDE - based on APHA 3110-3120 B 23 rd Edition						
* Arsenic (As)	mg/L	0.05	0.018		≤0.05	C
* Cadmium (Cd)	mg/L	0.05	0.011		-	-
* Chromium (Cr)	mg/L	1.0	30.48		-	-
* Manganese (Mn)	mg/L	0.0	3.89		-	-
* Nickel (Ni)	mg/L	0.05	0.44		-	-
* Molybdenum (Mo)	mg/L	0.0	0.44		-	-
Total Calcium - Method: Titrimetric Technique - APHA 9220 B 23 rd Edition						
Total Calcium	CPU180M	-	60		≤100 mg/L	MC
Total Sodium (Cl) - Method: Titrimetric Technique - APHA 9220 B 23 rd Edition						
Total Sodium (Cl)	CPU180M	-	81		≤100 mg/L	MC



ANALYTICAL REPORT

LHR-22-0744/10

Signature for		CSP-LHR-02-05141008			
Client ID		Tale M61 / 17 Salsir		Analytical	
Issued by		CSP-LHR-02-05141008		CSP-LHR-02-05141008	
Parameter	Unit	LOD	Results	Method as per PMDC for Drinking Water	Remarks
Turbidity Based on APHA 2120 B 22° Scatter					
Turbidity	NTU	1.0	12	<5 NTU	HC
pH Based on APHA 4500 H ⁺ B 22° Scatter					
pH @ 20°C	pH	0.1	6.91	6.5-8.5	C
Color Based on APHA 2120 B 22° Scatter (Standard Method 2007)					
Color	PCU	5.0	95	≤15 PCU	C
Total Dissolved Solids Based on APHA 2540 C 22° Scatter					
Total Dissolved Solids (TDS)	mg/L	5.0	382	<1000	C
Total Hardness Based on APHA 2540 C 22° Scatter					
Total Hardness, TDS in CaCO ₃	mg/L	1.0	312	<500	C
Alkalinity, Total in CaCO₃ Based on APHA 2320 B 22° Scatter					
Alkalinity, Total in CaCO ₃	mg/L	1.0	3.8	-	-
Mercury, Methyl (MeHg) Based on APHA 8310.01-03 22° Scatter					
MeHg (Me)	mg/L	1.0	<1.0	≤0.01	C
Cadmium Based on APHA 8000 B 22° Scatter					
Cadmium (Cd)	mg/L	1.0	<1.0	-	-
Barium, Barium (Ba) Based on APHA 2340 C 22° Scatter					
Barium, Barium (Ba)	mg/L	1.0	83	-	-
Sulfate Based on APHA 8000 B 22° Scatter					
Sulfate (SO ₄ ²⁻)	mg/L	0.0	41.16	-	-
Chloride Based on APHA 8000 B 22° Scatter					
Chloride	mg/L	0.0	29.54	<250	C
Conductivity, Electrical Based on APHA 2510 B 22° Scatter					
Conductivity, Electrical	µS/cm	0.0	763	-	-
Fluoride Based on APHA 8000 B 22° Scatter					
Fluoride F	mg/L	1.0	<1.0	≤1.5	C
Heavy Metals (ICP-OES) Based on APHA 3110-3130 B 22° Scatter					
Antimony (Sb)	mg/L	0.005	<0.005	≤0.05	C
As (As)	mg/L	0.005	0.39	-	-
Cadmium (Cd)	mg/L	1.0	35.78	-	-
Copper (Cu)	mg/L	0.2	0.87	-	-
Calcium (Ca)	mg/L	0.01	89.18	-	-
Chromium (Cr)	mg/L	0.01	33.96	-	-
Total Coliform Membrane Filtration Technique - APHA 9220 B 22° Scatter					
Total Coliform	CFU/100ml	-	Accept	≤1000 CFU/100ml	C
Fecal Coliform (E. coli) Membrane Filtration Technique - APHA 9220 B 22° Scatter					
Fecal Coliform (E. coli)	CFU/100ml	-	Accept	≤1000 CFU/100ml	C



ANALYTICAL REPORT

LHR-22-0744/10

Sample No.		LHR-22-0744/10-08				
Site ID		Tube Well / 25 Chak				
Screened By		Sanjiv				
Parameter		Unit	LOD	Result	Unit in mg/L or mg/kg or L/100ml	Remarks
Turbidity Based on APHA 2150 B 22 nd Edition						
Turbidity	NTU	1.0	47	<5 NTU		MC
pH Based on APHA 4500 H ⁺ B 22 nd Edition						
pH @ 20°C	pH unit	0.1	7.85	6.5-8.5		C
Color Based on APHA 2120 B 22 nd Edition (Aptomol No. 200)						
Color	PCU	5.0	45.0	≤15 PCU		C
Total Dissolved Solids Based on APHA 2540 D 22 nd Edition						
Total Dissolved (TDS)	mg/L	5.0	308	<1000		C
Total Hardness Based on APHA 2540 D 22 nd Edition						
Hardness, Total as CaCO ₃	mg/L	1.0	218	<500		C
Alkalinity, Total as CaCO₃ Based on APHA 4500 B 22 nd Edition						
Alkalinity, Total as CaCO ₃	mg/L	1.8	218	-		-
Heavy Metals (mg/L) Based on APHA 4500-02-01 22 nd Edition						
(Mn+10)	mg/L	1.8	<1.0	22		C
Cadmium Based on APHA 3210 B 22 nd Edition						
Cadmium (Cd)	mg/L	1.8	<1.0	-		-
Hardness, Bicarbonate Based on APHA 2540 D 22 nd Edition						
Hardness, Bicarbonate	mg/L	1.0	84	-		-
Sulfate Based on APHA 4500 SO ₄ 22 nd Edition						
Sulfate (SO ₄)	mg/L	5.0	3504	-		-
Chloride Based on APHA 4500 CL 22 nd Edition						
Chloride	mg/L	0.5	11.13	<350		C
Conductivity, Electrical Based on APHA 2510 B 22 nd Edition						
Conductivity, Electrical	µS/cm	2.0	813.3	-		-
Fluoride Based on APHA 4500 F 22 nd Edition						
Fluoride F	mg/L	1.0	4.18	2.5		C
Heavy Metals (µg/L) Based on APHA 3110-3130 B 22 nd Edition						
Arsenic (As)	µg/L	0.005	<0.005	20.00		C
Copper (Cu)	µg/L	0.005	0.39	-		-
Lead (Pb)	µg/L	1.0	1728	-		-
Mercury (Hg)	µg/L	0.1	0.44	-		-
Nickel (Ni)	µg/L	0.02	75	-		-
Manganese (Mn)	µg/L	0.02	3248	-		-
Total Coliform Membrane Filtered Technique APHA 9223 B 22 nd Edition						
Total Coliform	CFU/100ml	-	Absent	<1 CFU / 100ml		C
Fecal Coliform (E. coli) Membrane Filtered Technique APHA 9223 D 22 nd Edition						
Fecal Coliform (E. coli)	CFU/100ml	-	Absent	<1 CFU / 100ml		C



ANALYTICAL REPORT

LHR-22-0744/10

Sample Info		CSP-LHR-22-0744-10-12				
Client ID		RHM-22464				
Submitted By		(Bohara Water Sample)				
Formulator		Unit	LOD	Result	Method per WHO for Drinking Water	Remarks
Turbidity based on APHA 2130 B 22 nd Edition						
Turbidity	NTU	1.0	31	<5 NTU	MC	
pH based on APHA 4500 th B 22 nd Edition						
pH @ 20°C	pH unit	0.1	7.36	6.5-8.5	C	
Color based on APHA 2120 B & C 22 nd Edition (Aptical Density 550)						
Color	PCU	5.0	<5.0	25-100	C	
Total Dissolved Solids based on APHA 2540 C 22 nd Edition						
Total Dissolved Solids (TDS)	mg/L	5.0	368	<1000	C	
Total Hardness based on APHA 2540 C 22 nd Edition						
Hardness, Total as CaCO ₃	mg/L	1.0	86	<500	C	
Alkalinity, Total as CaCO₃ based on APHA 2550 B 22 nd Edition						
Alkalinity, Total as CaCO ₃	mg/L	1.8	80	-	-	
Hardness, Hardness (TH) based on APHA 2550 B 22 nd Edition						
Hardness (TH)	mg/L	1.8	<1.0	275	C	
Calcium based on APHA 2200 B 22 nd Edition						
Calcium (Ca)	mg/L	1.8	<1.0	-	-	
Magnesium based on APHA 2290 B 22 nd Edition						
Magnesium (Mg)	mg/L	1.0	<1.0	-	-	
Sulfate based on APHA 4500 SO ₄ 22 nd Edition						
Sulfate (SO ₄)	mg/L	5.0	10.18	-	-	
Chloride based on APHA 4500 Cl 22 nd Edition						
Chloride	mg/L	0.5	5.90	<250	C	
Conductivity, Electrical based on APHA 2510 B 22 nd Edition						
Conductivity, Electrical	µS/cm	2.0	363	-	-	
Fluoride based on APHA 4500 F 22 nd Edition						
Fluoride F	mg/L	1.0	<1.0	2.0	C	
Heavy Metals based on APHA 3110 B 22 nd Edition						
As (mg/L)	mg/L	0.005	<0.005	<0.005	C	
Cd (mg/L)	mg/L	0.005	0.018	-	-	
Cr (mg/L)	mg/L	1.0	0.01	-	-	
Pb (mg/L)	mg/L	0.02	1.01	-	-	
Ca (mg/L)	mg/L	2.00	55.28	-	-	
Magnesium (mg/L)	mg/L	0.02	90	-	-	
Total Coliform Membrane Filtration Technique APHA 9220 B 22 nd Edition						
Total Coliform	CFU/100ml	-	30	<1000	MC	
Fecal Coliform (FC) Membrane Filtration Technique APHA 9220 B 22 nd Edition						
Fecal Coliform (FC)	CFU/100ml	-	14	<1000	MC	

Annexure I: Environmental Analysis testing reports
Air Quality



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab. ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. # PGG/MS/PT/001 Rev. Date: 27-Jan-22 (Rev. #01)

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref. #: PGG/LAB/2023-4717 / AA

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Ambient Air
Monitoring By: Pak Green Laboratories (Pvt.) Ltd.
Monitoring Site: Kashmir Colony
Monitoring Location: N 32.954271° E 73.675663°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: AQMS
Monitoring Duration: 24 hours
Monitoring Date: 21-Jul-23 to 22-Jul-23

Results:									
Sr. No.	Time	CO	NO	NO _x	SO ₂	PM ₁₀	PM _{2.5}	O ₃	SPM
		ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³	ug/m ³
1.	11:00 AM	1.162	3.93	28.67	23.06				
2.	12:00 PM	1.031	6.43	32.32	28.60				
3.	1:00 PM	1.055	5.22	30.70	29.00				
4.	2:00 PM	1.065	7.07	33.38	29.90				
5.	3:00 PM	1.064	8.05	37.30	24.45				
6.	4:00 PM	1.290	5.66	30.34	20.31				
7.	5:00 PM	1.102	8.68	62.58	14.16				
8.	6:00 PM	1.016	10.92	74.03	29.00				
9.	7:00 PM	0.992	10.39	23.80	40.33				
10.	8:00 PM	1.046	10.62	30.90	36.33				
11.	9:00 PM	0.975	9.49	64.54	34.52				
12.	10:00 PM	1.050	11.67	50.76	33.09				
13.	11:00 PM	1.050	10.09	34.52	30.27				
14.	12:00 AM	1.004	9.67	28.63	29.34				
15.	1:00 AM	1.003	9.14	24.57	26.63				
16.	2:00 AM	0.918	9.50	20.51	27.39				
17.	3:00 AM	1.001	8.34	39.43	26.69				
18.	4:00 AM	1.085	7.81	38.48	26.06				
19.	5:00 AM	1.050	5.14	36.58	23.50				
20.	6:00 AM	1.073	7.08	33.74	25.28				
21.	7:00 AM	1.018	4.56	33.54	24.13				
22.	8:00 AM	1.262	6.42	33.54	24.40				
23.	9:00 AM	1.169	3.93	31.30	27.95				
24.	10:00 AM	1.069	5.14	26.84	35.20				
Average (24 hours)		1.070	7.73	35.81	28.08				
PEQG		8	40	80	120	180	35	130	500
		8hours	24hours	24hours	24hours	24hours	24hours	1 hour	24hours



info@pakgreen.pk

pakgreen@hotmail.com

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Doc. # PGQ/MS/FF/063 | Rev. Date: 27-Jan-22 | Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan, Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGQ/LAB/2023-4717/AA

Date: 01-Aug-23

PEQS: Punjab Environmental Quality Standards

Remarks: Parameters with *are exceeding with PEQS Limits.

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- The report is not valid for any negotiations.

Field Analyst	Chief Analyst	Laboratory Incharge



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk



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Doc. # PGG/MSFF/003 Rev. Date 27-Jan-22 | Rev. # 21

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

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TEST REPORT

Ref. #: PGG/LAB/2023-0718/AA

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Ambient Air
Monitoring By: Pak Green Laboratories
Site Location: Jhelum
Monitoring Location: Alraf Park
Monitoring Coordinates: N 32.922429° E 73.728974°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: AQMS
Monitoring Duration: 24 hours
Monitoring Date: 22-Jul-23 to 23-Jul-23

Results:

Sr. No.	Time	CO	NO	NO _x	SO ₂	PM ₁₀	PM _{2.5}	O ₃	SPM
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	11:00 AM	1.319	5.70	16.48	29.36				
2.	12:00 PM	1.343	8.87	38.23	26.83				
3.	1:00 PM	1.380	7.02	36.20	24.01				
4.	2:00 PM	1.356	6.30	33.36	26.26				
5.	11:00 AM	1.417	6.89	37.82	28.80				
6.	4:00 PM	1.307	8.74	38.63	30.49				
7.	5:00 PM	1.343	9.79	41.68	23.44				
8.	6:00 PM	1.430	8.60	34.57	26.54				
9.	7:00 PM	1.454	7.15	35.76	28.20				
10.	8:00 PM	1.479	7.81	37.01	24.85				
11.	9:00 PM	1.531	8.47	37.82	24.28				
12.	10:00 PM	1.294	6.10	32.14	29.08				
13.	11:00 PM	1.466	7.55	30.51	23.16	128.7	37.6*	65.6	356.6
14.	12:00 AM	1.368	6.62	42.29	24.01				
15.	1:00 AM	1.307	6.10	45.94	25.98				
16.	2:00 AM	1.356	9.13	39.04	22.60				
17.	3:00 AM	1.380	11.38	46.35	25.42				
18.	4:00 AM	1.343	8.34	47.77	27.11				
19.	5:00 AM	1.503	12.30	42.69	29.65				
20.	6:00 AM	1.479	11.51	41.68	24.29				
21.	7:00 AM	1.319	10.85	39.45	25.70				
22.	8:00 AM	1.405	9.02	37.21	25.13				
23.	9:00 AM	1.368	8.21	38.23	25.72				
24.	10:00 AM	1.452	7.94	41.88	24.01				
Average (24 Hours)		1.383	8.38	37.05	25.96				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk



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Doc. # PGG/MSFF/001 Rev. Data: 27-Jan-23 (Rev. # 01)

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Ref. # PGG/LAB/2023-4718/AA

Date: 01-Aug-23

PEQS: Punjab Environmental Quality Standards

Remarks: Parameters with *are exceeding with PEQS Limits.

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Field Analyst	Chief Analyst	Laboratory Incharge



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk



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Doc. # PGG/MS/TF/003 Rev. Date: 27-Jan-22 Rev. # 01

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TEST REPORT

Ref. #: PGG/LAB/2023-4719/AA

Date: 01-Aug-23

Name of Client: PMDEC
Nature of Monitoring: Ambient Air
Monitoring By: Pak Green Laboratories
Site Location: Jhelum
Monitoring Location: Kala Gujran Park
Monitoring Coordinates: N 32.975889° E 73.697091°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: AQMS
Monitoring Duration: 24 hours
Monitoring Date: 23-Jul-23 to 24-Jul-23

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM ₁₀	PM _{2.5}	O ₃	SPM
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	11:00 AM	1.331	1.47	26.90	31.59				
2.	12:00 PM	1.343	1.65	28.32	34.13				
3.	1:00 PM	1.393	4.82	37.45	27.93				
4.	2:00 PM	1.442	5.08	40.30	32.44				
5.	11:00 AM	1.568	3.10	32.99	31.31				
6.	4:00 PM	1.355	3.76	35.42	29.90				
7.	5:00 PM	1.442	3.50	34.21	27.65				
8.	6:00 PM	1.503	4.69	38.47	27.08				
9.	7:00 PM	1.307	5.74	40.50	27.93				
10.	8:00 PM	1.543	4.55	33.39	33.29				
11.	9:00 PM	1.393	3.76	36.44	27.36				
12.	10:00 PM	1.454	5.48	39.08	29.90				
13.	11:00 PM	1.430	7.19	42.53	27.65				
14.	12:00 AM	1.531	8.38	43.14	30.73	137.8	40.2*	73.2	200.3
15.	1:00 AM	1.294	4.55	33.39	28.77				
16.	2:00 AM	1.343	5.87	32.78	29.06				
17.	3:00 AM	1.380	4.82	34.61	27.93				
18.	4:00 AM	1.503	4.42	37.05	30.47				
19.	5:00 AM	1.442	2.05	28.72	27.08				
20.	6:00 AM	1.319	5.10	32.99	27.65				
21.	7:00 AM	1.356	3.37	34.61	29.06				
22.	8:00 AM	1.393	1.91	29.33	27.65				
23.	9:00 AM	1.466	2.18	26.69	26.52				
24.	10:00 AM	1.452	1.08	27.30	27.65				
Average (24 Hours)		1.391	4.02	34.44	29.20				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours



info@pakgreen.pk

pakgreen@hotmail.com

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Ref. #: PGG/LAH/2023-4719/AA

Date: 01-Aug-23

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Field Analyst	Chief Analyst	Laboratory Incharge





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Doc. No: POG/SMS-PP/005 Rev. Date: 27-Jan-22 Rev. 8.2.2

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref. in POG/LAB/2023-4720/AA

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Ambient Air
Monitoring By: Pak Green Laboratories
Site Location: Pakistan
Monitoring Location: Jada Chowk
Monitoring Coordinates: N 32.948029° E 73.713283°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: AQMS
Monitoring Duration: 24 hours
Monitoring Date: 24-Jul-23 to 25-Jul-23

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM ₁₀	PM _{2.5}	O ₃	SPM
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	11:00 AM	1.007	8.36	28.64	20.14				
2.	12:00 PM	1.040	4.62	26.41	29.16				
3.	1:00 PM	0.978	3.76	20.93	28.32				
4.	2:00 PM	1.138	8.30	28.44	30.60				
5.	11:00 AM	1.089	6.14	9.97	23.52				
6.	4:00 PM	0.991	4.16	20.52	26.91				
7.	5:00 PM	1.224	9.57	29.05	28.60				
8.	6:00 PM	1.188	2.05	14.84	24.87				
9.	7:00 PM	0.966	4.55	26.21	31.42				
10.	8:00 PM	0.954	8.68	28.84	42.13				
11.	9:00 PM	0.917	5.08	25.39	22.39				
12.	10:00 PM	1.101	4.55	24.38	19.86				
13.	11:00 PM	1.212	6.14	26.81	18.73				
14.	12:00 AM	1.040	3.23	18.90	19.29				
15.	1:00 AM	1.089	10.36	28.84	21.27				
16.	2:00 AM	1.114	3.76	24.99	19.01				
17.	3:00 AM	0.966	2.57	17.27	19.86				
18.	4:00 AM	1.040	3.76	20.52	17.88				
19.	5:00 AM	0.978	7.33	28.84	18.45				
20.	6:00 AM	0.954	9.04	35.51	20.14				
21.	7:00 AM	0.978	4.82	22.75	28.60				
22.	8:00 AM	1.077	3.76	21.33	20.70				
23.	9:00 AM	1.138	3.37	20.12	19.57				
24.	10:00 AM	1.114	2.14	18.69	19.01				
Average (24 Hours)		1.054	5.41	23.58	24.12				
PEQS		5 80hours	40 24hours	83 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk



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Doc# PGG/MSFF/003 Rev. Date: 27-Jan-22 Rev. # 01

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Ref. #: PGG/LAB/2023-4725/AA

Date: 01-Aug-23

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info@pakgreen.pk

pakgreen@hotmail.com

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Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref. #: PGG/LAB/2023-0721/AA

Date: 05-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Ambient Air
Monitoring By: Pak Green Laboratories
Monitoring Site: Jhelum
Monitoring Location: Shandur Check
Monitoring Coordinates: N 32°02'126" E 73°53'1373"
Name of Sampling Person: Mr. Adil
Monitoring Instrument: AQMS
Monitoring Duration: 24 hours
Monitoring Date: 25-Jul-23 to 26-Jul-23

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM ₁₀	PM _{2.5}	O ₃	SPM
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	11:00 AM	1.579	5.11	24.45	21.67				
2.	12:00 PM	1.465	7.62	28.30	28.21				
3.	1:00 PM	1.432	6.41	26.48	28.61				
4.	2:00 PM	1.480	8.26	19.17	29.51				
5.	3:00 PM	1.501	9.22	13.08	24.94				
6.	4:00 PM	1.682	8.85	35.02	20.12				
7.	5:00 PM	1.577	10.07	38.36	13.77				
8.	6:00 PM	1.433	12.11	49.81	28.61				
9.	7:00 PM	1.409	11.58	19.58	40.14				
10.	8:00 PM	1.463	11.81	26.68	36.14				
11.	9:00 PM	1.392	10.68	60.32	34.13				
12.	10:00 PM	1.437	13.05	46.54	32.70				
13.	11:00 PM	1.467	12.08	30.39	30.58				
14.	12:00 AM	1.421	10.86	24.41	28.75	133.1	38.3*	69.5	378.5
15.	1:00 AM	1.482	10.53	30.35	28.44				
16.	2:00 AM	1.365	10.39	16.29	27.00				
17.	3:00 AM	1.512	9.33	35.21	26.30				
18.	4:00 AM	1.502	8.64	34.19	25.67				
19.	5:00 AM	1.437	6.33	32.16	23.11				
20.	6:00 AM	1.670	8.27	29.52	24.89				
21.	7:00 AM	1.455	5.77	29.52	23.76				
22.	8:00 AM	1.679	7.63	29.12	24.01				
23.	9:00 AM	1.586	5.12	26.88	27.54				
24.	10:00 AM	1.444	5.76	22.62	37.81				
Average (24 Hours)		1.686	8.89	31.59	27.81				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours





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Ref. #: PGQ/LAB/2023-4721 / AA

Date: 08-Aug-23

PEQS: Punjab Environmental Quality Standards

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Field Analyst	Chief Analyst	Laboratory Incharge





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Doc. #: PGG/MSFFI/001 Rev. Date: 27-Jan-22 Rev. #: 01

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EPA Certified

TEST REPORT

Ref. #: PGG/LAB/2023-4722/AA

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Ambient Air
Monitoring By: Pak Green Laboratories
Site Location: Iqbal
Monitoring Location: Bilal Tower
Monitoring Coordinates: N 32.955333° E 75.743667°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: AQMS
Monitoring Duration: 24 hours
Monitoring Date: 26-Jul-23 to 27-Jul-23

Results

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM ₁₀	PM _{2.5}	O ₃	SPM
		µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	11:00 AM	1.236	9.66	30.23	25.86				
2.	12:00 PM	1.260	12.83	24.01	21.33				
3.	1:00 PM	1.297	10.98	21.98	18.51				
4.	2:00 PM	1.223	10.66	19.14	20.76				
5.	11:00 AM	1.834	10.85	23.60	23.30				
6.	4:00 PM	1.724	12.70	24.41	24.99				
7.	5:00 PM	1.760	13.75	27.46	17.94				
8.	6:00 PM	1.847	12.56	20.35	21.04				
9.	7:00 PM	1.871	11.11	19.54	22.74				
10.	8:00 PM	1.896	11.77	22.79	19.35				
11.	9:00 PM	1.748	12.43	23.60	18.79				
12.	10:00 PM	1.711	10.06	17.92	23.58				
13.	11:00 PM	1.883	11.51	16.29	18.47	138.6	41.5*	70.9	186.9
14.	12:00 AM	1.785	10.58	28.07	19.32				
15.	1:00 AM	1.724	10.04	31.72	21.29				
16.	2:00 AM	1.723	13.09	24.82	17.91				
17.	3:00 AM	1.797	15.34	32.13	20.73				
18.	4:00 AM	1.740	12.30	33.55	22.42				
19.	5:00 AM	1.920	16.26	28.47	21.96				
20.	6:00 AM	1.896	15.47	27.46	19.60				
21.	7:00 AM	1.736	14.81	25.23	21.61				
22.	8:00 AM	1.822	13.88	22.99	20.44				
23.	9:00 AM	1.783	12.17	24.01	19.03				
24.	10:00 AM	1.828	11.33	27.66	19.32				
Average (24 Hours)		1.799	12.32	24.10	20.86				
PEQS		5 8hours	40 24hours	80 24hours	130 24hours	150 24hours	35 24hours	130 1 hour	500 24hours





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Ref. #: PGG/LAB/2023-4722/AA

Date: 01-Aug-23

PEQS: Punjab Environmental Quality Standards

Remarks: Parameters with *are exceeding with PIQS Limits.

Terms & Conditions:

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- The left-over sample (if an available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.

Field Analyst	Chief Analyst	Laboratory Incharge



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk



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Doc# PGG/ESQ/FF/0031 Rev: Date: 27-Jan-22 Rev: # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. # PGG/LAB/2023-4723/AA

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Ambient Air
Monitoring By: Pak Green Laboratories
Site Location: Jhelum
Monitoring Location: Karim Pura
Monitoring Coordinates: N 32.853849° E 73.724167°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: AQMS
Monitoring Duration: 24 hours
Monitoring Dates: 27-Jul-23 to 28-Jul-23

Results

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM ₁₀	PM _{2.5}	O ₃	SPM
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	11:00 AM	0.989	3.05	21.79	11.87				
2.	12:00 PM	1.001	3.25	12.77	20.65				
3.	1:00 PM	1.051	6.40	21.90	13.85				
4.	2:00 PM	1.102	6.66	24.75	18.36				
5.	11:00 AM	1.005	4.68	20.44	17.23				
6.	4:00 PM	1.014	5.34	22.87	29.10				
7.	5:00 PM	1.100	5.08	21.66	36.80				
8.	6:00 PM	1.161	6.27	25.92	13.00				
9.	7:00 PM	0.963	7.32	27.95	13.85				
10.	8:00 PM	1.321	6.15	20.84	19.21				
11.	9:00 PM	1.051	3.54	23.89	13.28				
12.	10:00 PM	1.112	7.06	26.53	15.82				
13.	11:00 PM	1.088	8.77	29.98	20.02				
14.	12:00 AM	0.989	9.56	30.59	16.67	146.5	48.0*	71.4	354.7
15.	1:00 AM	0.952	6.15	20.84	14.69				
16.	2:00 AM	1.001	7.45	20.23	14.98				
17.	3:00 AM	1.018	6.40	22.06	13.83				
18.	4:00 AM	1.161	6.00	24.50	16.39				
19.	5:00 AM	1.432	3.63	16.17	13.00				
20.	6:00 AM	0.977	4.68	20.44	15.41				
21.	7:00 AM	1.014	4.95	22.06	14.98				
22.	8:00 AM	1.051	3.49	16.78	15.80				
23.	9:00 AM	1.124	3.76	23.77	12.44				
24.	10:00 AM	1.069	2.66	32.23	13.57				
Average (24 Hours)		1.066	5.00	22.96	16.81				
PEQS		5-8hours	40-24hours	60-24hours	120-24hours	150-24hours	35-24hours	130-1 hour	500-24hours



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk



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Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2023-4723/AA

Date: 08-Aug-23

PEQS: Punjab Environmental Quality Standards

Remarks: Parameters with *are exceeding with PEQS Limits

Terms & Conditions:

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Field Analyst	Chief Analyst	Laboratory Incharge





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Doc. #: PGG/IMS/PP/063 | Rev. Date: 27-Jan-22 | Rev. # 03

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2023-4724/AA

TEST REPORT

Date: 01-Aug-25

Name of Client: PMDFC
Nature of Monitoring: Ambient Air
Monitoring By: Pak Green Laboratories
Site Location: Jhelum
Monitoring Location: Sahil Colony
Monitoring Coordinates: N 32.941389° E 73.741944°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: AQMS
Monitoring Duration: 24 hours
Monitoring Date: 28-Jul-23 to 29-Jul-23

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM ₁₀	PM _{2.5}	O ₃	SPM
		mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
1.	11:00 AM	2.224	14.58	35.56	22.17				
2.	12:00 PM	1.661	9.70	33.33	31.39				
3.	1:00 PM	1.599	7.98	27.85	30.35				
4.	2:00 PM	1.759	14.32	35.36	41.63				
5.	11:00 AM	1.710	10.36	16.89	25.55				
6.	4:00 PM	1.612	8.38	27.44	28.94				
7.	5:00 PM	1.845	13.79	35.97	30.65				
8.	6:00 PM	1.809	6.27	21.76	26.40				
9.	7:00 PM	1.587	8.77	33.13	33.45				
10.	8:00 PM	1.575	15.90	35.76	44.16				
11.	9:00 PM	1.358	9.30	32.31	24.42				
12.	10:00 PM	1.722	8.77	31.30	21.89				
13.	11:00 PM	1.855	10.36	33.73	20.76				
14.	12:00 AM	1.661	7.45	25.82	21.32	143.7	45.8*	63.7	424.1
15.	1:00 AM	1.710	14.58	35.76	23.30				
16.	2:00 AM	1.733	7.98	31.91	21.04				
17.	3:00 AM	1.587	8.79	24.19	21.89				
18.	4:00 AM	1.661	7.98	27.24	19.91				
19.	5:00 AM	1.599	11.55	35.76	20.48				
20.	6:00 AM	1.575	13.26	40.43	22.17				
21.	7:00 AM	1.599	9.04	29.67	30.63				
22.	8:00 AM	1.698	7.98	28.25	22.73				
23.	9:00 AM	1.733	7.59	27.04	21.60				
24.	10:00 AM	1.733	6.36	25.61	21.04				
Average (24 Hours)		1.700	9.96	30.50	26.15				
PDQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	130 1 hour	500 24hours



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk



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Ref. #: PGG/LAB/2023-4724/AA

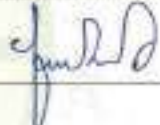
Date: 03-Aug-23

PEQS: Punjab Environmental Quality Standards

Remarks: Parameters with *are exceeding with PEQS Limits.

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Field Analyst	Chief Analyst	Laboratory Incharge
		



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk

Noise Quality



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Doc# PGG/IMS/FF/003 Rev. Date: 21-Jan-23 Rev # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref. #: PGG/LAB/2023-0725/NL

Date: 03-Aug-23

Name of Client: PMDFC
 Nature of Monitoring: Noise Level
 Monitoring By: Pak Green Laboratories
 Monitoring Site: Jhotum
 Monitoring Location: Kashmir Colony
 Monitoring Coordinates: N 32.984271° E 73.675661°
 Name of Sampling Person: Mr. Adil
 Monitoring Instrument: LAND TEK SL 5468P
 Monitoring Duration: 24 hours
 Monitoring Date: 21-Jul-23 to 22-Jul-23

Results:

Sr. No.	Day Time	Equivalent Noise
		dB (A)
1.	7:00 AM	63.8
2.	8:00 AM	60.5
3.	9:00 AM	67.4
4.	10:00 AM	61.3
5.	11:00 AM	66.2
6.	12:00 PM	59.1
7.	1:00 PM	59.0
8.	2:00 PM	62.7
9.	3:00 PM	63.5
10.	4:00 PM	58.7
11.	5:00 PM	61.1
12.	6:00 PM	66.0
13.	7:00 PM	67.7
14.	8:00 PM	60.5
15.	9:00 PM	62.8
Average		62.8
Sr. No.	Night Time	Equivalent Noise
		dB (A)
16.	10:00 PM	55.7
17.	11:00 PM	55
18.	12:00 AM	53.8
19.	1:00 AM	53.5
20.	2:00 AM	56.7
21.	3:00 AM	52.3
22.	4:00 AM	56.8
23.	5:00 AM	52.1
24.	6:00 AM	49.8
Average		54.2

End of Report



info@pakgreen.pk

pakgreen@hotmail.com

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Ref. #: PGG/LAB/2023-4725/NL

Date: 01-Aug-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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- The report is not valid for any negotiations.
- Daily calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge



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Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2023-4726/NL

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Noise Level
Monitoring By: Pak Green Laboratories
Site Location: Jhelum
Monitoring Location: Altal Park
Monitoring Coordinator: N 32.923629° E 73.728074°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: LAND TEK SL 5868P
Monitoring Duration: 24 hours
Monitoring Date: 22-Jul-23 to 23-Jul-23

Results:

Sr. No.	Day Time	Equivalent Noise
		dB (A)
1.	7:00 AM	62.6
2.	8:00 AM	59.3
3.	9:00 AM	66.2
4.	10:00 AM	60.1
5.	11:00 AM	65.0
6.	12:00 PM	61.9
7.	1:00 PM	64.0
8.	2:00 PM	64.5
9.	3:00 PM	62.1
10.	4:00 PM	65.5
11.	5:00 PM	64.4
12.	6:00 PM	64.8
13.	7:00 PM	67.1
14.	8:00 PM	64.7
15.	9:00 PM	61.6
Average		63.6
Sr. No.	Night Time	Equivalent Noise
		dB (A)
16.	10:00 PM	56.7
17.	11:00 PM	54.5
18.	12:00 AM	35
19.	1:00 AM	52.7
20.	2:00 AM	53.8
21.	3:00 AM	55.5
22.	4:00 AM	51.1
23.	5:00 AM	56.3
24.	6:00 AM	49.9
Average		53.9

End of Report



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Ref. #: PGG/LAB/2023-4726/NE

Date: 01-Aug-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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- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge



info@pakgreen.pk

pakgreenc@hotmail.com

www.pakgreen.pk



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TEST REPORT

Ref. #: PGG/LAB/2023-4727/NL

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Noise Level
Monitoring By: Pak Green Laboratories
Site Location: Jhelum
Monitoring Location: Kala Gajran Park
Monitoring Coordinates: N 32.975489° E 73.697091°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: LAND TEK SL 5868P
Monitoring Duration: 24 hours
Monitoring Date: 23-Jul-23 to 24-Jul-23

Results:

Sr. No.	Day Time	Equivalent Noise
		dB (A)
1.	7:00 AM	61.0
2.	8:00 AM	57.2
3.	9:00 AM	61.6
4.	10:00 AM	58.5
5.	11:00 AM	63.9
6.	12:00 PM	60.3
7.	1:00 PM	62.4
8.	2:00 PM	62.2
9.	3:00 PM	64.5
10.	4:00 PM	61.9
11.	5:00 PM	62.8
12.	6:00 PM	65.3
13.	7:00 PM	61.5
14.	8:00 PM	63.1
15.	9:00 PM	60.0
Average		62.0
Sr. No.	Night Time	Equivalent Noise
		dB (A)
1.	10:00 PM	56.3
2.	11:00 PM	51.8
3.	12:00 AM	50.6
4.	1:00 AM	48.3
5.	2:00 AM	49.4
6.	3:00 AM	51.3
7.	4:00 AM	46.7
8.	5:00 AM	52.4
9.	6:00 AM	48.5
Average		50.5

End of Report



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Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2025-4727/NL

Date: 05-Aug-25

PEQS: Punjab Environmental Quality Standards

Sl. 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



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Doc. #: PGG/MS/FF/003 Rev. Date: 27-Jan-22 Rev. #: 01

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EPA Certified

TEST REPORT

Ref. #: PGG/LAB/2023-4728/NL

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Noise Level
Monitoring By: Pak Green Laboratories
Site Location: Jhalum
Monitoring Location: Jada Chowk
Monitoring Coordinates: N 32.948029° E 73.713285°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: LAND-TEK SL 5068P
Monitoring Duration: 24 hours
Monitoring Date: 24-Jul-23 to 25-Jul-23

Sr. No.	Day Time	Equivalent Noise
		dB (A)
1.	7:00 AM	65.6
2.	8:00 AM	62.3
3.	9:00 AM	67.2
4.	10:00 AM	61.1
5.	11:00 AM	67.5
6.	12:00 PM	62.4
7.	1:00 PM	64.5
8.	2:00 PM	63.2
9.	3:00 PM	65.6
10.	4:00 PM	64.0
11.	5:00 PM	62.9
12.	6:00 PM	67.3
13.	7:00 PM	63.6
14.	8:00 PM	63.2
15.	9:00 PM	62.5
Average		64.9
Sr. No.	Night Time	Equivalent Noise
		dB (A)
1.	10:00 PM	57.9
2.	11:00 PM	53.3
3.	12:00 AM	52.1
4.	1:00 AM	49.8
5.	2:00 AM	50.9
6.	3:00 AM	52.6
7.	4:00 AM	48.2
8.	5:00 AM	48.5
9.	6:00 AM	50
Average		51.5

End of Report



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Doc. No: PQG/MS/FF/001 Rev. Date: 27-Jan-22 [Rev. # 01]

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Ref. #: ICG/LAB/2023-4728/NL

Date: 01-Aug-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



Page 2 of 2





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc # PG/MS/FF/063 Rev. Date: 27-Jan-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref. #: PG/LAB/2025-4729/NL

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Noise Level
Monitoring By: Pak Green Laboratories
Monitoring Site: Jhelum
Monitoring Location: Shandar Chowk
Monitoring Coordinates: N 32.929126° E 73.731373°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: LAND TEK SL 5868P
Monitoring Duration: 24 hours
Monitoring Date: 25-Jul-23 to 26-Jul-23

Results:

Sl. No.	Day Time	Equivalent Noise
		dB (A)
1.	7:00 AM	67.2
2.	8:00 AM	68.9
3.	9:00 AM	70.8
4.	10:00 AM	64.7
5.	11:00 AM	69.6
6.	12:00 PM	62.5
7.	1:00 PM	62.4
8.	2:00 PM	66.1
9.	3:00 PM	68.7
10.	4:00 PM	62.1
11.	5:00 PM	64.5
12.	6:00 PM	69.4
13.	7:00 PM	71.1
14.	8:00 PM	63.9
15.	9:00 PM	67.6
Average		66.3
Sl. No.	Night Time	Equivalent Noise
		dB (A)
16.	10:00 PM	61.2
17.	11:00 PM	52.7
18.	12:00 AM	51.5
19.	1:00 AM	53.2
20.	2:00 AM	54.4
21.	3:00 AM	50
22.	4:00 AM	54.5
23.	5:00 AM	49.8
24.	6:00 AM	47.5
Average		52.8

End of Report



Page 1 of 2





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Doc# PGG/MS/FF/051 Rev. Date: 27-Jan-22 (Rev. # 01)

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2023-0729/NL

Date: 01-Aug-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



Page 2 of 2



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ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc# PGG/MSFF/063 Rev. Date: 27-Jan-22 Rev # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref: PGG/LAB/2023-0730/NL

TEST REPORT

Date: 03-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Noise Level
Monitoring By: Pak Green Laboratories
Site Location: Bedum
Monitoring Location: Bedal Town
Monitoring Coordinates: N 32.953033° E 75.741867°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: LAND TEK SL 5868P
Monitoring Duration: 24 hours
Monitoring Date: 26-Jul-23 to 27-Jul-23

Results:

Sr. No.	Day Time	Equivalent Noise
		dB (A)
1.	7:00 AM	61.0
2.	8:00 AM	57.7
3.	9:00 AM	64.6
4.	10:00 AM	71.0
5.	11:00 AM	63.4
6.	12:00 PM	70.1
7.	1:00 PM	62.4
8.	2:00 PM	67.6
9.	3:00 PM	60.5
10.	4:00 PM	63.9
11.	5:00 PM	62.8
12.	6:00 PM	63.2
13.	7:00 PM	65.5
14.	8:00 PM	63.1
15.	9:00 PM	64.4
Average		64.1
Sr. No.	Night Time	Equivalent Noise
		dB (A)
16.	10:00 PM	56
17.	11:00 PM	58.3
18.	12:00 AM	57.1
19.	1:00 AM	54.8
20.	2:00 AM	55.9
21.	3:00 AM	57.6
22.	4:00 AM	53.2
23.	5:00 AM	58.4
24.	6:00 AM	53
Average		56.0

End of Report



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ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. # PGG/MS/FF/063 Rev. Date 27-Jan-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2023-4730/NL

Date: 01-Aug-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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PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. #: PGG/IMS/FF/063 | Rev. Date: 27-Jan-22 | Rev. #: 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref. #: PGG/LAB/2023-4731/NL

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Noise Level
Monitoring By: Pak Green Laboratories
Site Location: Jhelum
Monitoring Location: Karam Para
Monitoring Coordinates: N 32.93389° E 73.724167°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: LAND TEK SL 9864P
Monitoring Duration: 24 hours
Monitoring Date: 27-Jul-23 to 28-Jul-23

Sr. No.	Day Time	Equivalent Noise
		dB (A)
1.	7:00 AM	59.9
2.	8:00 AM	56.6
3.	9:00 AM	63.5
4.	10:00 AM	57.4
5.	11:00 AM	62.8
6.	12:00 PM	59.2
7.	1:00 PM	61.3
8.	2:00 PM	61.1
9.	3:00 PM	63.4
10.	4:00 PM	60.8
11.	5:00 PM	61.7
12.	6:00 PM	64.1
13.	7:00 PM	60.4
14.	8:00 PM	62.0
15.	9:00 PM	59.2
Average		60.9
Sr. No.	Night Time	Equivalent Noise
		dB (A)
16.	10:00 PM	59.3
17.	11:00 PM	55.
18.	12:00 AM	55.8
19.	1:00 AM	51.5
20.	2:00 AM	52.6
21.	3:00 AM	54.3
22.	4:00 AM	49.9
23.	5:00 AM	55.6
24.	6:00 AM	51.7
Average		53.7

End of Report.....



