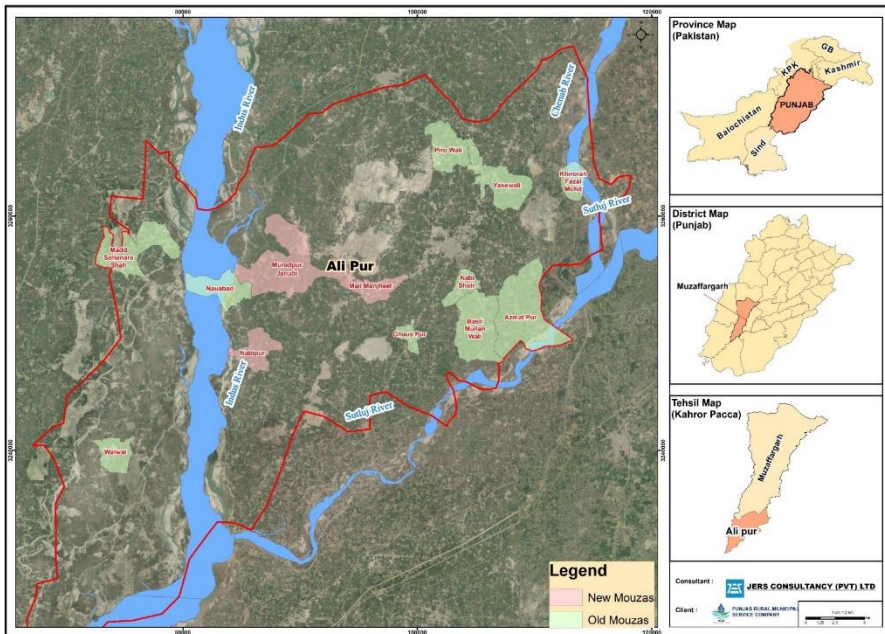




Punjab Rural Municipal Services Company (PRMSC)

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIA)

Draft Report



PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT (PRSWSSP) PILOT PHASE, CLUSTER SOUTH-II.

Revenue Villages of Tehsil Ali Pur, District Muzaffargarh

June 2023



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GUIDELINES FOR PREPARATION AND REVIEW OF ENVIRONMENTAL REPORTS

CHECKLIST

Clause No.	Requirements for Preparation and Review of Environmental Reports	Page No./ Section of IEE/EIA Report
2	Commencing Environmental Assessment	
2.3	Format of Report: Report should contain:	
2.3 (A)	Executive Summary, which should contain:	
	1. Title and location of the project	Page 1
	2. Name of the proponent	Page 1
	3. Name of the organization preparing the report	Page 1
	4. A brief outline of the proposal	Page 1
	5. The major impacts	Page 6
	6. Recommendations for mitigation measures	Page 7
	7. Proposed monitoring	Page 7
2.3 (B)	Introduction should include:	
	1. Purpose of the report	1.2
	2. Identification of the project and proponent	1.3
	3. Details of the consultant	1.3
	4. Brief description of nature, size and location of project	1.4, 1.5
2.3 (C)	Description of project should include:	
	1. Type and category of project	3.1
	2. Objectives of project	3.2
	3. Alternatives considered realistically (in detailed) and reasons for their rejection	Section 4
	4. Location and the site layout of the project (may be annexed at the end of report)	3.3
	5. Land use on the site	3.4
	6. Road access	3.5
	7. Vegetation features of the site	3.6
	8. Cost and magnitude of operation	3.7
	9. Schedule of implementation	3.8
	10. Description of the project (Process Flow Chart/ Steps)	3.9
	11. Restoration and rehabilitation plans	3.11
	12. Government approvals	3.12
2.3 (D)	Description of Environment should include:	
	1. Clear cut picture of existing environmental resources: Physical	Section 5

Clause No.	Requirements for Preparation and Review of Environmental Reports	Page No./ Section of IEE/EIA Report
	- Ecological - Socioeconomic	5.1
		5.2
		5.3
	2. Quality of life values	5.3.3
	3. Lab reports of environmental analyses	5.1.7, 5.1.8
2.3 (E)	Screening of potential Environmental Impacts and mitigation measures should include Environmental parameters regarding:	
	1. Project location	
	2. Design	7.3
	3. During construction Phase	7.4
	4. During operational phase	7.5
	5. Potential Environmental Enhancement Measures	7.6
2.3 (F)	Environmental management and monitoring program should include	
	1. Institutional capacity	8.2
	2. Training schedule	Table 8.2
	3. Summary of impacts and their mitigation measures	
	4. Equipment maintenance details	8.5
	5. Environment budget	8.6
2.5	Involvement of stakeholder/public consultation: (For EIA only) Communicate the possible impacts and concerns to assist further analysis and decision making	
	1. Proponent	Details Are Present in Chapter 6 of The Report i.e. "Stakeholder Consultation".
	2. The responsible authority	
	3. Other department and agencies	
	4. Environmental practitioners and experts	
	5. Affected and wider community	
2.7	Site Selection should include: sustainability of the site (will not be prohibited, environmentally sensitive, incompatible to surroundings and unsuitable)	included
3	Assessing Impacts (For EIA only)	
3.2	Identification of all impacts	Matrices and Checklist provide in Chapter 7 of Impact Assessment
3.2 Table 2	Methodologies for impact identifications (one/more)	
	1. Checklist	
	2. Matrices	
	3. Networks	
	4. Overlays	
	5. GIS and computer expert system	
3.3 and 3.6	Impact analysis and prediction (one/more)	

Clause No.	Requirements for Preparation and Review of Environmental Reports	Page No./ Section of IEE/EIA Report
	1. Meetings	
	2. Workshops	
	3. Consultations/ case studies	
3.5	Characteristics of impacts (nature, magnitude, extent and location, timing, duration, reversibility, risk)	Section 7
3.10	Impact Significance: acceptable, require mitigation or are unacceptable to the community	Section 7 & 8
	1. Ecological importance	
	2. Social Importance	
	3. Environmental standards	
4	Mitigation and Impact Assessment	
4.1	Purpose of mitigation measures should include:	
	1. What is the problem	7.1
	2. When will problem will occur and when it should be addressed	7.1
	3. Where problem should be addressed	7.1
	4. How the problem should be addressed	7.1
4.2	Whys of achieving mitigation measures	7.2
	1. Changing in planning and design	7.2.1
	2. Improved monitoring and management practices	7.2.4
	3. Compensation in money terms	7.2.2
	4. Replacement, relocation and rehabilitation	7.2.3
4.3	Prepare an environmental management plan	8.4
5	Reporting	
5.1	Clear reporting style supported by maps or other descriptive details	✓
5.2	Specific terms of references should be present in report	✓
5.2	Appendices	
	1. Glossary	✓
	2. List of abbreviations	✓
	3. List of individuals and organizations consulted along with their written feedback	✓
	4. Sources of data and a full list of all reference material used	✓
	5. List of names, qualifications and roles of team members carrying out the IEE /EIA study	✓

List of Abbreviations

AOI	Area of Influence
AQI	Air Quality index
ABR	Anaerobic Batch Reactor
BDL	Below Detectable Limit
CC	Construction Contractor
CO	Carbon monoxide
dB	Decibels
DG	Director General EPA
Dia	Diameter
EIA	Environmental impact Assessment
EMP	Environmental Management Plan
EMMP	Environmental Management and monitoring Plan
ESMP	Environmental and social Management Plan
Ft	feet
Fig	figure
GOP	Government of Punjab
HSE	Health and Safety engineer
IEE	Initial environmental examination
Km	kilometers
LGO	Local government organization
LAA	Land acquisition act
LLR	Low level reservoir
MSDS	Material Safety data sheet
NEQS	National Environment quality standards
NCS	National Conservation Strategy
NSL	Natural Surface Level
NOx	Oxides of Nitrogen

NOC	Environment and Social Management Plan
OHR	Environmental Protection Agency
EHS	Environment Health and Safety
HDPE	High Density Polyethylene
hp	Horse Power
Kw	Kilowatt
MICS	Multiple Indicator Cluster Survey
MSW	Municipal Solid Waste
Mm	Millimeter
MRS	Market rate System
O&M	Operation and Maintenance
LG&CD	Local Government and Community Development
NRW	Non-Revenue Water
OHR	Overhead tank
OP	Operational Policy
IFC	International Finance Corporation
PRMSC	Punjab Rural Municipal Services Company
PRSWSSP	Punjab Rural Sustainable Water Supply & Sanitation Project
PSLM	Pakistan Social Living Standards Measurement
PDSSP	Punjab Devolve Social Services Program
PHED	Public Health Engineering Department
RCC	Reinforced Cement Concrete
RO	Reverse Osmosis
PEPA	Pakistan Environmental Protection Act
SWM	Solid Waste Management
TS	Transfer Station
uPVC	unplasticized polyvinyl chloride.



VLD	Voluntary Land Donation
WB	World Bank
WW	Waste water
WS	Water Supply
WWTP	Wastewater treatment Plant
WASH	Water, Sanitation and Hygiene
UNICEF	United Nations Children's Fund

Glossary

ANAEROBIC BAFFLED REACTOR (ABR): An anaerobic baffled reactor (ABR) is an improved Septic Tank with a series of baffles under which the grey-, black- or the industrial wastewater is forced to flow under and over the baffles from the inlet to the outlet .

AQUIFER: An aquifer is an underground layer of water-bearing, permeable rock, rock fractures, or unconsolidated materials. Groundwater from aquifers can be extracted using a water well.

CHLORINATION: Chlorination is the process of adding chlorine to drinking water to kill parasites, bacteria, and viruses.

EIA (Environmental Impact Assessment): It is the process of identifying, predicting, evaluating and mitigating of effects of biophysical, social and other relevant proposed projects and physical activities prior to major decisions and commitments being made.

EMP (Environmental Management Plan): An EMP is a site-specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation.

ESIA (Environmental Social Impact Assessment): It is to identify the impacts of the project on social and environmental conditions.

FAUNA: Word used for combination of all the species of animals.

FLORA: Word used for combination of all the species of plants.

IEE (Initial Environment Examination): Initial examination of projects for identification of hazards of project.

ISO (International Organization for Standardization): The International Organization for Standardization is an international standard-setting body composed of representatives from various national standards organizations.

NCS (National Conservation Strategy): Three objectives of the National Conservation Strategy (NCS) are: (i) conservation of natural resources; (ii) sustainable development; and (iii) improved efficiency in the use and management of resources.

NOC (No Objection Certificate): It is a kind of clearance issued by EPA necessary for any project to be constructed.

OHSAS (Occupational Health and Safety Assessment Series): It is an international standard for occupational health and safety management systems.

PEPA (Pakistan Environmental Protection Act 1997): An act to provide the protection, conservation, rehabilitation and improvement of environment, for the prevention and control of pollution and promotion of sustainable development.

TOPOGRAPHY: Physical features of any area including soil, water and air are called topography.



TUBEWELL: A tube well is a type of water well in which a long, 100–200 millimetres-wide, stainless steel tube or pipe is bored underground. It is used to extract groundwater.

RESERVOIR: It is an open-air storage area (usually formed by masonry or earthwork) where water is collected and kept in quantity so that it may be drawn off for use. Reservoirs are an important feature of many water supply systems around the world.

SEWERAGE: Sewerage is the infrastructure that conveys sewage or surface runoff using sewers.

Executive Summary

Consultant:	JERS Consultancy (PVT) LTD.
Location of the project	Tehsil Ali Pur, District Muzaffargarh
Proponent:	Punjab Rural Municipal services Company, Govt of Punjab
Title of the Project:	Punjab Rural Sustainable Water Supply & Sanitation Project (PRWSS), Cluster South-II” for ten Revenue Villages of Tehsil Ali Pur, District Muzaffargarh .

1. Introduction

The executive summary presents an overview of the main findings of Environmental Impact Assessment (EIA) of the project of “Punjab Rural Sustainable Water Supply & Sanitation Project (PRWSS) , Cluster South-II” for ten Revenue Villages of Tehsil Ali Pur, District Muzaffargarh.”.

The Government of Punjab aims to expand the access to clean facility drinking water and to improve sanitation particularly in rural areas of Punjab. The Punjab Rural Sustainable Water Supply and Sanitation Project (PRSWSSP) will help upgrade water supply and sanitation infrastructure and services that ensure equitable and sustainable access to drinking water and safe wastewater management. The project prioritizes rural settlements of Punjab, where water contamination and poor sanitation practices are more prevalent, causing high levels of illness and child stunting. The project will implement tailored, cost-effective solutions for both large and small rural settlements, using scalable technologies that help facilitate solid and animal waste management at the household and community levels. It will also establish a water-quality monitoring system to ensure compliance with national and provincial standards for drinking and waste water.

The PRSWSSP will promote safe water handling, hygiene, and water conservation practices at the household level, with a focus on maternal, newborn and child health. District Muzaffargarh is situated in the southern part of Punjab Province and spread over an area of 8,249 sq.km. The District is located between 28°57' to 30°46' north latitude and 70°30' to 71°47' east longitude. Geographically, District D.G. Khan and Rajanpur are located on east, District Multan, Bahawalpur and Rahim Yar Khan on West, District Layyah and Rahim Yar Khan are located in the north and south of the district respectively. District Muzaffargarh consists of four tehsils namely Muzaffargarh, Kot Addu, Jatoi and Ali Pur, while these tehsils are divided into 111 union councils and 986 Mouza's respectively. Alipur is a city and Tehsil of Muzaffargarh District in the Punjab province. The city is subdivided into 14 Union Councils. It has a population of over 398,053.

The entire district is smooth plain with elevation ranging from 111 to 131 meters. The average rainfall in the district is 45 mm. Much of the area of Muzaffargarh is dry or arid and consists of sand dunes and barren lands known as Thal area while other parts of the area whether flooded from the river or irrigated by inundation canals is less dry. The temperature ranges generally from 25-43°C in summer and 10-32°C in winter. Ali pur tehsil of Thal Doab underlain thick sandy material of varies grade with intercalation of clayey layers of various thickness and extension. The study of drill cuttings and electric logs has shown thick sandy material extends down up to more than 200 meters(600ft) with intercalation of clay layers of varying depth, thickness and extension. In spite of heterogeneous nature of materials, the aquifer overall behaves as single homogeneous water body under water table condition.

The main water source of Ali pur is ground water. The water table is shallow approximately 10 ft. to 20 ft. depth from natural ground surface. The shallow groundwater quality is fresh to marginal in the central part of the tehsil area. The groundwater quality is fresh in eastern areas of tehsil along Chenab River and poor in western tehsil area along Indus River. The water supply tubewells can be installed up to 70 to 200 meters as recommended by Electrical Resistivity Survey in tehsil Mouzas located on left bank of Indus River.

The initial estimated capital cost for the sub-project is approximately PKR 2.2 billion whereas environmental budget is approximately PKR 14 million.

2. Brief Outline of the Proposal

The purpose of this report, environmental and social baseline data and conditions at/ around the project site has been undertaken. The data has been gathered from different sources of information including consultation with the locals, private visits, field surveys, desktop studies and existing information sources. Interviews with the people near the project has been conducted to collect their opinion regarding to the project after findings it has been concluded that project will not have any adverse impact on the socio-economic environment of the existing community or environment. As the project is provision of clean drinking water and Sanitation in rural areas so the functioning of the project would not be the reason of nuisance for the nearby community. Moreover, project will have and positive impact in term of employment opportunities, will create jobs during construction and operational phase and will contribute to the national economy by meeting the demands. Most of the predicted impacts are insignificant and other are of limited nature, so far this regard necessary mitigation measure and improvement have been suggested and proposed.

In this EIA report, a brief introduction to Punjab Rural Municipal Services Company is presented and need of project is highlighted. Report examines the policy and legal framework of this project. It also establishes the baseline conditions in the project area and then assess the impact of project. The proposed option For settlements having less than 40 households, only behavior change and communication campaign will run in the respective settlements and no water and sanitation infrastructure will be provided; In the settlements above 150 HHs, the wastewater collection will be done through pipes and wastewater treatment facilities i.e., ABR, packed tower trickling filters, or BTFs will be proposed.

Proposed water supply system in Mouzas will comprise of water source, water treatment, pump house, transmission main, overhead reservoir, water distribution system, stand posts and allied structures.

Proposed sewerage system shall consist of sewage collection pipe network, sewage treatment, sewage disposal system and allied structures. For the collection of sewage, Consultant has gone through various sewage collection options for selected model mouzas. The options include but not limited to the following;

1. RCC Lateral Sewers
2. uPVC Sewer Pipeline (with 8-inch diameter)
3. uPVC Sewer Pipeline (with 6-inch diameter)

For the treatment of sewage, the Consultant has studied the options of stabilization ponds, septic tanks with soakage wells and anaerobic baffled reactor (ABR). Sewage after treatment shall be disposed into nearby water course for onward agriculture use.