Page 1 of 2



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ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. No. PGG/MS/FF/063 | Rev. Date: 27-Jan-22 | Page: 8 of 11

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2025-4751/NL

Date: 01-Aug-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



Page 2 of 2



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Doc. #: PGG/MS/IFF-063 | Rev. Date: 27-Jan-22 | Rev. #: 01

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TEST REPORT

Ref. #: PGG/LAB/2023-4732/NL

Date: 01-Aug-23

Name of Client: PMDFC
Nature of Monitoring: Noise Level
Monitoring By: Pak Green Laboratories
Site Location: Jhelum
Monitoring Location: Sahil Colony
Monitoring Coordinates: N 32.941589° E 73.741944°
Name of Sampling Person: Mr. Adil
Monitoring Instrument: LAND TEK SL 5864P
Monitoring Duration: 24 hours
Monitoring Date: 28-Jul-23 to 29-Jul-23
Results:

Se. No.	Day Time	Equivalent Noise
		dB (A)
1.	7:00 AM	63.9
2.	8:00 AM	71.2
3.	9:00 AM	64.5
4.	10:00 AM	70.3
5.	11:00 AM	65.1
6.	12:00 PM	60.5
7.	1:00 PM	71.2
8.	2:00 PM	63.3
9.	3:00 PM	64.7
10.	4:00 PM	64.1
11.	5:00 PM	63.0
12.	6:00 PM	65.4
13.	7:00 PM	61.7
14.	8:00 PM	63.3
15.	9:00 PM	61.7
Average		63.3
Se. No.	Night Time	Equivalent Noise
		dB (A)
16.	10:00 PM	62
17.	11:00 PM	54.2
18.	12:00 AM	52
19.	1:00 AM	54.7
20.	2:00 AM	53.8
21.	3:00 AM	57.3
22.	4:00 AM	53.1
23.	5:00 AM	53.4
24.	6:00 AM	52.7
Average		53.6

End of Report



Page 1 of 2



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ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. # PSG/MS/FAQT Rev. Date: 27-Jan-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

Ref. #: PGG/LAB/2023-4752/NL

Date: 01-Aug-25

PEQS: Punjab Environmental Quality Standards

Sl. 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



Water Analysis



PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. # PGGIMS/F/053 Rev. Date 27-Jan-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

TEST REPORT

Ref: PGG/LAB/2023-4686/DW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Belum

Sample Description:

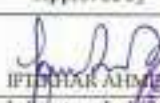
Nature of sample	Drinking water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Altai Park N 32.9224° E 73.728997°
Sample source	Turbine Bore 66 Ft.
Sample Code	DW-1583
Date of sampling	25-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters with are in compliance with FEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD BAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc No: PGG/MSF-F-003 Rev: Date: 27-Jan-22 Rev: 3-01

Head Office: 46-M, Gulberg III, Lahore-Pakistan, Ph: +9242-35441444 Cell: 0303-4442334

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Ref#: PGG/LAB/2023-1686/DW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^A	-	-	6.5-8.5	0.001	7.553 at 25.2°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.30	APHA-2130 B
6.	Total dissolved Solids (TDS) ^A	mg/L	1000	<1000	10	639	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^A	mg/L	-	<500	0.1	480	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^A	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^A	mg/L	250	<250	0.1	69	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^A	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^A	mg/L	2	2	0.0001	0.0200	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.5	APHA-4500-F-D
18.	Lead (Pb) ^A	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^A	mg/L	0.5	≤0.5	0.0010	0.0010	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^A	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3113 B
22.	Nitrate ^A	mg/L	50	≤50	0.001	0.038	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^A	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk



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ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. # PGG/MS/IT/003 Rev. Date: 27-Jan-22 Rev. # 01

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Ref: POG/LAB/2023-0686/DW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.05	APHA-CL-B
26.	Zinc (Zn) ²⁺	mg/L	3.0	5.0	0.0001	0.005	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	45.8102	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	3.0763	APHA-3111 B
30.	Iron (Fe) ²⁺	mg/L	-	-	0.0010	0.0018	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

*PNAC Accredited
LDL: Lowest Detection Limit



**PAK GREEN** ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. No: POG/IMS/FF/063 | Rev. Date: 27-Jan-22 | Rev. # 01

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TEST REPORT

Ref#: POG/LAB/2023-4687/DW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Drinking Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Kala Gujran Park N 32.07588° E 73.697078°
Sample source	Turbine Bore 72 Ft.
Sample Code	DW-1584
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PECQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR ALI KHAN Laboratory In-charge



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk



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ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Doc. # PGG/MQ/FF/002 Rev. Date: 27-Jan-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan, Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref: PGG/LAB/2023-4687/DIV

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^a	-	-	6.5-8.5	0.001	7.548 at 24.5°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.38	APHA-2130 B
6.	Total dissolved Solids (TDS) ^a	mg/L	1000	<1000	10	849	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^a	mg/L	-	<500	0.1	540 ^a	APHA-2540 C
8.	Aluminium (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^a	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^a	mg/L	250	<250	0.1	73	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^a	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^a	mg/L	2	2	0.0001	0.0138	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.7	APHA-4500-F-D
18.	Lead (Pb) ^a	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^a	mg/L	0.5	≤0.5	0.0010	0.0010	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^a	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^a	mg/L	50	≤50	0.001	0.058	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^a	mg/L	3	≤3	0.001	0.013	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Doc. No. PGG/MS/FF/063 Rev. Date: 27-Jan-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref#: PGC/LAB/2023-4687/DW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-C3-B
26.	Zinc (Zn ²⁺) ^A	mg/L	3.0	5.0	0.0001	0.0024	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5030 D
28.	Sodium (Na) ^A	mg/L	-	-	0.0100	80.0039	APHA-3131 B
29.	Potassium (K) ^A	mg/L	-	-	0.0100	7.7574	APHA-3111 B
30.	Iron (Fe) ^A	mg/L	-	-	0.0010	0.0111	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Focal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

^APNAC Accredited
LDL: Lowest Detection Limit





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Doc # PGG/MS/IT/063 Rev. Date: 27-Jan-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref#: PGG/LAB/2023-4688/DW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Drinking Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Jada Chowk N 32.948062° E 73.713255°
Sample source	Turbine Boer 68 ft.
Sample Code	DW-1585
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PEQS & WHO Standards.

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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 left-over 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 Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Doc# PGG/MS/PP/003 Rev. Date: 27-Jan-22 Rev.# 01

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Ref#: PGG/LAB/2023-4688/DW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.312 at 24.6°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.40	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	835	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	540 [^]	APHA-2340 C
8.	Aluminium (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	68	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0204	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.6	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0023	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.040	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤ 3	0.001	0.010	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



info@pak.green.pk

pakgreene@hotmail.com

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Doc. No: PGG/MS-PF/053 Rev. Date: 27-Sep-22 Rev. 4.01

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Ref: PGG/LAB/2023-4688/DW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CL-B
26.	Zinc (Zn ²⁺) ^A	mg/L	3.0	5.0	0.0001	0.0037	APHA-3111 B
27.	Phenolic Compound (As Fluorid)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ^A	mg/L	-	-	0.0100	70.2456	APHA-3111 B
29.	Potassium (K) ^A	mg/L	-	-	0.0100	4.0903	APHA-3111 B
30.	Iron (Fe) ^A	mg/L	-	-	0.0010	0.0294	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliforms	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

^APNAC Accredited

LDL: Lowest Detection Limit



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Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref#: PGG/LAB/2023-0889/DW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Drinking Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Shandar Chowk N 32.929104° E 73.731331°
Sample source	Turbine Bore 75 PL
Sample Code	DW-1586
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PQS & WHO Standards.

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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Manager





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Ref: PGG/LAB/2023-4689/DW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^o	-	-	6.5-8.5	0.001	7.578 at 24.8°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.38	APHA-2130 B
6.	Total dissolved Solids (TDS) ^o	mg/L	1000	<1000	10	879	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^o	mg/L	-	<500	0.1	587 ^o	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3131 D
13.	Cadmium ^o	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^o	mg/L	250	<250	0.1	83	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^o	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^o	mg/L	2	2	0.0001	0.0212	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.7	APHA-4500-F-D
18.	Lead (Pb) ^o	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^o	mg/L	0.5	≤0.5	0.0010	0.0113	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^o	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^o	mg/L	50	≤50	0.001	0.063	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^o	mg/L	3	≤3	0.001	0.015	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



info@pakgreen.pk

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Ref# PGG/LAB/2023-4689/DIN

Date: 01-Aug-23

Chemical Parameters Analysis Results

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CI-B
26.	Zinc (Zn ⁺⁺) ^	mg/L	3.0	5.0	0.0001	0.0130	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	69.9770	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	4.0216	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0161	APHA-3111 B

Biological Parameters Analysis Results

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

*PNAC Accredited

LDL: Lowest Detection Limit



info@pakgreen.pk

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Doc. #: PGGMS/FF/003 Rev. Date: 27-Jan-22 Rev. #: 01

Head Office: 45-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref#: PGG/LAB/2023-4690/DW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Drinking Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Bilal Town N 32.953379° E 73.741708°
Sample source	Turbine Bore 63 Ft.
Sample Code	DW-1587
Date of sampling	23-Jul-23

Summary of Test Results:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PQS & WHO Standards.

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Sample Analyzed by:	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Manager





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Cor. H-10/2, PMDFF/063, Feroz, Datta 27-Jan-22, Page 8 of 11

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Ref#: PGG/LAB/2023-4690/DW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^o	-	-	6.5-8.5	0.001	7.421 at 25.4°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.35	APHA-2130 B
6.	Total dissolved Solids (TDS) ^o	mg/L	1000	<1000	10	815	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^o	mg/L	-	<500	0.1	570 ^o	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 E
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^o	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 E
14.	Chloride (Cl ⁻) ^o	mg/L	250	<250	0.1	73	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^o	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^o	mg/L	2	2	0.0001	0.0219	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.6	APHA-4500-F-D
18.	Lead (Pb) ^o	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^o	mg/L	0.5	≤0.5	0.0010	0.0083	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle ^o	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^o	mg/L	50	≤50	0.001	0.030	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^o	mg/L	3	≤ 3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



info@pakgreen.pk

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Ref#: PGG/LAB/2023-4600/DW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn) [^]	mg/L	3.0	5.0	0.0001	0.0237	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	84.1818	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	7.9602	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0010	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

End of Report

[^]PNAC Accredited

LDL: Lowest Detection Limit



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Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref#: PGG/LAB/2023-4691/DW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Ihelum

Sample Description:

Nature of sample	Drinking Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Karim Pura N 32.953806° E 75.714201°
Sample source	Turbine Bore 80 Ft.
Sample Code	DW-1588
Date of sampling	23-Jul-23

Summary of Test Results:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	Parameters with * are not in compliance with PEQS & WHO Standards.

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- The left-over 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 Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory In-charge





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Doc. # PGQ/MS-FT-003 Rev. Date: 27-Jan-22 Rev. # 01

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Ref: PGQ/LAB/2023-4691/DW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.441 at 25.2°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	3	5	0.01	0.28	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	622	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	450	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	69	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0268	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.4	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0010	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.028	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Doc # PGG/MS-FF-001 | Rev. Date: 27-Jan-22 | Rev # 01

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Ref#: PGG/LAB/2023-4691/DW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.03	APHA-Cl-B
26.	Zinc (Zn) [^]	mg/L	3.0	3.0	0.0001	0.0045	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	45.8450	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	3.0649	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0010	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

[^]PNAC Accredited
LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2023-0092/DW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Drinking Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Sahil Colony N 32.941435° E 73.741944°
Sample source	Turbine Bore 72 Ft.
Sample Code	DW-1589
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PEQS & WHO Standards.

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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTICHAH AHMED Laboratory Incharge





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

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Doc. # PGG/MS/FF/083 Rev. Date 27-Jan-22 Rev. #11

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Ref: PGG/LAB/2023-4692/DW

Date: 01-Aug-25

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^a	-	-	6.5-8.5	0.001	7.476 at 24.9°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.25	APHA-2130 B
6.	Total dissolved Solids (TDS) ^a	mg/L	1000	<1000	10	838	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^a	mg/L	-	<500	0.1	540 ^a	APHA-2540 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.05	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^a	mg/L	0.005	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^a	mg/L	250	<250	0.1	73	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^a	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^a	mg/L	1	2	0.0001	0.0224	APHA-3111 B
17.	Fluoride (F ⁻) ^a	mg/L	1.5	≤1.5	0.1	0.5	APHA-4500-F-D
18.	Lead (Pb) ^a	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^a	mg/L	0.5	≤0.5	0.0010	0.0010	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^a	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^a	mg/L	50	≤50	0.001	0.035	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^a	mg/L	3	≤3	0.001	0.009	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Doc. No. PGG/MS/FF/003 | Rev. Date: 27-Jan-22 | Rev. 6.01

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Ref: PGG/LAB/2023-4692/DW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/l.	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-C1-B
26.	Zinc (Zn ²⁺) ^A	mg/L	3.0	5.0	0.0001	0.0022	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ^A	mg/L	-	-	0.0100	86.1030	APHA-3111 B
29.	Potassium (K) ^A	mg/L	-	-	0.0100	7.8630	APHA-3111 B
30.	Iron (Fe) ^A	mg/L	-	-	0.0010	0.0010	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

*PNAC Accredited
LDL: Lowest Detection Limit



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Doc. #: PGG/MS/FF/053 Rev. Date: 27-Jun-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref#: PGG/LAB/2023-4693/DW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Belum

Sample Description:

Nature of sample	Drinking Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Kashmir Colony N 32.984242° E 75.675723°
Sample source	Turbine Bore 69 Ft.
Sample Code	DW-1590
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks:	Parameters with * are not in compliance with PECs & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMAD Laboratory Manager



info@pakgreen.pk

pakgreen@hotmail.com

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Doc. No. PGG/MS/FF/053 | Rev. Date: 27-Jan-22 | Rev. # 31

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Ref: PGG/LAB/2023-4693/DW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^o	-	-	6.5-8.5	0.001	7.486 at 25.3°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.28	APHA-2130 B
6.	Total dissolved Solids (TDS) ^o	mg/L	1000	<1000	10	862	APHA-2340 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^o	mg/L	-	<500	0.1	530 ^o	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^o	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^o	mg/L	250	<250	0.1	69	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^o	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^o	mg/L	2	2	0.0001	0.0313	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	<1.5	0.1	0.6	APHA-4500-F-D
18.	Lead (Pb) ^o	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^o	mg/L	0.5	≤0.5	0.0010	0.0010	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^o	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^o	mg/L	50	≤50	0.001	0.048	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^o	mg/L	3	≤3	0.001	0.005	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref#: PGG/LAB/2023-4695/DW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-E
26.	Zinc (Zn) ²⁺	mg/L	3.0	5.0	0.0001	0.0298	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	84.1575	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	7.9182	APHA-3111 B
30.	Iron (Fe) ³⁺	mg/L	-	-	0.0010	0.0010	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

*PNAC Accredited
LDL: Lowest Detection Limit





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TEST REPORT

Ref: PGG/LAB/2023-4704/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum
Sample Description:	
Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Near Mehbsoo CNG N 32.948299° E 73.743924°
Sample source	Tube Well-23, Bore 230 Ft.
Sample Code	GW-1601
Date of sampling	22-Jul-23
Summary of Test Result:	
Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks: All Parameters with are in compliance with PQS & WHO Standards.	

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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMAD Laboratory Incharge





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Doc. #: PGG/MS/FF/061 Rev. Date: 27-Jan-22 Rev. 8.01

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Ref#: PGG/LAB/2023-4704/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^a	-	-	6.5-8.5	0.001	7.754 at 24.5°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.40	APHA-2150 B
6.	Total dissolved Solids (TDS) ^a	mg/L	1000	<1000	10	340	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^a	mg/L	-	<500	0.1	240	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^b	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^a	mg/L	250	<250	0.1	05	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^a	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^a	mg/L	2	2	0.0001	0.0277	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) ^a	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^a	mg/L	0.5	≤0.5	0.0010	0.0666	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^a	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^a	mg/L	50	≤50	0.001	0.001	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^a	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.03	0.01	0.0001	0.0001	APHA-3114-C





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

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Doc. #: PGG/MS/FF/003 Rev. Date: 27-Jan-22 Rev. #: 01

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Ref#: PGG/LAB/2023-4704/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CI-B
26.	Zinc (Zn ²⁺) [^]	mg/L	3.0	5.0	0.0001	0.0210	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	22.8900	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	4.4212	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0391	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

[^]PNAC Accredited

LDL: Lowest Detection Limit



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pakgreen@hotmail.com

www.pakgreen.pk



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TEST REPORT

Ref#: PGG/LAB/2023-4705/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Jamia Asria M.M # 01 N 32.933069° E 73.728649°
Sample source	Tube Well-24, Bore 210 Ft.
Sample Code	GW-1602
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters with are in compliance with PEQS & WHO Standards.

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- The left-over 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 Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR CHAUDHARY Laboratory In-charge





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Ref#: PGG/LAB/2023-4705/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^a	-	-	6.5-8.5	0.001	7.684at 24.3°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.32	APHA-2130 B
6.	Total dissolved Solids (TDS) ^a	mg/L	1000	<1000	10	450	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^a	mg/L	-	<500	0.1	310	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.5	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^a	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^a	mg/L	250	<250	0.1	10	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^a	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^a	mg/L	2	2	0.0001	0.069	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.3	APHA-4500-F-D
18.	Lead (Pb) ^a	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^a	mg/L	0.5	≤0.5	0.0010	0.0726	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^a	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^a	mg/L	50	≤50	0.001	0.020	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^a	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C





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Doc. # PGG/MS/FFA/03 Rev. Date: 27-Jan-22 Page # 31

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Ref: EGG/LAB/2023-4705/CW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-C3-B
26.	Zinc (Zn) ⁺	mg/L	3.0	5.0	0.0001	0.0230	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	38.7027	APHA-3111 II
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	5.2401	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0266	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

ATNAC Accredited

LDL: Lowest Detection Limit



info@pakgreen.pk

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Doc. #: PGG/MS/FF/063 | Rev. Date: 27-Jan-22 | Rev. #: 01

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TEST REPORT

Ref#: PGG/LAB/2023-4706/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Shahdab Road N 32.937476° E 73.756255°
Sample source	Tube Well-25, Bore 210 ft.
Sample Code	GW-16/0
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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- The left-over 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 Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

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Ref: PGG/LAB/2023-4706/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.713 at 24.0°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.30	APHA-2150 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	434	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	320	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	10	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0031	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0921	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.051	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C





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Ref#: PGG/LAB/2023-4706/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn) ⁺	mg/L	3.0	5.0	0.0001	0.0187	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	27.7117	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	5.1703	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0415	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method/Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Focal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

*PNAC Accredited

LDL: Lowest Detection Limit



info@pak-green.pk

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Doc# PGG/MS/FF/063 | Rev. Date: 22-Jan-22 | Rev. # 01

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TEST REPORT

Ref#: PGG/LAB/2020-4707/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Opposite Ransan Bazar MM# 02 N 32.95434° E 73.7767°
Sample source	Tube Well-26, Bore 210 Ft.
Sample Code	GW-1604
Date of sampling	22-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters with are in compliance with PEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QASIM-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMAD Laboratory Manager





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Ref: TGG/LAB/2023-4707/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.711 at 24.0°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionalde	-	Non-Objectionalde	APHA-2160 C
4.	Odor	-	-	Non-Objectionalde	-	Non-Objectionalde	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.30	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	475	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	300	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.1	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl) ⁻ [^]	mg/L	250	<250	0.1	15	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0273	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.3	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0938	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.025	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



info@pakgreen.pk

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Ref#: PGG/LAB/2023-4707/GW

Date: 08-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn) ²⁺ ^	mg/L	3.0	5.0	0.0001	0.0241	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5500 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	37.7718	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	5.0900	APHA-3111 B
30.	Iron (Fe) ²⁺	mg/L	-	-	0.0010	0.0957	APHA-3111 B

Biological Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	FEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

FEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

*PNAC Accredited

LDL: Lowest Detection Limit





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TEST REPORT

Ref#: PGG/LAB/2023-4708/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Thelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Jubilee Chat Bagh Mohallah N 32.926074° E 73.75732946°
Sample source	Tube Well-27, Bore 210 Ft.
Sample Code	GW-1608
Date of sampling	22-Jul-23

Summary of Test Results:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Ref#: PGG/LAB/2023-4718/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^a	-	-	6.5-8.5	0.001	7.767 at 23.9°C	APHA-4500-H ⁺ B
2.	Colour	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectable	-	Non-Objectable	APHA-2160 C
4.	Odor	-	-	Non-Objectable	-	Non-Objectable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.40	APHA-2130 B
6.	Total dissolved solids (TDS) ^a	mg/L	1000	<1000	10	399	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^a	mg/L	-	<500	0.1	220	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^a	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl) ⁻ ^a	mg/L	250	<250	0.1	05	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^a	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^a	mg/L	2	2	0.0001	0.0413	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) ^a	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^a	mg/L	0.5	≤0.5	0.0010	0.0731	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^a	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^a	mg/L	50	≤50	0.001	0.001	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^a	mg/L	3	≤ 3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref#: PGG/LAB/2023-4706/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-C5-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	0.0204	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	26.0563	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	5.0597	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0473	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-forms	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

APNAC Accredited
LDL: Lowest Detection Limit



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Doc # PGG/IMS/FF/063 Rev. Date: 27-Jan-22 Rev # 01

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TEST REPORT

Ref#: PGG/LAB/2023-4709/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Mandi Mor Opposite Govt. High School Boys N 32.942691° E 73.718396°
Sample source	Tube Well-30, Bore 210 FL
Sample Code	GW-1606
Date of sampling	23-Jul-23

Summary of Test Results:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	Parameters with * are not in compliance with PEQS & WHO Standards.

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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Director





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Ref#: PGG/LAB/2023-4709/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^A	-	-	6.5-8.5	0.001	7.612 at 24.5°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.42	APHA-2130 B
6.	Total dissolved Solids (TDS) ^A	mg/L	1000	<1000	10	542	APHA-2540 C

Chemical Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^A	mg/L	-	<500	0.1	350	APHA-2540 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3113 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3113 D
13.	Cadmium ^A	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^A	mg/L	250	<250	0.1	24	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^A	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^A	mg/L	2	2	0.0001	0.0014	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.3	APHA-4500-F ⁻ D
18.	Lead (Pb) ^A	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^A	mg/L	0.3	≤0.3	0.0010	0.0033	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^A	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^A	mg/L	50	≤50	0.001	0.034	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^A	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C





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Ref: PGG/LAB/2023-0709/GIV

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CL-B
26.	Zinc (Zn) ^A	mg/L	5.0	5.0	0.0001	0.0210	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ^A	mg/L	-	-	0.0100	56.4137	APHA-3111 B
29.	Potassium (K) ^A	mg/L	-	-	0.0100	7.1836	APHA-3111 B
30.	Iron (Fe) ^A	mg/L	-	-	0.0010	0.0406	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method/ Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report.....

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

*PNAC Accredited

LDL: Lowest Detection Limit



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Doc. # PGG/MS/PP/002 Rev. Date: 27-Jan-22 Rev. # 01

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TEST REPORT

Ref#: PGG/LAB/2023-4710/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Karim Para Road N 32.955793° E 73.724546°
Sample source	Tube Well-31, Bore 210 Ft.
Sample Code	GW-1607
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are not in compliance with PEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Ref: PGG/LAB/2023-4710/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^a	-	-	6.5-8.5	0.001	7.716 at 24.2°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.45	APHA-2130 B
6.	Total dissolved Solids (TDS) ^a	mg/L	1000	<1000	10	410	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^a	mg/L	-	<500	0.1	270	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.9	0.9	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^a	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^a	mg/L	250	<250	0.1	05	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^a	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^a	mg/L	2	2	0.0001	0.0030	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) ^a	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^a	mg/L	0.5	≤0.5	0.0010	0.0562	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^a	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^a	mg/L	50	≤50	0.001	0.009	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^a	mg/L	3	≤ 3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref: PGG/LAB/2023-4710/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn) [^]	mg/L	3.0	5.0	0.0001	0.0056	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	37.0049	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	4.6443	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.2347	APHA-3111 B

Biological Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

[^]PNAC Accredited

LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2023-4711/GW

Date: 01-Aug-23

Name of Client:	Punjab Municipal Development Fund Company (PMDFC)
Project Site:	Jhelum

Sample Description:

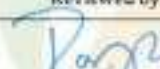
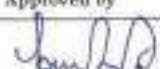
Nature of sample:	Ground Water
Sampling By:	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location:	Near Al-Arif Model School N 32.950846° E 73.718455°
Sample source:	Tube Well-32, Bore 210 Ft.
Sample Code:	GW-1608
Date of sampling:	23-Jul-23

Summary of Test Results:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory In-charge





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Ref#: PGG/LAB/2023-4711/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^a	-	-	6.5-8.5	0.001	7.511 at 24.5°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.50	APHA-2130 B
6.	Total dissolved Solids (TDS) ^a	mg/L	1000	<1000	10	630	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^a	mg/L	-	<500	0.1	360	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.05	0.0010	0.0010	APHA-3111 B
10.	Arsenic ^c	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^a	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^a	mg/L	250	<250	0.1	54	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^a	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^a	mg/L	2	2	0.0001	0.0331	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.4	APHA-4500-F ⁻ D
18.	Lead (Pb) ^a	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^a	mg/L	0.5	≤0.5	0.0010	0.1319	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^a	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^a	mg/L	50	≤50	0.001	0.043	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^a	mg/L	3	≤3	0.001	0.007	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



info@pakgreen.pk

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Doc # PGG/MS/FF/053 Rev. Date: 27-Jan-22 Rev # 31

Head Office: 46-M, Gulberg III, Lahore-Pakistan, Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

Ref#: PGG/LAB/2023-4711/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CI-B
26.	Zinc (Zn ⁺²) ^	mg/L	3.0	5.0	0.0001	0.0222	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	79.4888	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	5.2640	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0359	APHA-3111 B

Biological Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

^PNAC Accredited
LDL: Lowest Detection Limit



info@pakgreen.pk

pakgreen@hotmail.com

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Doc. # PGG/MSFF/083 Rev. Date: 27-Jan-22 Rev. # 01

Head Office: 46-M. Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref#: PGG/LA8/2023-4712/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Thelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Near Passport Office Mushadabad N 32.945388° E 73.717732°
Sample source	Tube Well-33, Bore 210 Ft.
Sample Code	GW-1609
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PQS & WHO Standards.

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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 left-over 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 Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFKHAR AHMED Laboratory Incharge





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Ref#: PGG/LAB/2023-4712/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^A	-	-	6.5-8.5	0.001	7.552 at 23.2°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.45	APHA-2130 B
6.	Total dissolved Solids (TDS) ^A	mg/L	1000	<1000	10	536	APHA-2540 C

Chemical Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^A	mg/L	-	<500	0.1	340	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^A	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^A	mg/L	250	<250	0.1	24	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^A	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^A	mg/L	2	2	0.0001	0.0510	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) ^A	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^A	mg/L	0.5	≤0.5	0.0010	0.0683	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle ^A	mg/L	0.02	≤0.02	0.0010	0.0030	APHA-3111 B
22.	Nitrate ^A	mg/L	50	≤50	0.001	0.010	APHA-4500-NO ₃ ⁻ II
23.	Nitrite ^A	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



info@pakgreen.pk

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Ref#: PGG/LAB/2023-4712/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	0.0250	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	59.7868	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	7.0790	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0390	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Focal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

⁺PNAC Accredited
LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2023-4713/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Ehsan Road Kala Gujran N 32.974725° E 73.692809°
Sample source	Tube Well-34, Bore 210 Ft.
Sample Code	GW-1610
Date of sampling	23-Jul-23

Summary of Test Results:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PQQS & WHO Standards.

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- The left-over 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 Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory In-Charge





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Doc #: PGG/IMS/PP/063 Rev: Date: 27-Jan-22 Page 3 of 11

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Ref#: PGG/LAB/2023-4713/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^o	-	-	6.5-8.5	0.001	7.676 at 24.0°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.32	APHA-2130 B
6.	Total dissolved Solids (TDS) ^o	mg/L	1000	<1000	10	400	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^o	mg/L	-	<500	0.1	220	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^o	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^o	mg/L	250	<250	0.1	10	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^o	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^o	mg/L	2	2	0.0001	0.0359	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) ^o	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^o	mg/L	0.5	≤0.5	0.0010	0.1441	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^o	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^o	mg/L	50	≤50	0.001	0.014	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^o	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



info@pakgreen.pk

pakgreen@btinternet.com

www.pakgreen.pk



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Ref#: PGG/LAB/2023-4713/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-8
26.	Zinc (Zn ⁺²) [^]	mg/L	3.0	5.0	0.0001	0.0184	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	35.2692	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	4.4801	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0524	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

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LDL: Lowest Detection Limit





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Doc. No: PGG/MS/FFA/03 Rev. Date: 27-Jun-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

TEST REPORT

Ref#: PGG/LAB/2023-4714/GW

Date: 01-Aug-23

Name of Client:	Punjab Municipal Development Fund Company (PMDFC)
Project Site:	Jhelum

Sample Description:

Nature of sample:	Ground Water
Sampling By:	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location:	Chak Barham Road Kala Gujran N 32.978332° E 73.700182°
Sample source:	Tube Well-35, Bore 210 Ft.
Sample Code:	GW-1611
Date of sampling:	23-Jul-23

Summary of Test Results:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory In-Charge





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Ref#: PGG/LAB/2023-4714/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^A	-	-	6.5-8.5	0.001	7.722 at 24.0°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.30	APHA-2130 B
6.	Total dissolved Solids (TDS) ^A	mg/L	1000	<1000	10	370	APHA-2540 C

Chemical Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^A	mg/L	-	<500	0.1	230	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^A	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^A	mg/L	250	<250	0.1	05	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^A	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^A	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) ^A	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^A	mg/L	0.5	≤0.5	0.0010	0.0297	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^A	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^A	mg/L	50	≤50	0.001	0.021	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^A	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



info@pakgreen.pk

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Ref#: PGG/LAB/2023-4714/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn) [^]	mg/L	3.0	5.0	0.0001	0.0041	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	40.8944	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	4.4316	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0508	APHA-3111 B

Biological Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization

[^]PNAC Accredited
LDL: Lowest Detection Limit



info@pakgreen.pk

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TEST REPORT

Ref#: PGG/LAB/2023-4713/GW

Date: 01-Aug-23

Name of Client:	Punjab Municipal Development Fund Company (PMDFC)
Project Site:	Jhelum

Sample Description:

Nature of sample:	Ground Water:
Sampling By:	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location:	Kashmir Colony New N 32.984155° E 73.675796°
Sample source:	Tube Well-37, Bore 210 FL.
Sample Code:	GW-1612
Date of sampling:	23-Jul-23

Summary of Test Results:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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- The left-over 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 Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Doc. No: PGG/IMS/FF/063 | Rev: 01 | Date: 27-Jan-22 | Page: 8 of 11

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Ref#: PGG/LAB/2023-4715/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.745 at 23.9°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.25	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	350	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	300	APHA-2540 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	05	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0111	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.018	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C





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Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl_2)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CI-B
26.	Zinc (Zn^{+2}) [^]	mg/L	3.0	5.0	0.0001	0.0032	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	55.6060	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	5.5074	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0642	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method/Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization

[^]PNAC Accredited
LDL: Lowest Detection Limit



info@pakgreen.pk

pakgreen@hotmail.com

www.pakgreen.pk



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Doc. # PG/MSFF/063 Rev. Date 22-Jan-22 Rev. #01

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TEST REPORT

Ref#: PG/LAB/2023-4716/GW

Date: 01-Aug-23

Name of Client:	Punjab Municipal Development Fund Company (PMDFC)
Project Site:	Jhelum

Sample Description:

Nature of sample:	Ground Water
Sampling By:	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location:	Bagh Mohallah Kundan Gath New N 32.927218° E 73.734562°
Sample source:	Tube Well-38, Bore 210 Ft.
Sample Code:	GW-1613
Date of sampling:	22-Jul-23

Summary of Test Results:

Physical Parameters:	Compliance
Biological Parameters:	Compliance
Chemical Parameters:	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory In-charge





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Doc. #: PGG/M3/FF/053 | Rev. Date: 27-Jan-22 | Rev. # 011

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Ref#: PGG/LAB/2023-4716/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.677 at 23.8°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.28	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	383	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<300	0.1	220	APHA-2540 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.05	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Calcium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	10	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0001	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.3	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0142	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.020	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CI-B
26.	Zinc (Zn ⁺²) [^]	mg/L	3.0	5.0	0.0001	0.0037	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	44.4969	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	5.1640	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0376	APHA-3111 B

Biological Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization

[^]PNAC Accredited
LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2023-4694/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Inside Stadium Suleman Paras N 32.925248° E 73.729126°
Sample source	Tube Well-1, Bore 210 Ft.
Sample Code	GW-1591
Date of sampling	22-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters with are in compliance with PECs & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Ref#: PGG/LAB/2023-4694/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.704 at 24.6°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.35	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	475	APHA-2540 C

Chemical Parameters Analysis Results:

Sl. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	280	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	15	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0344	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.4	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0702	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.001	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref#: PGG/LAB/2023-4694/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ²⁺) [^]	mg/L	3.0	5.0	0.0001	0.0204	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	34.2909	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	5.2742	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0307	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

[^]PNAC Accredited
LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2023-0995/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Tehsil Road N 32.925589° E 73.730545°
Sample source	Tube Well-2, Bore 210 Ft.
Sample Code	GW-1592
Date of sampling	22-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters with are in compliance with PECs & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH ^A	-	-	6.5-8.5	0.001	7.671 at 24.8°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.25	APHA-2130 B
6.	Total dissolved Solids (TDS) ^A	mg/L	1000	<1000	10	418	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness ^A	mg/L	-	<500	0.1	260	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^A	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^A	mg/L	250	<250	0.1	15	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^A	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^A	mg/L	2	2	0.0001	0.0292	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.3	APHA-4500-F-D
18.	Lead (Pb) ^A	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^A	mg/L	0.5	≤0.5	0.0010	0.0809	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^A	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^A	mg/L	50	≤50	0.001	0.001	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^A	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C





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Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

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Ref#: PGG/LAB/2023-4695/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer and 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	0.0215	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	32.5502	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	5.9574	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0534	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

^PNAC Accredited
LDL: Lowest Detection Limit





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TEST REPORT

Ref: PGG/LAB/2023-4696/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	District Council Katchery N 32.943158° E 73.741282°
Sample source	Tube Well-6, Bore 210 ft.
Sample Code	GW-1593
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



info@pakgreen.pk

pakgreen@hotmail.com

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Ref#: PGG/LAB/2023-4696/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.572 at 24.8°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.25	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	385	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	240	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	05	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0279	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0693	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.001	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



info@pakgreen.pk

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Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	0.0151	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	22.6521	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	4.5775	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0037	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

^PNAC Accredited
LDL: Lowest Detection Limit



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EPA Certified

TEST REPORT

Ref#: PGG/LAB/2023-4697/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Sheesha Ground N 32.931696° E 73.727295°
Sample source	Tube Well-10, Bore 230 Ft.
Sample Code	GW-1594
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters with are in compliance with PEQS & WHO Standards.