Solid waste management system shall consist of hand carts, collection containers / bins, MiniTippers and solid waste enclosures.

Report further concludes that project is environmentally feasible and also desirable for the public. The study concludes that the sub-project does not involve any long term irreversible negative impacts. Most of the negative impacts identified in the study are temporary and manageable through adopting the Environmental Management Plan, by providing monitoring arrangements and resources during design, construction and operation stages of the project.

3. Legal and Administrative Framework

This EIA has been prepared to address the requirements defined in the national and provincial regulations and policies. Punjab Environment Protection Act 2012 being as principal legislation of environmental protection in Punjab Province envisages protection, improvement, conservation and rehabilitation with the help of legal action against polluters and green awakening of communities. The Act is applicable to a broad range of issues and extends to socioeconomic aspects, land acquisition, air, water, soil, marine and noise pollution, as well as the handling of hazardous waste. The discharge or emission of any effluent, waste, air pollutant or noise in an amount, concentration or level in excess of the National Environment Quality Standards (NEQSS) or Punjab Environmental Quality Standards (PEQSS) specified by the Punjab Environment Protection Agency (PEPA) are prohibited under the Act. Section 11, 13, 14, 15, 16 and 17 of PEPA will be applicable on PRSWSSP interventions. It is expected that no sub-projects will fall under E-1 category as per requirements of Section 12 of PEPA Act, 2012 and or Schedule I and II of PEPA Review of IEE/EIA Regulations 2000 (Amended 2022). In addition, the Environmental and Social Management Framework Has been developed. ESMF addresses the requirements detailed in the WB Operational Policies (OPs) addressing environmental and social aspects and considerations. PRSWSSP has been categorized as Category B. The World Bank's Operation Policy 4.01 (OP 4.01) requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. The OP defines the EA process and various types of the EA instruments and PRSWSSP will comply with all the processes and procedures of this OP. The project activities however do not trigger other safeguard policies such as OP 4.04 for natural habitat, OP 4.36 for forestry, OP 4.09 for pest management, OP 4.37 for safety of dams, , OP 4.11 for Physical Cultural Resources, OP 4.10 for indigenous people, OP 7.60 for projects in disputed areas. While OP 7.50 for projects in international waterways is triggered as the project is situated in the Indus Basin and relies on the waters of the Indus basin aquifer and the Indus River, transboundary waterways. OP 4.12 for involuntary resettlement is also triggered for the subprojects where land acquisition will be required on a larger scale, anyhow, it is expected land acquisition on a small scale will be required for some of the sub-projects interventions which will be acquired on voluntary basis through Voluntary Land Donation (VLD) procedures of WB. Other relevant policies and WB Guidelines e.g., labor influx guidance note (2016), policy on access to information and Gender Based Violence (GBV) and IFC Guidelines on Environment, Health and Safety and COVID-19 Considerations in Construction / Civil Works Projects (during pandemic) will also be applicable during execution of PRSWSSP proposed interventions funded by WB.

4. Criteria for Impacts Characterization

Table 0.1 Criteria for characterization of impacts

Sr. No.	Impacts Characteristics	Categories
1	Nature of the Impact	Direct: The environmental parameter is directly changed by the project.
		Indirect: The environmental parameter changes as a result of change in another parameter.
2	Duration of the impact	Short Term: Lasting only till the duration of the project such as noise from the construction activities.
		Medium Term: Lasting for a period of few months to a year after the project before naturally reverting to the original condition.
		Long Term: Lasting for a period much greater than medium term impacts before naturally reverting to the original condition.
3	Geographical location of the impact	Local: Within the area of project i.e. operation site and access road.
		Regional: Within the boundaries of the project area.
		National: Within the boundaries of the country.
		Global: Trans-boundary impacts
4	Timing	Construction and Operation
5	Likelihood of the impact	High: High likelihood of occurrence during lifetime of operation, Regular/continuous part of operations.

		Moderate: Moderate possibility of occurrence during lifetime of operation, Periodic/occasional part of operations.
		Low: Unlikely to occur during lifetime of operation.
6	Reversibility of the impact	Reversible: When a receptor resumes its pre-project condition.
		Irreversible: When a receptor does not or cannot resume its pre-project condition.
7	Significance of the impact	Major, Moderate, Minor, Negligible and Beneficial; Based on the consequence, likelihood, reversibility, geographical extent, duration, level of public concern and conformance with legislative or statutory requirements.
8	Consequence severity of impact	High: Serious/catastrophic damage to environment
		Medium: Measurable damage to the environment, potential to reduced efficiency

5. The Major Impacts and Mitigation Measures

The EIA Report comprises baseline data on the existing condition of the physical and biological environment, the anticipated environmental impacts, and proposed mitigation measures. Field surveys were undertaken to assess the physical and biological environment. Data has been collected from secondary sources to supplement the findings of the field survey. All the issues such as the ecology, management of construction, shelter and sanitation, use of equipment and machineries, environmental health and safety, occupational hazard, social and environment management and monitoring plan have been dealt with in detail in the respective sections of the report.

Mitigation measures have been proposed in the EIA based on the selection and siting of construction sites to reduce this impact. Various trainings have been proposed for the Contractor to ensure the implementation of proposed mitigation measures. Further, the sub-project area does not fall in wildlife habitat and does not cause any large scale or irreversible adverse impacts directly. There are no major adverse impacts related to operation phase, and impacts will be temporary, localized and reversible in nature. Primarily, environment & social impacts are associated with construction activities as occupational health safety, temporary

noise and air pollution, solid waste pollution for which proper mitigation measures are proposed in chapter seven. No labour camps are required as house on rent or guest house would be available for accommodation close to the sites.

Impacts associated with biodiversity, air quality, soil, solid waste, labour health and safety, public convenience and safety, Physical Cultural Resources and land acquisition were assessed for design, construction and operational phase. These were found to range from low to medium in nature. Suggested mitigation measures are proposed in Section 7 and 8 of the EIA. These mitigation measures are proposed to significantly reduce the identified potential environmental and social impacts associated with sub-project activities. The mitigation measures include the use of PPEs by labor, water spraying for dust control, limiting noisy activities during day hours, fencing of construction area, and safety measures for prevention of COVID-19.

6. Recommendations for Mitigation Measures

The intensity and severity of impacts, foreseen due to the construction and operation of the Project vary with change in the nature and magnitude of the impacts as well as depend upon the baseline environmental conditions of the area. The mitigation measures during construction phase will require implementation of EMMP in letter and spirit. Other mitigations to reduce the adverse environmental impact will be:

- The adverse environmental impacts will be significantly minimized by adopting best management and monitoring practices as well as by implementation of EMMP effectively.
- It is also recommended that the Proponent should obtain an Environmental Approval (NOC) from the Punjab-EPA before proceeding further into the construction and operational activities.

7. Proposed Monitoring

An environmental management and monitoring plan provide a delivery mechanism to address the potential environmental impacts of a Project during its construction and operational phases, to enhance project benefits, and to introduce health and safety standards of good practice to be adopted for project.

This process requires proper monitoring to report any performance or any mitigation measurement during the construction and operational phases. Environmental monitoring will be carried out to ensure that all the construction activities comply and adhere to the environmental provisions and standard specifications, so that all mitigation measures are implemented. The proponent will ensure the proper implementation of mitigation measures for the concerned operation and maintenance phase through adequate monitoring. The proposed management and monitoring plan for proposed project is given below:

Table 0.2: Summary of Proposed Monitoring Plan

Components	Parameters	Location	Frequency	Responsibility	Duration
Construction Phase					
Ambient Air Quality	CO, NO _x , SO _x , PM ₁₀	Centre Point of Construction area	Once-off	Construction Contractor and PRMSC	24 hours
Noise Level	-	Nearby Receptors	Once-off	Construction Contractor and PRMSC	Reading taken at 15 Sec. Intervals over 15 min, every hour and then averaged
Ground Water Quality	For parameters given in PEQs	Nearby Receptors	Once-off	Construction Contractor and PRMSC	-
Operational Phase					
Air Quality	CO, NO _x , SO _x , PM ₁₀	Nearby Receptors	Quarterly	PRMSC	24 hours
Ground Water Quality	Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Enterococci/ Streptococci, Conductivity, Carbonates, Bicarbonates, Arsenic, Chloride, Fluoride, Manganese, Iron, Nitrates, Nitrites, pH, TDS, Sulfate, Ammonia,	Sample from Source Water and end point	Annually	PRMSC	-

Components	Parameters	Location	Frequency	Responsibility	Duration
Construction Phase					
	Copper, Magnesium, Phenol, Zinc, DO				
Wastewater quality	For parameters given in PEQs	Influent and effluent of ABR	Once - off	Construction Contractor and PRMSC	—
Noise Level	-	Nearby operational Facility	Quarterly	PRMSC	24 hours

8. Conclusion

Environmental Impact Assessment Report concludes that the setting up of project and the associated activities will not lead to any major adverse environmental effect. The minor and short term impacts can be mitigated as illustrated in the report. Tehsil area is mostly underlain by freshwater aquifers, especially close to major canals. Water quality in all mouzas was studied. It has been concluded from the water quality reports that seeped ground water near the canals was biologically contaminated but no heavy metal or hazardous chemical pollution was observed. The ground water (extracted via shallow and deep tube-wells) can be used for the potable purposes after its disinfection.

As the project is provision of clean water and sanitation in rural areas so the functioning of the project would not be the reason of nuisance for the nearby community. Moreover, project will have and positive impact in term of employment opportunities, will create jobs during construction and operational and will help in achieving the UNDP Sustainable Development Goal 6 for clean water and sanitation. Therefore, the project will not add to degradation of the environment at the Project Area. The proposed project is considered viable, of enormous potential benefits and environmentally friendly, as supported by this EIA report. Accordingly, the EIA in the present form may be approved.

It is recommended that the proponent should obtain an environmental approval (No Objection Certificate) from the Punjab-EPA before proceeding further into the construction activities as per regulatory requirements.

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1 INTRODUCTION

This chapter presents the back ground of the project, its purpose and brief account. It also describes the structure and scope of this report.

1.1 Project Background

Pakistan is the world's sixth most populous country with 208 million people – nearly one-third of whom remain poor. Periodic macroeconomic crises and a low human capital basis have constrained the country's growth prospects. Over the last two decades, economic growth in Pakistan has averaged at 4.4 percent a year, below the South Asian annual average of 6.3 percent. Low investment in human capital, slow progress of structural reforms, low private investment, and slow export growth due to an overvalued currency, among others, have hindered growth prospects. The country was making good progress in stabilizing its economy and implementing much needed structural reforms. However, the COVID-19 pandemic has significant negative impacts on the economy. The closure of businesses and disruption to the supply chains are significantly affecting the services and manufacturing sectors, which account for nearly 80 percent of total gross domestic product (GDP). The impact of the ongoing economic disruption is expected to contract GDP by 1.3 percentage points in FY20. Stunting among children under five is a fundamental health and development challenge in Pakistan. After four decades of stagnation, the country has made some progress in improving nutrition, but stunting rates remain very high. The latest Pakistan Demographic Health Service indicates a decline in child stunting from 44 percent in 2011 to 37 percent by 2018. The National Nutrition Survey (2018) indicates an overall stunting rate of 40 percent. These results are broadly consistent and reflect a stunting rate that is exceptionally high and at odds with the country's success in poverty reduction, the increase in household investments in WASH infrastructure, improvements in dietary diversity, even among the poorest, the reduction in open defecation and the institutional and policy focus on nutrition. Under the MDGs, access to water was measured in terms of the proximity of the water source to the home/dwelling and whether that source was considered "protected". No explicit attention was paid to the safety of the water source from bacterial and other chemical contaminants or the sustainability of the resource itself. Piped water access is higher in urban areas, though it has been steadily declining over the past two decades, in both urban and rural areas. By 2018, only 13 percent of rural households had access to piped water, as compared to 29 percent of urban households, but even where piped water was available, less than 4% was piped into dwellings. The rest was provided into a yard/plot (3.9 percent), into a point in the neighborhood (1.8 percent), or via community level public taps (3.6 percent). Further, only a third of those with access to piped water had running water available for more than 6 hours a day. Access to improved sanitation is still quite low across rural Punjab. As is the case with improved water, "improved" sanitation is an MDG indicator that was focused on ending open defecation and thus most types of latrines, in/near households get included in some type of improved sanitation tracking. Overall, among rural households in Punjab, 73 percent are seen as having access to improved sanitation. However, only 4.9 percent have access to flush/pour-flush latrines connected to a sewer system, and another 50 percent have access to flush/pour-flush

latrines connected to septic tanks with any overflow leading to a communal drain. These can be relatively safe if properly engineered and the sludge properly disposed of. The WASH-Poverty Diagnostic (2018) found that due to the absence of regulatory oversight and the absence of any enforcement of design standards, septic tank toilets in rural Punjab are often little more than single tank closed pits. Even those with two or three tanks are often poorly designed and are manually emptied without any protection, with the fecal waste disposed into nearby water bodies or open spaces. Many are so poorly constructed that they routinely develop cracks – thereby contributing to groundwater contamination. The other types of toilets considered “improved” are variants of pit latrines which are clear contributors to groundwater contamination, particularly in areas where the water table is shallow. Of the remaining 27 percent, 7 percent use unimproved sources and close to 20 percent practice open defecation

The Government of Punjab aims to expand the access to clean facility drinking water and to improve sanitation particularly in rural areas of Punjab. The Punjab Rural Sustainable Water Supply and Sanitation Project (PRSWSSP) will help upgrade water supply and sanitation infrastructure and services that ensure equitable and sustainable access to drinking water and safe wastewater management. The project prioritizes rural settlements of Punjab, where water contamination and poor sanitation practices are more prevalent, causing high levels of illness and child stunting. The project will implement tailored, cost-effective solutions for both large and small rural settlements, using scalable technologies that help facilitate solid and animal waste management at the household and community levels. It will also establish a water-quality monitoring system to ensure compliance with national and provincial standards for drinking and waste water. The PRSWSSP will promote safe water handling, hygiene, and water conservation practices at the household level, with a focus on maternal, newborn and child health.

To implement this project Punjab Rural Municipal Services Company (PRMSC) has been established under Section 42 of Companies Act 2017.

1.2 Purpose of Report

This report is an environmental impact assessment study of Provision of safe drinking water and sanitation services project in ten Revenue Villages of Tehsil Ali Pur, District Muzaffargarh. This report aims to identify all the possible environmental impacts of the project and suggest mitigations measures.

This report has been prepared to conform to the requirements of the Punjab Environmental Protection (Amendment) Act 2012 (PEPA), 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 impact assessment, and has obtained from the Provincial Agency approval in respect thereof.”

The proponent feels its social, moral and legal obligation to protect environment. It is in this context that the company initiated the process of gaining Environmental Approval from the EPA, Government of Punjab. Accordingly, it on its own approached EPA for guidance in this

regard. According to the direction of the EPA, as detailed in the preceding para under "Introduction" this EIA is being submitted for issuance of the said Environmental Approval in compliance with the Punjab Environmental Protection Act -1997 (Amended 2012) Section 12.

The EIA report takes into account socio economic, physical, and environmental, land use, forestry, crops, water bodies, bio diversity (flora and fauna), heritage, and other relevant aspects associated with the project itself and the area around the project. The report also describes mitigation measures those will be adopted to undo environmental impacts on any segment of the environment i.e. human health and environmental health around the project site both during construction and normal operation of the project. The report provides relevant information, as required under the officially approved format, to help the decision makers (EPA Punjab in the Present case) before issuing the desired environmental approval.