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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR ARMED Laboratory Incharge





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Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method/ Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.638 at 24.6°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectable	-	Non-Objectable	APHA-2160 C
4.	Odor	-	-	Non-Objectable	-	Non-Objectable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.25	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	477	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method/ Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	910	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.05	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	20	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0285	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.3	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.1144	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.022	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref#: PGG/LAB/2023-4697/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	0.0181	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	35.6073	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	6.1725	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0554	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

*PNAC Accredited

LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2023-4698/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Slaughter House N 32.949223° E 73.720213°
Sample source	Tube Well-12, Bore 210 Ft.
Sample Code	GW-1595
Date of sampling	21-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with FEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Ref#: PGG/LAB/2023-4698/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.514 at 25.3°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.30	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	650	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	370	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	05	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0349	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.5	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.1330	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickle [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.048	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref#: PGG/LAB/2023-4698/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CJ-B
26.	Zinc (Zn ⁺²) ^	mg/L	3.0	5.0	0.0001	0.0189	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	67.5090	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	5.2158	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0407	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

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LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2023-4699/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Darbar Fir Azmat Wali Khan Guljran N 32.975889° E 73.697091°
Sample source	Tube Well-17, Boon 210 Ft.
Sample Code	GW-1596
Date of sampling	25-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	Parameters with * are not in compliance with PQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Doc. A: PGG/MS/FF/003 | Rev. Date: 27-Jan-22 | Rev # 01

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Ref#: PGG/LAB/2023-4699/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.590 at 24.4°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.25	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	482	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	310	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	20	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0239	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.3	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.1938	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.001	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CL-B
26.	Zinc (Zn) ²⁺ ^	mg/L	3.0	5.0	0.0001	0.0182	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0000	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	37.1394	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	6.9956	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0592	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Cell-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

WHO: World Health Organization

MPN: Most Probable Number

*FNAC Accredited

LDL: Lowest Detection Limit



info@pakgreen.pk

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Doc. No: PGG/IMS/IT/053 | Rev: 01 | Date: 27-Jan-22 | Page: 01

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TEST REPORT

Ref#: PGG/LAB/2023-4700/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Near Noorani Mosque Kala Gujran N 32.971989° E 73.702906°
Sample source	Tube Well-18, Bore 210 Ft.
Sample Code	GW-1897
Date of sampling	25-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are not in compliance with PEQS & WHO Standards.

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- The report is not valid for any negotiations.

Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.588 at 24.4°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.27	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	616	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	350	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.05	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤ 0.05	≤ 0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	54	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0370	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.4	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.1707	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.038	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-CI-B
26.	Zinc (Zn ²⁺) ^	mg/L	3.0	5.0	0.0001	0.0191	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ⁺	mg/L	-	-	0.0100	56.6675	APHA-3111 B
29.	Potassium (K) ⁺	mg/L	-	-	0.0100	7.9503	APHA-3111 B
30.	Iron (Fe) ⁺	mg/L	-	-	0.0010	0.0385	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-forms	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

^PNAC Accredited
LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2023-4701/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Kashmir Colony N 32.963982° E 73.67567°
Sample source	Tube Well-19, Bore 210 Ft.
Sample Code	GW-1598
Date of sampling	25-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



info@pakgreen.pk

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Ref#: PGG/LAB/2023-4701/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method/ Technique
1.	pH ^a	-	-	6.5-8.5	0.001	7.718 at 24.1°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.30	APHA-2130 B
6.	Total dissolved Solids (TDS) ^a	mg/L	1000	<1000	10	365	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method/ Technique
7.	Total Hardness ^a	mg/L	-	<300	0.1	230	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium ^a	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) ^a	mg/L	250	<250	0.1	10	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) ^a	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) ^a	mg/L	2	2	0.0001	0.0007	APHA-3111 B
17.	Fluoride (F ⁻) ^a	mg/L	1.5	≤1.5	0.1	0.3	APHA-4500-F-D
18.	Lead (Pb) ^a	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) ^a	mg/L	0.5	≤0.5	0.0010	0.0585	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel ^a	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate ^a	mg/L	50	≤50	0.001	0.001	APHA-4500-NO ₃ ⁻ E
23.	Nitrite ^a	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl_2)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-C1-8
26.	Zinc (Zn^{+2}) ^	mg/L	3.0	5.0	0.0001	0.0176	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) ^	mg/L	-	-	0.0100	40.2280	APHA-3111 B
29.	Potassium (K) ^	mg/L	-	-	0.0100	5.5392	APHA-3111 B
30.	Iron (Fe) ^	mg/L	-	-	0.0010	0.0523	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method/Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards

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WHO: World Health Organization

LDL: Lowest Detection Limit

MPN: Most Probable Number



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TEST REPORT

Ref#: PGG/LAB/2023-4702/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Descriptions:

Nature of sample	Ground Water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Bilal Town Near Post Office N 32.953557° E 73.741838°
Sample source	Tube Well-21, Bores 250 Ft.
Sample Code	GW-1599
Date of sampling	23-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

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- The left-over 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.
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Sample Analyzed by	Reviewed by	Approved by
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Ref#: PGG/LAB/2023-4702/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.660 at 24.6°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.46	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	370	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<300	0.1	250	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	65	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0020	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0787	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.001	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Doc. # PGG/MS/FF/003 Rev. Date: 27-Jan-22 Rev. # 01

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

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Ref#: PGG/LAB/2023-4702/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer and 0.5-1.5 at source	0.01	0.01	APHA-CI-B
26.	Zinc (Zn ²⁺) [^]	mg/L	3.0	5.0	0.0001	0.0228	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	22.6358	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	4.4475	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0342	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

[^]PNAC Accredited
LDL: Lowest Detection Limit



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TEST REPORT

Ref#: PGG/LAB/2023-4703/GW

Date: 01-Aug-23

Name of Client	Punjab Municipal Development Fund Company (PMDFC)
Project Site	Jhelum

Sample Description:

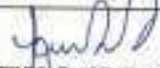
Nature of sample	Ground Water
Sampling by	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Sahil Colony N 32.941675° E 73.741788°
Sample source	Tube Well-22, Bore 210 Ft.
Sample Code	GW-1600
Date of sampling	25-Jul-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks:	All Parameters are in compliance with PEQS & WHO Standards.

Terms & Conditions:

- Analysis was conducted on the request of proponent for his own use.
- Report cannot be used regarding compliance of any complaint, EPO or any 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 left-over 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 Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge



info@pakgreen.pk

pakgreen@hotmail.com

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Ref#: PGG/LAB/2023-4703/GW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	FEQS	LDL	Results	Method / Technique
1.	pH [^]	-	-	6.5-8.5	0.001	7.707 at 24.4°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	0.001	0.000	APHA-2120 B
3.	Taste	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2160 C
4.	Odor	-	-	Non-Objectionable	-	Non-Objectionable	APHA-2150 B
5.	Turbidity	NTU	5	5	0.01	0.45	APHA-2130 B
6.	Total dissolved Solids (TDS) [^]	mg/L	1000	<1000	10	364	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	FEQS	LDL	Results	Method / Technique
7.	Total Hardness [^]	mg/L	-	<500	0.1	240	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	0.0010	0.0010	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	0.0010	0.0010	APHA-3111 B
10.	Arsenic	mg/L	≤0.05	≤0.05	0.0001	0.0001	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	0.0500	0.0500	APHA-3171 D
12.	Boron (B)	mg/L	0.3	0.3	0.0100	0.0100	APHA-3111 D
13.	Cadmium [^]	mg/L	0.003	0.01	0.0010	0.0010	APHA-3111 B
14.	Chloride (Cl ⁻) [^]	mg/L	250	<250	0.1	05	APHA-4500-Cl ⁻ B
15.	Chromium (Cr) [^]	mg/L	0.05	≤0.05	0.0010	0.0010	APHA-3111 B
16.	Copper (Cu) [^]	mg/L	2	2	0.0001	0.0248	APHA-3111 B
17.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.1	0.2	APHA-4500-F-D
18.	Lead (Pb) [^]	mg/L	0.01	≤0.005	0.0010	0.0010	APHA-3111 B
19.	Manganese (Mn ²⁺) [^]	mg/L	0.5	≤0.5	0.0010	0.0687	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	0.0001	0.0001	APHA-3112 B
21.	Nickel [^]	mg/L	0.02	≤0.02	0.0010	0.0010	APHA-3111 B
22.	Nitrate [^]	mg/L	50	≤50	0.001	0.001	APHA-4500-NO ₃ ⁻ E
23.	Nitrite [^]	mg/L	3	≤3	0.001	0.001	APHA-4500-NO ₂ ⁻ B
24.	Selenium	mg/L	0.01	0.01	0.0001	0.0001	APHA-3114-C



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Ref#: PGG/LAB/2023-4703/GW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine (Cl ₂)	mg/L	-	0.2-0.5 at consumer end 0.5-1.5 at source	0.01	0.01	APHA-Cl-B
26.	Zinc (Zn) [^]	mg/L	3.0	3.0	0.0001	0.0189	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	-	-	0.0005	0.0005	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	-	-	0.0100	23.5167	APHA-3111 B
29.	Potassium (K) [^]	mg/L	-	-	0.0100	4.5668	APHA-3111 B
30.	Iron (Fe) [^]	mg/L	-	-	0.0010	0.0344	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	LDL	Results	Method / Technique
31.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 D
32.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 F
33.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	-	Nil	APHA-9221 E

End of Report

PEQS: Punjab Environmental Quality Standards
WHO: World Health Organization
MPN: Most Probable Number

[^]PNAC Accredited
LDL: Lowest Detection Limit



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Wastewater Analysis



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Doc# PGG/MS/FF/063 Rev. Dtdm: 27-Jan-22 Rev # 01

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TEST REPORT

Ref #: PGG/LAB/2023-4684/WW

Date: 01-Aug-23

Name of Client:	Punjab Municipal Development Fund Company (PMDFC)
Project Site:	Ihelum

Sample Description:

Nature of sample:	Wastewater
Sampling By:	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location & Coordinates:	Suleman Paras N 32.922437° E 73.728978°
Sample source:	Main Nala
Sample Code:	WW-1581
Sample Type:	Grab
Date of sampling:	22-Jul-23

Summary of Test Result:

Physical Parameters:	Compliance
Chemical Parameters:	Compliance
Remarks:	All Parameters with 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.
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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 Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Ref #: PGG/LAB/2023-4684/WW

Date: 01-Aug-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQ5	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	26.4	APHA-2550 B
2.	pH [^]	-	6.5-8.5	0.001	7.216 at 26.4°C	APHA-4500-14 ⁺ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQ5	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) [^]	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	100	APHA-2540 D
6.	Total Dissolved Solids (TDS) [^]	mg/L	3500	10	780	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	0.005	0.005	APHA-5530 D
9.	Chloride (as Cl ⁻) [^]	mg/L	1000	0.1	73	APHA-4500-Cl ⁻ B
10.	Fluoride (F ⁻)	mg/L	10	0.1	0.4	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.018	APHA 5540 C
12.	Sulphate (SO ₄ ²⁻) [^]	mg/L	600	1	89	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	9.4	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
18.	Lead (Pb) [^]	mg/L	0.5	0.0010	0.2234	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





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Ref #: PGG/LAB/2023-4684/WW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method/Technique
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	0.0556	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	0.4639	APHA-3111 B
27.	Manganese (Mn) [^]	mg/L	1.5	0.0010	0.1248	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	0.02	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	0.2234	-
31.	Sodium [^]	mg/L	-	0.0100	89.4712	APHA-3111 B
32.	Cyanide (as CN ⁻) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

PEQS: Punjab Environmental Quality Standards
LDL: Lowest Detection Limit

End of Report

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Doc. #: PGG/MS/FF/063 | Rev. Date: 27-Jan-22 | Rev. #01

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TEST REPORT

Ref #: PGG/LAB/2023-4685/WW

Date: 01-Aug-23

Name of Client:	Punjab Municipal Development Fund Company (PMDFC)
Project Site:	Belum

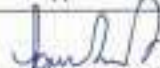
Sample Description:

Nature of sample:	Wastewater
Sampling By:	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Sampling Location & Coordinates:	Peer Haza (Sahil Colony) N 32.941038° E 73.743378°
Sample source:	Disposal
Sample Code:	WW-1362
Sample Type:	Composite
Date of sampling:	23-Jul-23

Summary of Test Result:

Physical Parameters:	Compliance
Chemical Parameters:	Partially Compliance
Remarks:	Parameters with * are not in compliance with PECQS 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.
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- The report is not valid for any negotiations.

Sample Analyzed by:	Reviewed by:	Approved by:
 QURAT-UL-AIN Lab Analyst	 MUHAMMAD RAZAULLAH Chief Analyst	 IFTIKHAR AHMED Laboratory Incharge





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Ref #: PGG/LAB/2023-4685/WW

Date: 03-Aug-23

Physical Parameters Analysis Result:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
1.	Temperature	°C	-	0.1	26.8	APHA-2550 B
2.	pH [^]	-	6.5-8.5	0.001	7.605 at 26.8°C	APHA-4500-H ⁺ B

Chemical Parameters Analysis Result:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) [^]	mg/L	80	1	118*	APHA-5210 D
4.	Chemical Oxygen Demand (COD) [^]	mg/L	150	0.4	188*	APHA-5220 B
5.	Total Suspended Solids (TSS) [^]	mg/L	200	1	120	APHA-2540 D
6.	Total Dissolved Solids (TDS) [^]	mg/L	3500	10	940	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	0.005	0.005	APHA-5530 D
9.	Chloride (as Cl ⁻) [^]	mg/L	1000	0.1	98	APHA-4500-Cl ⁻ B
10.	Fluoride (F ⁻)	mg/L	10	0.1	0.5	APHA-4500-F-D
11.	An Ionic detergent as MBAs	mg/L	20	0.001	0.028	APHA 5540 C
12.	Sulphate (SO ₄ ²⁻) [^]	mg/L	600	1	110	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	13.6	APHA-4500-NH 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
18.	Lead (Pb) [^]	mg/L	0.5	0.0010	0.2365	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



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QMS: PGG/MS/FF/003 Rev: Date: 27-Jan-22 (Rev: # 01)

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Ref #: PGG/LAB/2023-4685/WW

Date: 01-Aug-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	LDL	Results	Method / Technique
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	0.1506	APHA-3111 B
24.	Arsenic (As)	mg/L	1.0	0.0001	0.0003	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	0.7516	APHA-3111 B
27.	Manganese (Mn) [^]	mg/L	1.5	0.0010	0.1533	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	0.02	APHA-4500 Cl B
30.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	-	0.2565	-
31.	Sodium [^]	mg/L	-	0.0100	100.8183	APHA-3111 B
32.	Cyanide (as CN ⁻) Total	mg/L	1.0	0.001	0.001	APHA-4500-CN E

End of Report.

PEQS: Punjab Environmental Quality Standards
LDL: Lowest Detection Limit

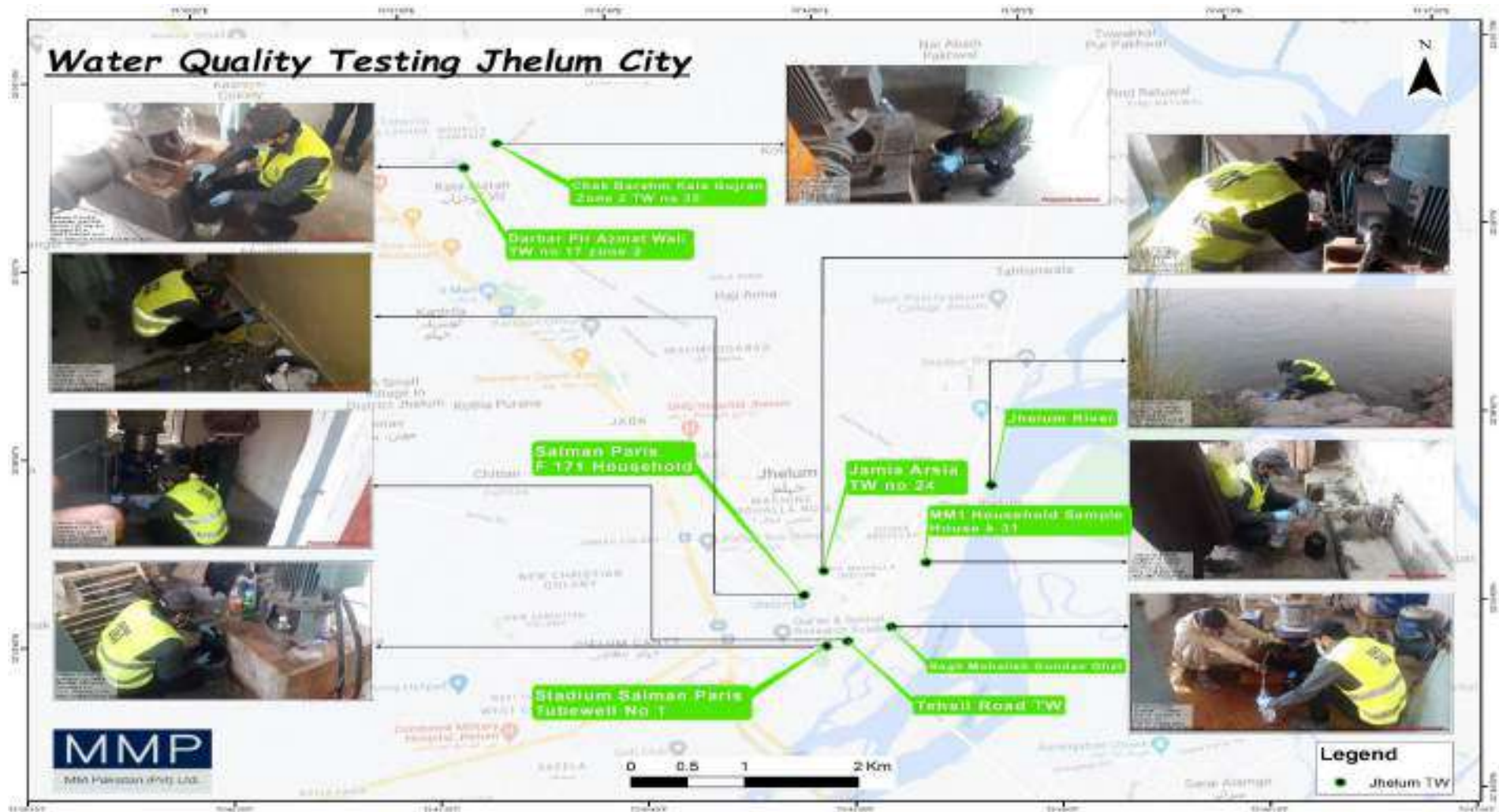
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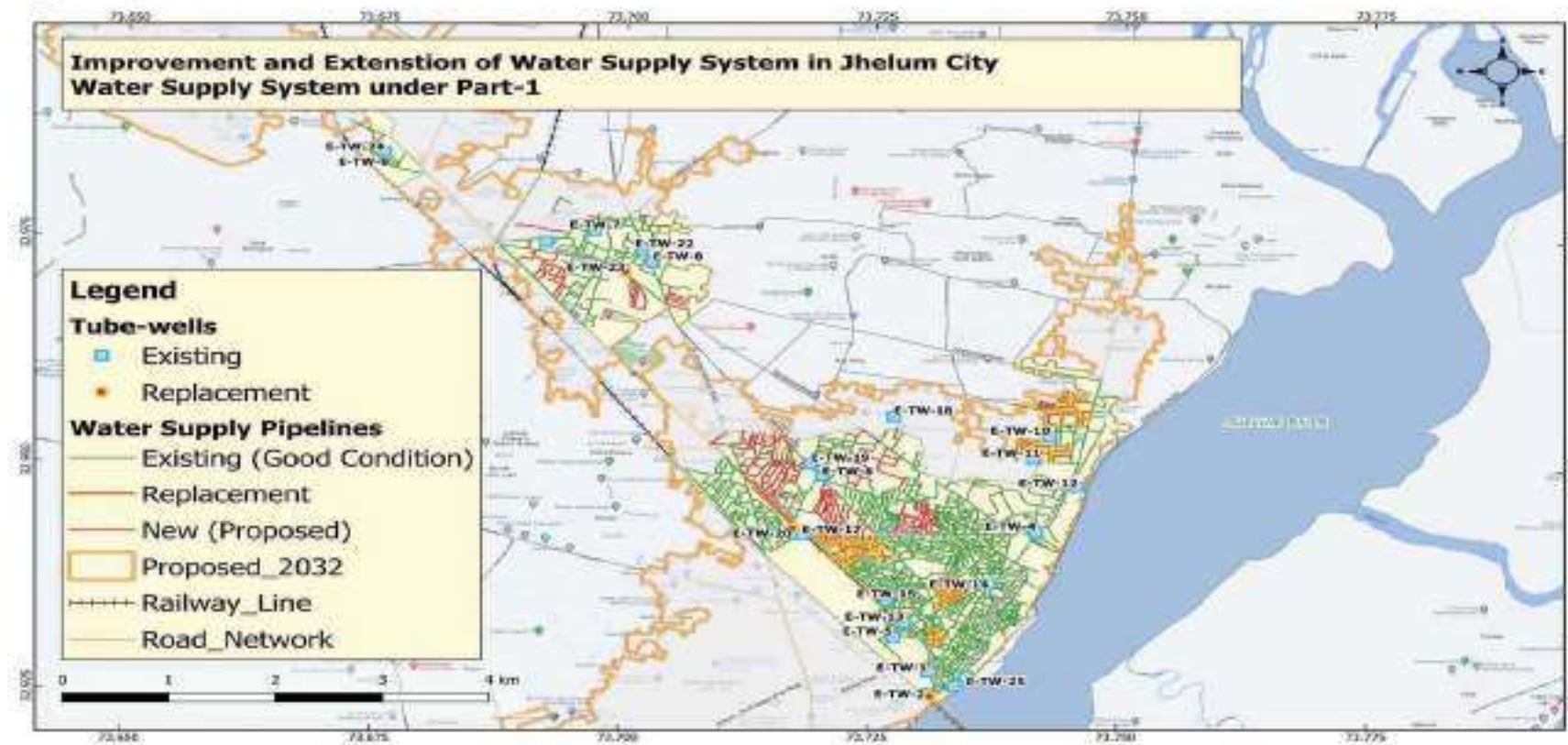
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Annexure J: Maps & Drawings

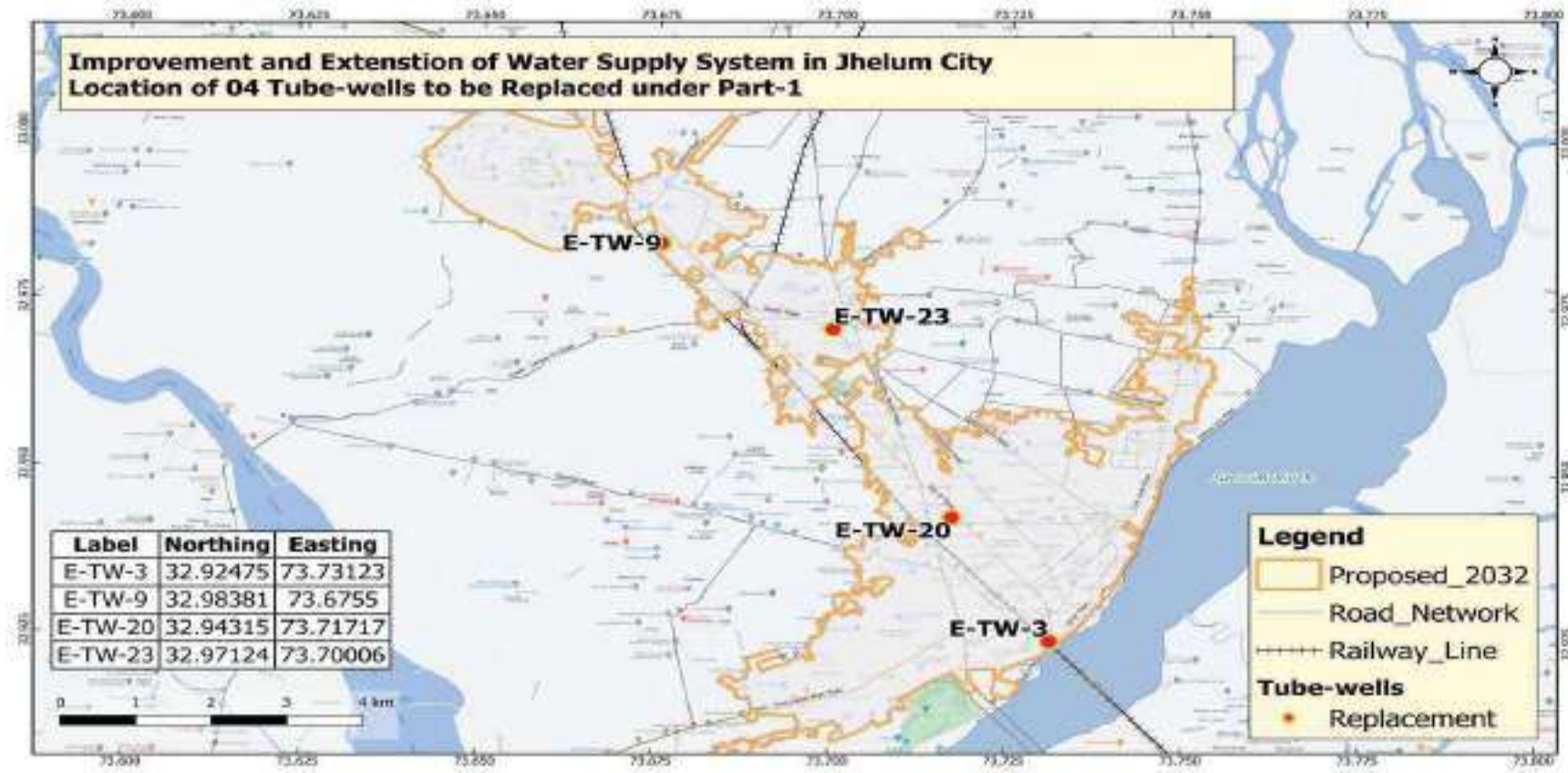
Drawings and Maps

Annexure F



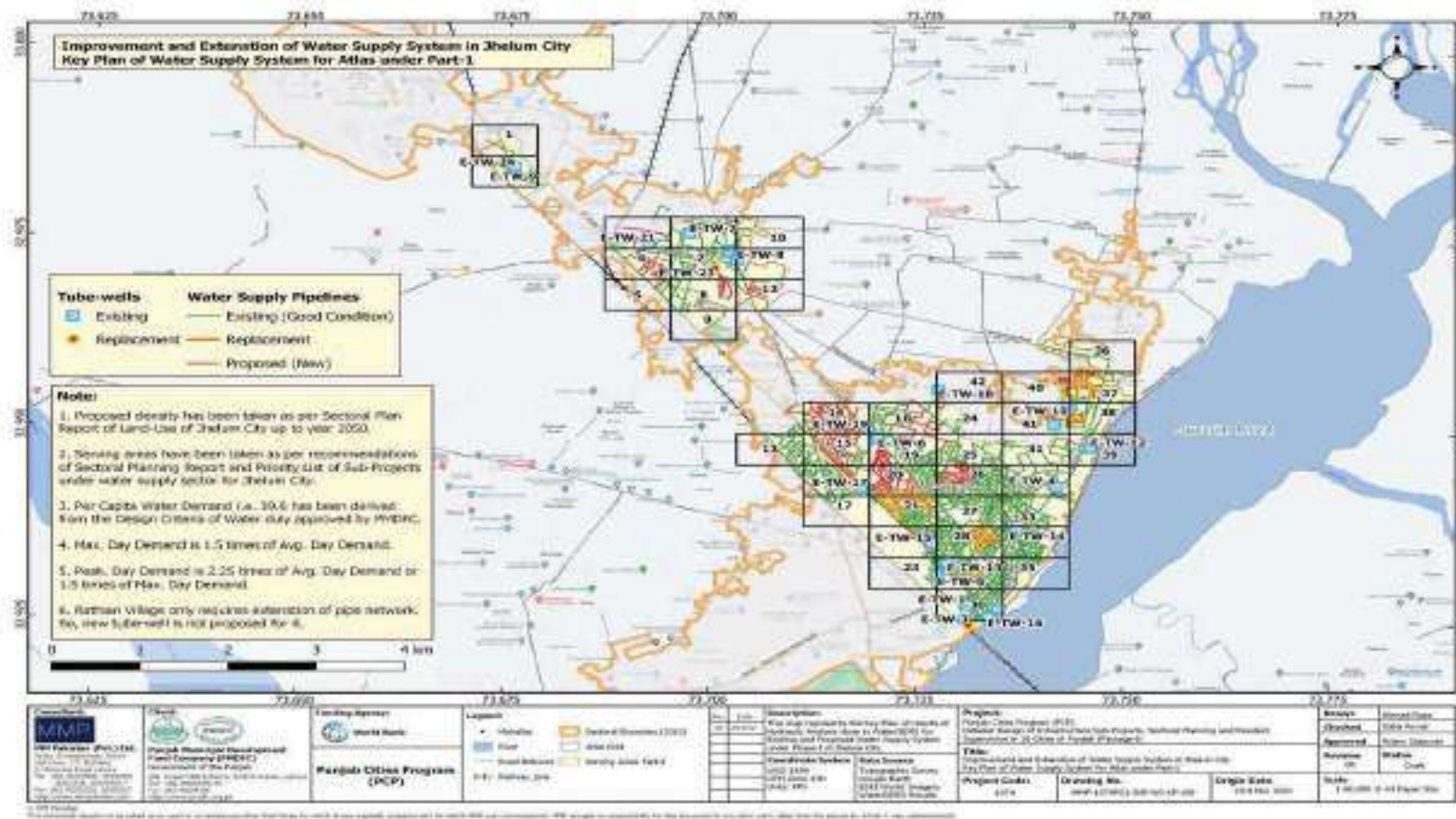
Drawings and Maps

Annexure-F



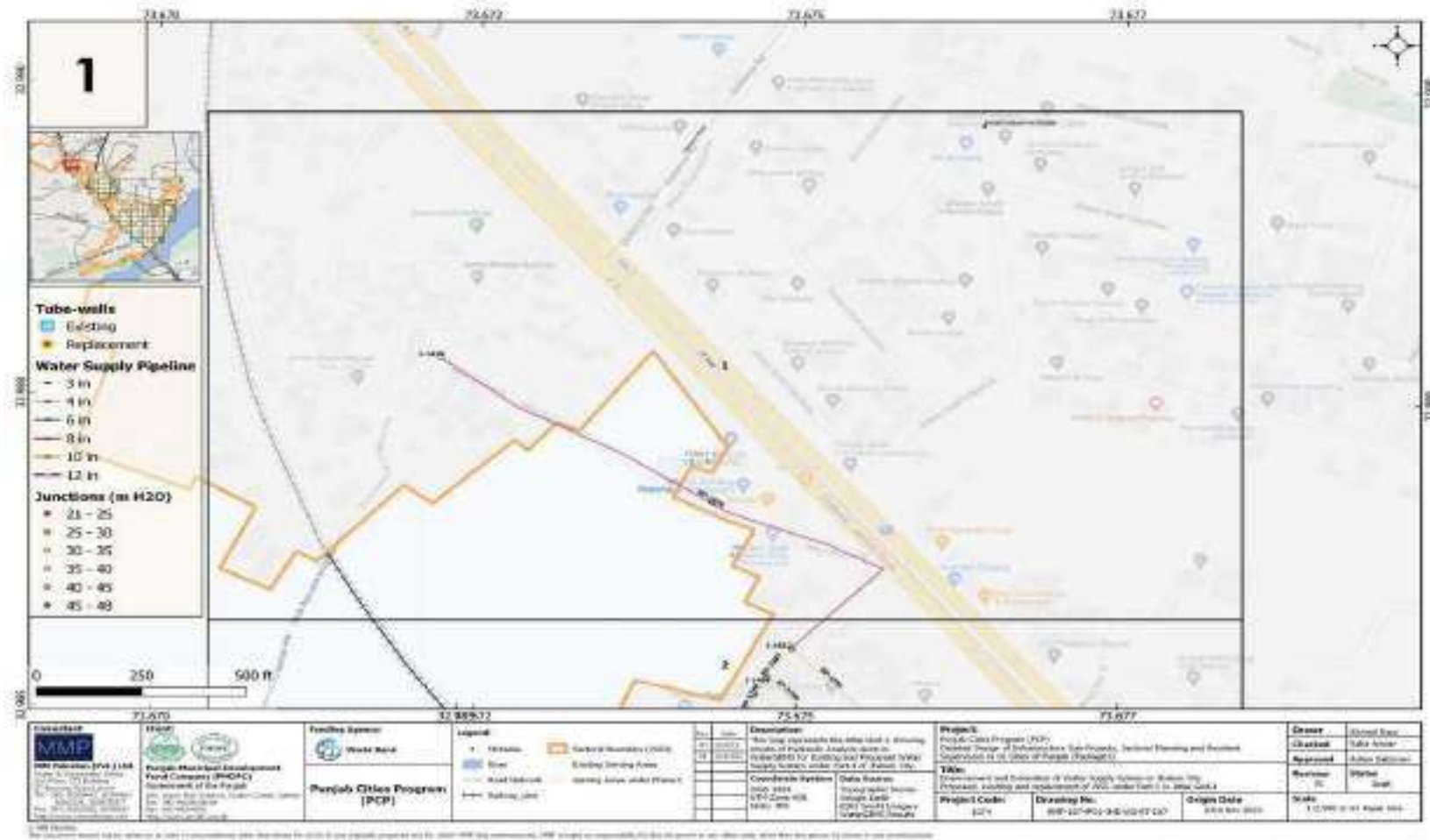
Drawings and Maps

Annexure-F



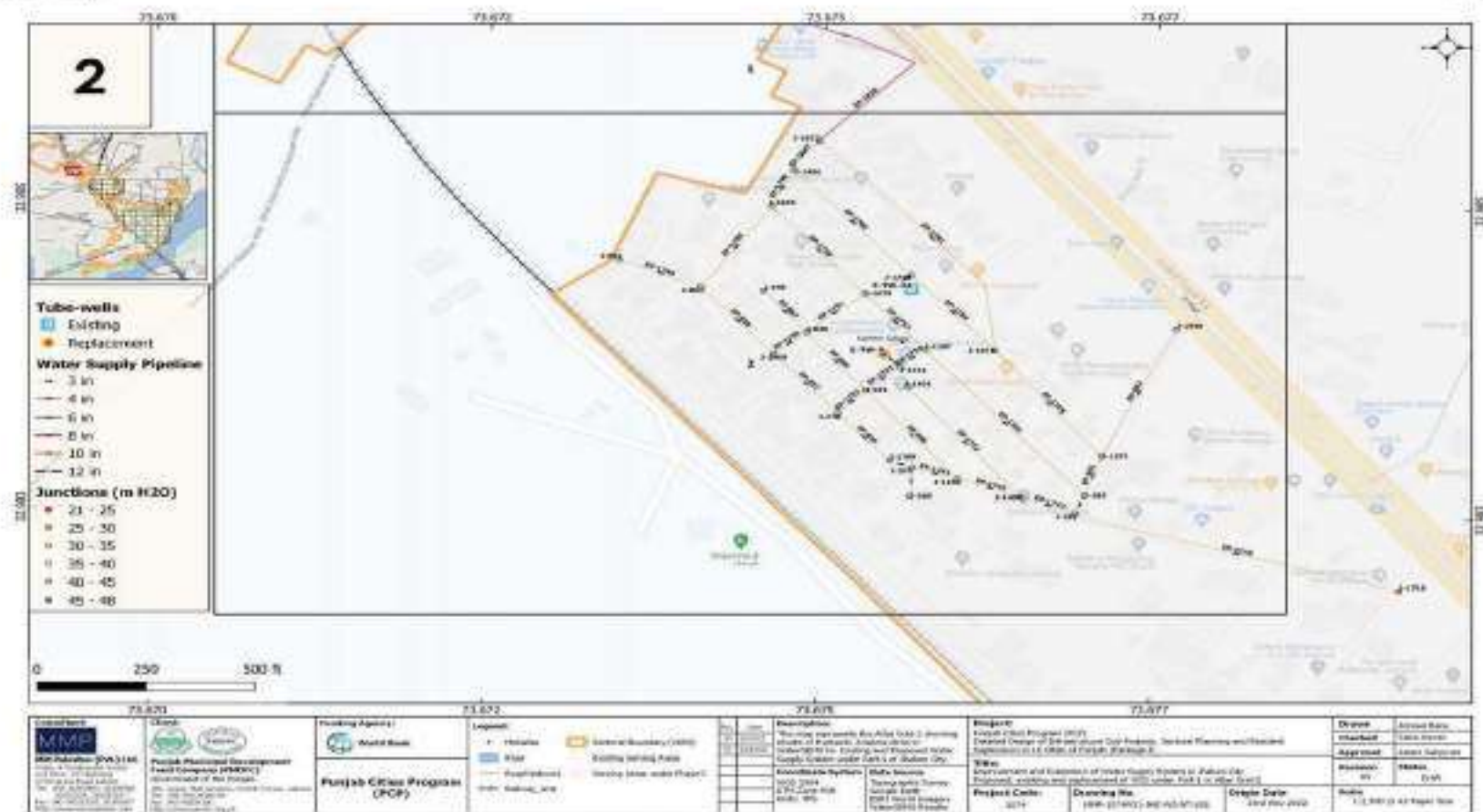
Drawings and Maps

Annexure-F



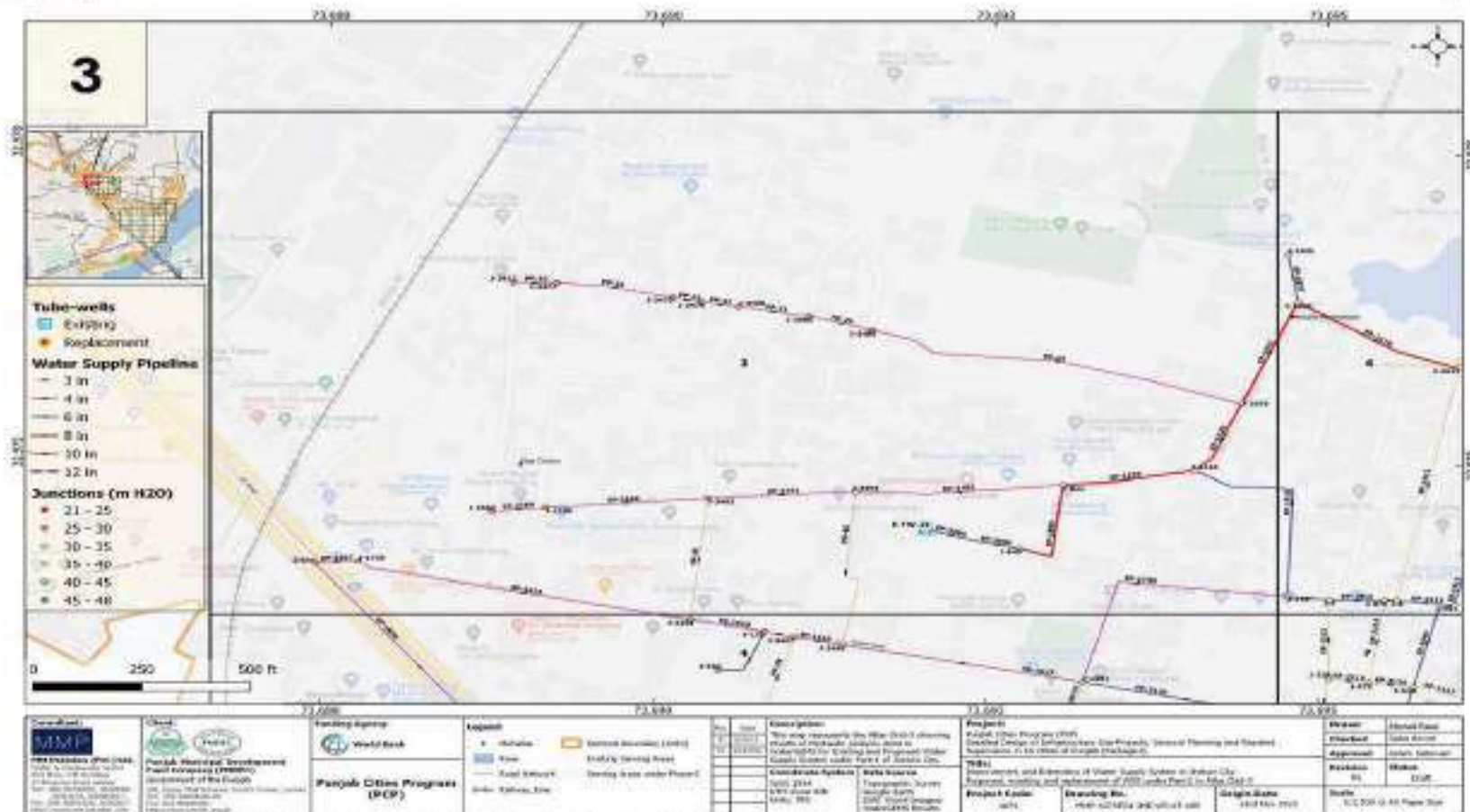
Drawings and Maps

Annexure F



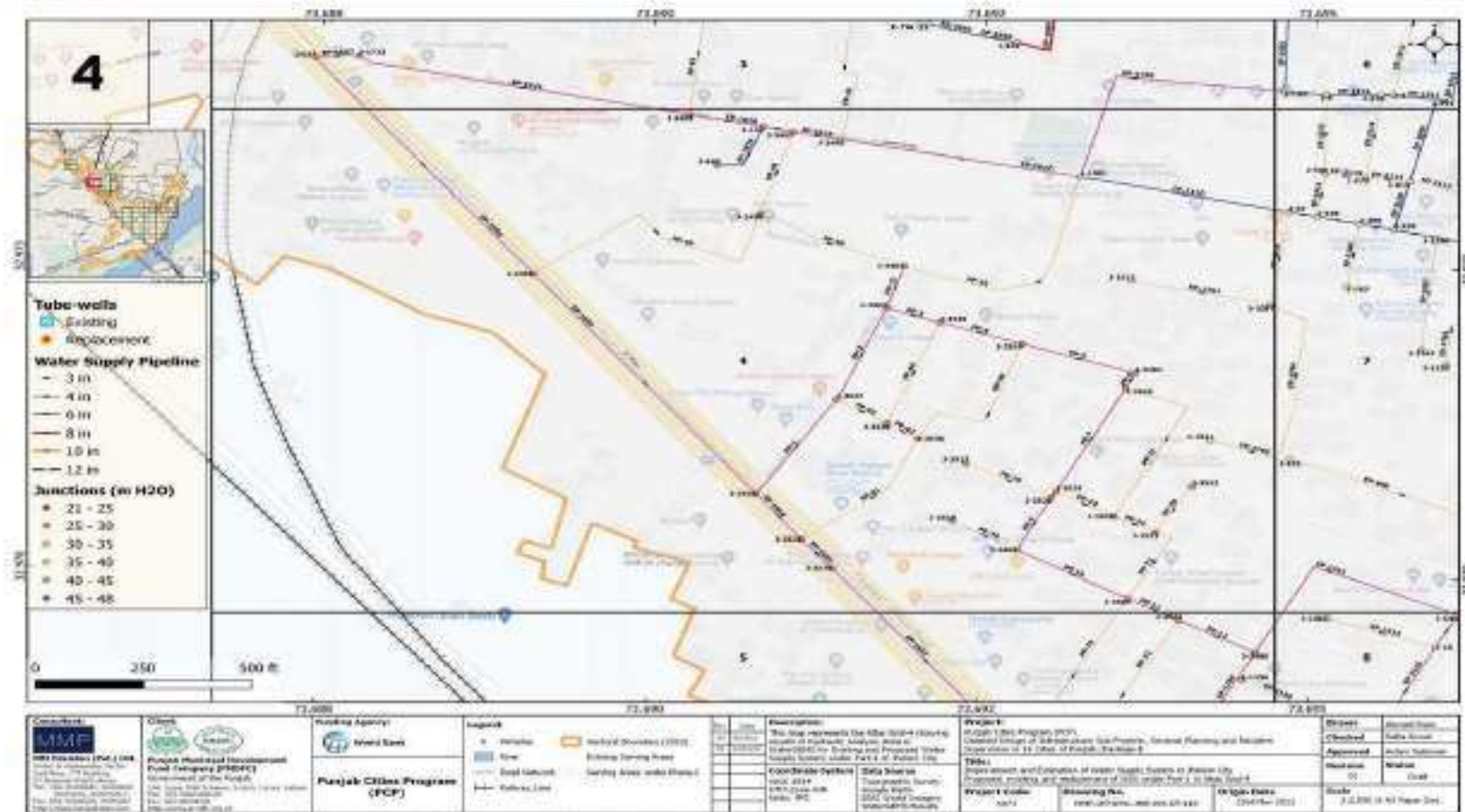
Drawings and Maps

Annexure F



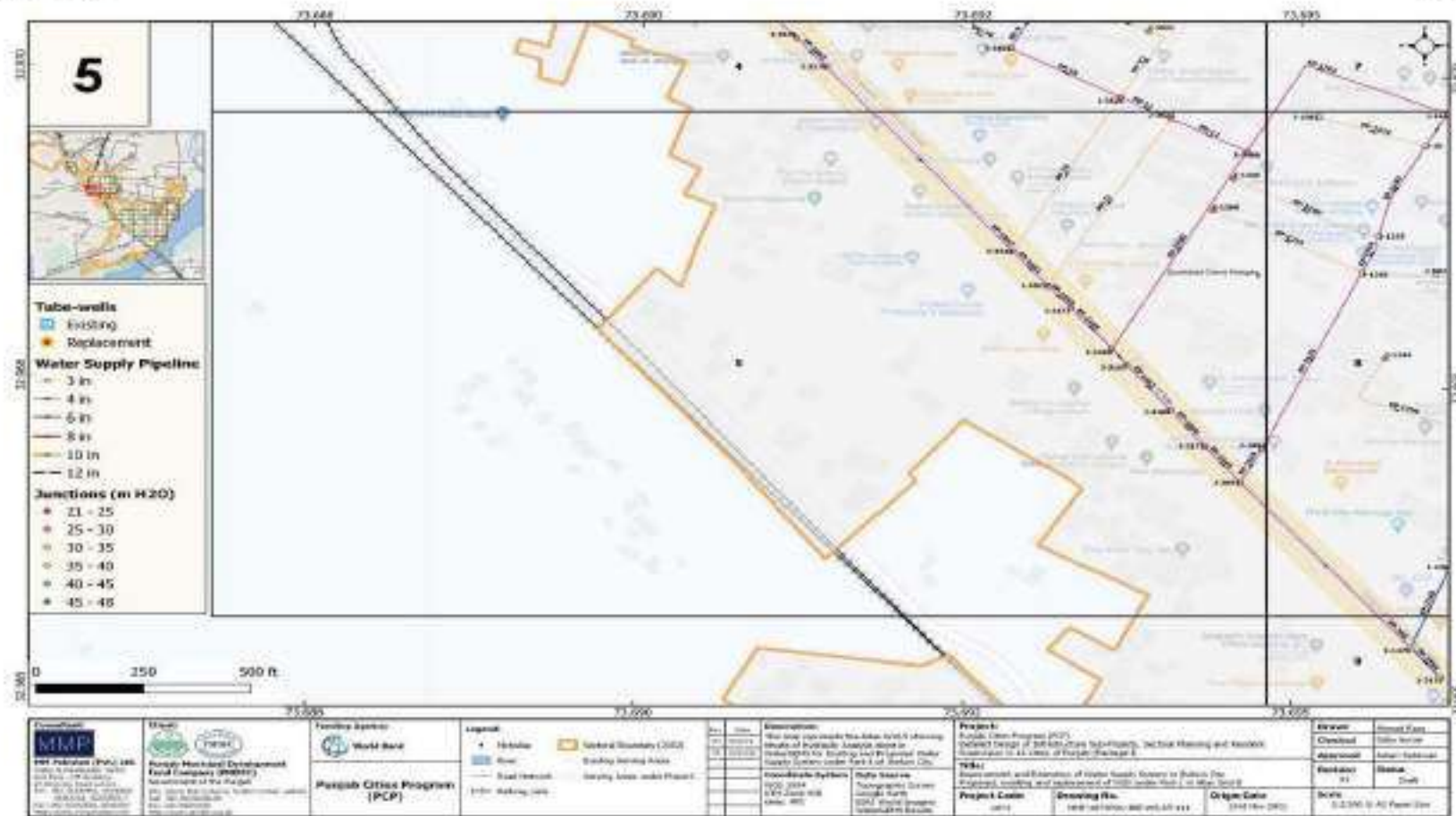
Drawings and Maps

Annexure-F



Drawings and Maps

Annexure-F



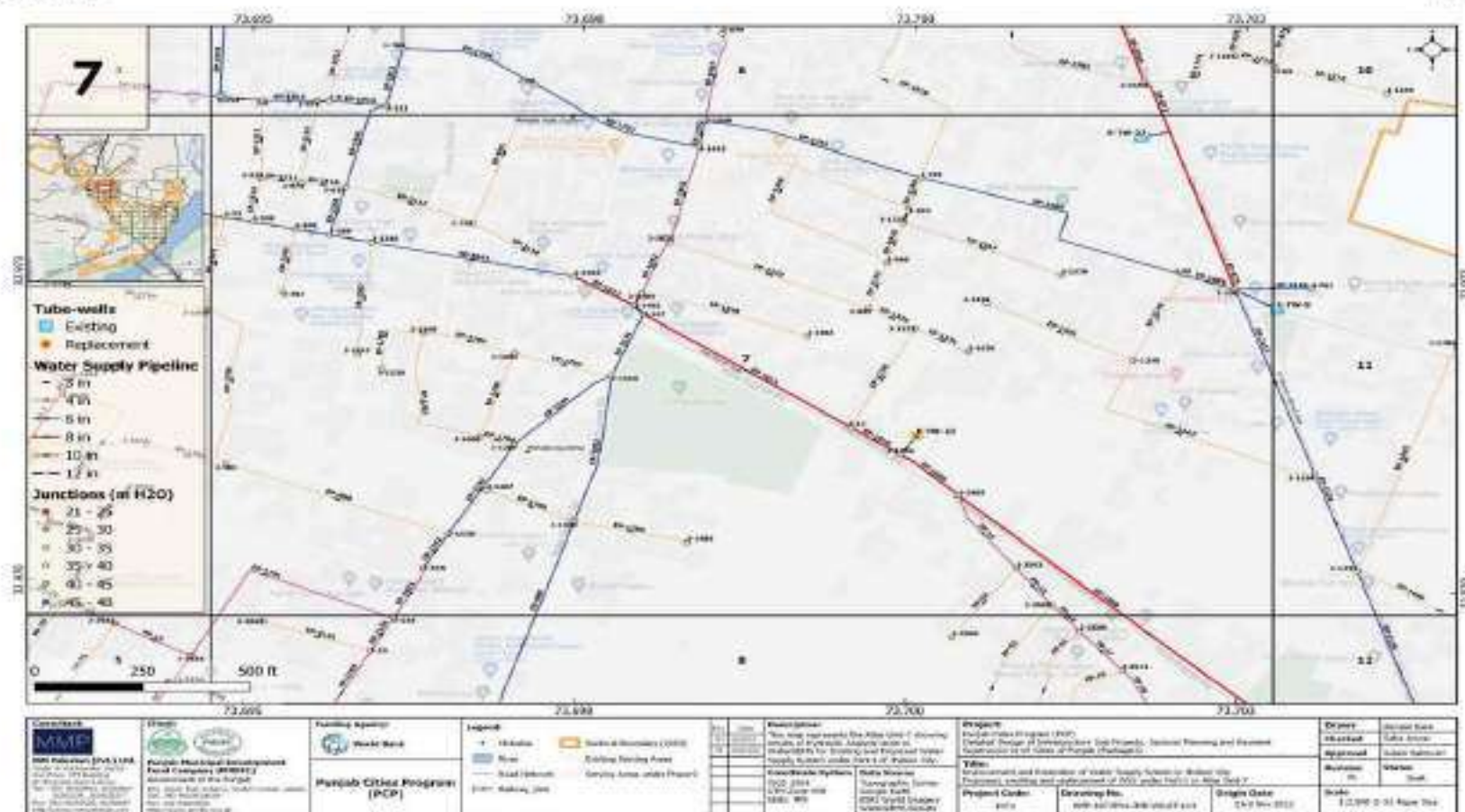
Drawings and Maps

Annexure F



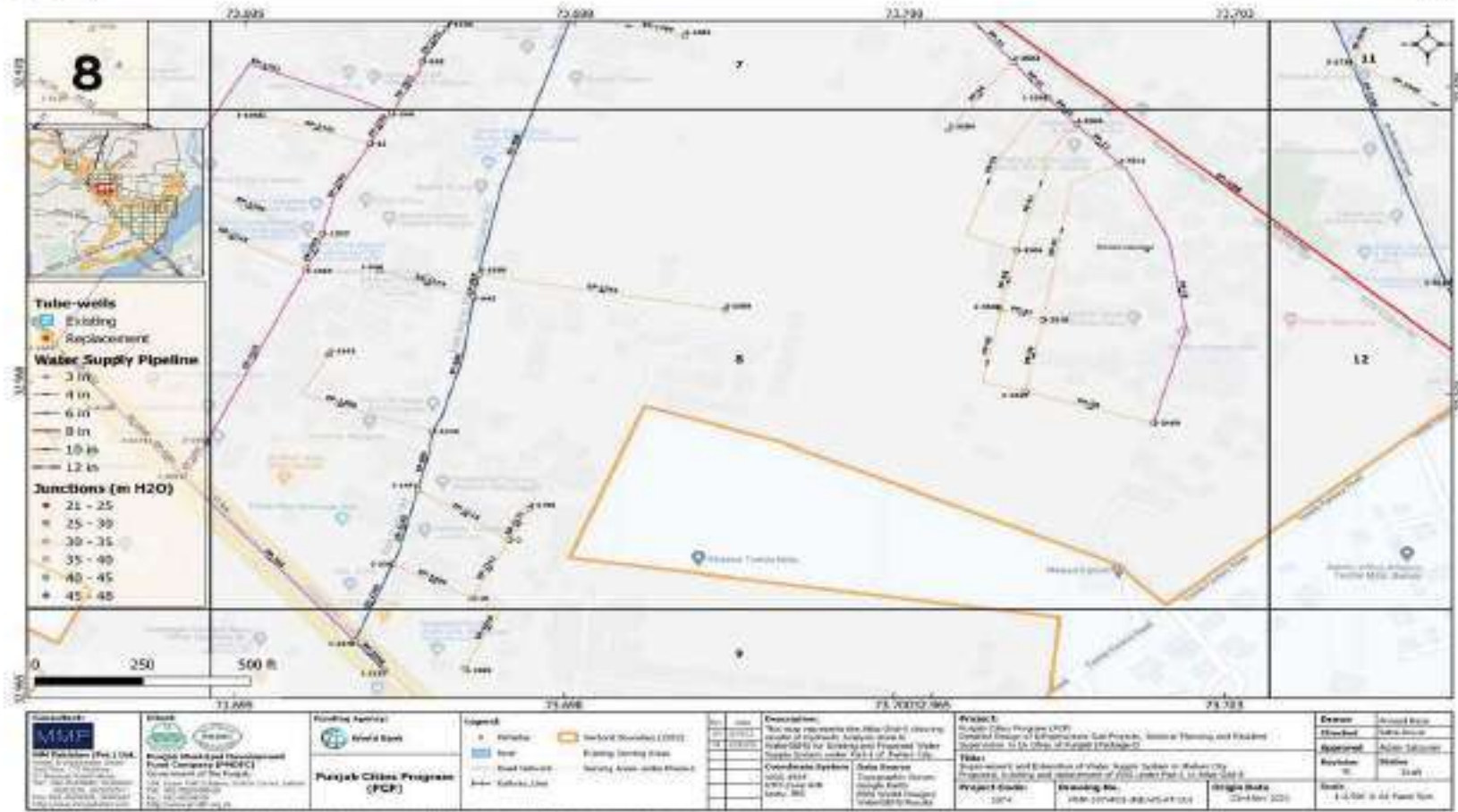
Drawings and Maps

Annexure-F



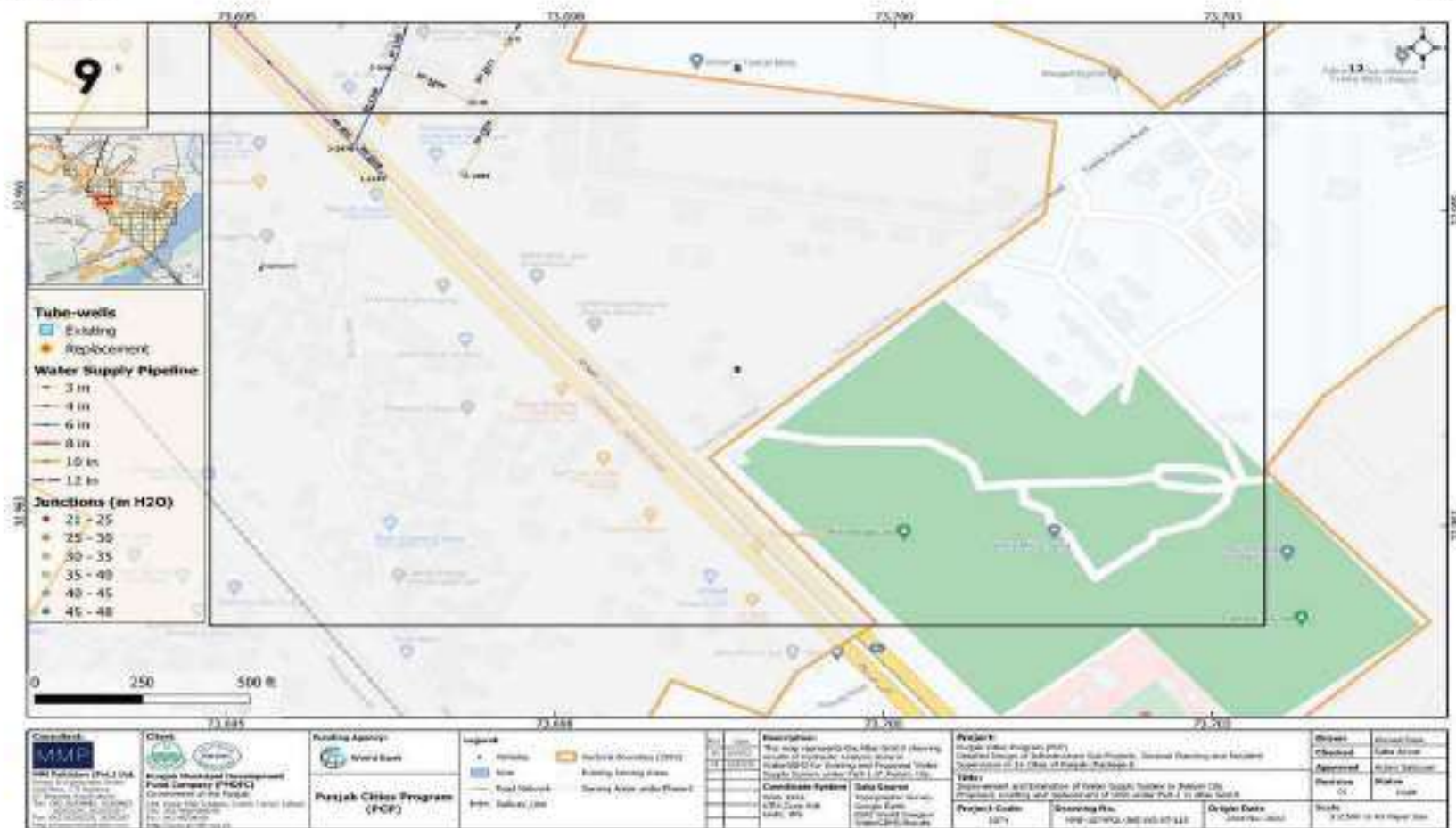
Drawings and Maps

Annexure-F



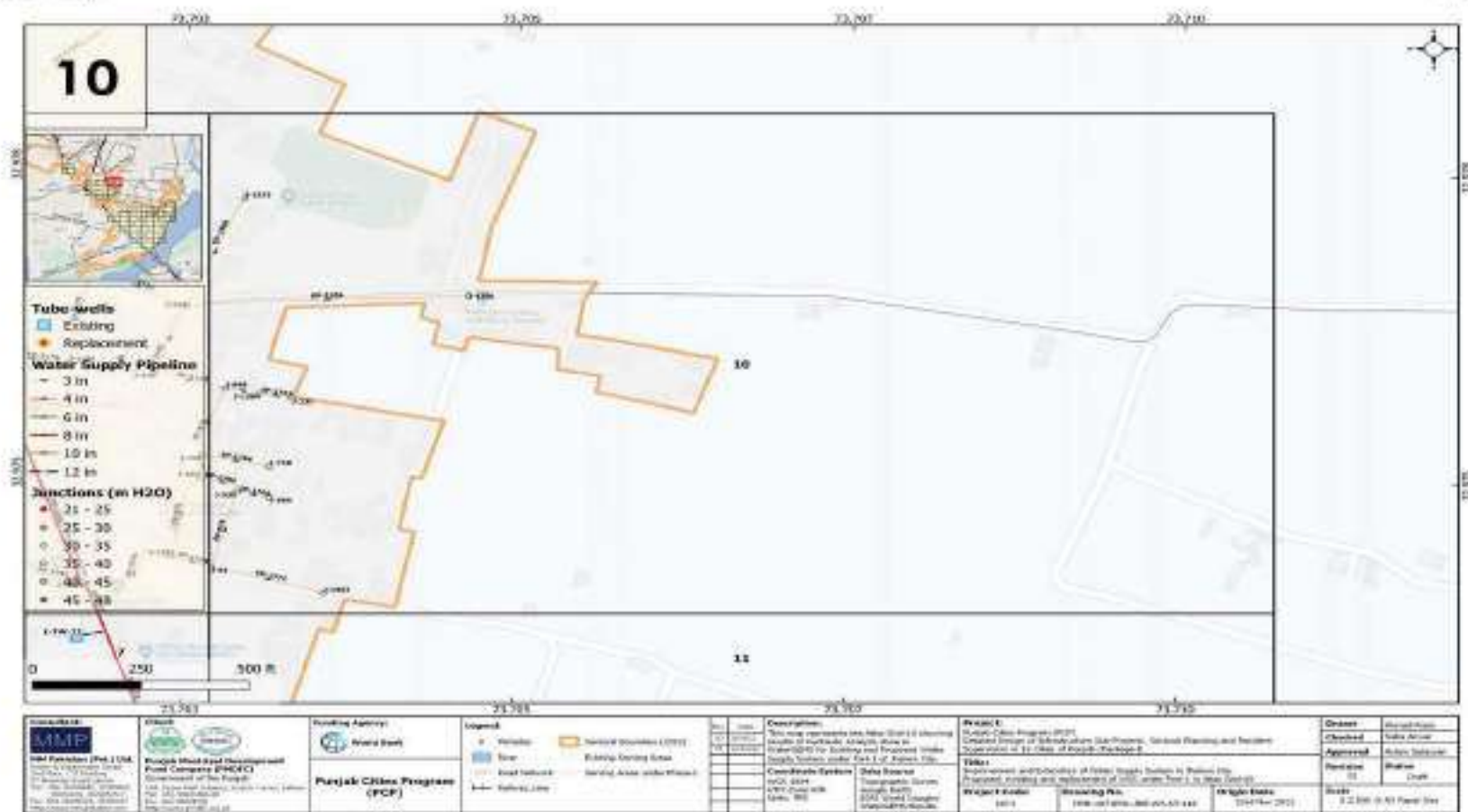
Drawings and Maps

Annexure-F



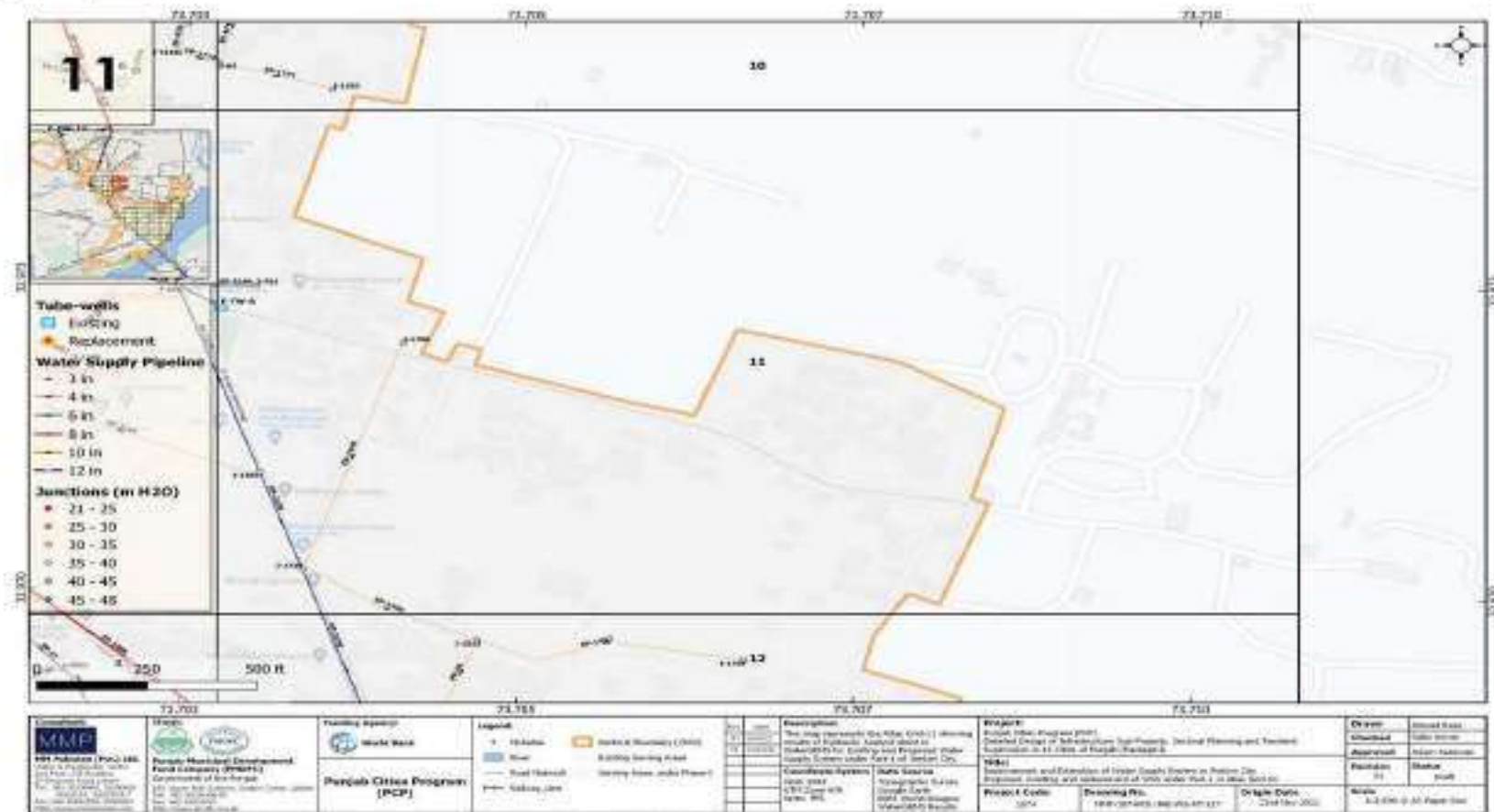
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Annexure F



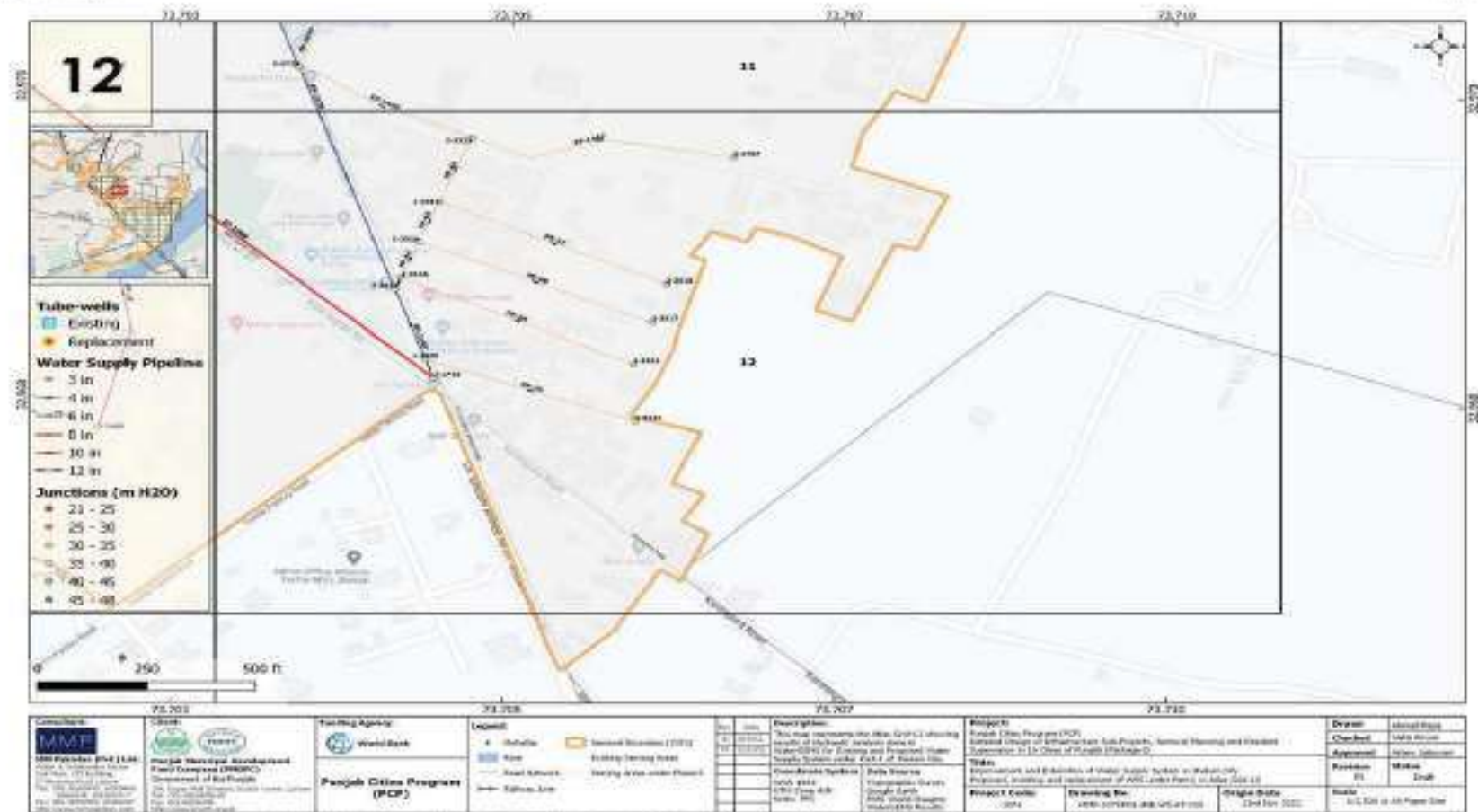
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Annexure-F