1.3 Details of Proponent and Consultant

Name: Punjab Rural Municipal Services Company

Contact: 042-35962888

Email: Hussain.kamran@punjab.gov.pk

Address: Head Office, 5th Floor, KD Plaza, Opposite Zoom Petrol Pump, MM Alam Road, Lahore

- **Consultant:**

The proponent has engaged M/s Jers Consultancy (Pvt) Ltd to conduct the EIA Study for the establishment and enhancement of aforesaid project in accordance with Punjab-EPA guidelines. For this purpose, Jers Consultancy (Pvt) Ltd has engaged the group of professionals which comprises of environmental specialists and environmental engineers. The details of the consultants are given below:

Sr#	Consultant Details	
1	Consultant	JERS Consultancy (Pvt) Limited
2	Address	24 Civic Center St, Township Commercial Area Lahore
3	Contact No.	042-35113123

Team Composition:

This EIA study was carried out by the team of JERS Consultancy Pvt. Ltd. comprising of environmentalists, sociologist, environmental chemist, ecologist and sector experts with diversified experience on local and international assignments. The detail of the project team deputed on this assignment is given below:

Table 1.1 Project Team and their Responsibilities

Sr #	Name	Designation	Qualification	Role in EIA Study
1	Mr. Ahtisham Raza	Senior Environmentalist	Masters in Environmental	Technical Review and Assessment

			Science	
2	Engr. Shamseela Falak Boas	Environmental Engineer	BSc. Environmental Engineering	Responsible for writing EIA Report, Conducted Impact Assessment and recommended Mitigation Measures
3	Engr. Tashfeen Abbas	Environmental Engineer	BSc. Environmental Engineering	Conducted site visits and environmental screening of project area. Participated in the process of public consultations.
4	Engr. Syed Musa	Junior Environmental Engineer	BSc. Environmental Engineering	Conducted site visit and data collection for the proposed sub-projects.
5	Engr. Hassan Shabbir	Junior Engineer (Civil)	BSc. Civil Engineering	Conducted site visits and environmental screening of project area. Participated in the process of public consultations.
6	Mr. Ghulam Murtaza	Social Expert	Masters in Social Sciences	Conducted site visit, project disclosure and social screening of the sub-project. Carried out gender studies within the project areas and participated in land acquisition/(VLD) activities.

1.4 Brief Description of Nature, Size and Location of Project

The aforesaid project is the Provision of Provision of Safe Drinking Water and sanitation in nine revenue villages of Tehsil Ali Pur of District Muzaffargarh. The project aims to serve a current population of ten revenue villages of Ali Pur (Mouza Khirorah Fazal, Ghauspur, Azmat Pur, Pirowala, Yakewali, Mullah Wala, Bait Nabi Shah, Mail Manjheeth, Muradpur Janubi and Nabipur) and will to continue to serve for next 27 years till 2050 incorporating the future Population. The location maps of the project area, and revenue villages are given below:

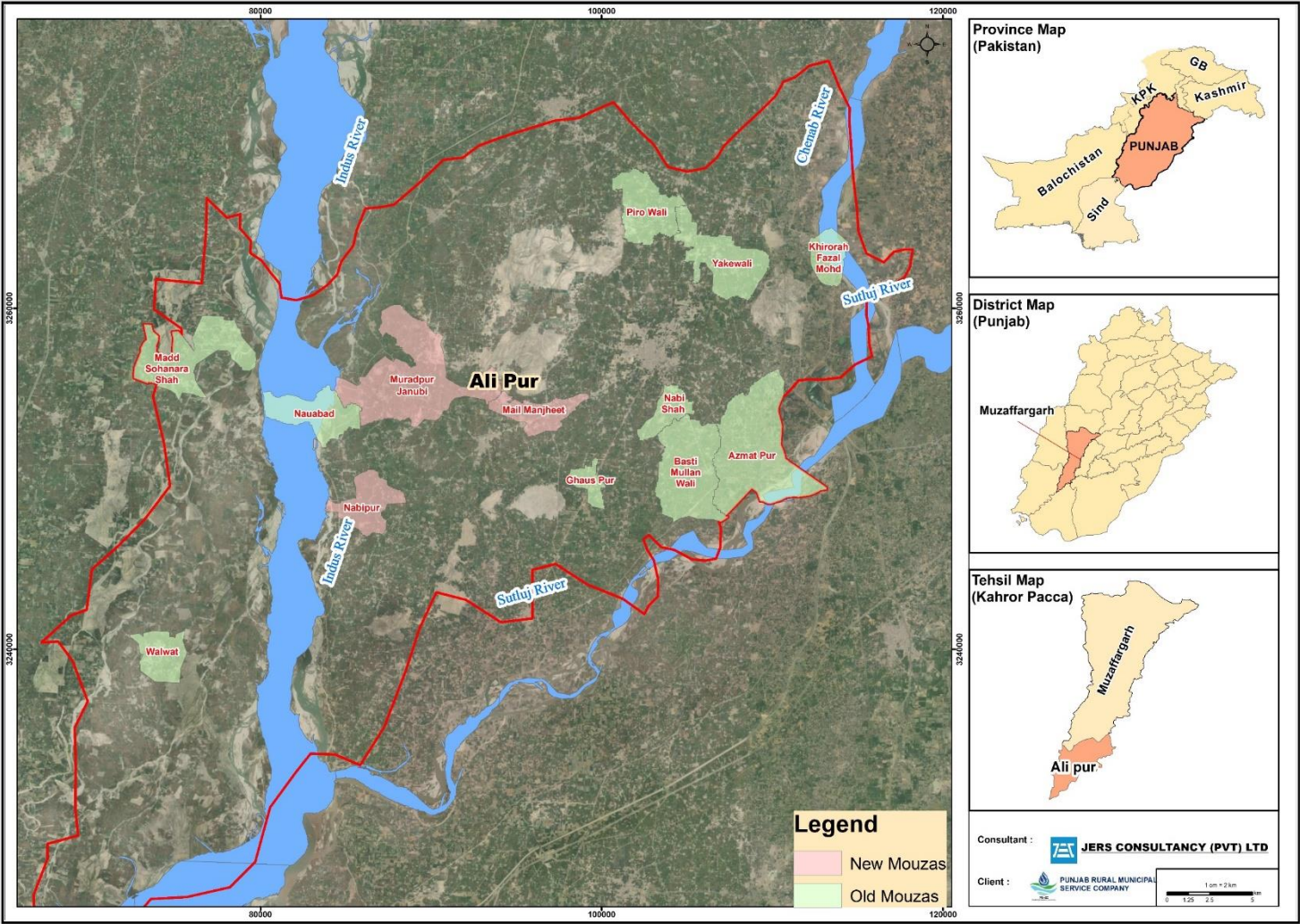


Figure 1.1: Location of priority Villages Ali Pur

1.5 Scope of the project

The overall components of the PRSWSSP are enlisted below:

- **COMPONENT 1:** Water Supply and Sanitation Infrastructure Development
- **COMPONENT 2:** Behavior Change and Capacity Development
- **COMPONENT 3:** Service delivery Improvement
- **COMPONENT 4:** Project Management and Monitoring

The proposed project will also combine infrastructure investments with a comprehensive behavior change and communication (BCC) campaign to:

- (i) provide potable water through cost-effective and sustainable investments;
- (ii) provide safely managed sanitation facilities to reduce the total fecal burden in the village environment; and
- (iii) raise awareness and promote behavior change for better hygiene practices at the household and community level to promote health and ensure the sustainability and quality of the water source.

For more than 150 households in a rural settlement (criteria provided by World Bank), piped network is proposed for water supply, while piped network with anaerobic baffles reactor (ABR) for sewage treatment is proposed.

The overall design horizon of this project is till year 2050.

2 POLICY, LEGISLATION, LEGAL & ADMINISTRATIVE FRAMEWORK

2.1 General

This section deals with the current policy as well as legal and administrative framework related to carrying out of Environmental Impact Assessment (EIA) of various projects. A number of laws exist in Pakistan, containing a number of clauses concerning protection of the environment. Like other Projects, this project is also required to go through an Environmental Assessment for getting a NOC under Section 12 of the Punjab Environmental Protection Act – 1997 (Amended 2012).

The Project is the provision of safe drinking water and falls under **Schedule II** (List of projects requiring EIA) in **Category F** (Water supply and treatment) and **Sub-section 1** (Water supply schemes and treatment plants with total cost of Rs.25 million and above) of “Review of IEE and EIA Regulations, 2022”.

The Director General, EPA Punjab is the authority to issue the requisite Environmental Approval after proper review of the project.

2.2 Existing Regulation and Framework

This EIA study has been carried out in the light of the policy guidelines for the preparation of IEE/EIA Reports under the procedure and practices formulated by the Provincial Environmental Protection Agency (EPA).

2.3 Relevant Legal / Institutional Framework

Details of the national/ provincial legislation, regulations, EPA guidelines, World Bank Operational Policies and guidelines which are relevant and applicable to the sub-project. Three sets of laws, policies and strategies i.e., national, provincial, and World Bank Operational Policies (OPs) are applicable for the project.

Sr. #	Name of Policies/National and Provincial Laws, Regulations, Procedures and Guidelines	Relevance and Applicability with PRSWSSP sub-projects
For Environmental Aspects		
1	Punjab Environment Protection Act 2012	Punjab Environment Protection Act 2012 being as principal legislation of environmental protection in Punjab Province envisages protection, improvement, conservation and rehabilitation with the help of legal action against polluters and green awakening of communities. Section 11,13,14,6 and 17 of PEPA will be applicable on sub-projects during and after execution of the sub-

		projects.
2	Pakistan Climate Change Policy, 2012	PRSWSSP targets to strengthen the implementation of adaptations and mitigation measures prescribed in PCC Policy, 2012, in selected 16 Districts/Tehsils of Punjab in terms of Rainwater harvesting, solid waste management (methane reduction), wastewater treatment and groundwater recharge.
3	Punjab Drinking Water Policy, 2011	The overall objective of Punjab's Water Policy is to provide clear policy directions to the Government of Punjab on the sustainable management and development of water from all sources of water (surface water, groundwater and rainwater), for all sub-sectors of water use (domestic, stock water, agriculture, industry). The sub-projects introduced supports Punjab Drinking Water Policy and activities for drinking water supply will be designed according to PDWP policy guidelines.
4	Punjab Water Act 2019	An Act to comprehensively manage and regulate water resources in the Punjab in the interest of conservation and sustainability. It is expedient to provide for comprehensive management of all water resources in the Punjab and to regulate their use in the interest of conservation and sustainability and matters connected with and ancillary thereto. Sub-projects support Punjab Water Act, 2019 and activities for drinking water supply will be designed in the light of PWA, 2019.
5	National Sanitation Policy, 2006	The National Sanitation Policy of Pakistan, 2006, stresses on the safe disposal of excreta away from the dwellings, creation of an open defecation-free environment and, promotion of health and hygienic practices in the country. PRSWSSP subprojects are in line with the sanitation policy guidelines, 2006
6	Punjab Urban Water and Sanitation Policy, 2007	The Punjab Urban Water and Sanitation Policy of the Government of the Punjab is intended to guide and support provincial institutions, District Governments, Tehsil Municipal Administrations, Water Utilities and communities for improving water and sanitation services. PRSWSSP will get support from Punjab Urban Water and Sanitation Policy, 2007 and will use to promote the key policy principles.
7	Pakistan Approaches to Total Sanitation, 2010	The PATS contains number of branded total sanitation models, having a key role of communities, which include: • Community Led Total Sanitation • School Led Total Sanitation • Component Sharing • Sanitation Marketing • Disaster Response The above models may be adopted by the provincial and local governments in accordance to what suits best in their local context and in accordance with the reinforcement values of PATS. Sub-projects will adopt the applicable models of

		PATS as and where necessary
8	Canal and Drainage Act 1873 and Amendment Act 2016	According to part VII of Drainage clause 59 (A) : Prohibition and control regarding the discharge of effluent into canal and drainage works.– (1) The Provincial Government may, by notification in the official gazette, prohibit the discharge of any effluent, including any solid or liquid matter or combination of them from industrial, municipal or any other source, into any river, canal and drainage work including any natural drainage channel. In line with this act, PRSWSSP is designed for the safe disposal of solid or liquid waste.
9	Punjab Wildlife Protection, Conservation and Management Act, 1974	The sub-projects will ensure the protection and conservation of all forms of wildlife during execution of project.
10	Punjab Growth Strategy 2018	The document endorses Punjab's health sector vision and strategy, which emphasizes improvement of water, sanitation and hygiene services to prevent communicable diseases and PRSWSSP, will follow this strategy
For Social Aspects		
11	Punjab Local Government (Amendment) Ordinance 2021	The Panchayats and Neighborhoods Councils Act, 2019 (PVPNCA 2019) was repealed in February 2021. through an amendment to the PLGA 2019. The result was the Punjab Local Government (Amendment) Ordinance 2021 that established a new tier of local government at the village level called Village Councils, which incorporated the main functions of village panchayats prescribed in the PVPNCA 2019 with regard to water, sanitation, and waste management. <i>Village Councils made under this Act will act as 1st tier of GRM and will strengthen the accountability. A detailed capacity building/training program will be designed for VCs in the light of Training / Capacity Building Framework prescribed in the ESMF</i>
12	Punjab Local Government Act, 2019	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: (2) 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 PRSWSSP 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 PRSWSSP. • 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 PRSWSSP.
13	The Punjab Occupational Safety And Health Act, 2019	In The Punjab Occupational Safety and Health Act, 2019 relevant sections are: Sec 8. Safety and Health, Sec 10. Consultation Sec 13. Notification and investigation of accidents, dangerous occurrences and occupational illness. Proposed sub-projects will consider these provisions for construction workers/labor
14	Punjab Local Government <i>Musalihat</i>	PRSWSSP supports these rules and sub-projects will

	Anjuman (Constitution and Functions) Rules, 2016	comply with these rules to restrict • Forced labor • Public insult, assault, and degradation of females and • Sexual harassment
15	Land Acquisition Act, 1894 and Punjab Land Acquisition Rules, 1983	LAA 1894 and Punjab Land Acquisition Rules will be applicable in PRSWSSP where private land will be acquired to carry out the Project activities. However, for land acquisition, compensation, livelihood restoration, and assessment and management of other social impacts.
16	Pakistan Antiquities Act 1975 and Punjab Antiquities Act 2012	Both laws will be applicable to the Project and the notified archeological/cultural heritage areas/sites will be screened carefully before undertaking sub-projects construction activities under the PRSWSSP during Environmental & Social Screening of each subproject under PRSWSSP by using the E&S Screening Checklist. 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. ESMPs prepared for PRSWSSP will cover these aspects in detail.
17	Punjab Restriction of Employment of Children Act 2016	Under this Act: 3. Prohibition on employment.– (1) An occupier shall not employ or permit a child to work in the establishment. (2) An occupier shall not employ or permit an adolescent to perform any hazardous work in the establishment Both these clauses will be applicable to PRSWSSP during hiring and management of construction labor for the sub-projects
18	Labor Laws Punjab and ILO Conventions ratified by the Government	PRSWSSP will comply with all the laws and ILO Conventions ratified by the Government of Pakistan applicable on construction labor/workers.
19	Guidelines for Public Consultation, 1997	These Guidelines will be used at planning and implementation stages of sub-projects under PRSWSSP. Public consultation has been carried out in the project areas and remarks of public and stakeholders have been noted and incorporated in finalizing the sub-projects.
20	Guidelines for Regulation of Disclosure of Environmental Information & Citizen engagement 2020	These guidelines are relevant to PRSWSSP and will be used for public disclosure of environmental information of PRSWSSP sub-projects and relevant instruments and GRM and citizen engagement.

3 PROJECT DESCRIPTION

3.1 Type and category of the project

The Project is the provision of safe drinking water and falls under **Schedule II** (List of projects requiring EIA) in **Category F** ((1)Water supply schemes and treatment plants with total cost of Rs.25 million and above (2) wastewater Channels and sewerage System Scheme) of “Review of IEE and EIA Regulations, 2022”.

Ali Pur is one of the tehsils of Muzaffargarh District, where Punjab Rural Municipal Services Company (PRMSC) intends to supply clean drinking water and sanitation facilities. Scope of the project includes:

- Installation of Single Village or Multi Village Based Water Supply Schemes in the tehsil, for which tube-wells will preferably supply seepage water from canal or groundwater in case of unavailability of seepage water from canals.
- Water will be pumped up from tubewell and disinfected using the method of chlorination in accordance with the water quality.
- The treated water will be pumped up to the overhead reservoir (OHR).
- Water in the OHR will flow by gravity to the selected rural settlements via piped network or low-level reservoir at standposts.
- For collection of sewage, RCC pipes are proposed and for smaller settlements this piped network would divert the sewage towards communal septic tanks coupled with soakage wells.
- For larger settlements (having more than 150 households), RCC sewerage pipe network is proposed and the sewage will be treated via Anaerobic baffled Reactor (ABR) and then disposed off in nearby drains or reused for irrigation purposes.
- The solid waste in the villages will also be collected and managed safely to avoid open heaps of garbage or burning of solid waste. Solid waste enclosures will be provided in villages which would serve as designated storage points of solid waste from where waste will be ultimately transported to landfill site.

3.2 Objectives of Project

The overall objective of the project is to provide equitable and sustainable access to safely managed water and sanitation and reduce diseases and child stunting in the marginalized rural areas of Tehsil Ali Pur, District Muzaffargarh.

- Provision of potable water through cost-effective and sustainable investments

- Provision of safely managed sanitation facilities to reduce the total fecal burden in the village environment; and
- To raise awareness and promote behavior change for better hygiene practices at the household and community level to promote health and ensure the sustainability and quality of the water source.

3.3 Location of Project

Muzaffargarh literally means "Fort of Muzaffar" since Governor of Multan, Nawab Muzaffar Khan founded it in 1794. Town, then in 1794, lied inside the walls of a fort built by Nawab Muzaffar Khan. It is one of oldest districts of Punjab.

District Muzaffargarh is situated in the southern part of Punjab Province and spread over an area of 8,249 sq.km. The District is located between 28°57' to 30°46' north latitude and 70°30' to 71°47' east longitude. Geographically, District D.G. Khan and Rajanpur are located on east, District Multan, Bahawalpur and Rahim Yar Khan on West, District Layyah and Rahim Yar Khan are located in the north and south of the district respectively.

The district is located in the form of a strip between two major rivers i.e. Chenab and Indus flowing on its eastern and western side of the district respectively. River Chenab flows for about 125 miles along the eastern side of the district. River is narrow in shape and less swift compare to River Indus. The Indus flows along the western boundary of the district. In the cold weather, it is about 2 miles wide. In the rainy season of monsoon, the river overflows from its banks largely and as a result, the river's width reach generally more than 10KM at some places. The eastern portion of the district consists of Thal desert, while small portion of the district has a forest cover lying along the river Indus. The district is linked with all major cities through network of major roads.

Alipur is a city and Tehsil of Muzaffargarh District in the Punjab province. The city is subdivided into 14 Union Councils. It has a population of over 398,053. Tehsil Alipur is one of the oldest Tehsil of Punjab which was established in the year 1928. It is situated at a distance of about 85 km from Muzaffargarh on the Karachi–Multan National High way. This Tehsil surrounded by rivers on three sides. The river Chenab runs along the eastern side, Indus on the Western and Sutulj /Chenab on the southern side. It is bounded by Tehsil Jatoi on the North /West ,Liaquatpur on the south , Ahmadpur East and Jalalpur Pirwala on the East. The location co-ordinates of the tehsil are 29.3317° N and 70.7644° E.

The sub-project comprises of 10 revenue villages where water supply and sanitation projects are proposed.

- Mouza Khirorah Fazal
- Ghauspur
- Azmat Pur
- Pirowala
- Yakewali
- Mullan Wali
- Bait Nabi Shah

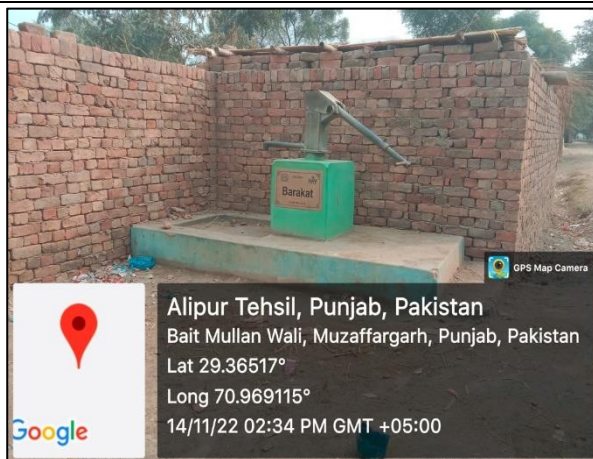
- Mail Manjheeth
- Muradpur Janubi and
- Nabipur

These villages have been selected on priority basis in South-II cluster as per the request of the proponent and World Bank (WB).

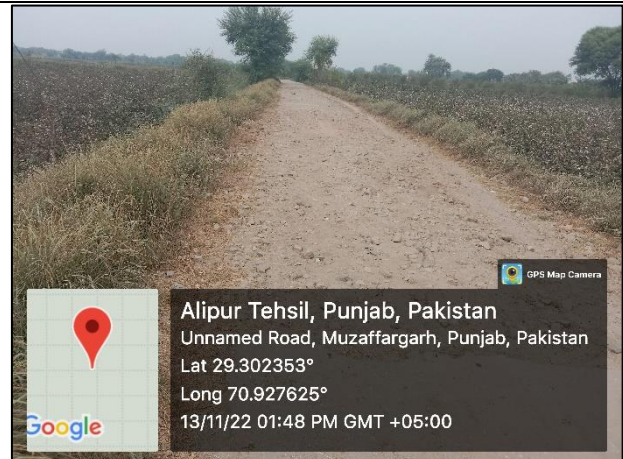
3.4 Land Use on Site

The proposed locations for sub-project components like tube-wells, pump house, OHRs, RO filtration plants and ABRs are within rural areas and vast agriculture lands are present on site or in the vicinity. Sites are either vacant piece of land, unpaved area or agricultural field. Enclosures for solid waste temporary storage are proposed near Sewage Treatment Unit (ABR) which would be a bit away from the residential settlements to avoid nuisance.

Following pictures show the land use at various sites within different villages in Tehsil Ali Pur.



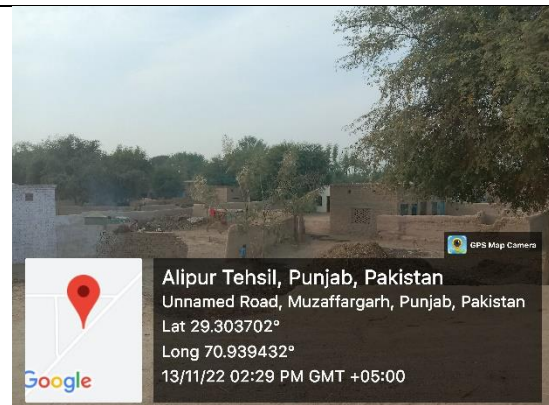
Hand Pump in Bait Mullan Wali



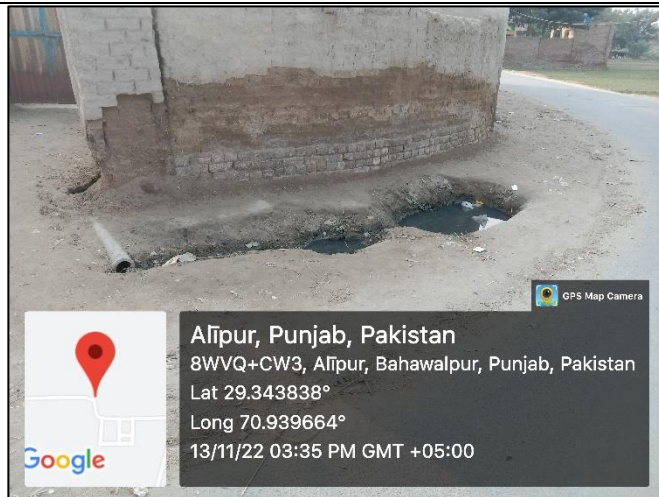
Kacha Track in Bait Mullan Wali



Agricultural fields and Dera in Mullan Wali



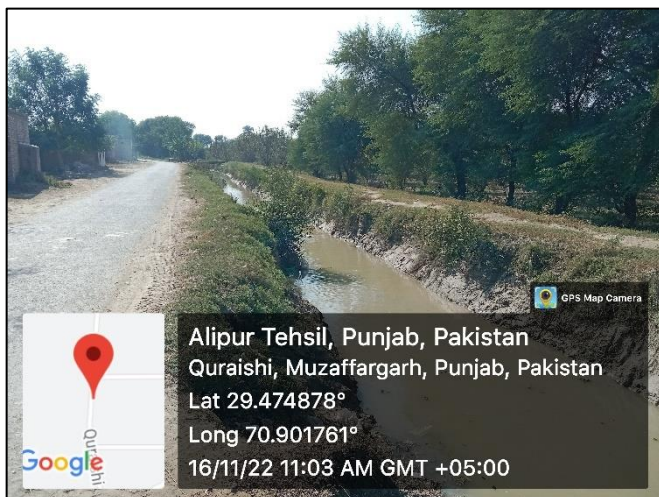
Kacha houses in Bait Mullan Wali



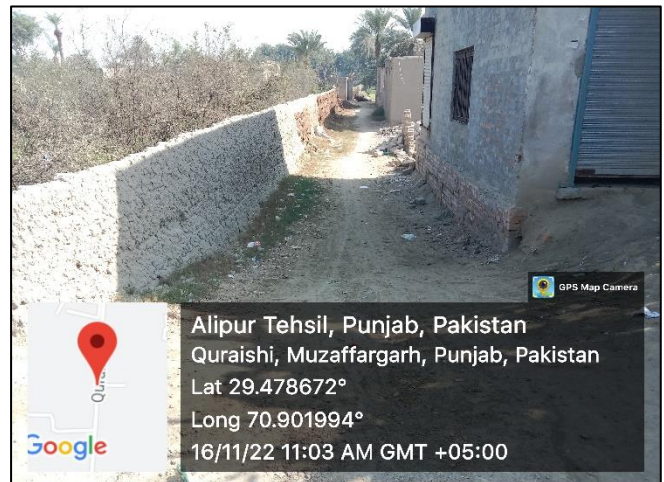
Sewage Conditions in Mullan Wali



Un attended solid waste lying in Azmat Pur



Irrigation Channel in Mouza Piro Wali



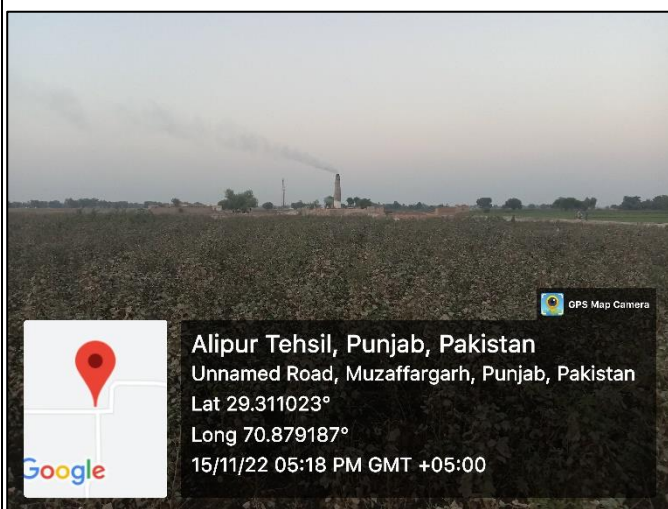
A street view in Mouza Piro Wali



Shops in Mouza Piro Wali



Date Trees in Pirowali



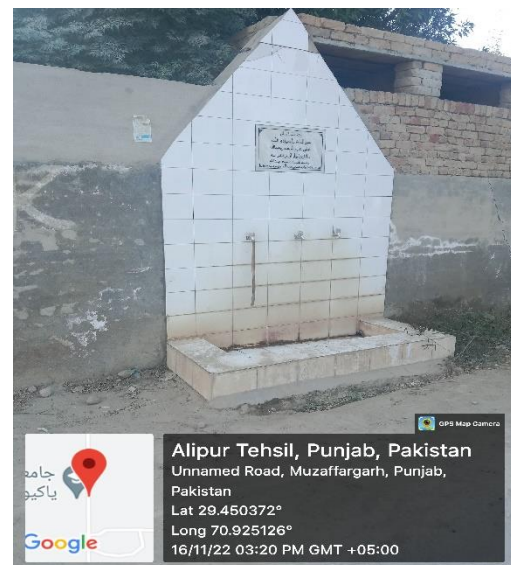
Cotton fields and brick kiln in Mouza Ghouspur



Solid waste clogging sewage channels in Ghouspur



A glimpse of rural culture in Mouza Ghouspur



Water filter plant in Mouza Yake Wali

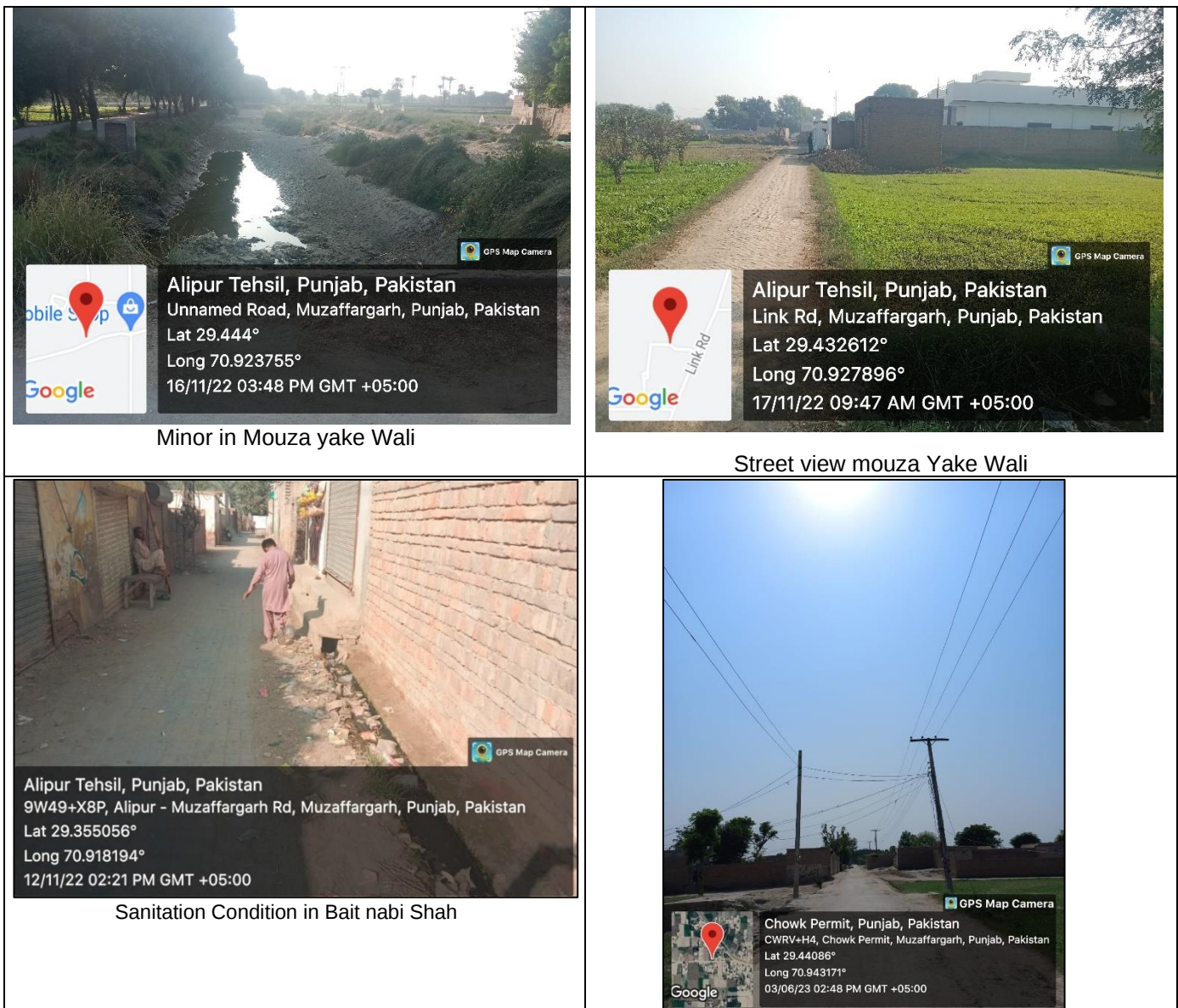


Figure 3.1 Land Uses Within the Project Area

3.5 Road Access

The sites have access via paved main roads like Ali Pur Khairpur road, Ali Pur Seetpur Road, Ali Pur Uch Sharif Road, Ali Pur Muzaffargarh Road and other internal roads (Pakka and Kacha roads). The pipelines shall be laid along the Right of Way (RoW) of the project and the construction material and other machinery shall be transported via this already existing road network.

3.6 Vegetative Features of Site

The proposed project covers the rural areas of Ali Pur which is an agricultural area. The proposed sites for water source/tubewells, overhead reservoir, and ABRs are also surrounded by vast agricultural lands. The boundaries of few sites are surrounded by Keekar or Safaidda trees and they don't need to be cut down for related project activities. At some sites small shrubs and grass are present. No endangered or threatened flora is found within the vicinity of the proposed sites.

3.7 Cost of the Project

The estimated Capital costs for the sub-project is PKR 3.6 billion.