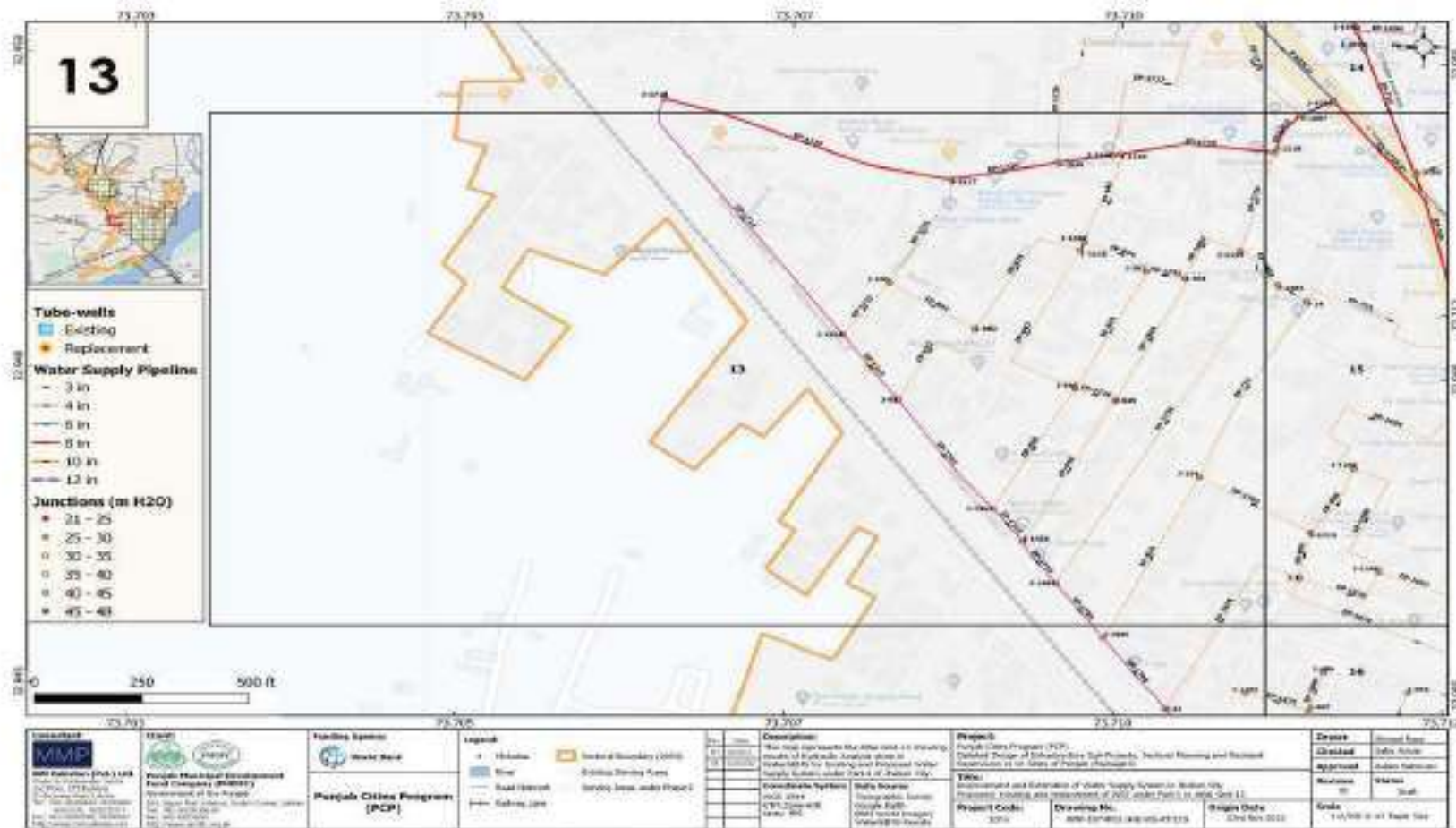
Drawings and Maps

Annexure F



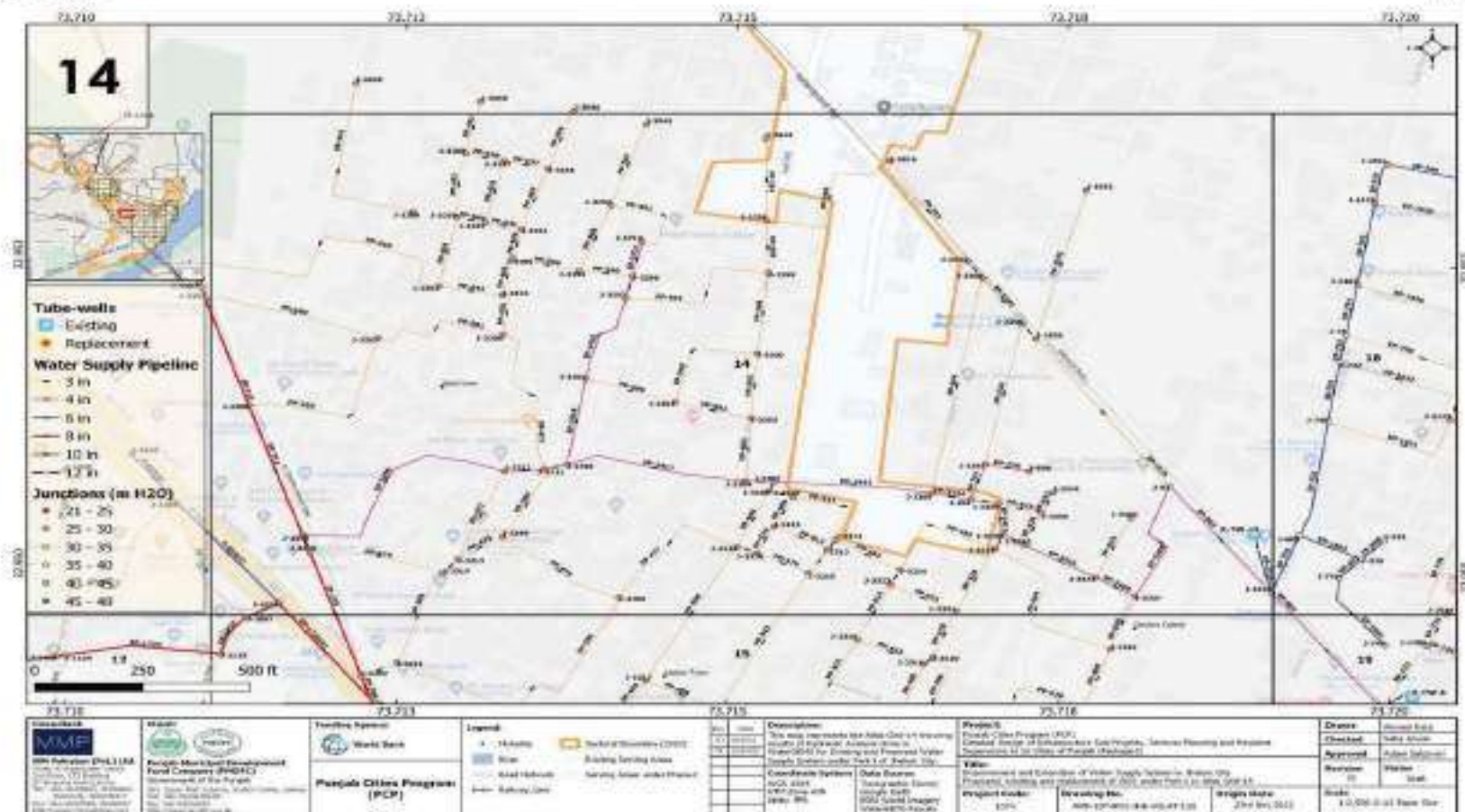
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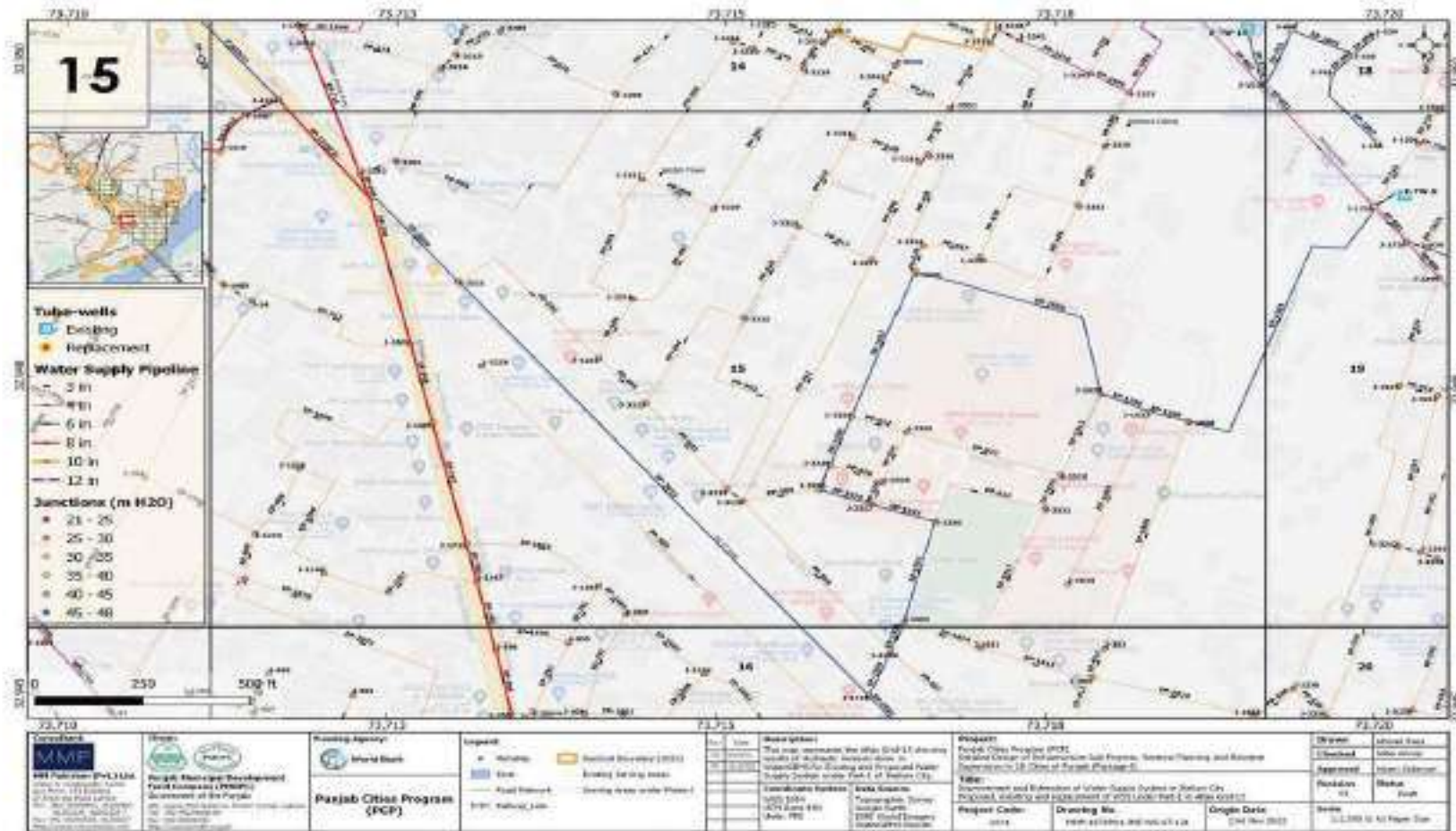
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Annexure-F



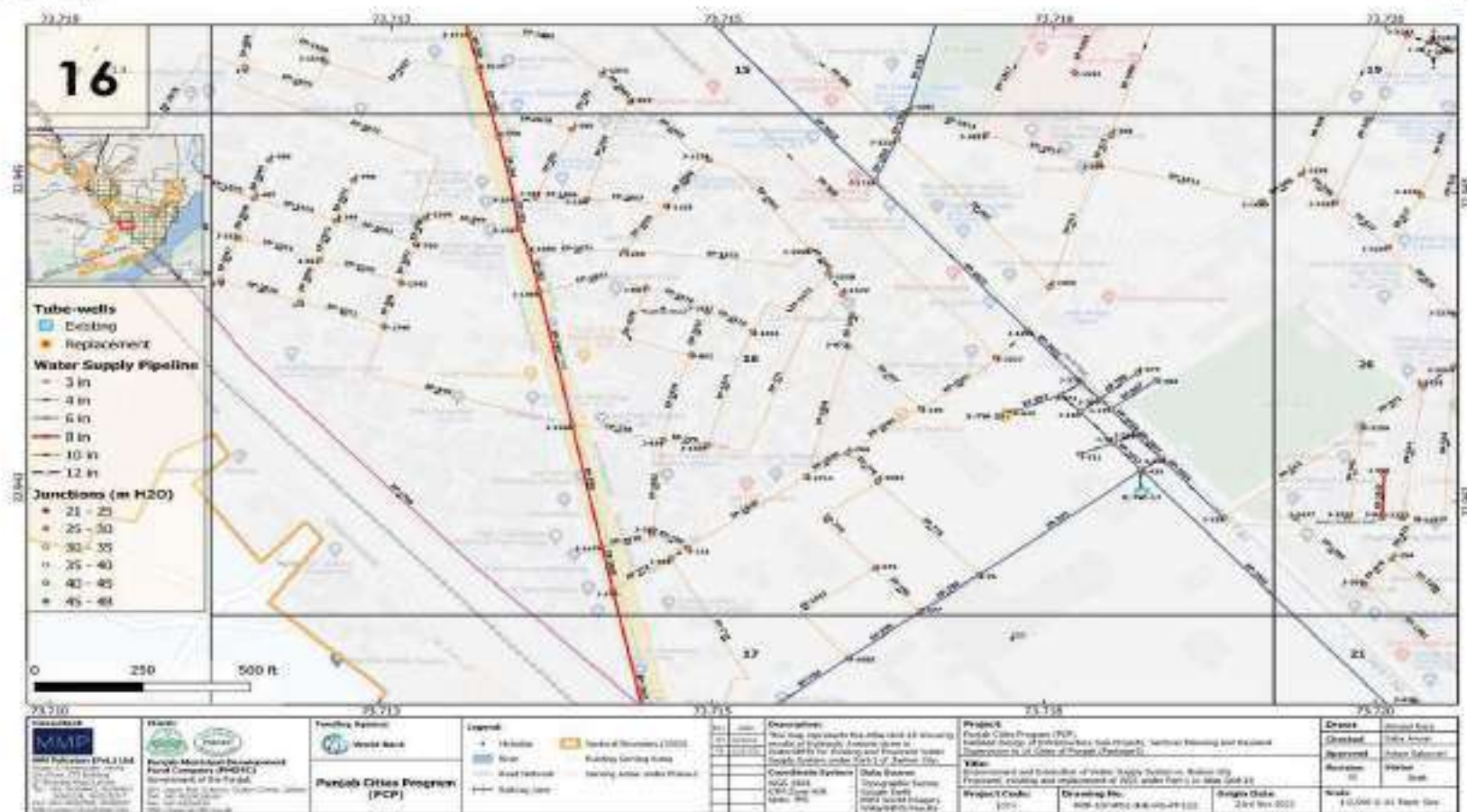
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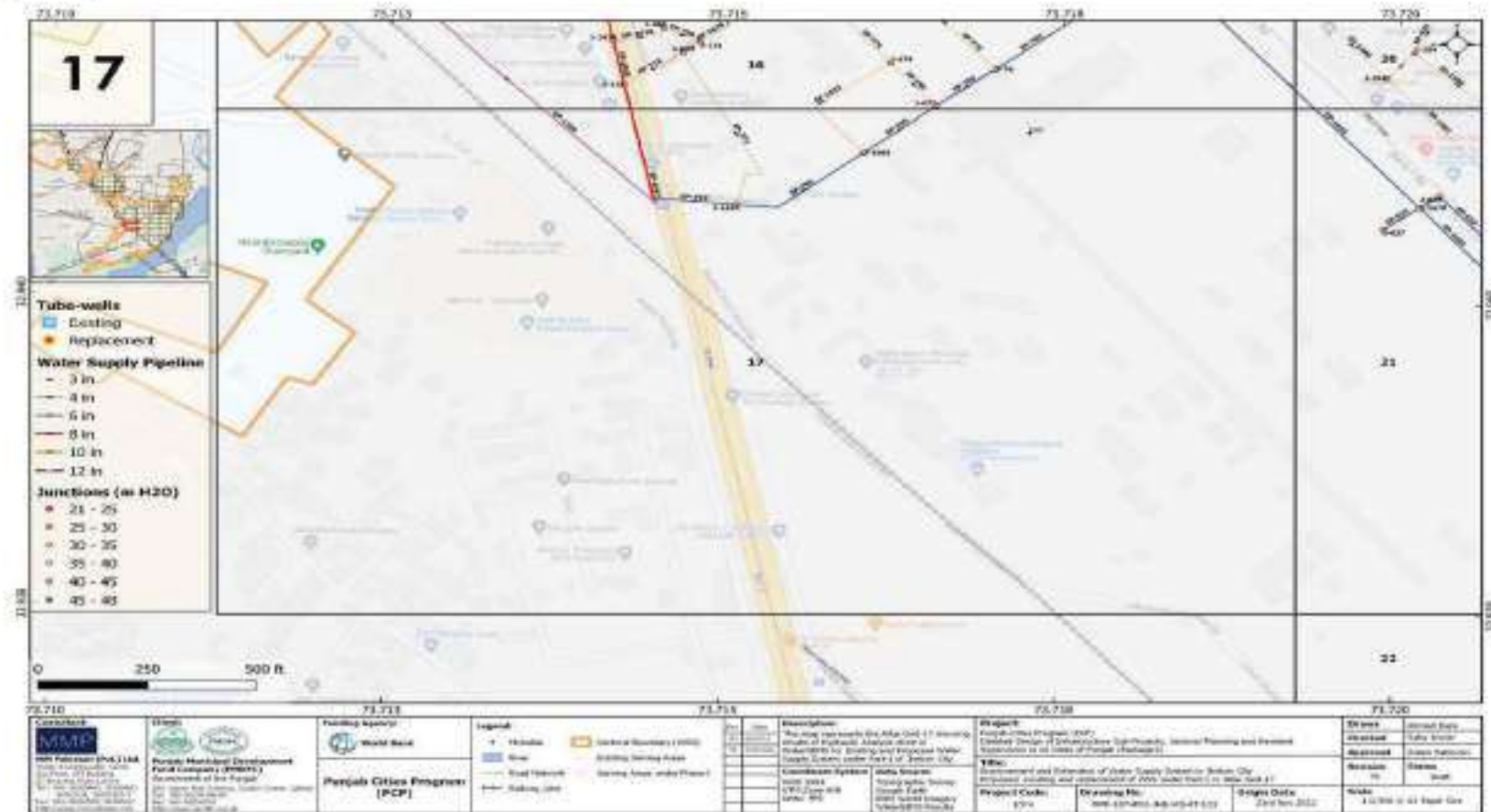
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Annexure F



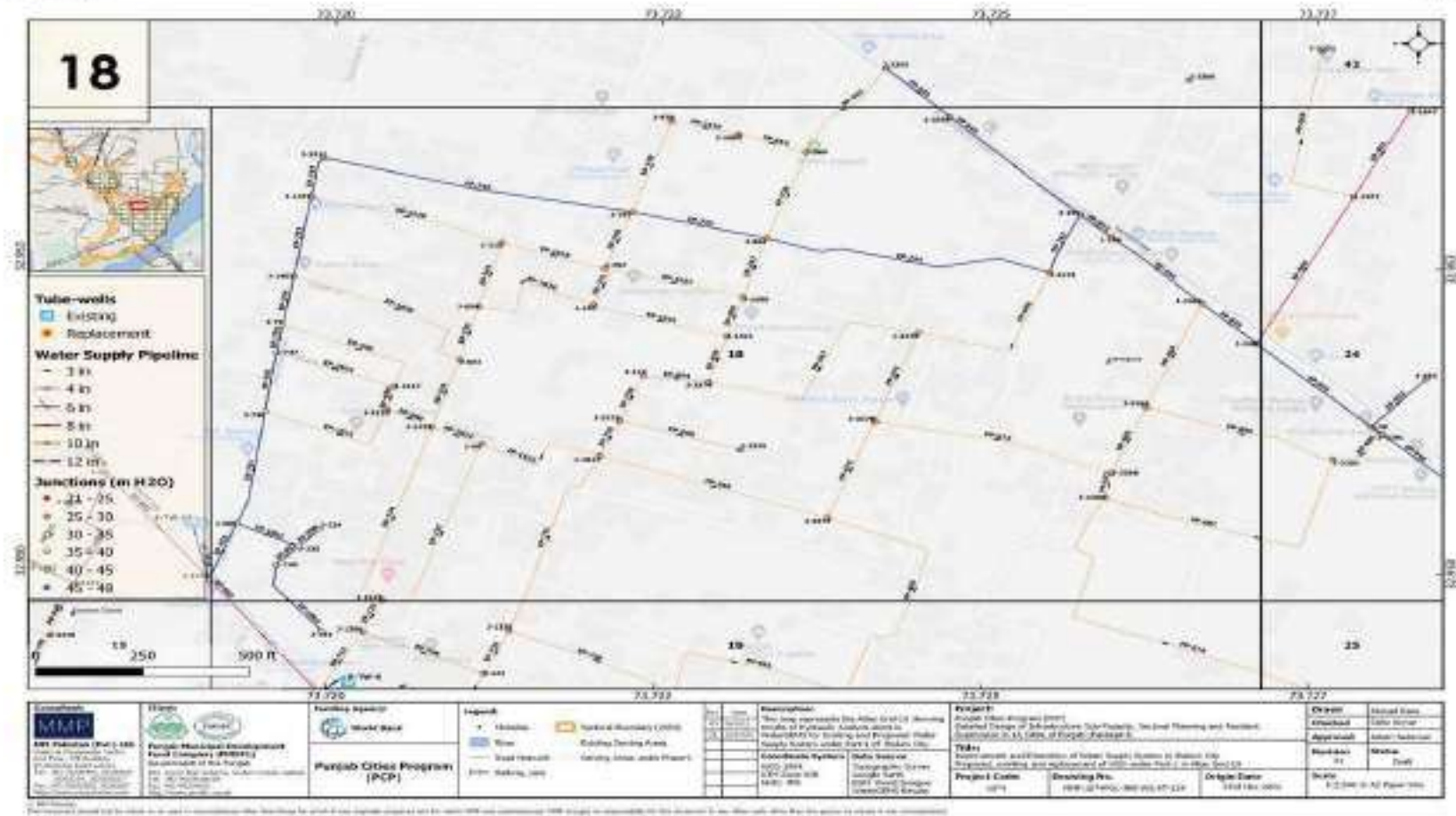
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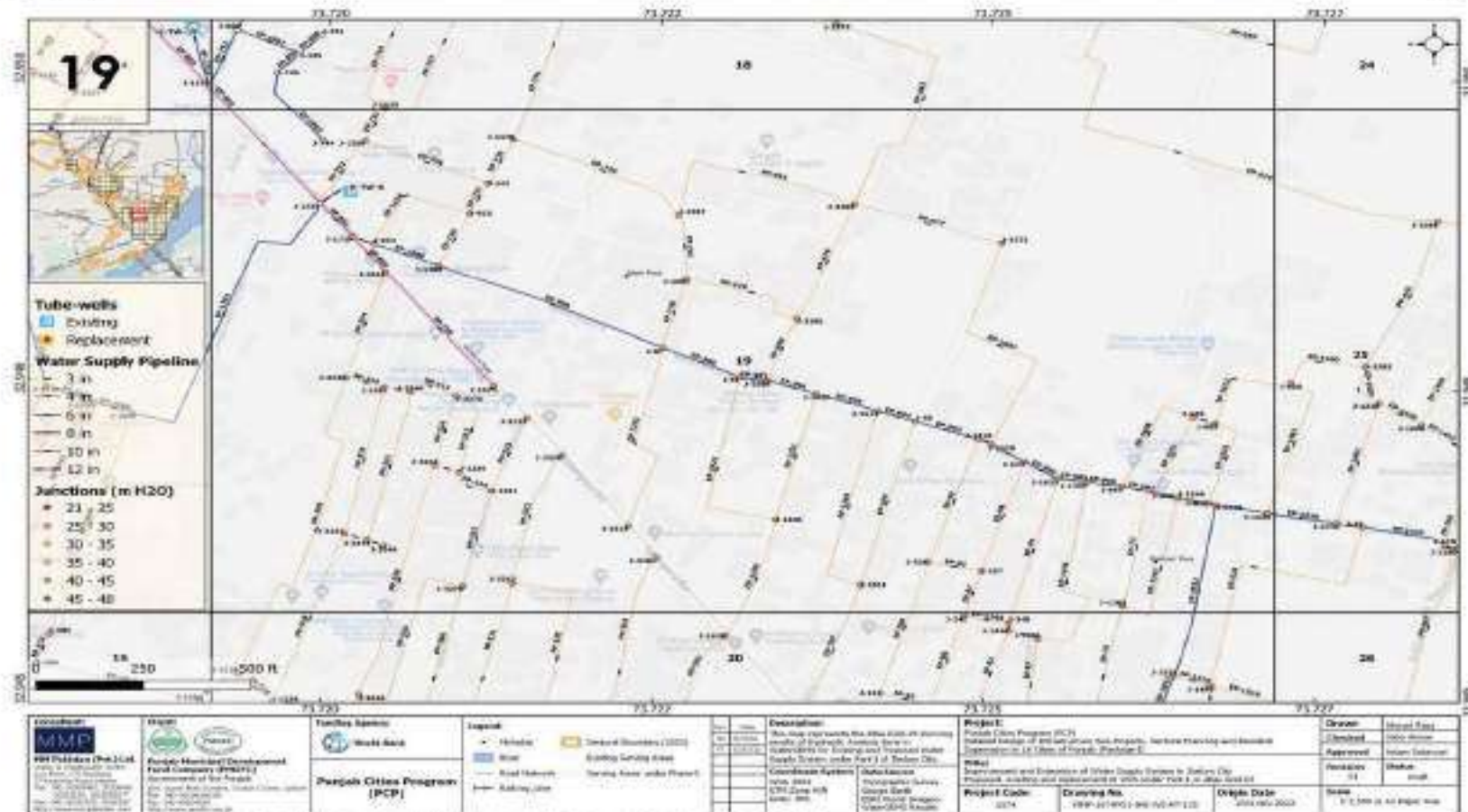
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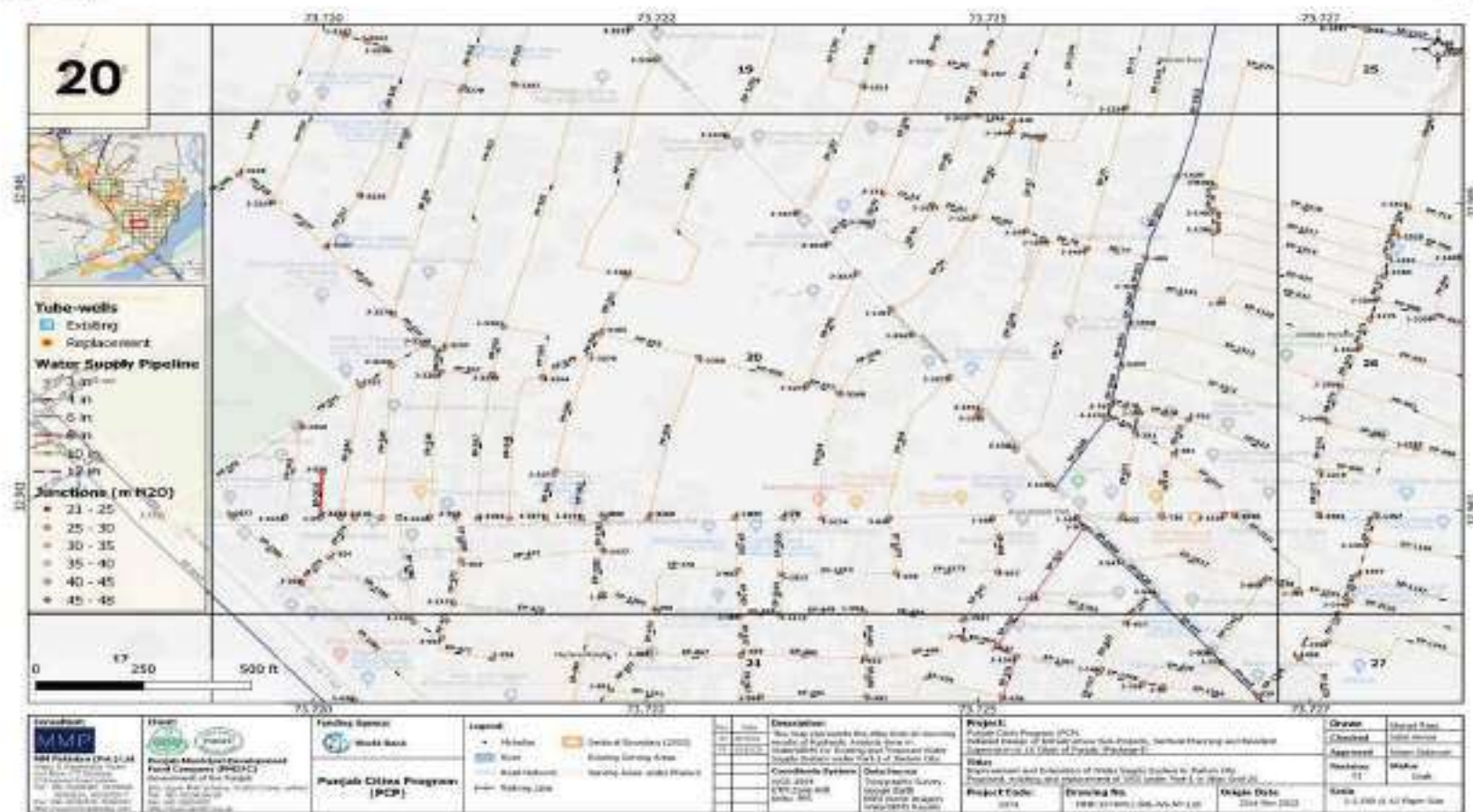
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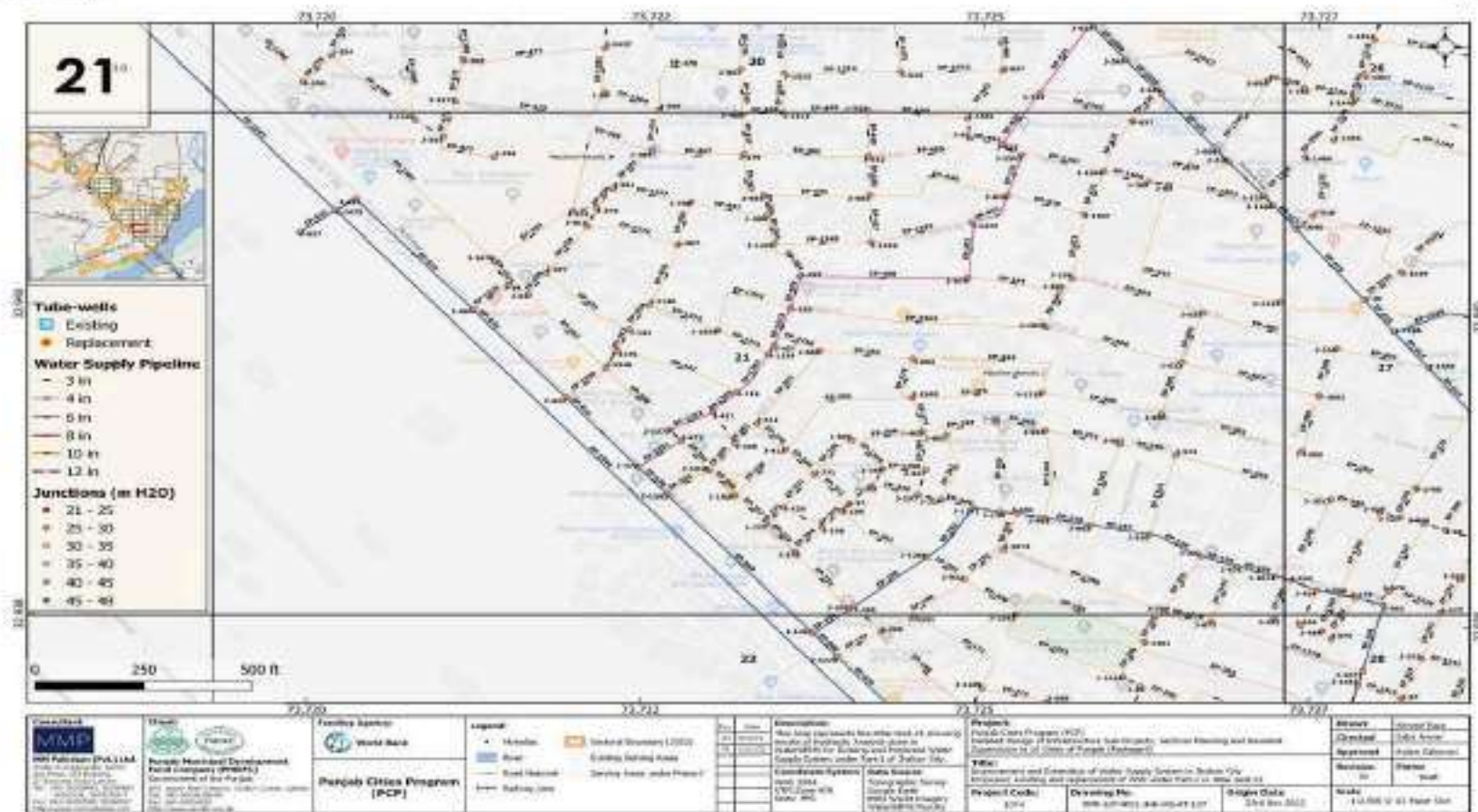
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Annexure F