Table 3.1: Estimated Capital Cost for ten revenue villages – Ali Pur

Sr. No.	Description	Amount Rs.
1	WATER SUPPLY SYSTEM	690,809,441
2	SEWERAGE SYSTEM	2,156,584,040
3	SOLID WASTE ENCLOSURE	31,096,216
4	ESMP COST	39,102,857
5	EMPLOYER/ENGINEER'S FACILITIES	7,357,142
	Total Amount Rs.	2,924,949,699
	PRA Charges @ 5%	146,247,484
	Escalation Charges @ 10%	292,494,969
	Contingencies @ 3%	87,748,490
	Add 1.50% (1.0% horticulture + gender action Plane 0.5% Charges)	43,874,245
	O&M Cost	139,381,280
	Total Amount Rs.	3,634,696,171

3.8 Schedule of Implementation

The project is estimated to be completed in 10 months which may be reckoned after release of funds. Six major activities are involved in the project which will be carried out simultaneously in all priority villages of the tehsil by the construction contractors. Following Gantt Chart depicts the relevant project activities and their tentative schedule of implementation:

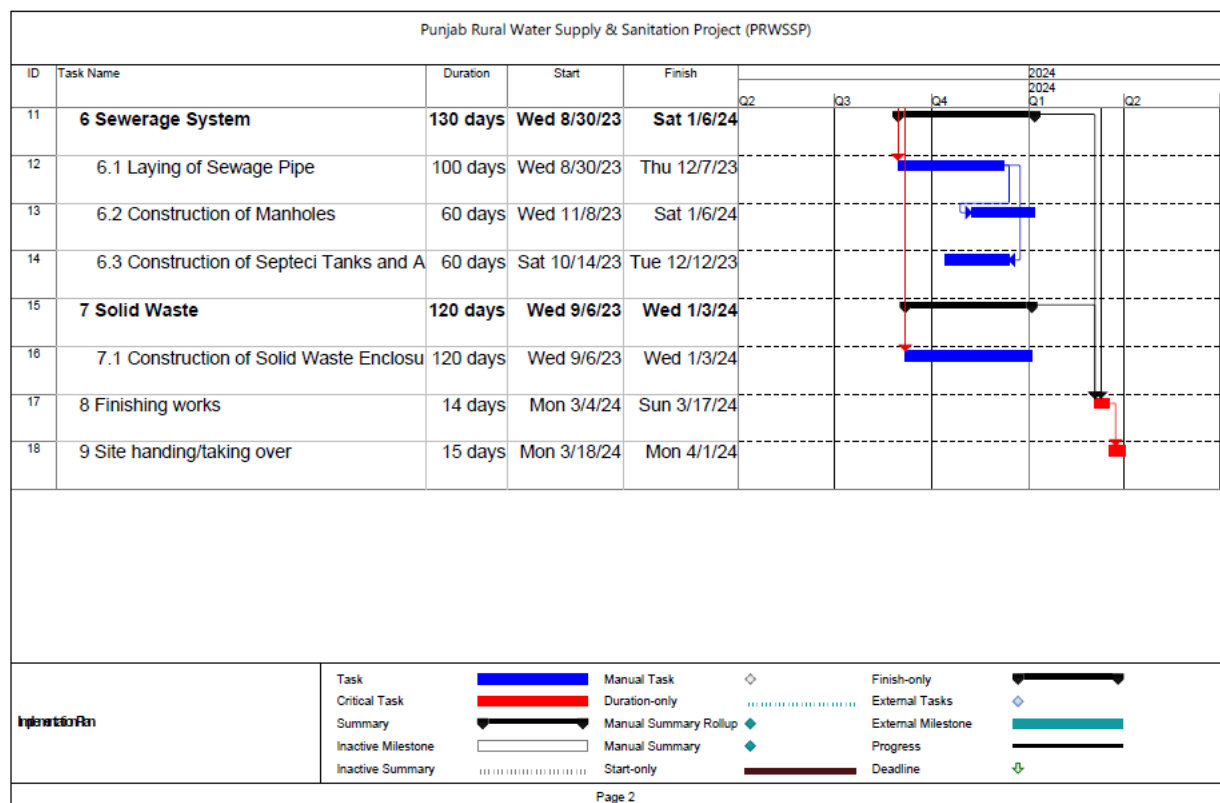
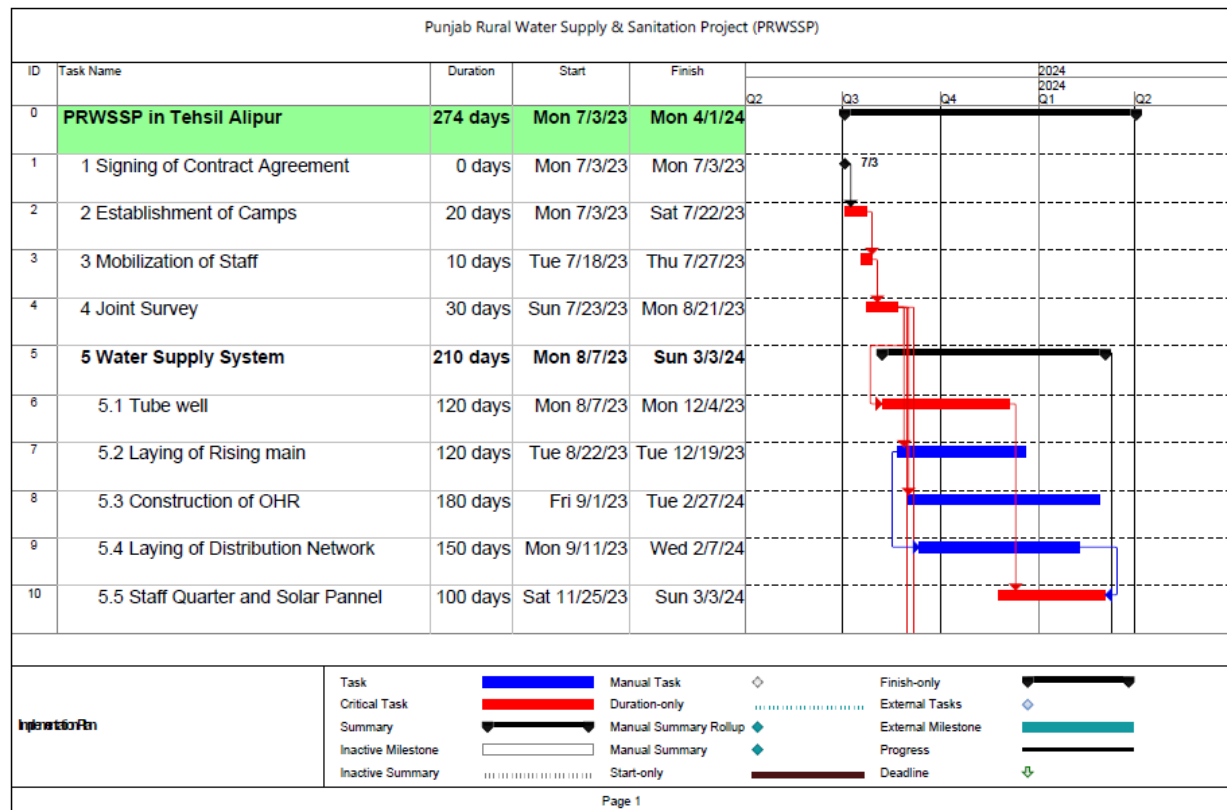


Figure 3.2: Schedule of Implementation

3.9 Description of Project

3.9.1 Design and Scope of work

Proposed water supply system in Mouzas will comprise of water source, water treatment, pump house, transmission main, overhead reservoir, water distribution system, and allied structures. Proposed sewerage system shall consist of sewage collection pipe network, sewage treatment, sewage disposal system and allied structures. Solid waste management system shall consist of hand carts, collection containers / bins, and solid waste enclosures.

3.9.1.1 Water Supply

Single Village Schemes (SVS) have been proposed for seven mouzas of the tehsil (SVS-1, SVS-2, SVS-3, SVS-4, SVS-5, SVS-6 and SVS-7). Tube well is proposed to draw potable water from shallow aquifer for the locals of multi-village scheme. Tubewell is designed for a design life of 15 years. After design period pump should be replaced. The Pumps flow has been designed on Max hourly Demand. The operating hour for the pump operation is being used 8 hours. Transmission main is proposed to supply water from tubewell to overhead reservoir. The sizing of rising main has been based on the max hourly water demands considering eight (08) hour working day. Overhead reservoir is proposed to store and supply water through gravity. The capacity of OHR is adopted as 1/4th of average day demand. Overhead tank has been designed for the six (06) hour storage of average daily water demand.

- Mouza Pirowali (SVS-1)

Tubewell 1 No. (0.5 cusec)

Head of Tubewell 200 ft

Rising Main :300 ft length 160 mm diameter

OHR 20,000 gallons

Distribution Network:

44640 ft Length 90 mm Dia

8750 ft Length 160 mm Dia

- Mouza Yakewali (SVS-2)

Tubewell 2 Nos. (1 cusec)

Head of Tubewell 200 ft

Rising Main: 370 ft length 200 mm diameter

OHR 30,000 gallons & 20,000 gallons

Distribution Network: 53380 ft Length 90 mm Dia,

10910 ft Length 160 mm Dia

5550 ft Length 125 mm Dia

- Mouza Azmatpur (SVS-3)

Tubewell 1 Nos. (1 cusec)

Head of Tubewell 200 ft

Rising Main 210 ft length 200 mm diameter

OHR 30,000 gallons

Distribution Network

62660 ft length 90 mm diameter,

24190 ft length 160 mm diameter

- Mouza Khirorah Fazal (SVS-4)

Tubewell 1 No. (0.25 cusec)

Head of Tubewell 160 ft

Rising Main 100 ft length 110 mm diameter

OHR 10,000 gallons

Distribution Network 6290 Length 90 mm Dia

- Mouza Beit Nabi Shah (SVS-5)

Tubewell 2Nos. (1 and 0.5 cusecs each)

Head of Tubewell 200 ft

Rising Main: 330 ft length 200 mm diameter

1450 ft length 160 mm diameter

OHR 50,000 gallons

Distribution Network: 62210 ft Length 90 mm Dia

16440 ft Length 160 mm Dia

2520 ft Length 200 mm Dia

- Mouza Beit Mullan Wali (SVS-6)

Tubewell 1 Nos (1 cusecs)

Head of Tubewell 200 ft

Rising Main: 340 ft Length 200 mm Dia

OHR 50,000 gallons

Distribution Network: 9480 ft Length 160 mm Dia

35360 ft Length 90 mm Dia

- Mouza Ghauspur (SVS-7)

Tubewell 1 Nos (0.5 cusecs)

Head of Tubewell 200 ft

Rising Main 100 ft Length 160 mm Dia

OHR 10,000 gallons

Distribution Network 19470 ft Length 90 mm Dia

Table 3.2: Proposed Water Supply System in each Mouza

Mouza	Settlements	No. of Houses Year 2023 (calculated as per population density)	Water Supply
Pirowali	Basti qureshi Qureshi New Abadi Qureshi Manzoor Shah Wali	269	Piped Network
	Basti Babbar	92	
	Basti Dina, Basti Jatoi Baloch	154	
Yakewali	Basti Durri Babbar	220	Piped Network
	Basti Yakiwala, Basti Milana and Basti Hanjani	505	Piped Network
	Basti Sikhani, Basti Beit, Basti Muhajar	962	Piped Network
	Basti Tarat	281	Piped Network
Azmatpur	Basti Badeela, Basti Ghaman, Basti Ghubang	496	Piped Network
	Basti Ghaman	175	Piped Network
	Basti Chanjan	213	Piped Network
	Basti Damar	170	Piped Network
Kirorah Fazal	Basti Khawaja	150	Piped Network
Beit Nabi Shah	Basti Ghabol	236	Piped network
	Mahisar Khan	255	Piped network
	Nai wala east , Lashari	265	Piped network
	Basti Yaru wala , Gashkori	359	Piped network

	Laal wala, mandu wala, bakhshay wla	454	Piped network
	Bakhu wala	208	Piped network
Mullan Wali	Basti Pally wali, Gobang	423	Piped network
	Bhangar, Naich, Gabol, Khairay wala, Ghulam, basti soobywali	459	Piped network
Ghauspur	Basti Sontaray wala	161	Piped network
	Basti Sabu wala	113	Piped network
	Basti Manka	103	Piped network

3.9.1.2 Allied Structures

Allied structures shall consist of;

- Operator Room
Operator room shall be provided for the residence of tube well operator.
- Chlorination Unit
Chlorination may be required as per WHO guidelines in order to disinfect water for public water supply. Chlorination shall protect the water from pathogens.
- Security Gate and Boundary Wall
Security gate and boundary wall shall be provided for the security of the pumping system, valves, solar system and other appurtenances.



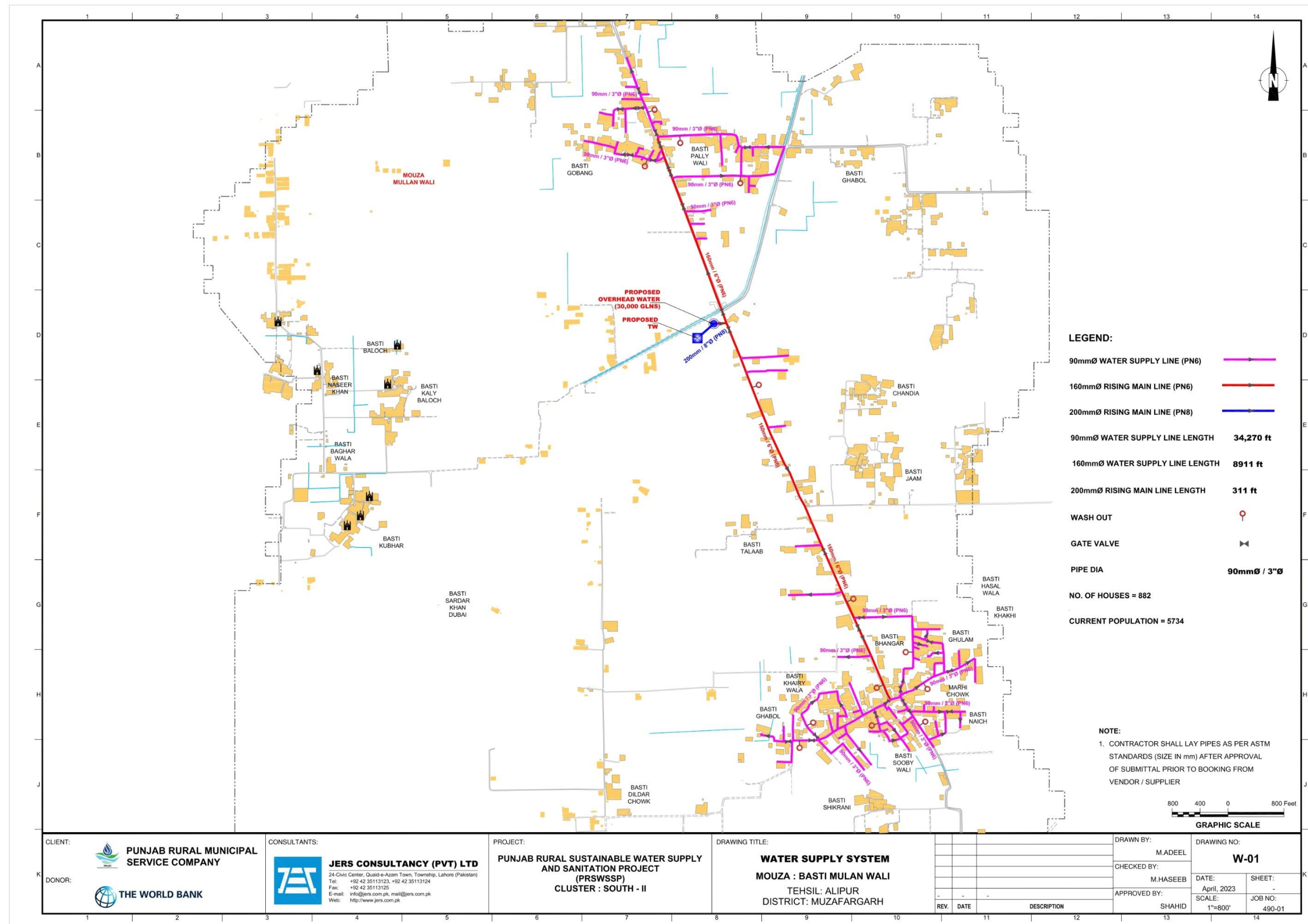


Figure 3.4: Proposed Water Supply System – Mullan Wali

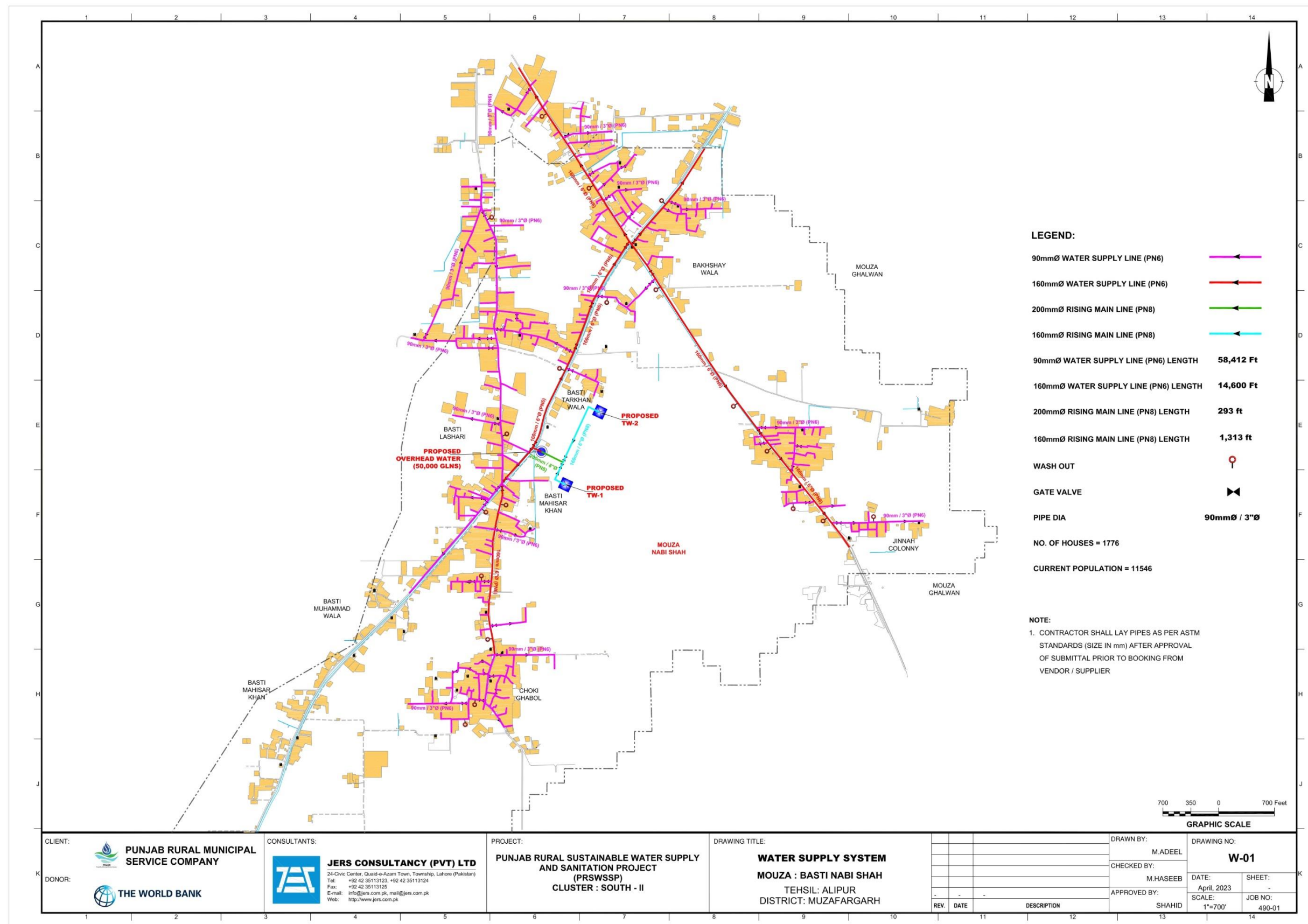


Figure 3.5: Proposed Water Supply System – Nabi Shah

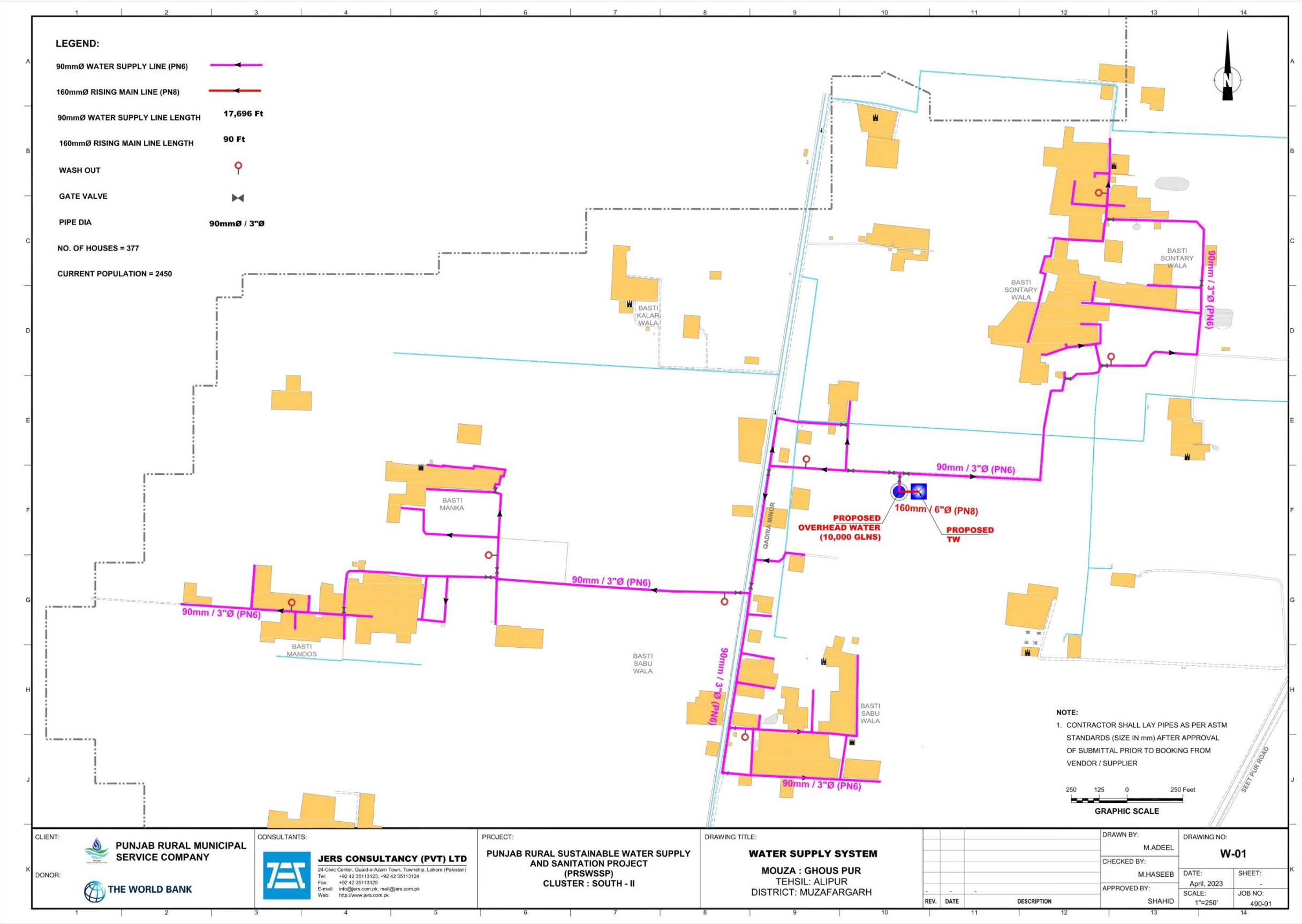


Figure 3.6: Proposed Drinking Water Sources – Mouza Ghouspur

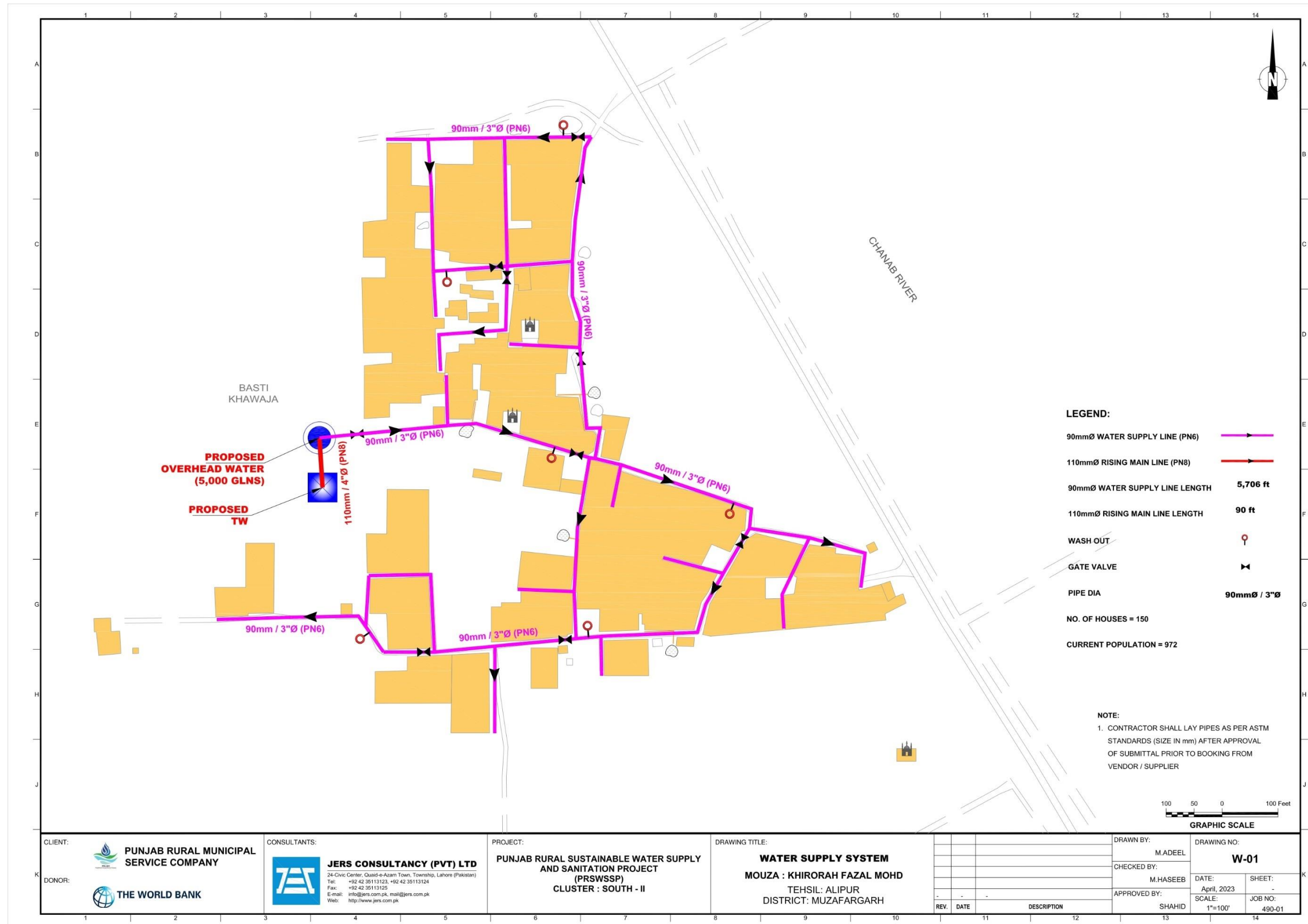


Figure 3.7: Proposed Water Supply System in Khirorah Fazal

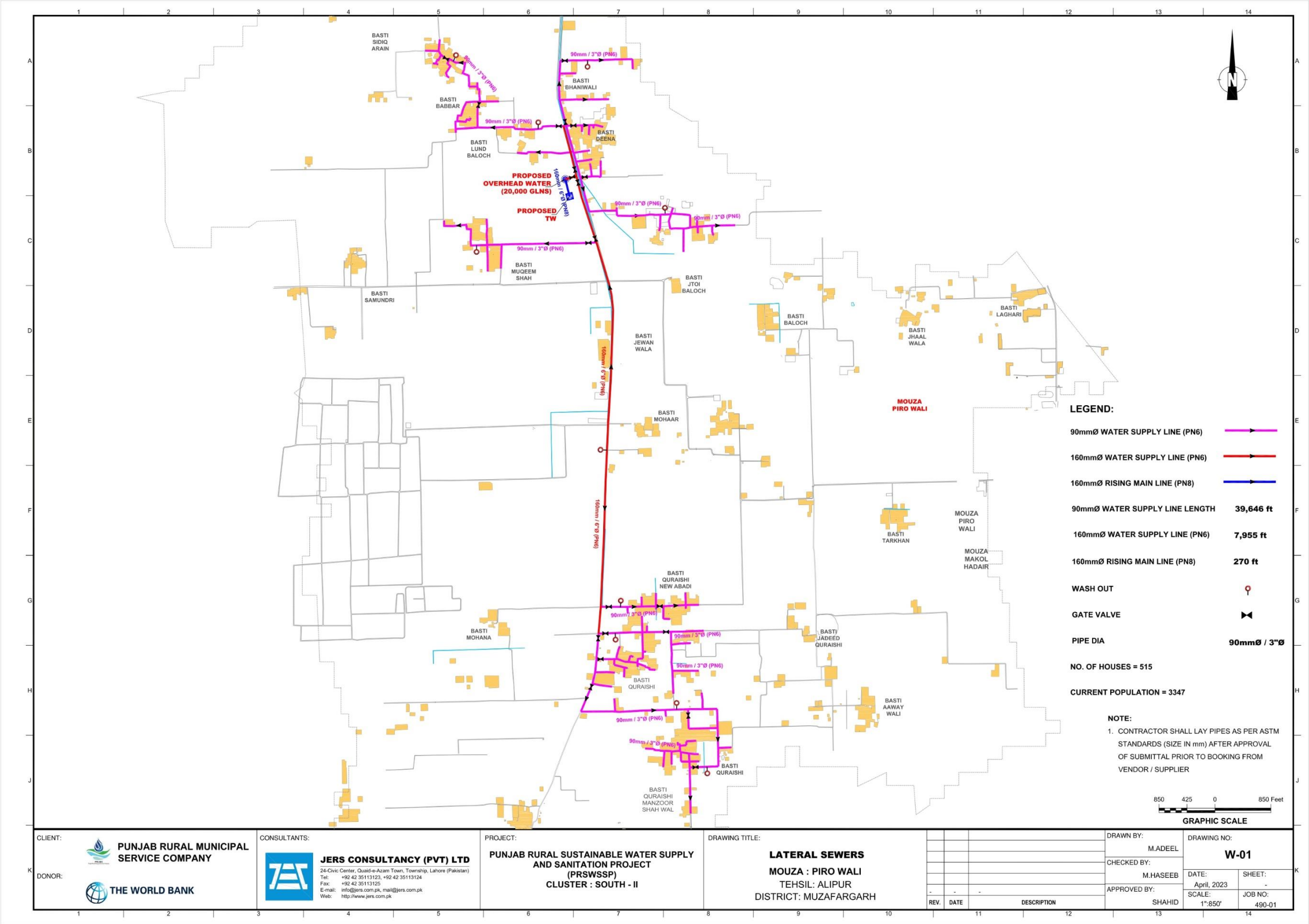


Figure 3.8: Water Supply System in Mouza Pirowali

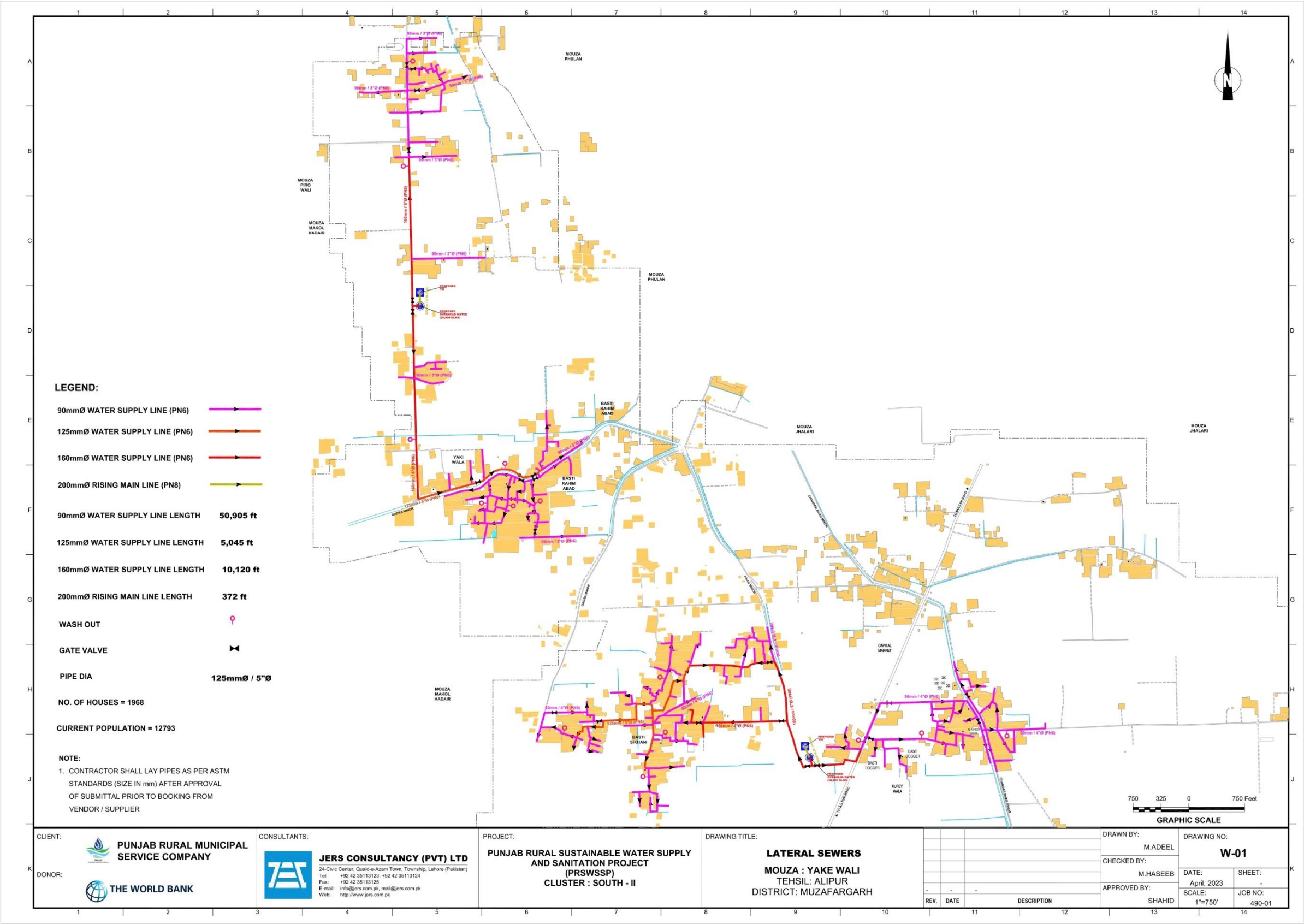


Figure 3.9: Water Supply System in Mouza Yakewali

3.9.1.3 Sewerage

For collection of sewage from model mouzas, RCC lateral sewers are proposed. Minimum size of the RCC sewer shall be 9-inches and laid with an earth cover of 3 feet. For the treatment of sewage, the Consultant has proposed septic tanks with soakage wells and anaerobic baffled reactor (ABR). Sewage after treatment shall be disposed into nearby water course for onward agriculture use.

The main objective of the proposed sewerage system is to converge the whole sewage towards a single point and then dispose of into pumping point that would eventually pump into proposed treatment plant. Following components are proposed in village:

- House connections chambers;
- Lateral sewer lines; these will dispose of into trunk lines;
- Trunk sewer lines;
- Sewage Treatment Plant.

Table 3.3: Proposed Sewerage System

Village Name	Total Served Population	Length of Sewerage Network (dia 9")	Length of Sewerage Network (dia 12")	No. of ABRs
	2050			
	Persons	ft	ft	No.
Pirowali	5004	29600	17250	3
Yakewali	19123	54340	11280	6
Azmat Pur	10238	56530	20820	4
Khiorah Fazal	1454	4090	1460	1
Beit Nabi Shah	17259	52500	19550	6
Mullan Wali	8571	28670	7900	2
Ghauspur	3660	10330	4620	3