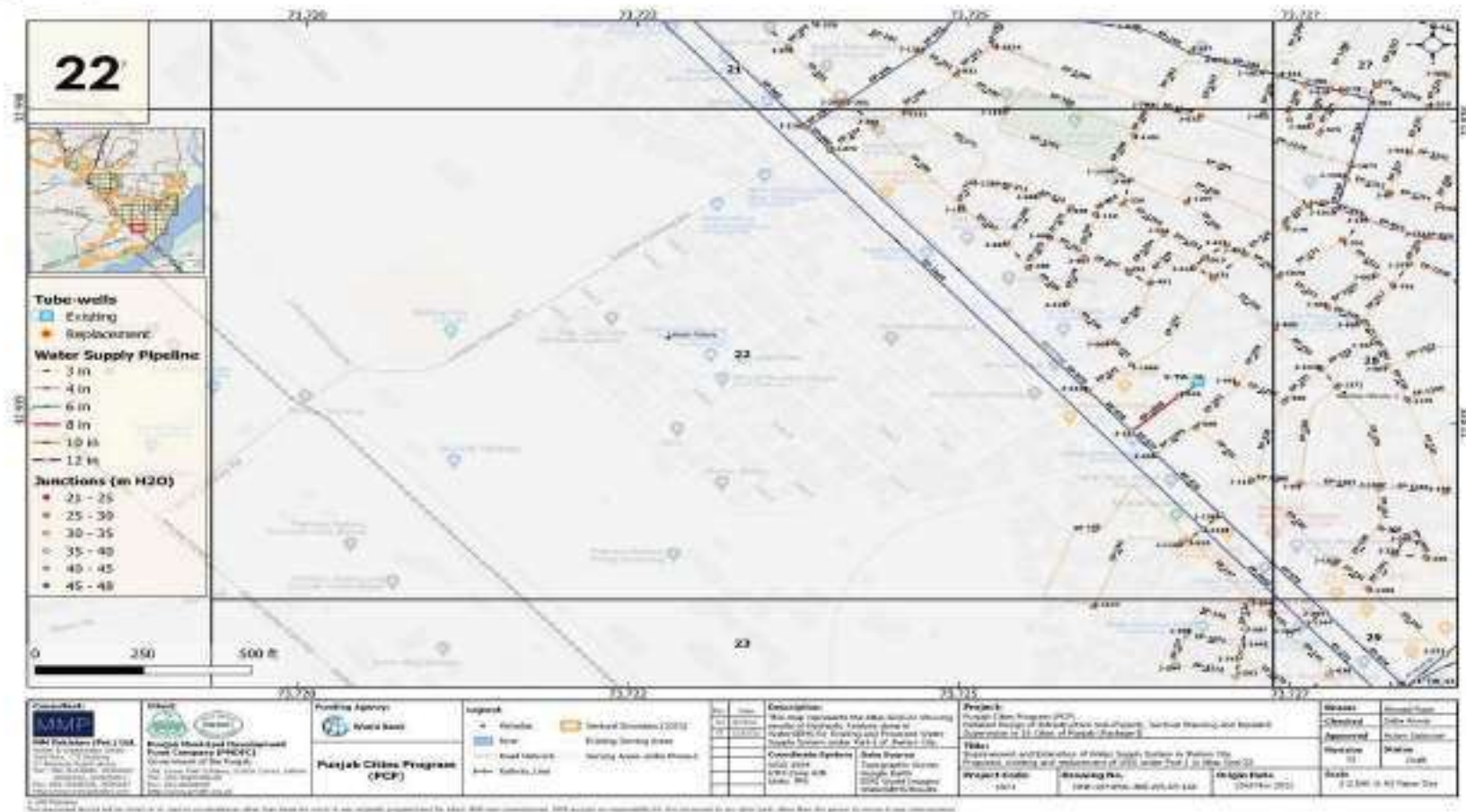
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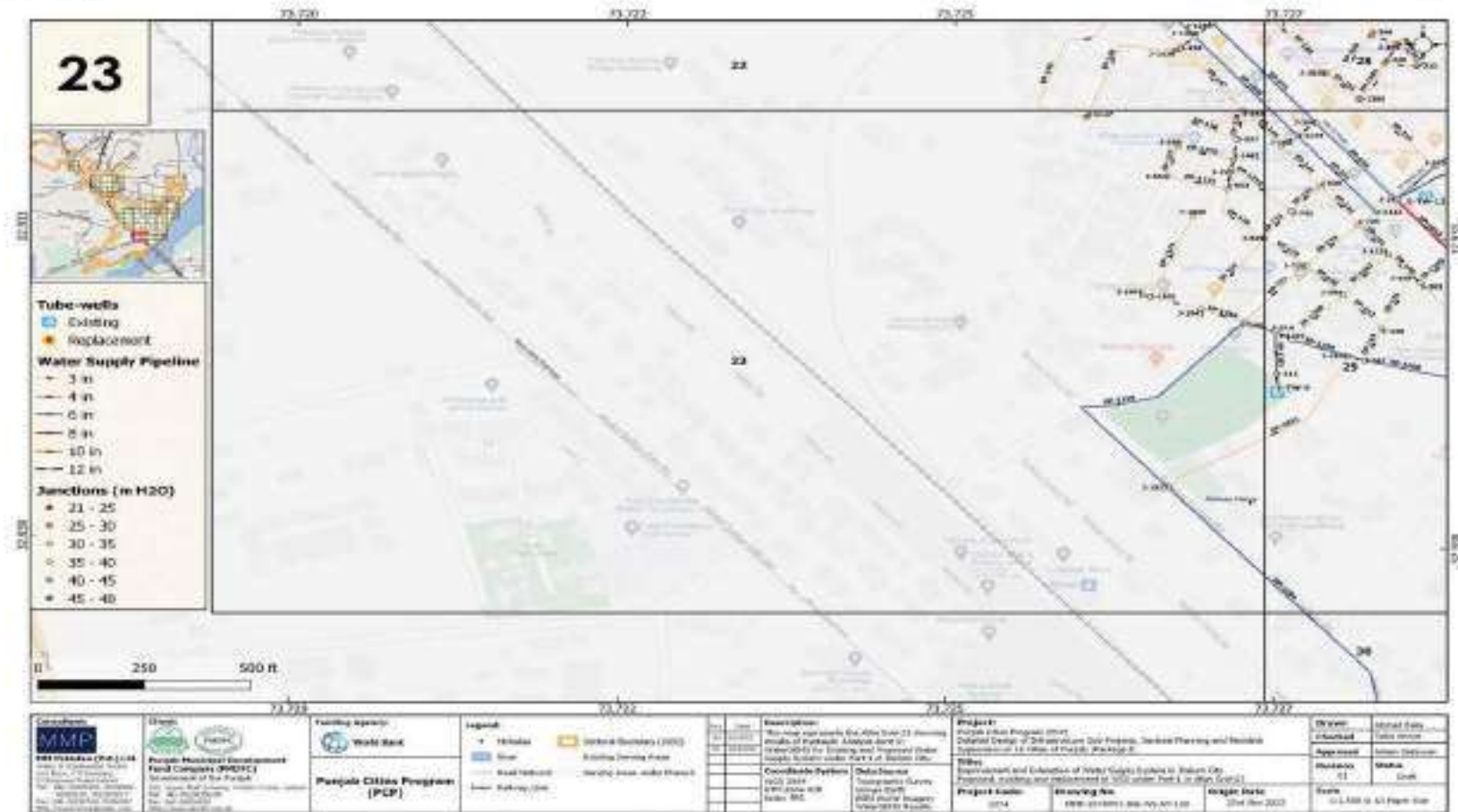
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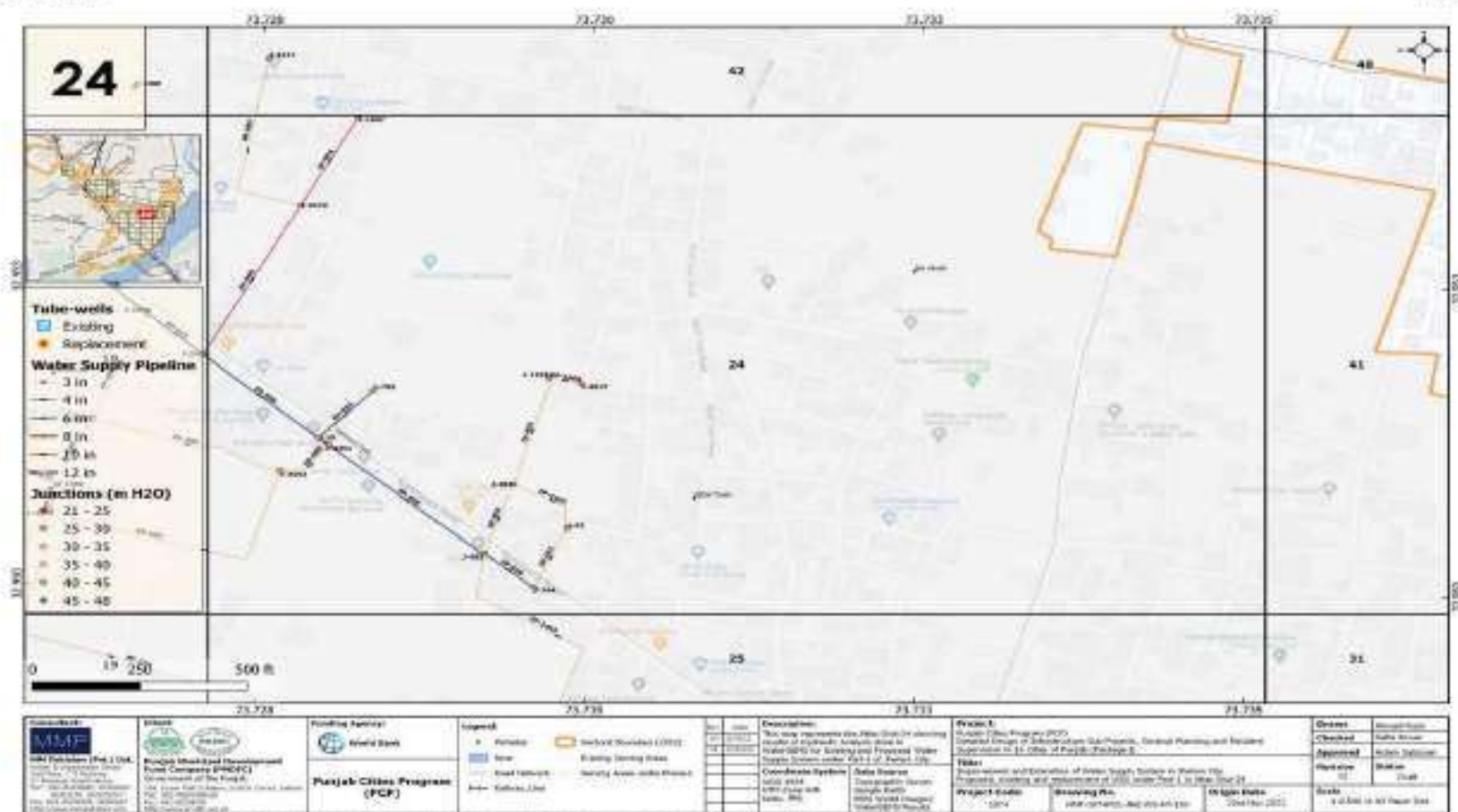
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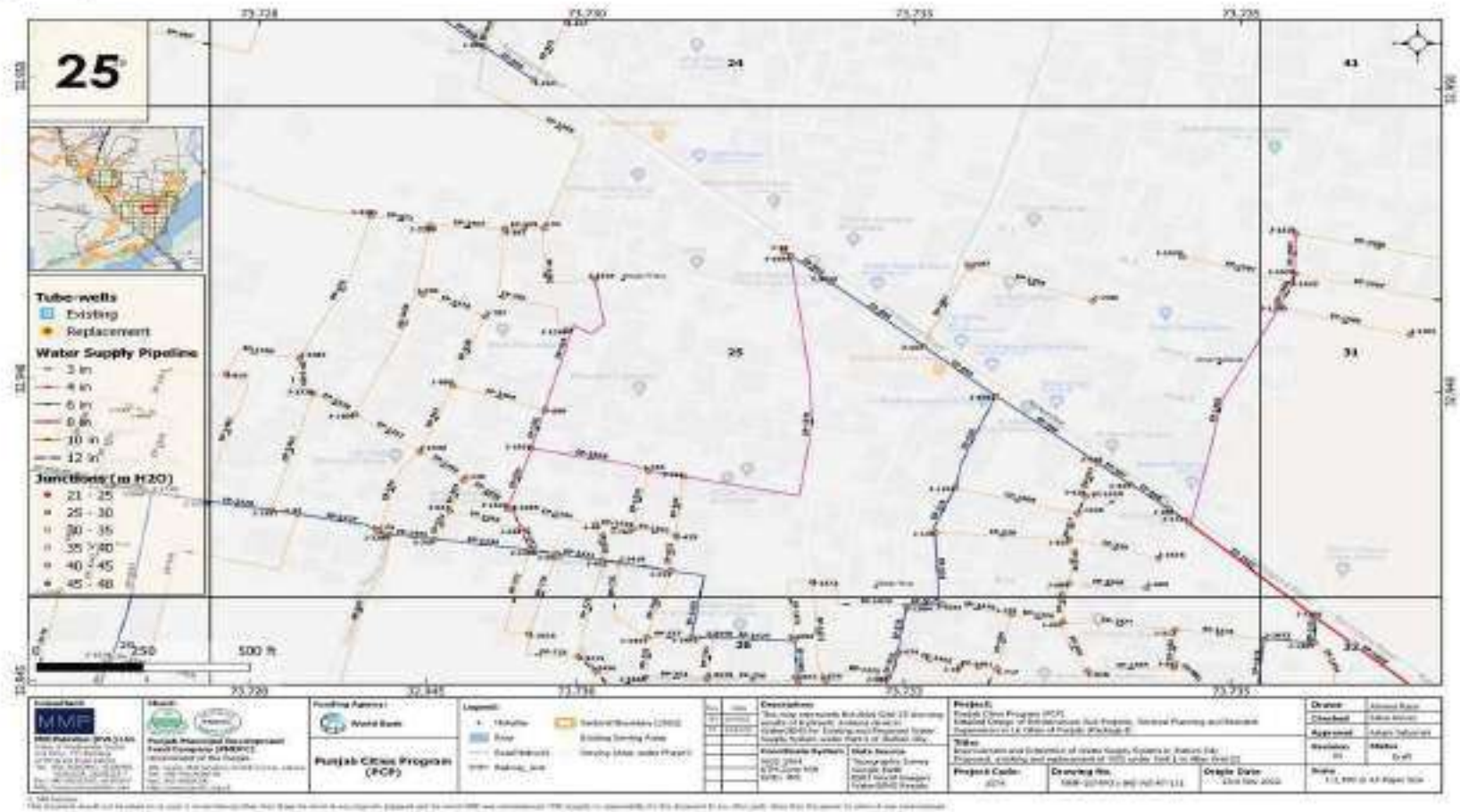
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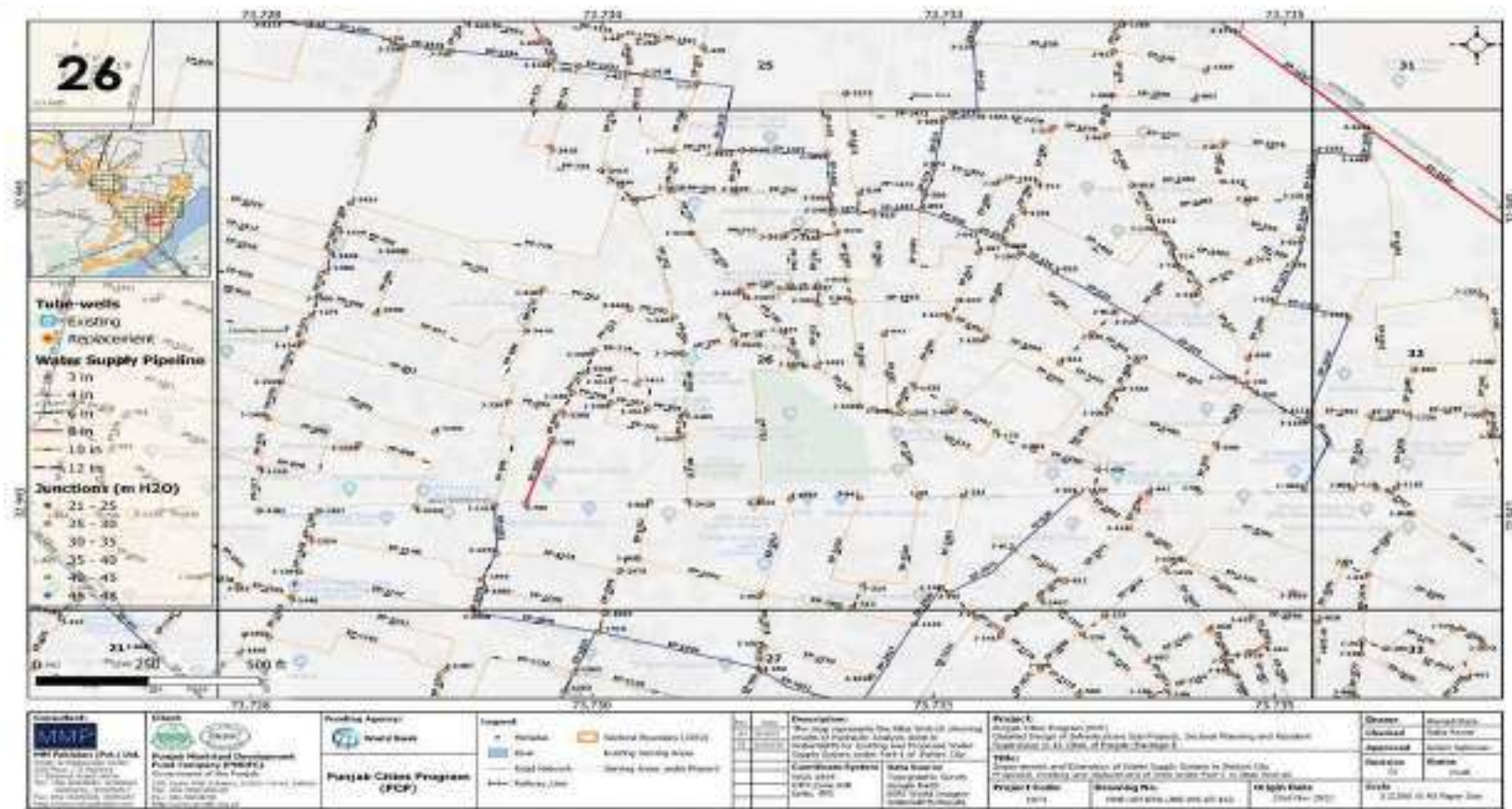
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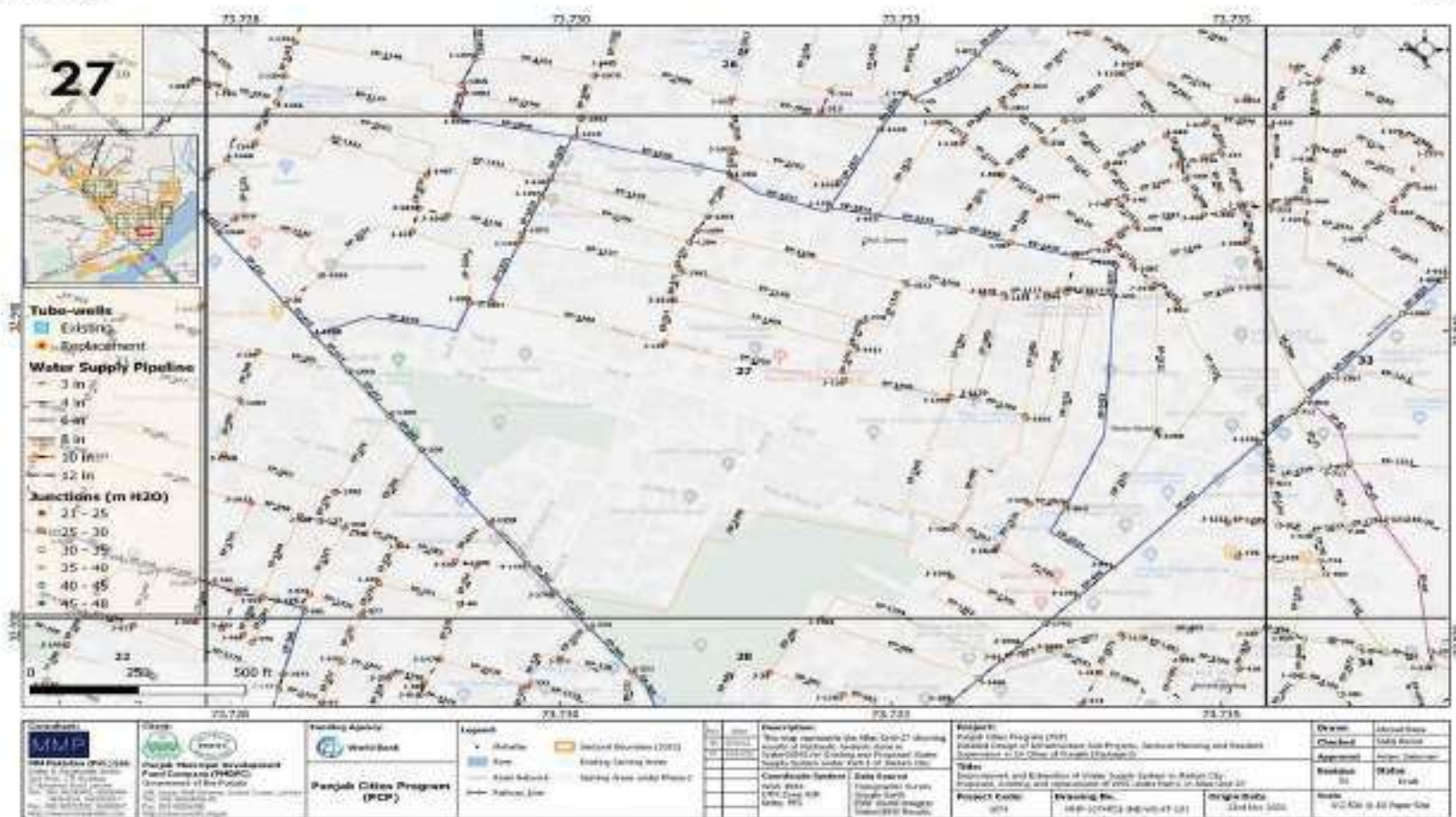
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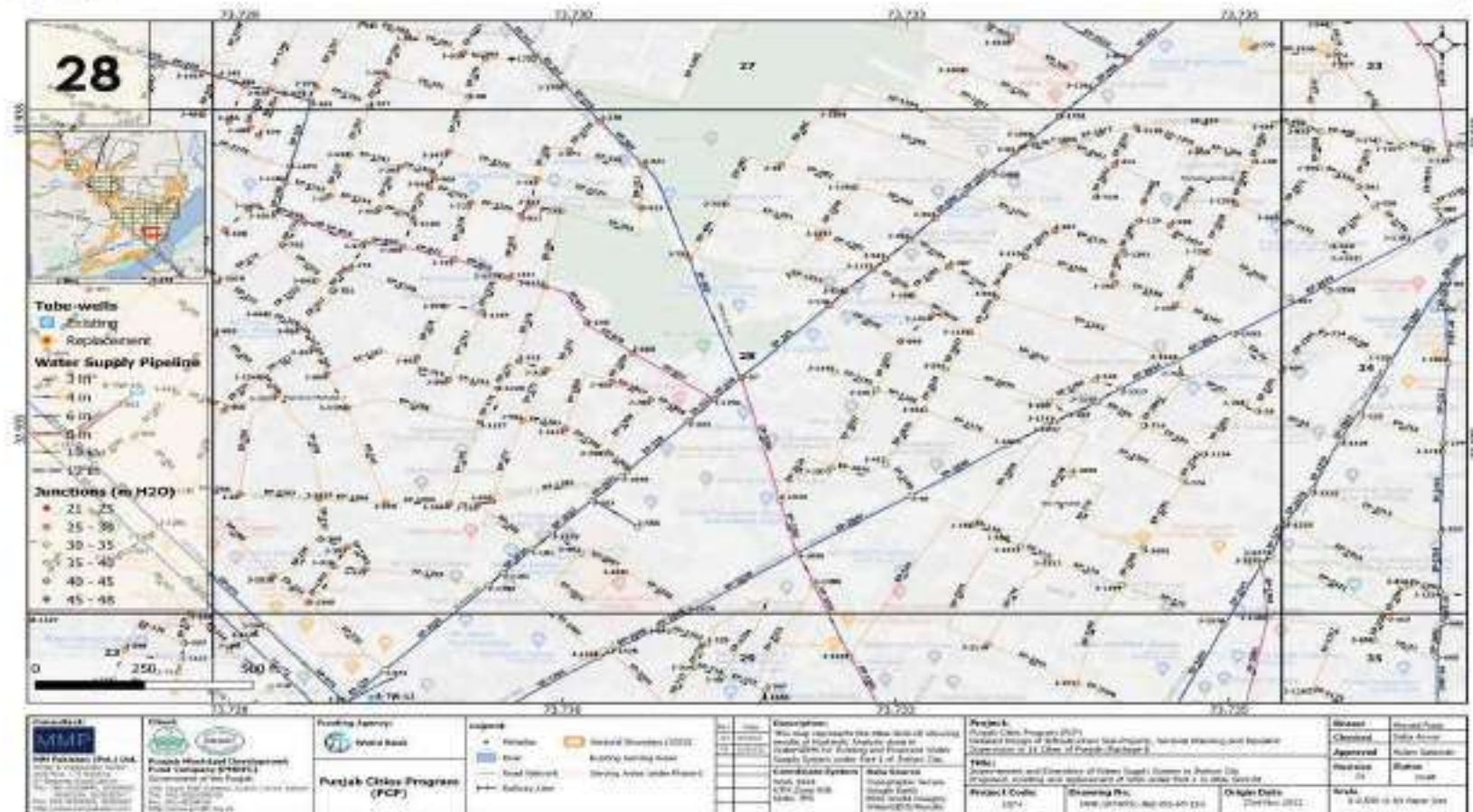
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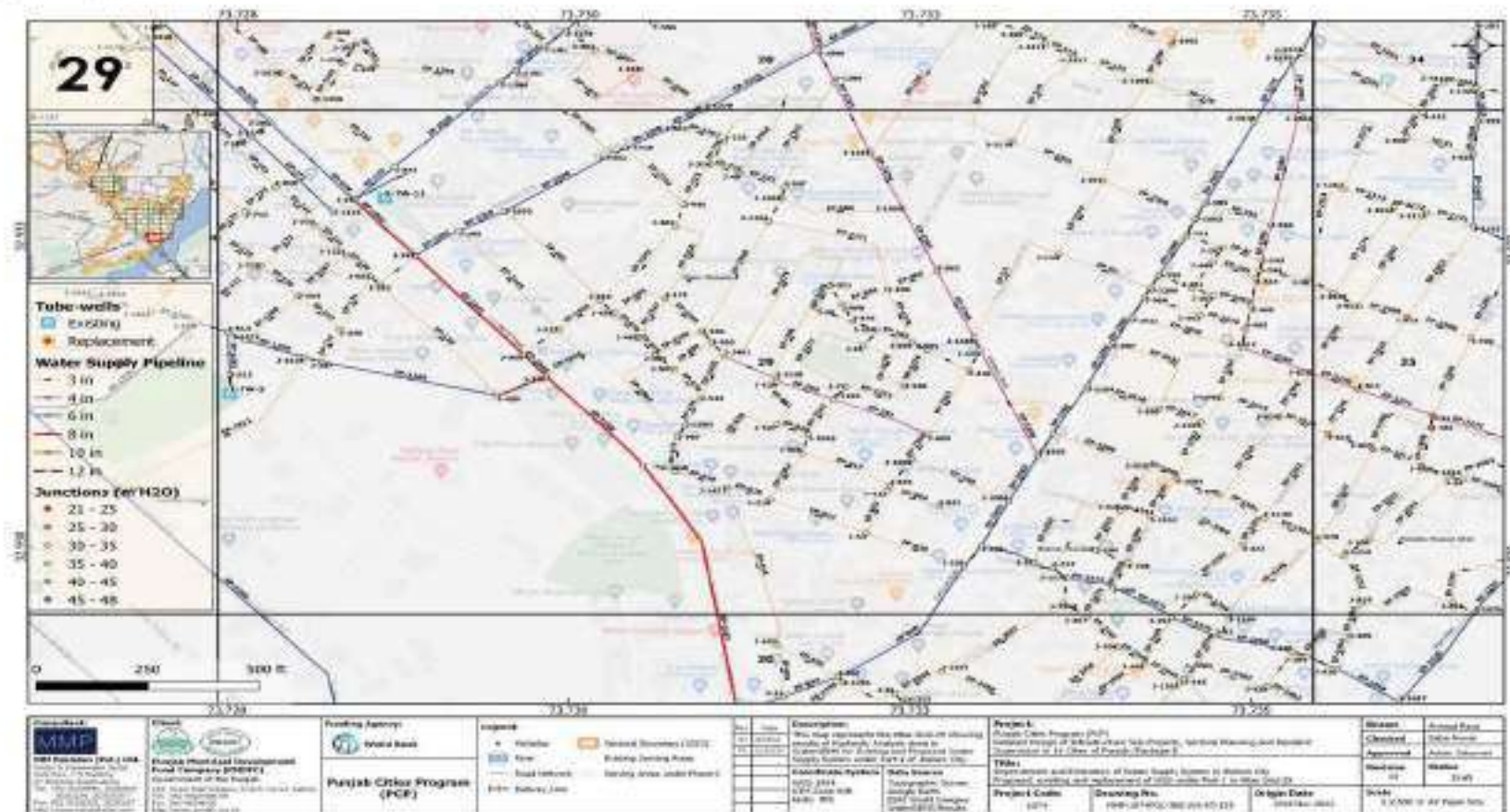
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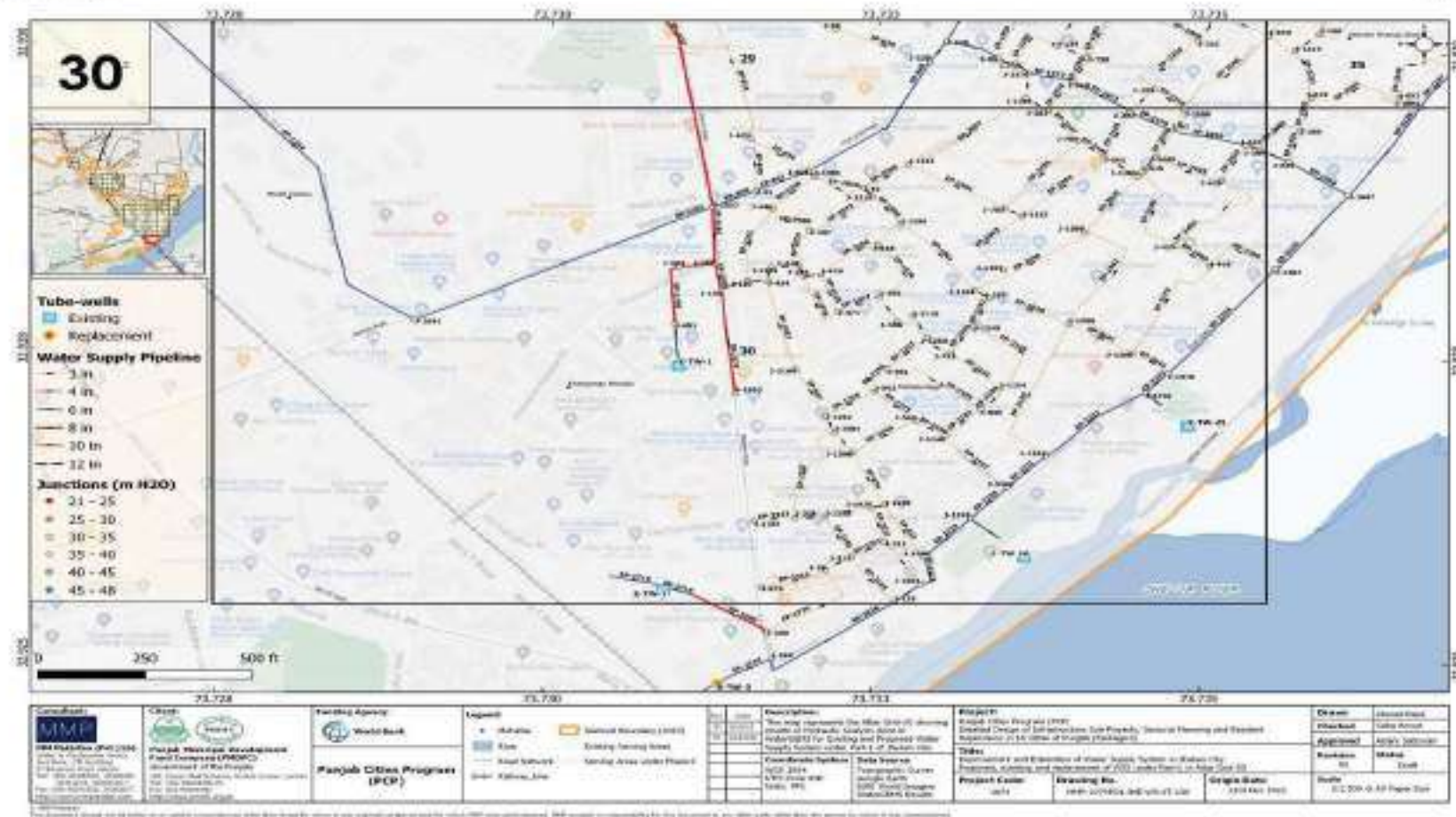
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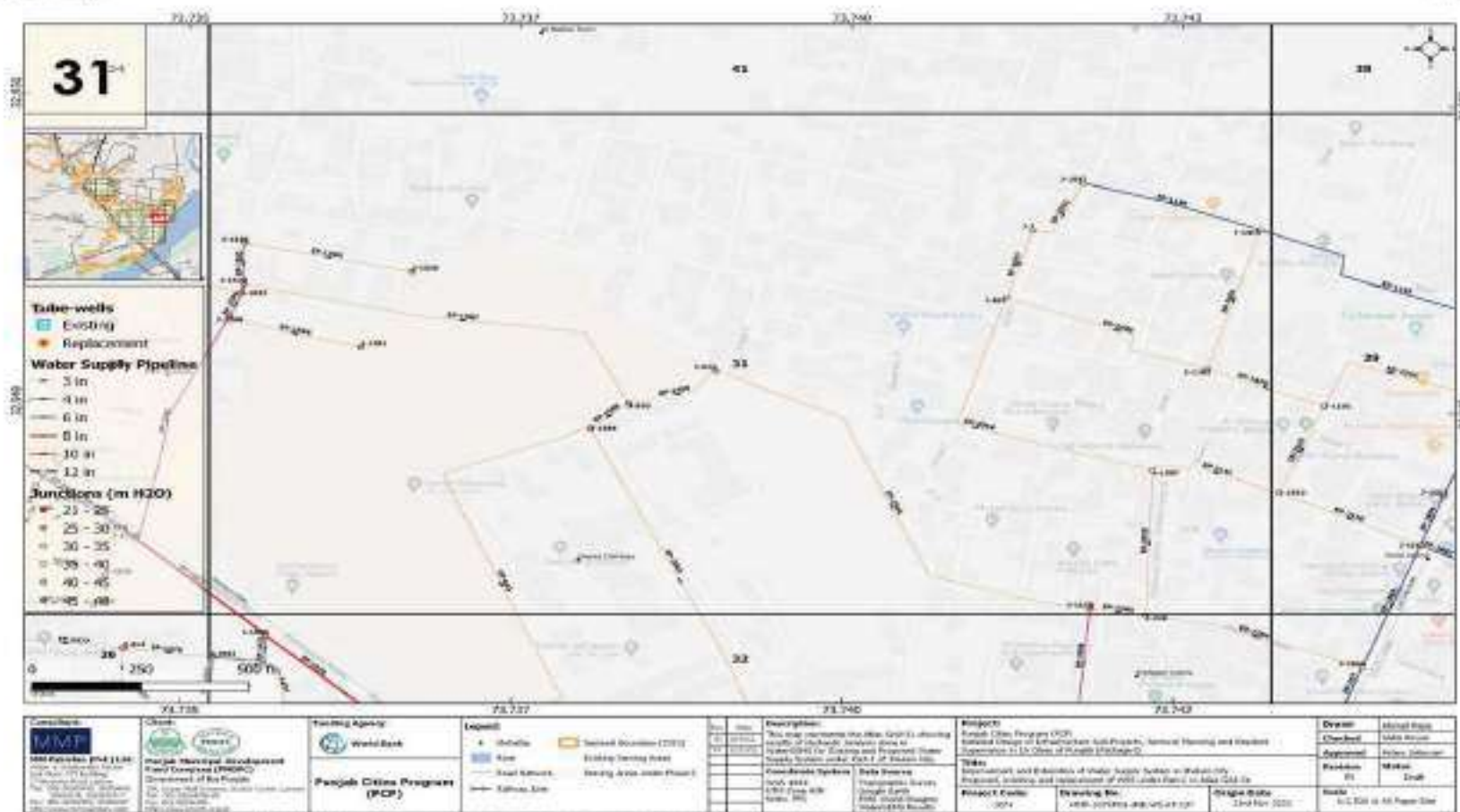
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Annexure F