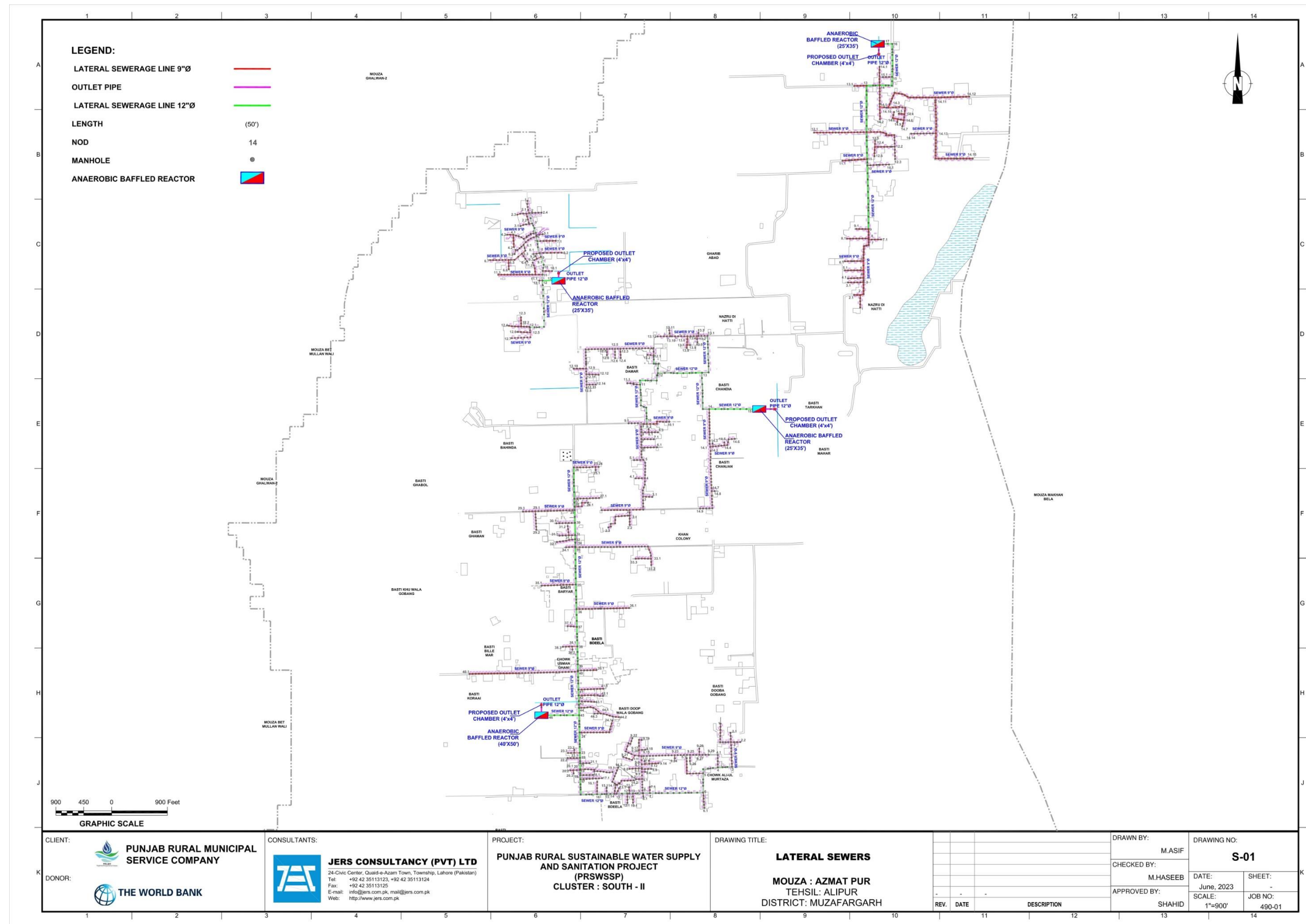


Figure 3.10: Proposed Sewerage System – AzmatPur

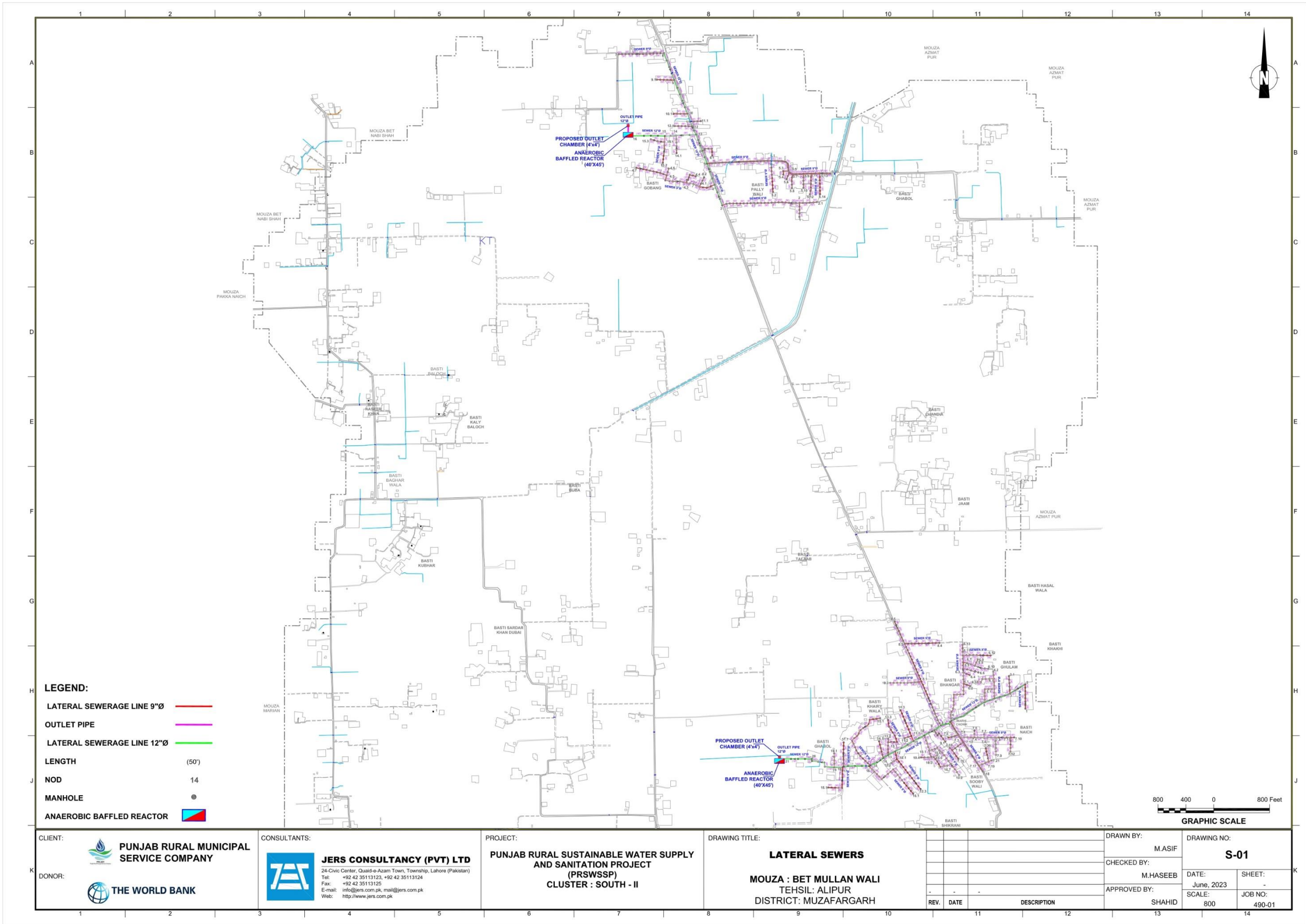


Figure 3.11: Proposed Sewerage System – Mullan Wali

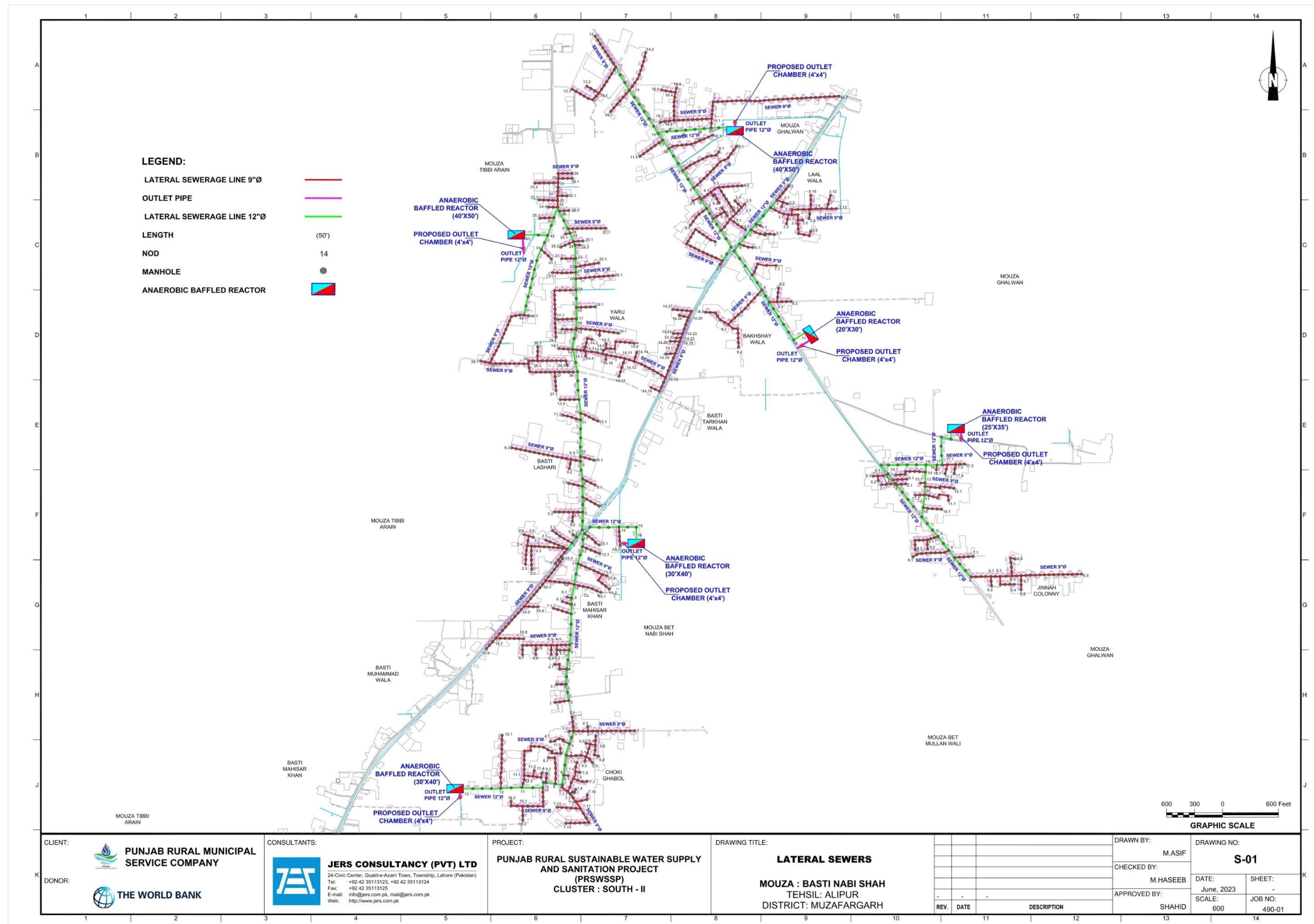


Figure 3.12: Proposed sewerage System – Nabi Shah

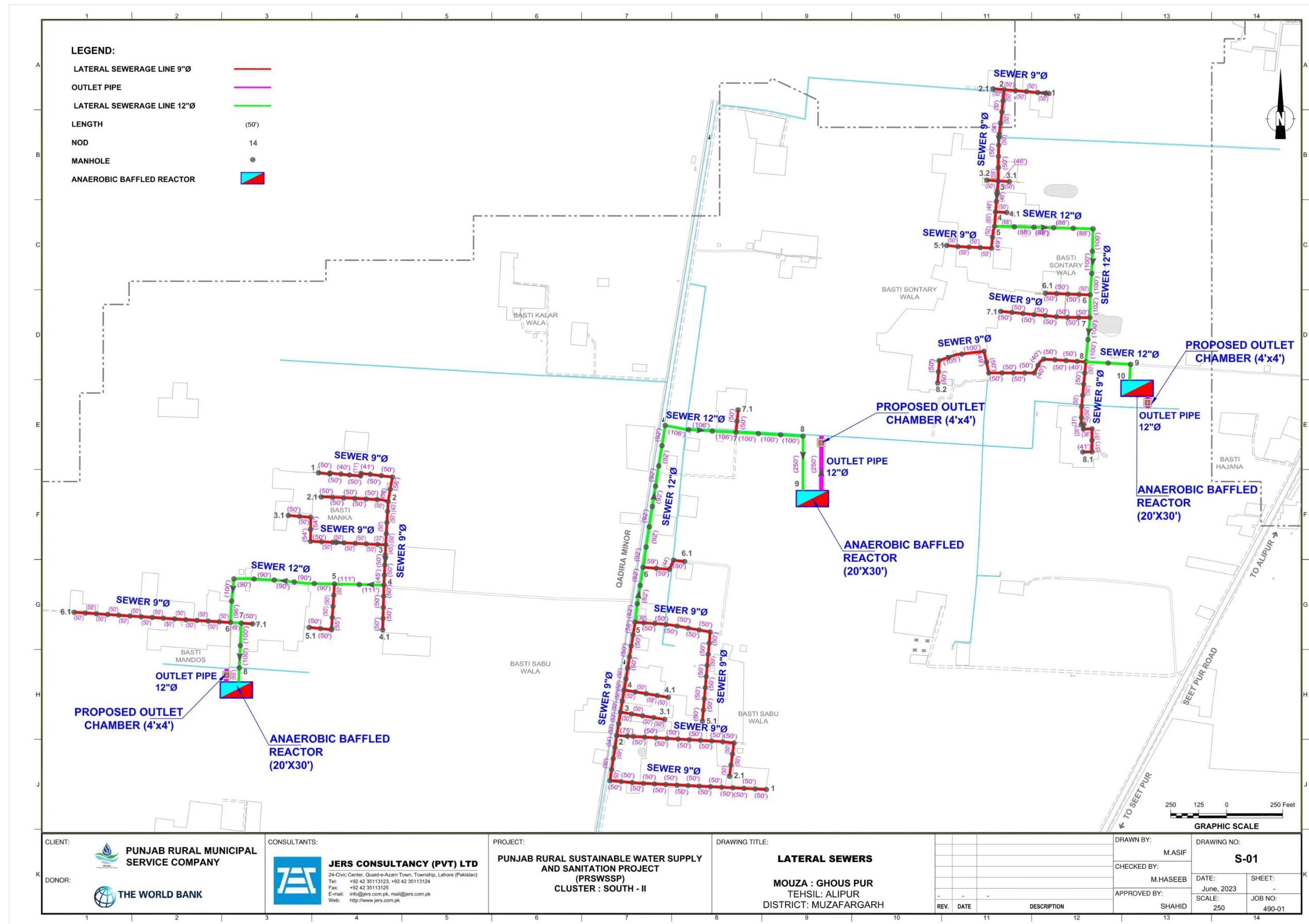


Figure 3.13: Proposed Sewerage System – Ghaus Pur

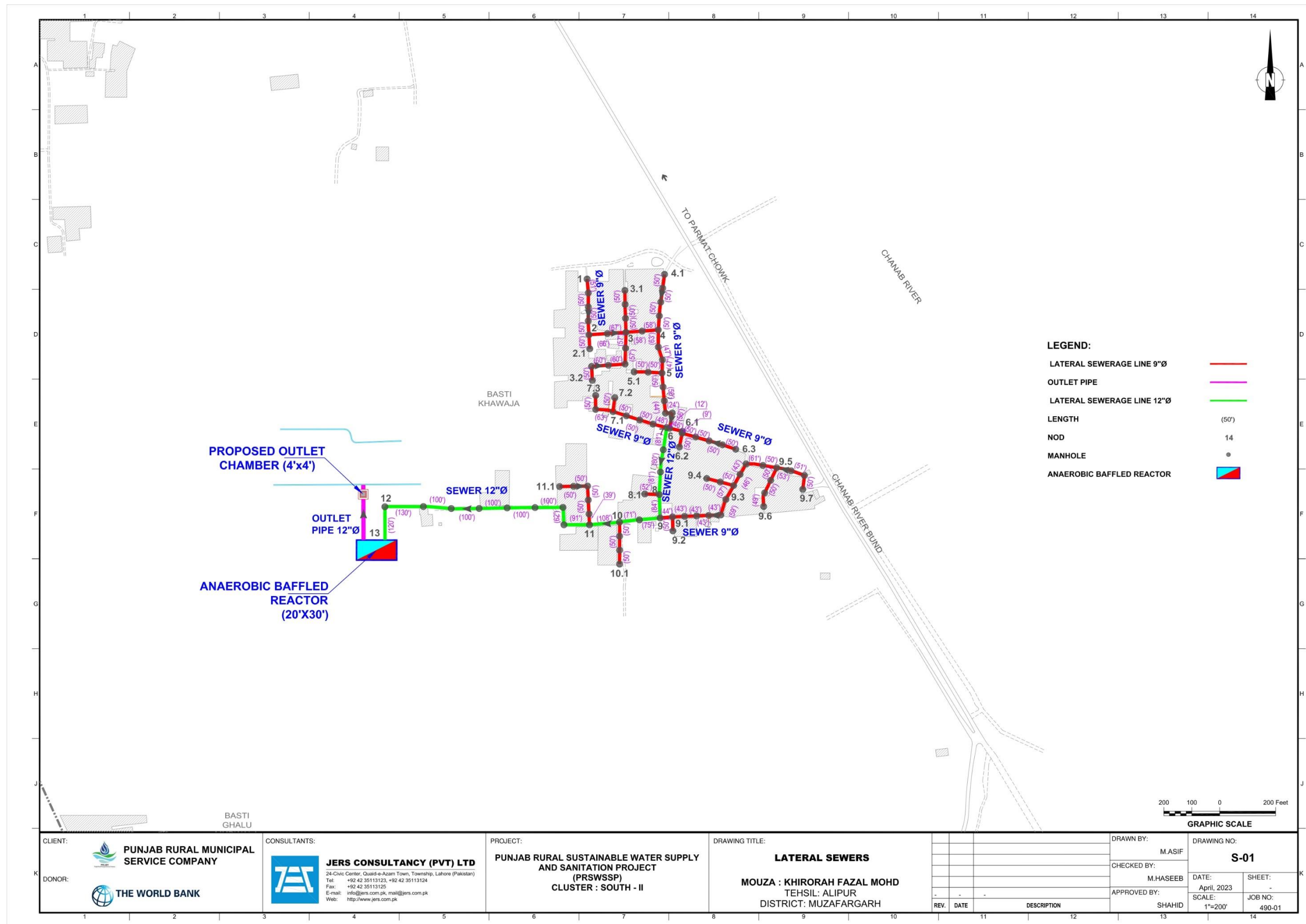


Figure 3.14: Proposed Sewerage System – Khirorah Fazal

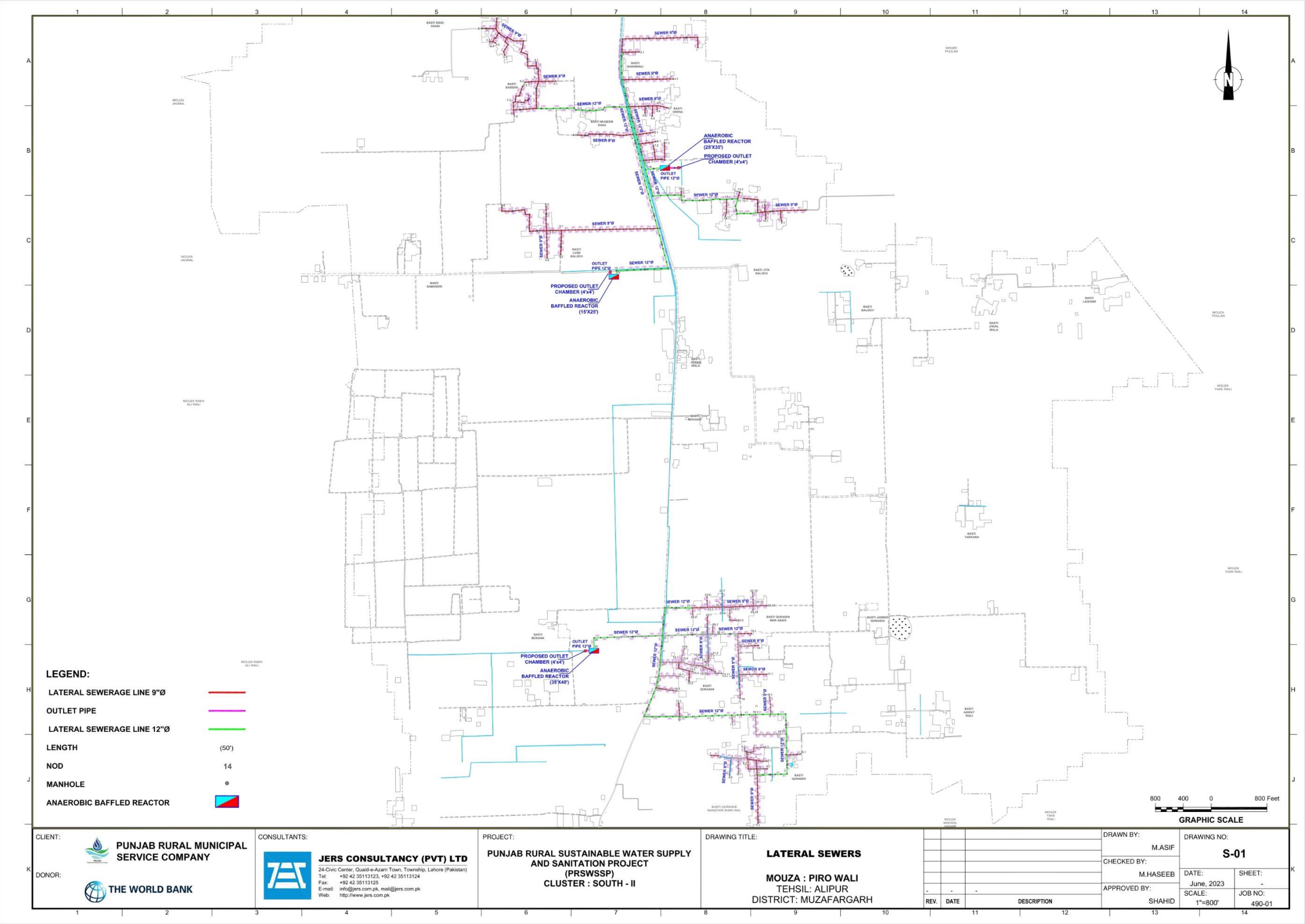


Figure 3.15: Proposed Sewerage System – Mouza Pirowali



3.9.1.4 Solid Waste

For solid waste collection from household level, bins are proposed to be placed at suitable points within the residential settlements while the waste would be collected by cycle carts and brought to a solid waste enclosure located in the vicinity of the area, from where it will be shifted into a larger vehicle and transferred to ultimate disposal site.

3.10 Labour Requirement

At the peak of construction activities, up to 200 labours (skilled and unskilled) for all mouzas are likely to be employed for the works at sub-projects. It is anticipated that approximately 75% of the workforce (mostly unskilled) will be from the sub-project area while some 25% of labour (skilled) would be hired from outside the sub-project area in case the skilled labour is not available within the area.

3.11 Land Requirement

Table 3.4: Area Requirement for different Components of the sub-project

Village Name	Land Requirement for Tubewell and OHWT	Land Requirement for ABR/Septic Tank	Total Land Requirement	Available Govt. Land
	Acres	Acres	Acres	Acres
Pirowali	0.05	0.1062502	0.15625017	Yes
Yakewali	0.13	0.3062505	0.43625049	No
Azmatpur	0.06	0.1562503	0.21625025	Yes
Kirorah Fazal	0.04	0.0312501	0.07125005	Yes
Beit Nabi Shah	0.13	0.2750004	0.40500044	No
Mullan Wali	0.06	0.1875003	0.2475003	Yes
Ghauspur	0.05	0.0937502	0.14375015	No

3.12 Restoration and Rehabilitation

A resettlement action plan is required only when following basic 8 categories of issues and impacts are occurring.

- a) Loss of land;
- b) Loss of structure;
- c) Loss of source of livelihood;
- d) Loss of access to common resources and facilities;
- e) Loss of standing crops, trees and perennial trees;
- f) Loss of public infrastructure;
- g) Losses during transition of displaced persons / establishments;
- h) Losses to host communities;

When considering these aspects against the impacts identified during the social management plan, it is determined that no category of social impacts is evoked. Moreover, the project is designed for a period of 27 years by keeping in view the future population. The minimum anticipated life of the project is 27 years. The individual modules such as damaged pipes, chlorine dosing pumps, , taps, tanks, solar panels, lights etc. will be replaced as and when required during this period. Laying of sewer or water pipes may temporarily affect the roads. Contractors would be strictly adhered to restore the existing roads after laying the sewerage or water network and ensure regular monitoring. The budget for restoration or rehabilitation is included in the detailed cost estimate of the project.

No tree cutting would be involved. Only some vegetation or wild bushes may need to be cut during construction works. The piped network will be placed along the Right of Way (RoW) and agricultural fields will not be disturbed. In case of any unforeseen loss of tree, ten additional trees would be planted for the loss of one tree. There might be some temporary impediments in movement of people, transport or animals. Mitigation measures will be provided in EMMP.