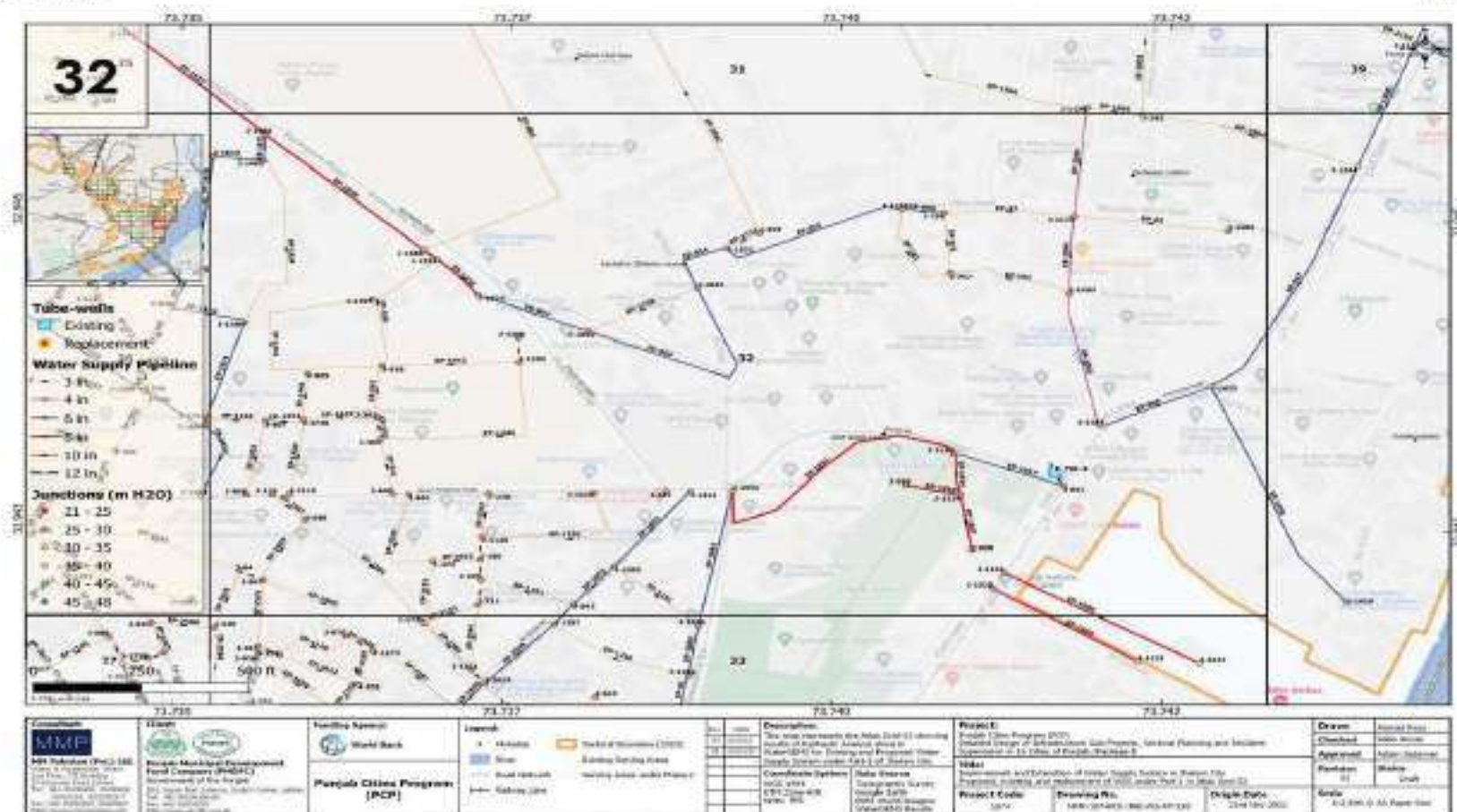
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Annexure F



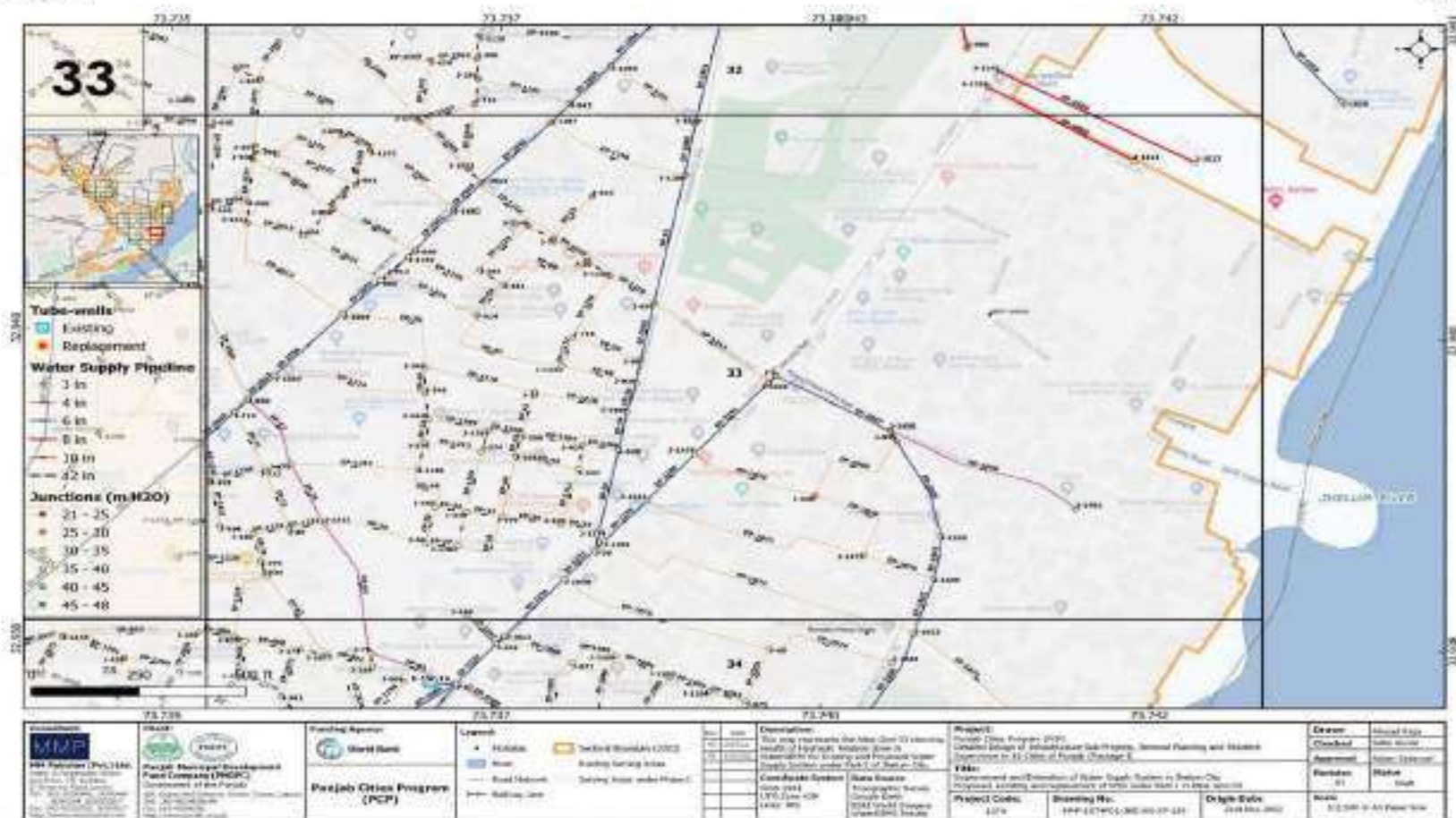
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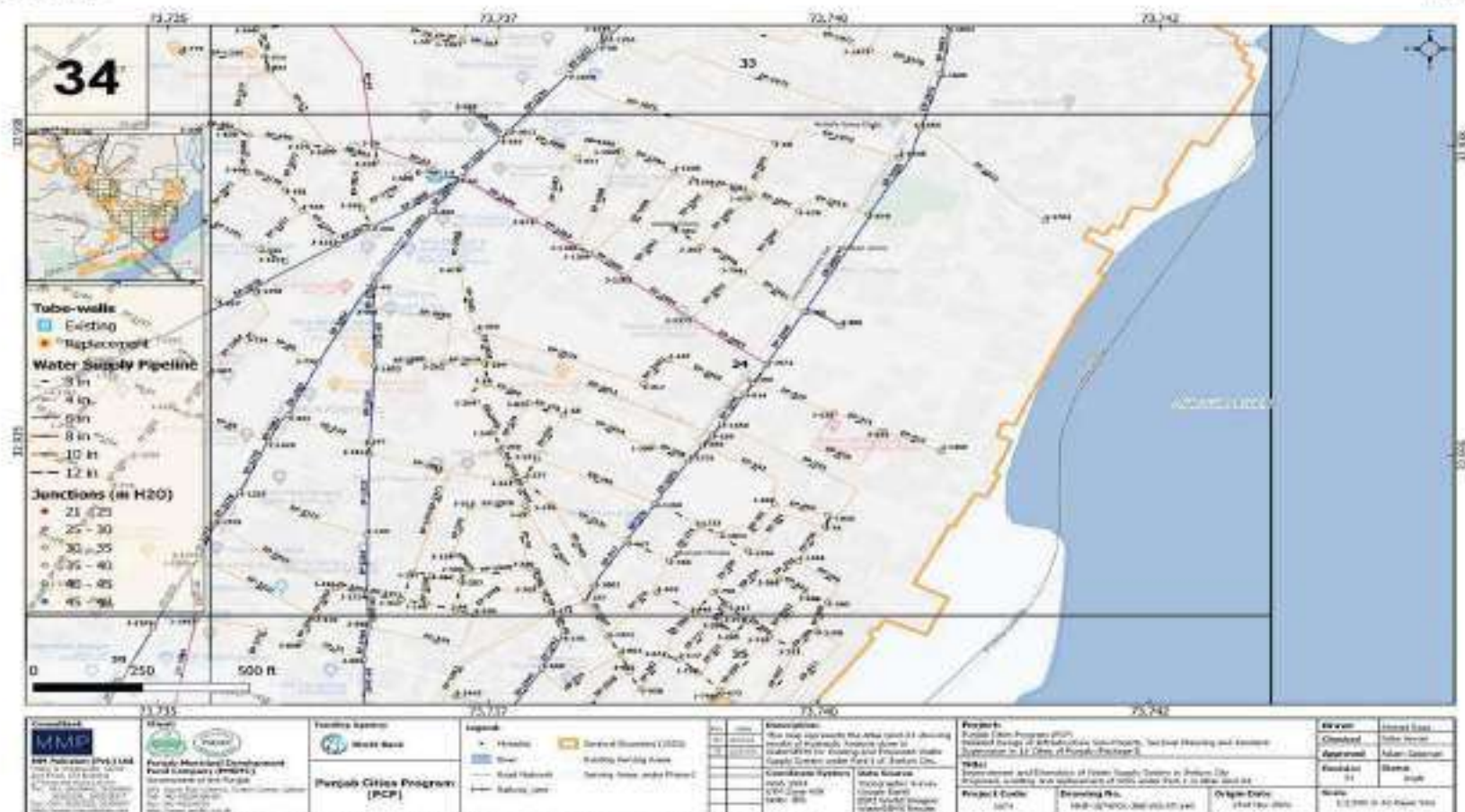
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Annexure-F



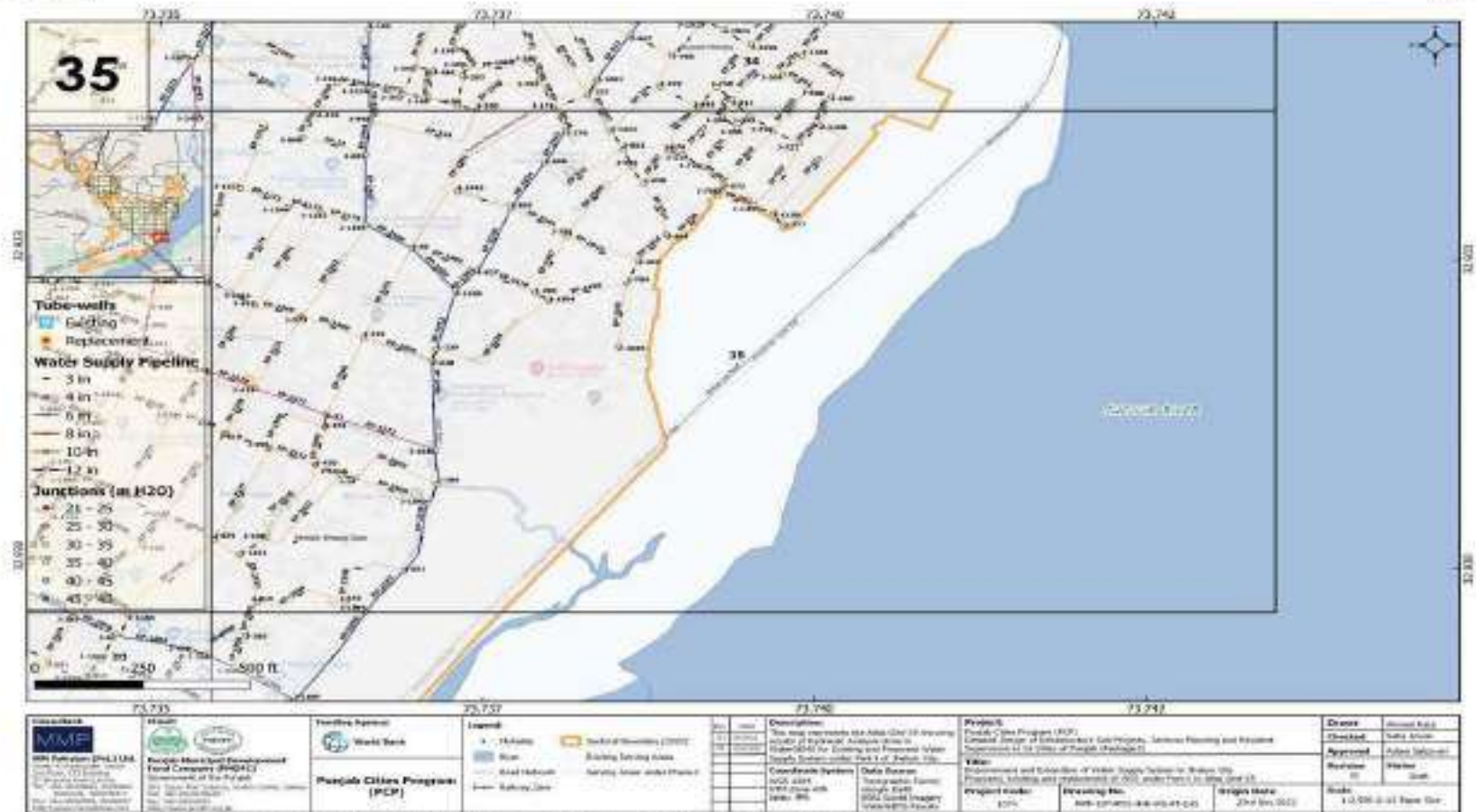
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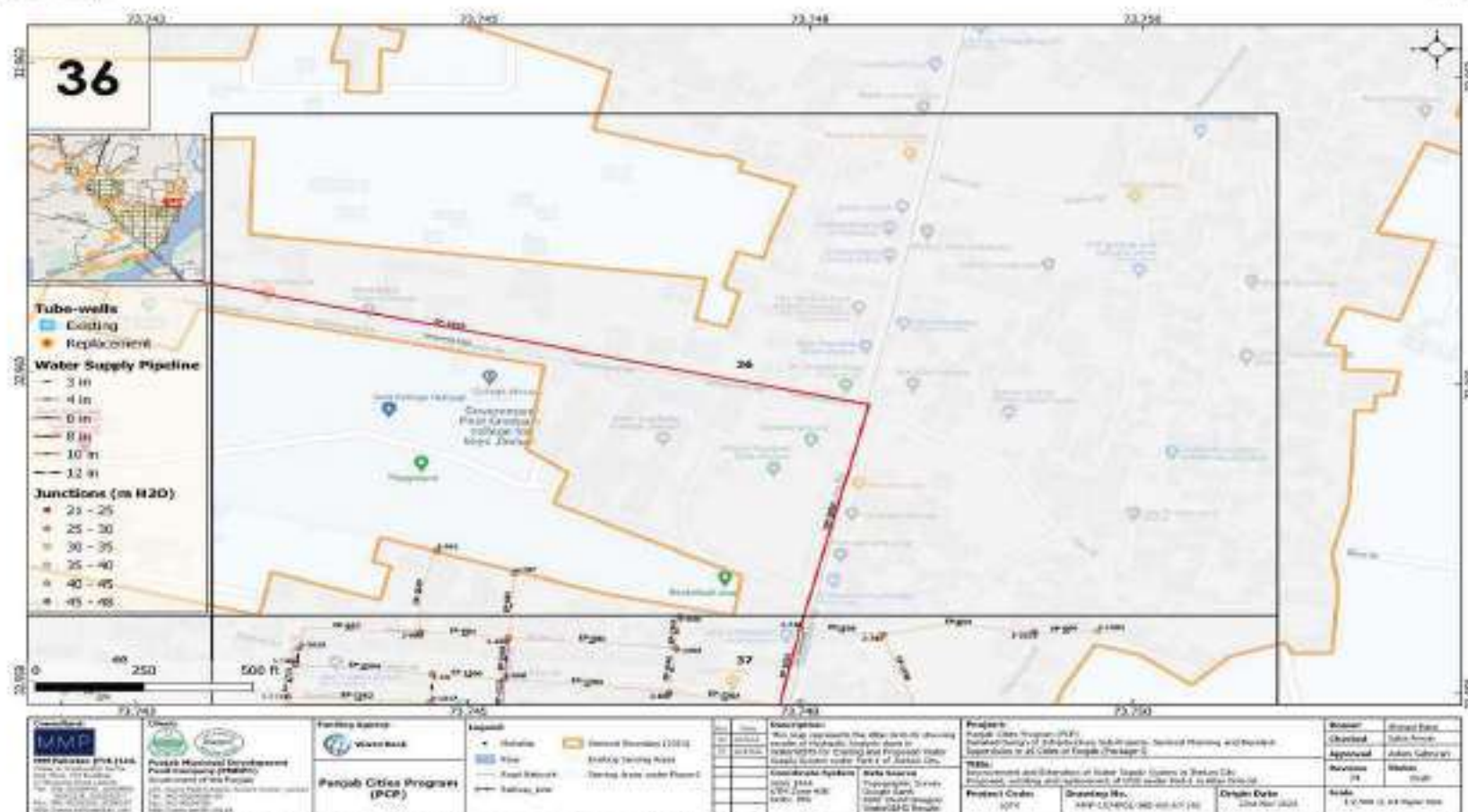
Drawings and Maps

Annexure-F



Drawings and Maps

Annexure F



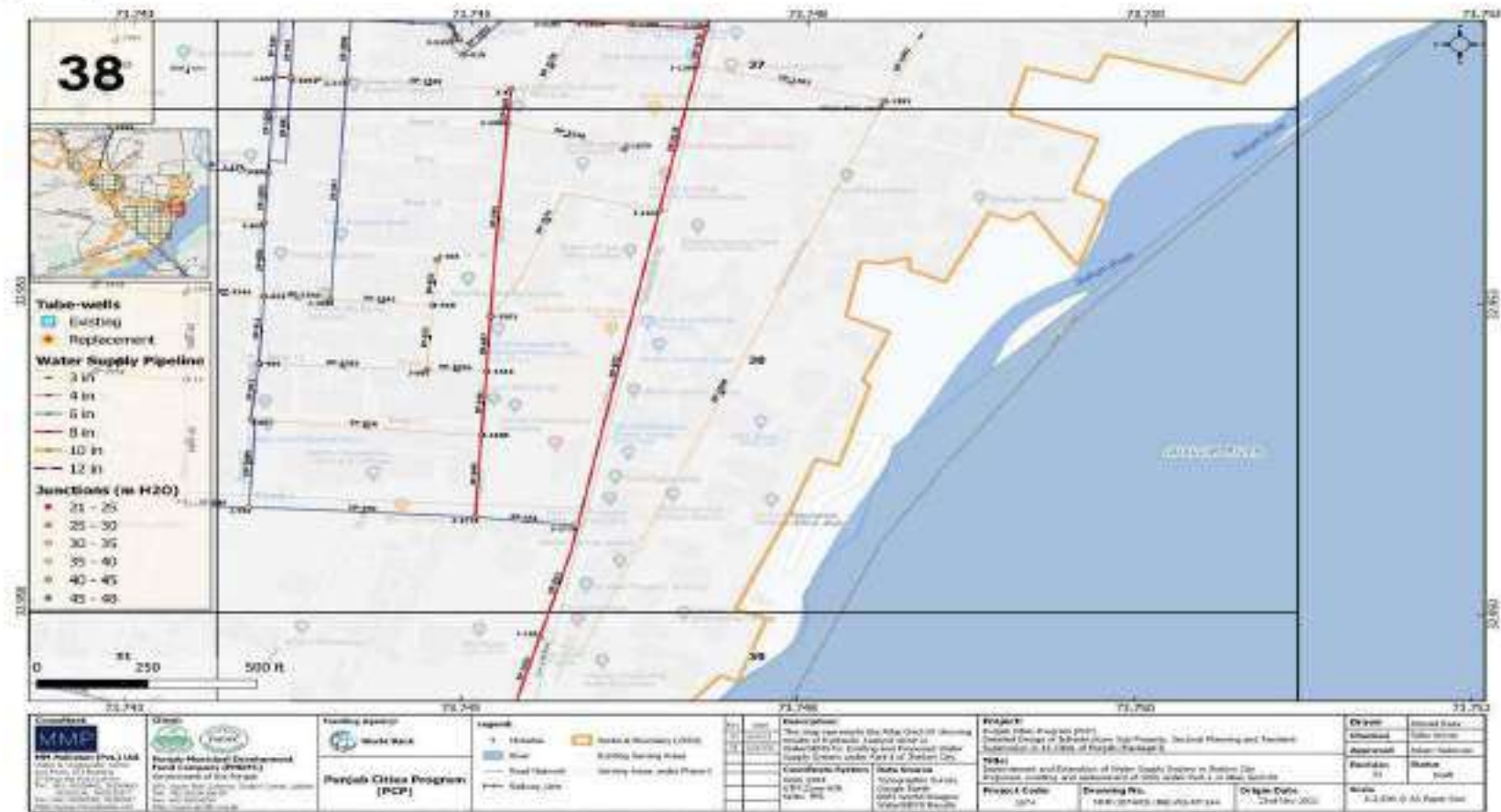
Drawings and Maps

Annexure-F



Drawings and Maps

Annexure-F



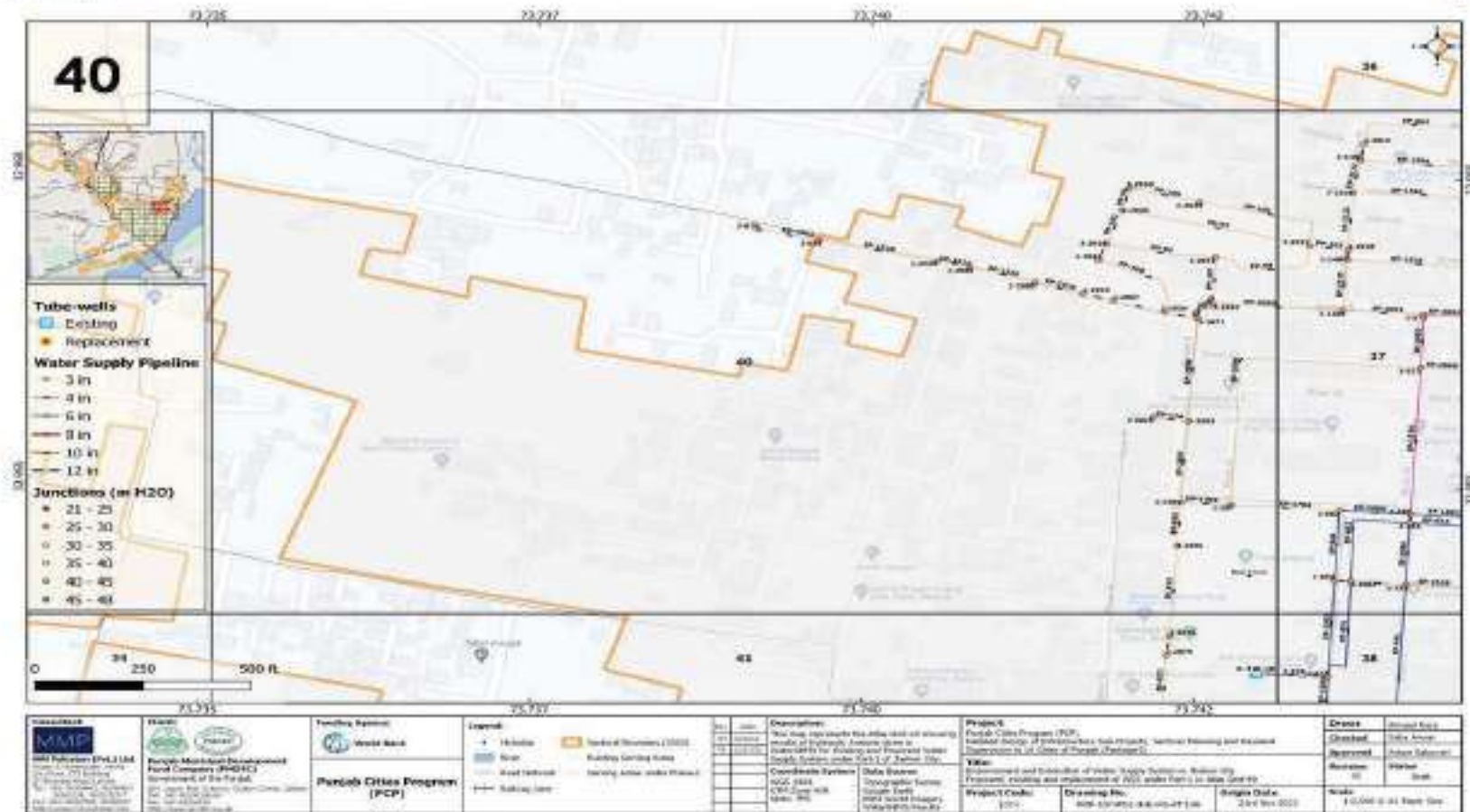
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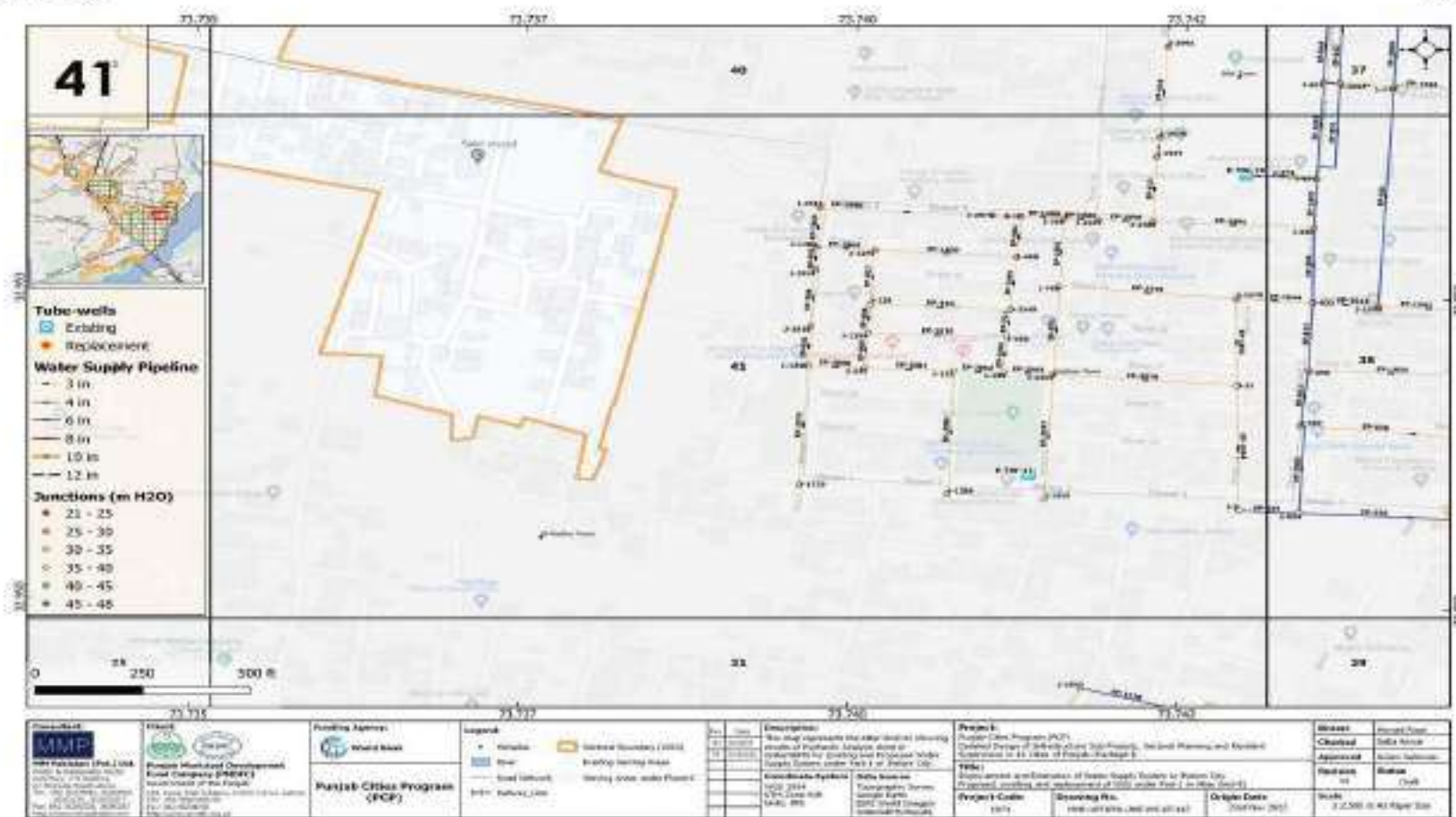
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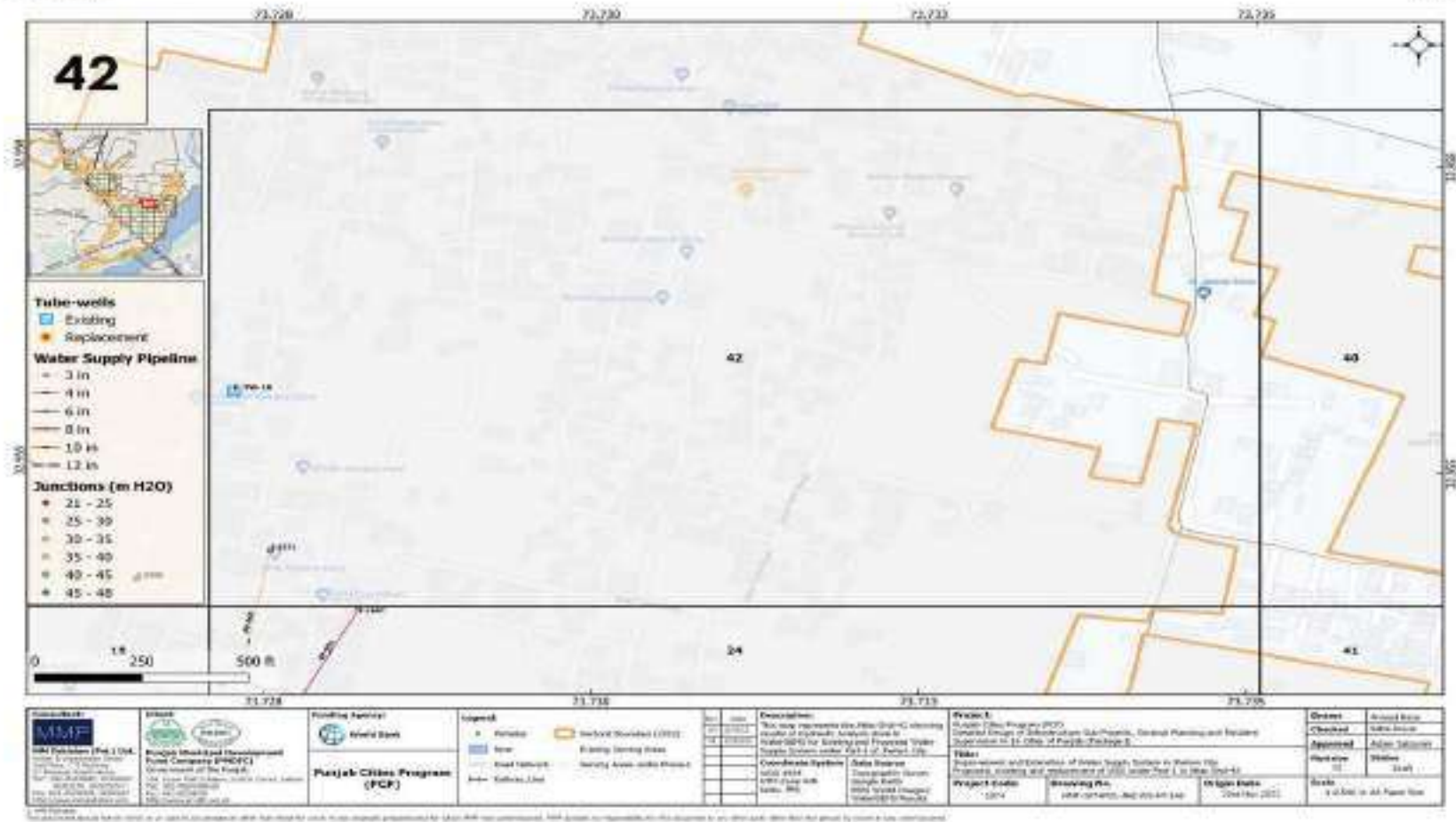
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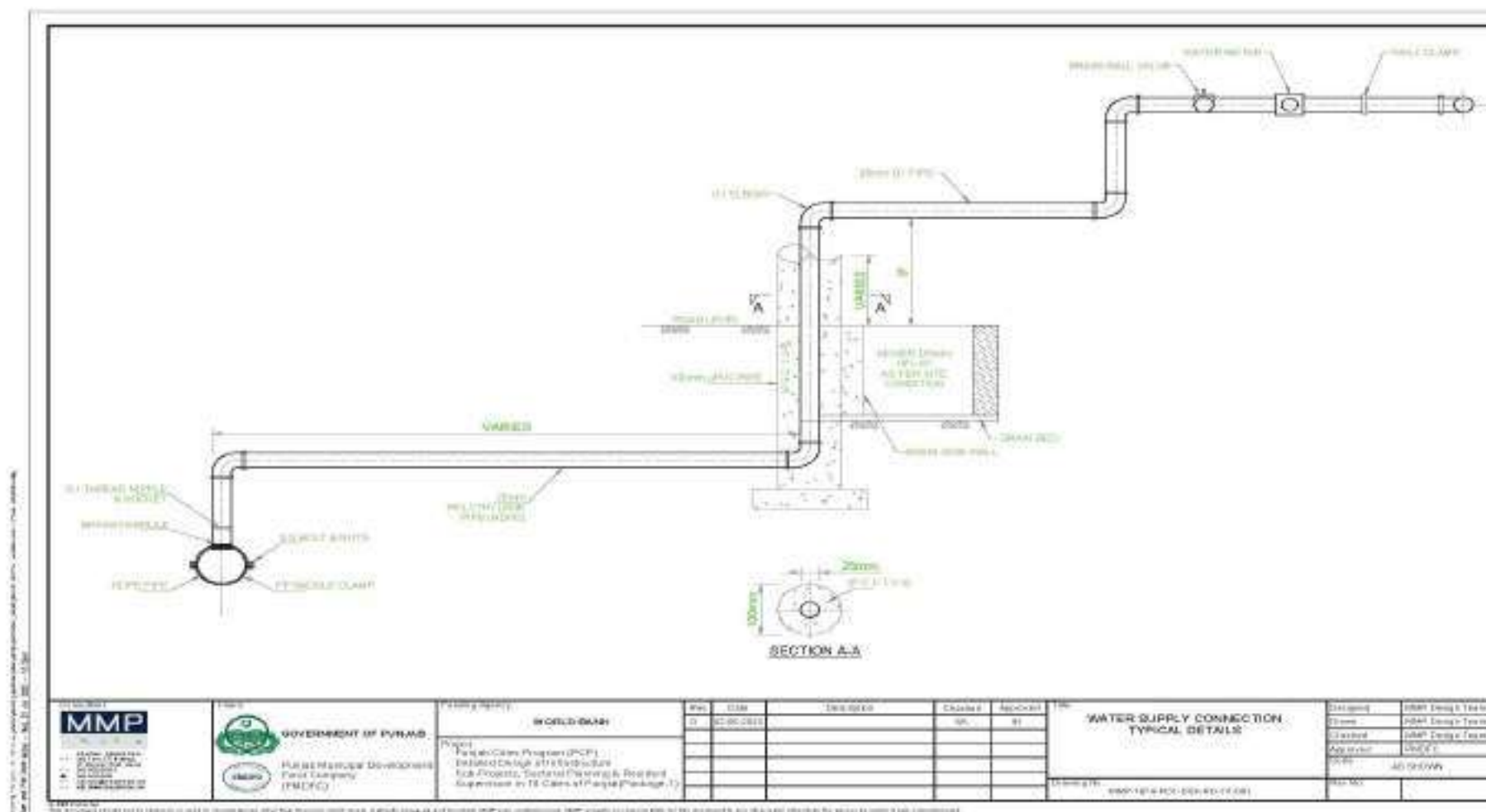
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Drawings and Maps

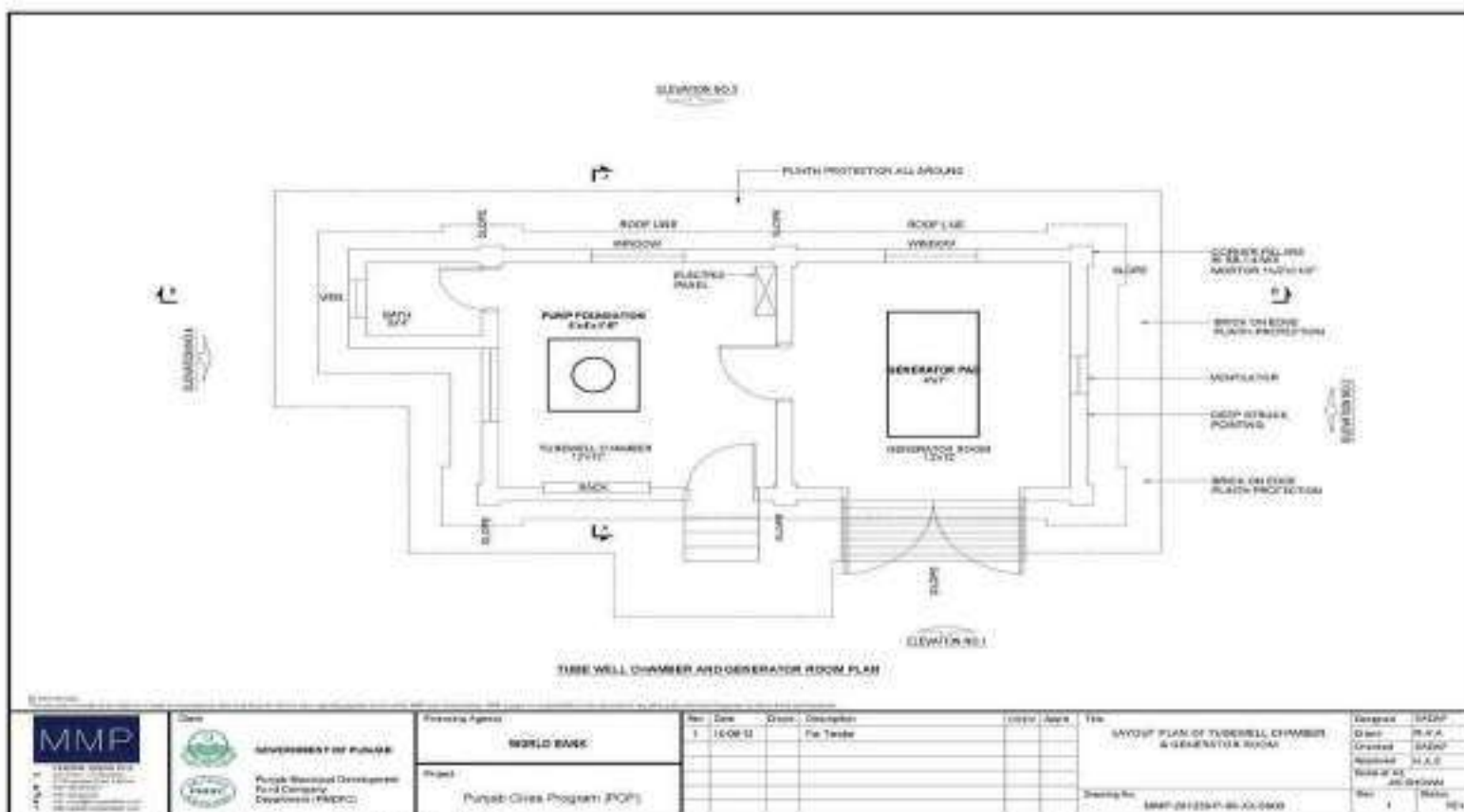
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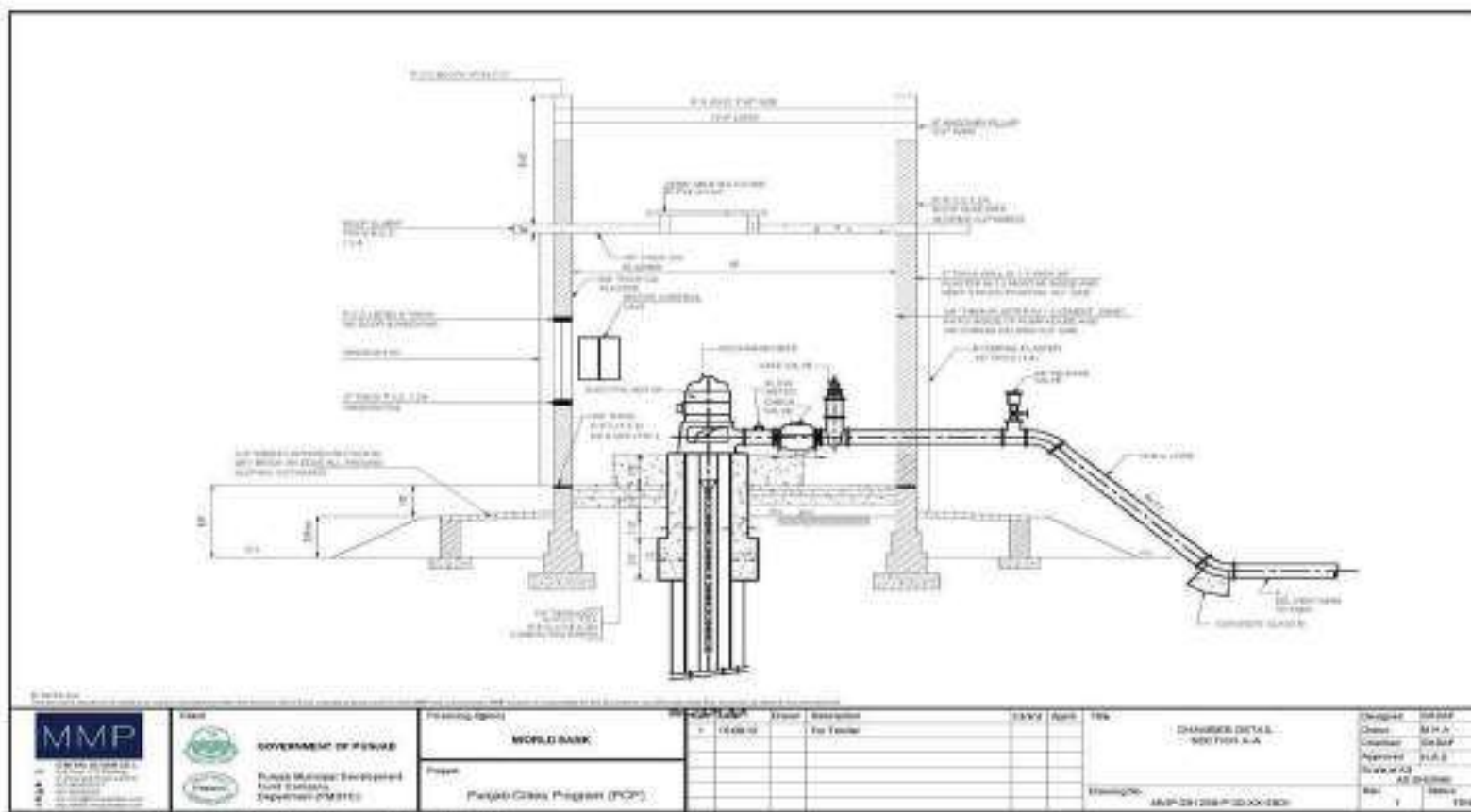
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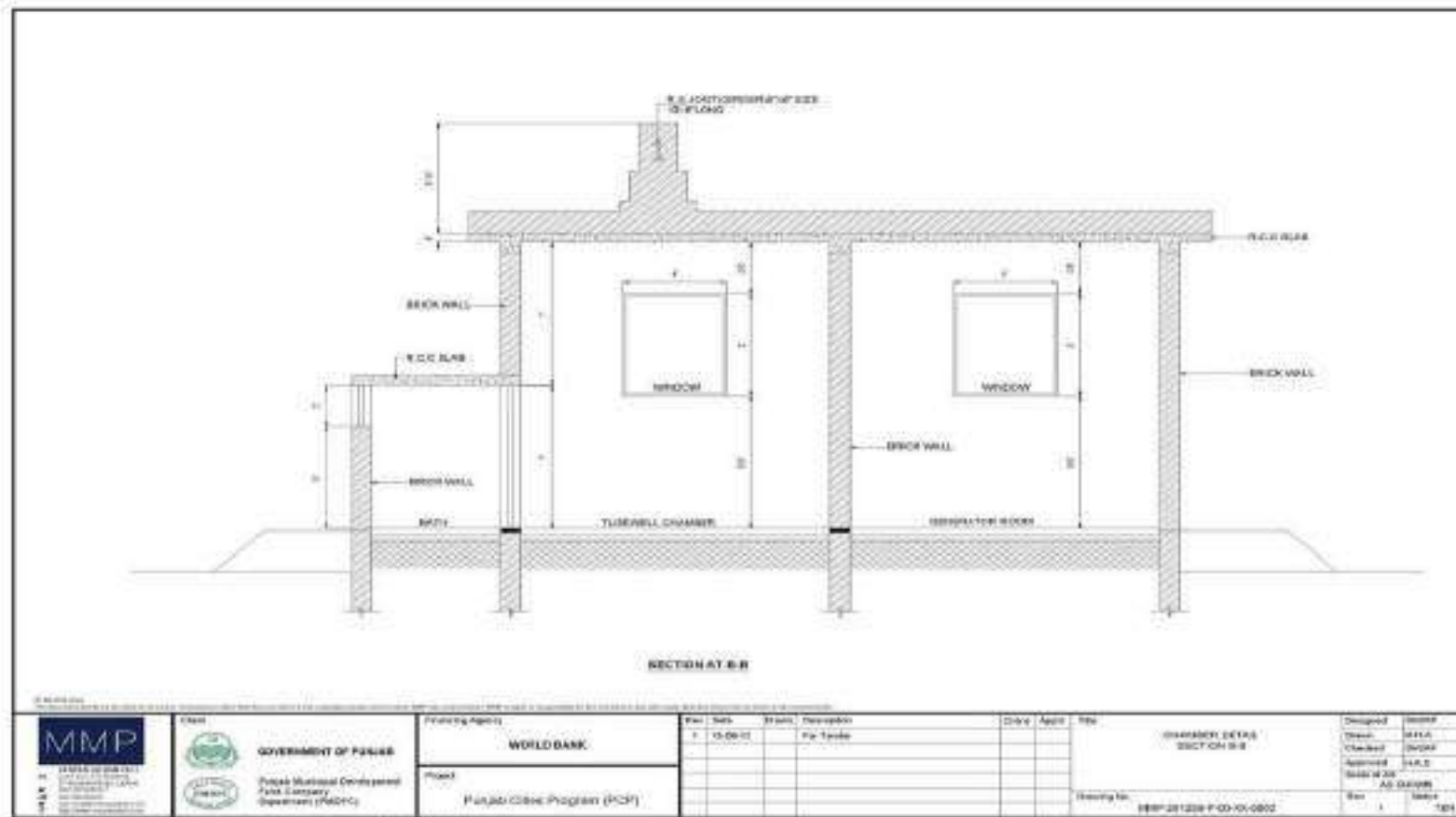
Drawings and Maps

Annexure F



Drawings and Maps

Annexure-F



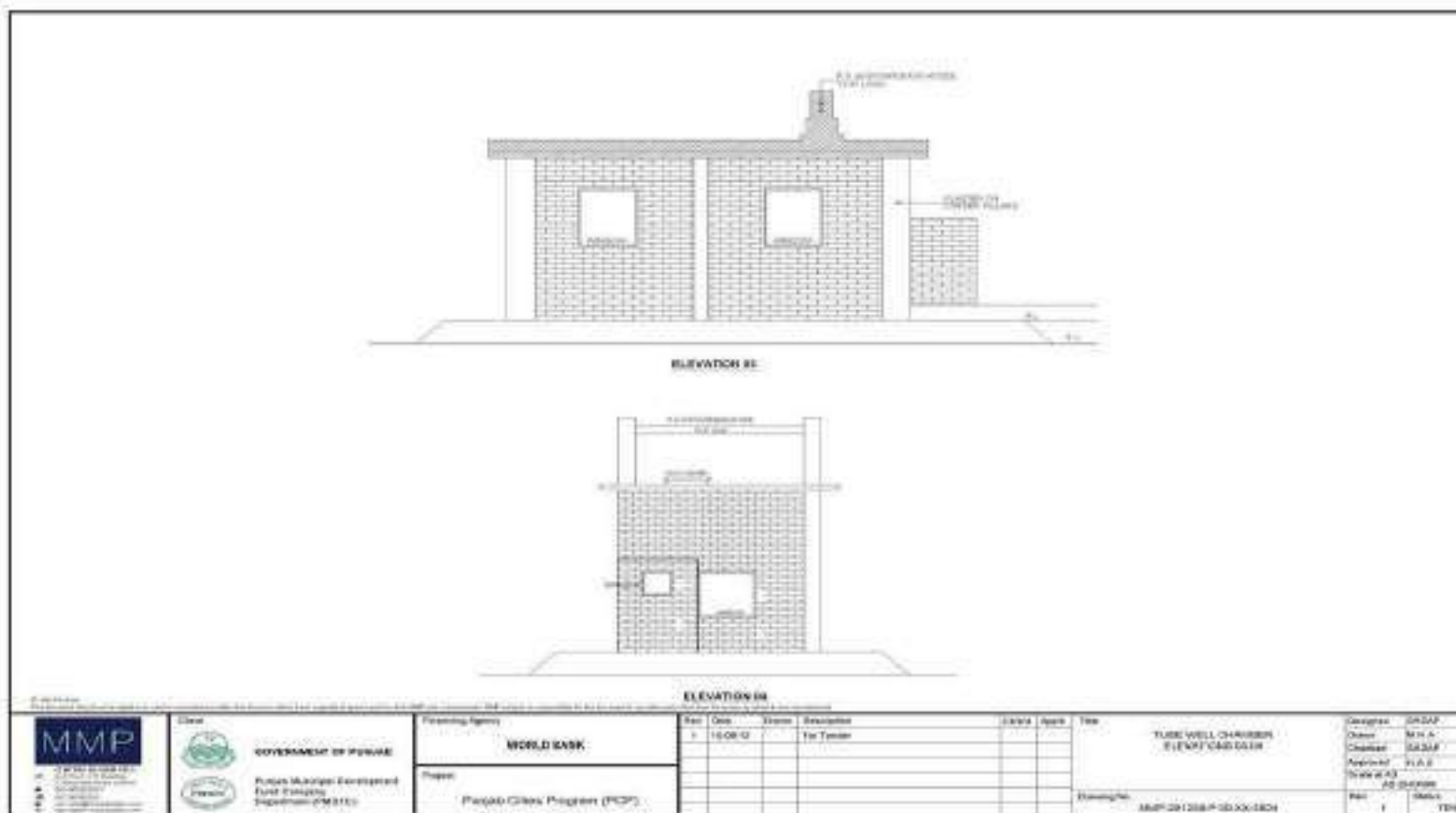
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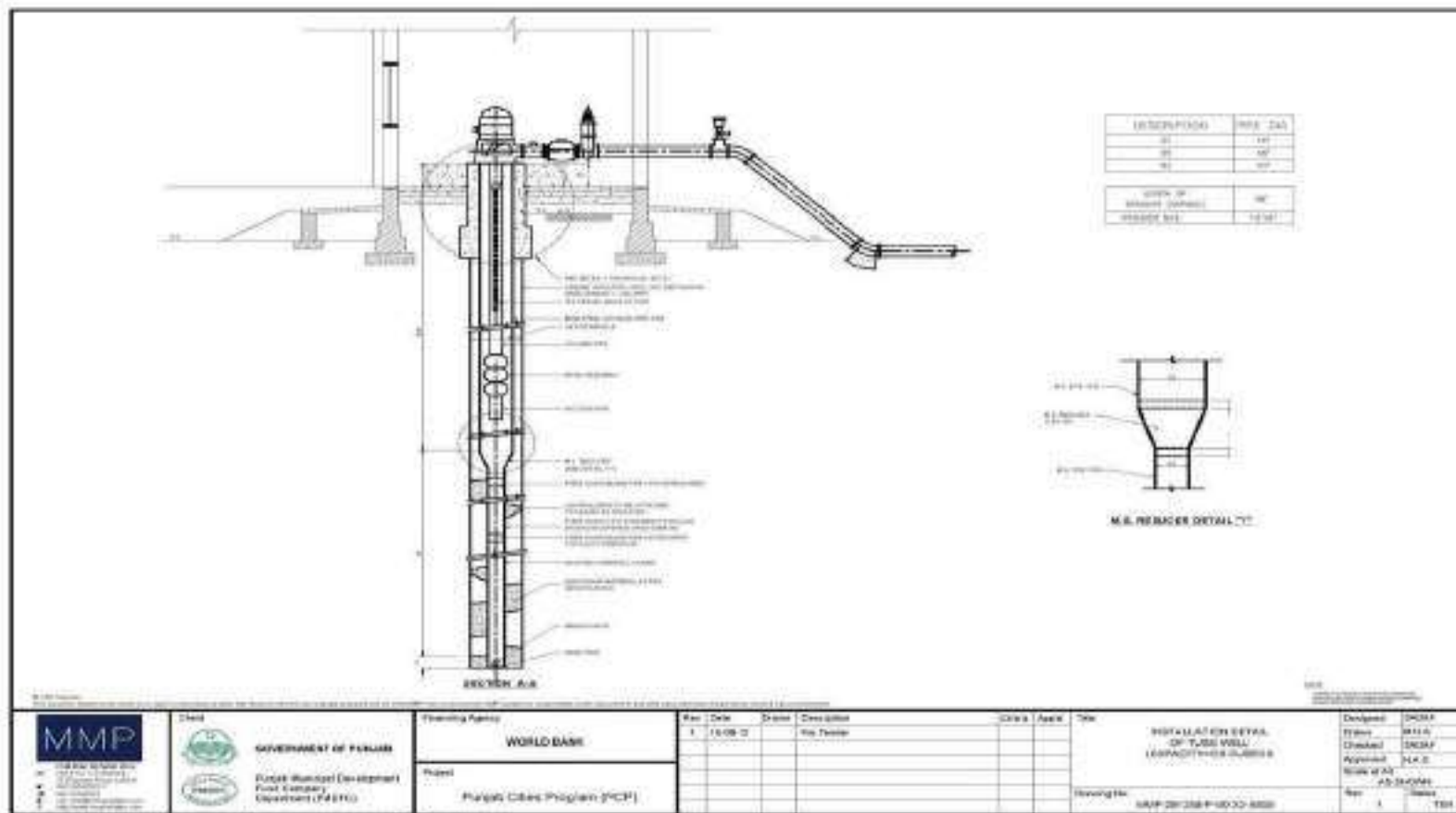
Drawings and Maps

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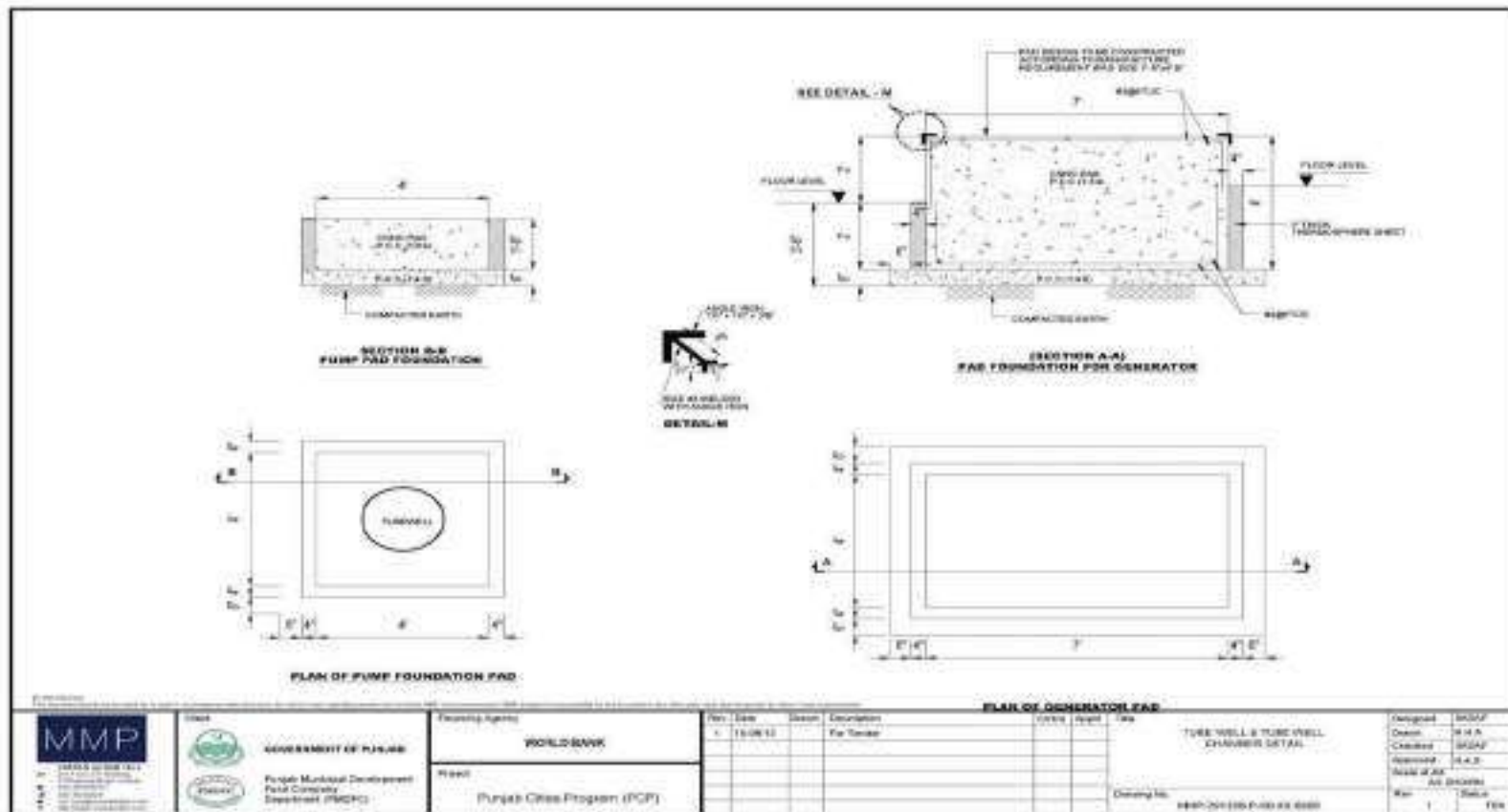
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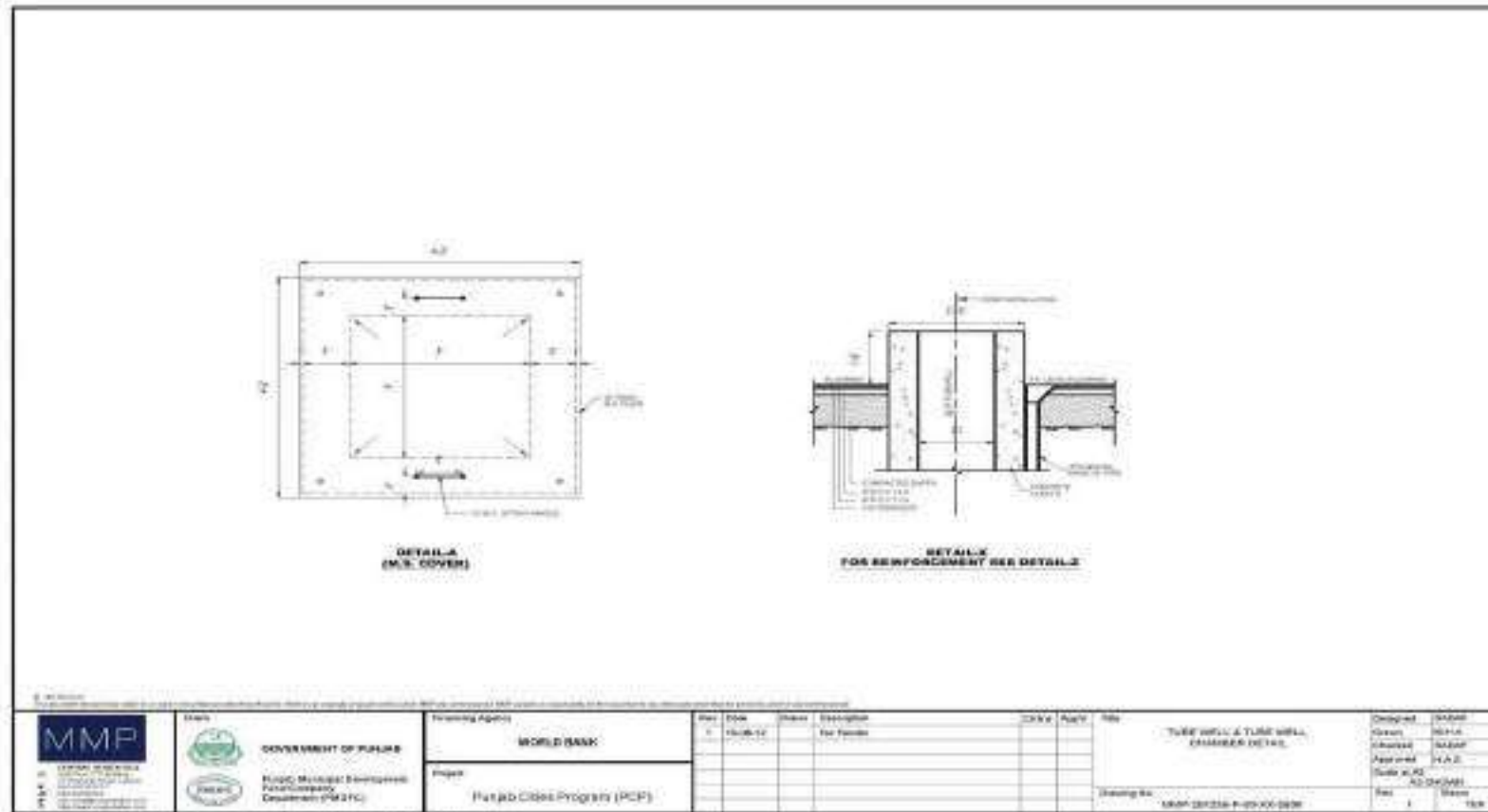
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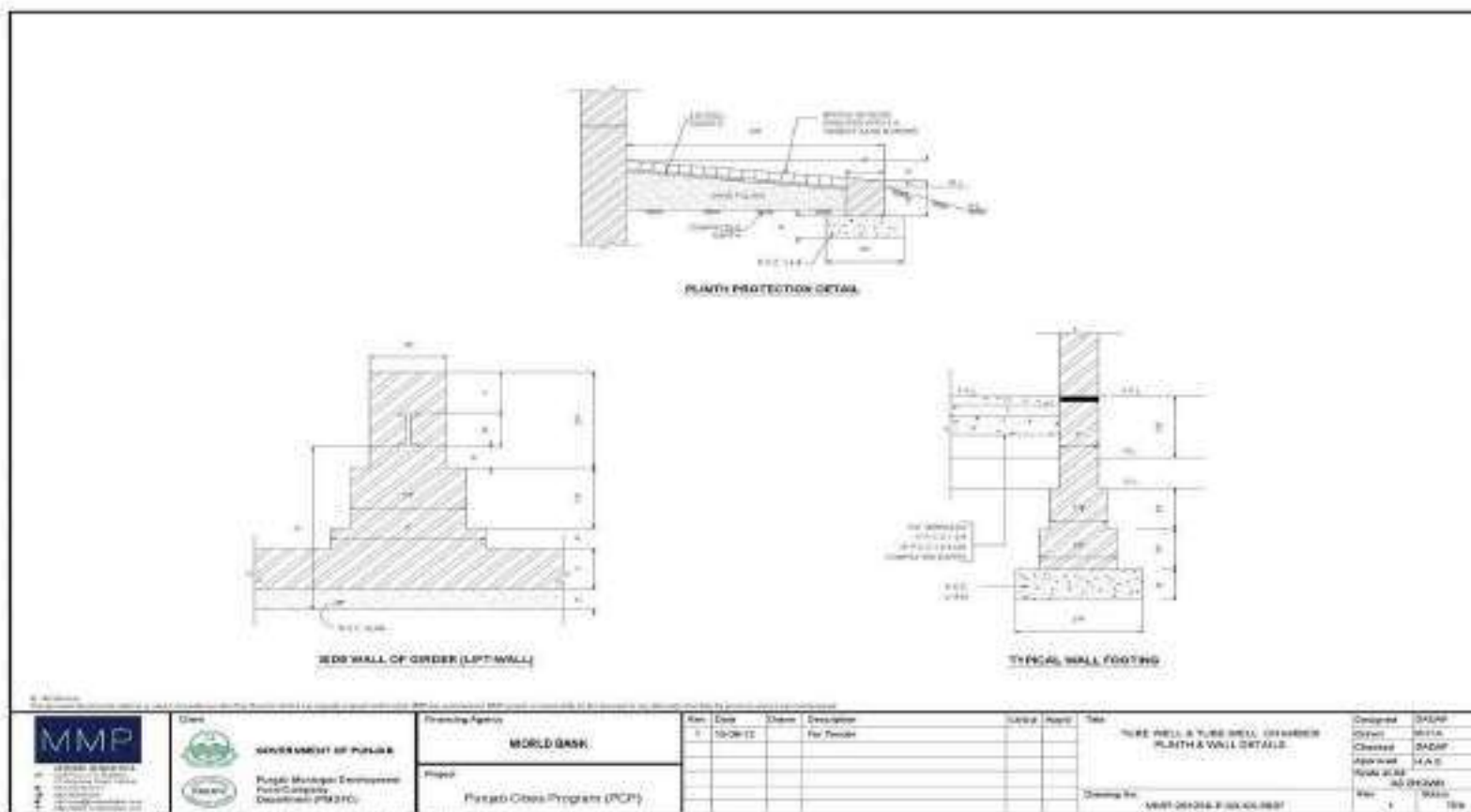
Drawings and Maps

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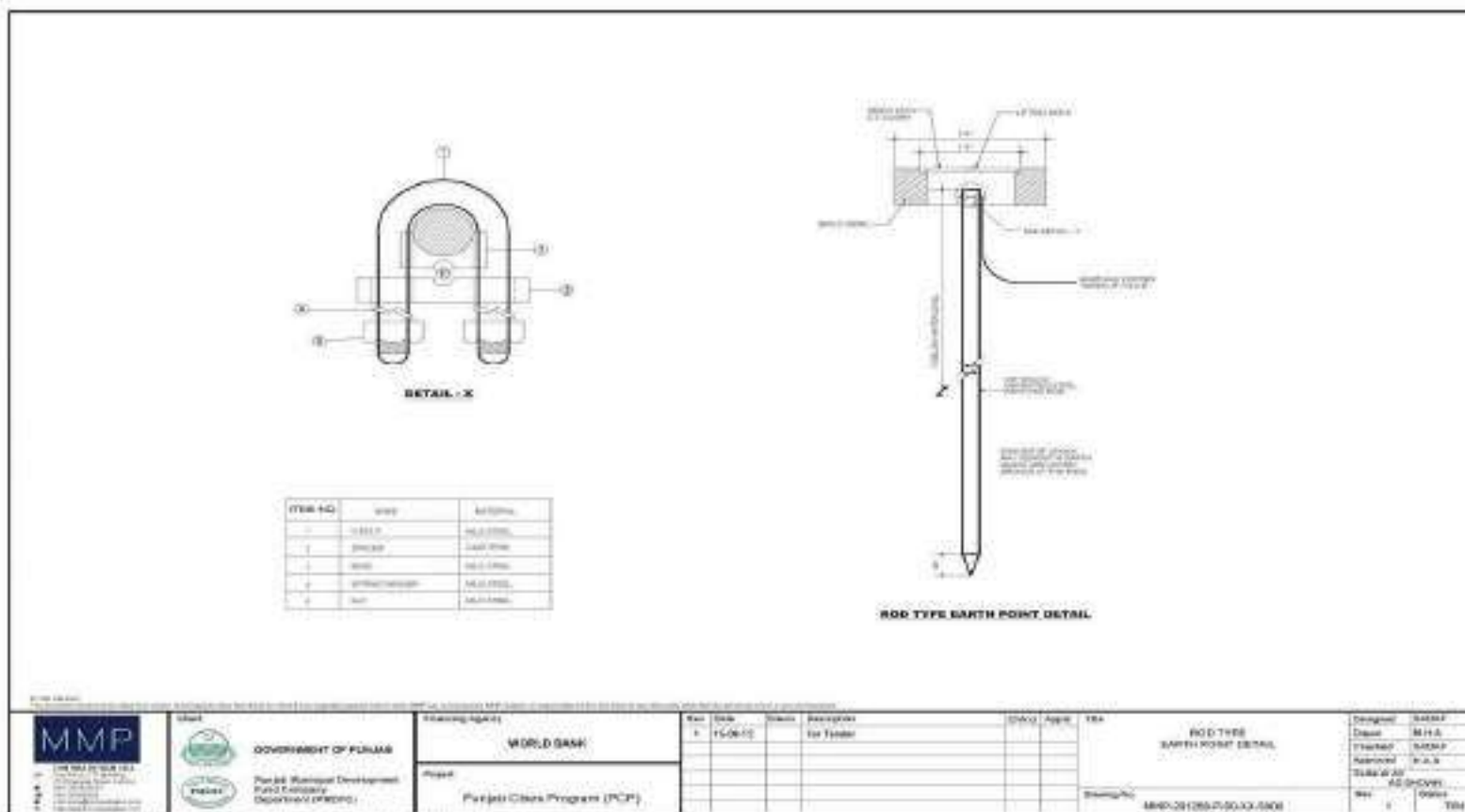


Drawings and Maps

Annexure-F

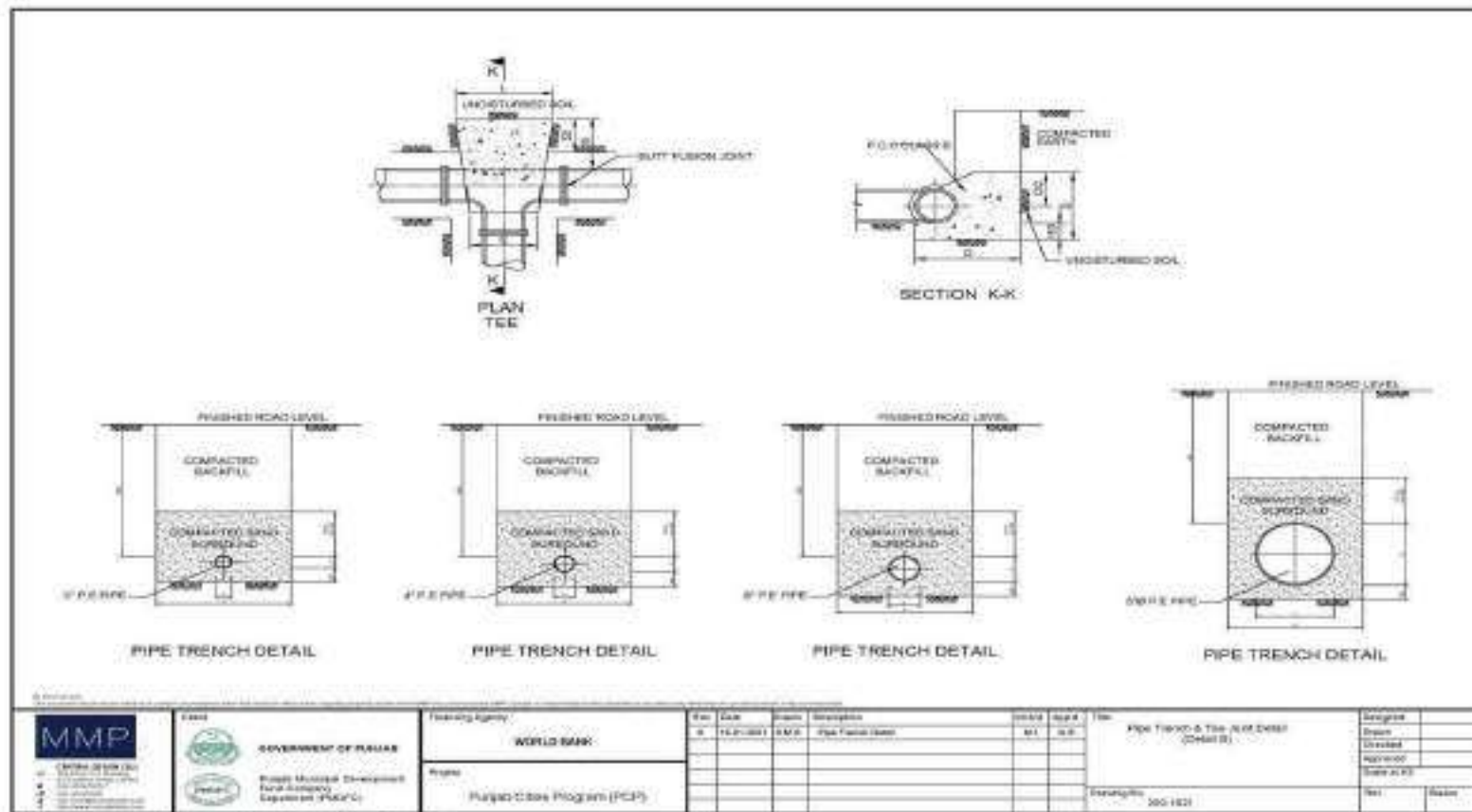


Annexure-F



Drawings and Maps

Annexure-F



Drawings and Maps

Annexure-F