No decommissioning procedures or restoration plans have been compiled at this stage, as it is envisaged that the system will be refurbished rather than decommissioned after the anticipated 27 years. The potential impacts during the decommissioning phase are expected to be minimal in comparison to those occurring during the operational phase, and no key issues are identified at this stage.

In case of unavailability of vacant land, agricultural land will be acquired through volunteer donation. However, the construction activities on such site will commence only when the already sown crop would be harvested at the end of growing season.

Therefore, it is concluded that no detailed Rehabilitation or Resettlement Action Plan is required for Tehsil Alipur.

Suitable locations are available for Labour Camps/House, Material Depots, Equipment and Machinery Yard or other activities related to construction. The Contractor should choose particular sites within the overall campus indicated in consultation with resident engineer. These activities shall not be allowed outside this land. If the Contractor chooses to locate his

facilities on a private land, he himself should be responsible for any compensation, resettlement or rehabilitation process and costs.

3.13 Government Approvals

The Punjab Government has committed itself for provision of safe drinking water to all its inhabitants of adequate quantity and at an affordable cost through equitable, efficient and sustainable services under the provincial drinking water policy. To meet with the targets of providing safe drinking water to all the citizens on priority, the Punjab government has established Punjab Rural Municipal Services Company (PRMSC).

With reference to "section 12 of Pakistan Environmental Protection Act 1997 (Amended 2012)", Environmental Approval from EPA is required prior to approvals from any other relevant government departments. After receiving Environmental approval from EPA, the NOCs from other relevant departments will be shared with EPA.

4 REVIEW OF PROJECT ALTERNATIVES

Alternatives are recommended and examined to determine the best method for achieving project objectives, while minimizing environmental impacts (WB December 1996). The discussion and analysis of alternatives in an EIA study should consider other practicable strategies that will promote the elimination of negative environmental impacts identified.

This section covers the project alternatives which were examined for the proposed project in Tehsil Ali Pur, District Muzaffargarh. An analysis of the available alternatives is necessary to establish that the most suitable management and technology options will be adopted for the project, while minimizing environmental impacts. This evaluation explains the selection of the most feasible alternative in terms of economics, environment and health & safety.

4.1 Technology/Process Alternatives

4.1.1 Types of water supply system design

For the proposed water supply solutions under the Study, the Consultants have addressed design for

- a. Multi-village System (MVS)**
- b. Single-village System (SVS)**
- c. Stand-Post**
- d. Skimming Well**
- e. Rainwater Harvest**

For water supply, the solutions account for options based on trunk level connectivity of major settlements through pumping of freshwater lenses; isolated solutions for scattered settlements 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 storage and delivery

a) Multi Village system

Trunk level connects sponsor solutions recognized under the Client interpretation of 'Multi Village System' (MVS) where one principal settlement in each revenue mauza is recognized as a contributing service area to a collective configuration of between 6-8 mouzas. Typical water allowance is 70 Lpcd and system storages are meant to preserve gravity heads in the main trunk. The system is meant to cater to 16-18 hour/day supply which is atypical of rural regimes. Each principal settlement is expected to have population > 2,000 persons (> 350 households) The arrangement is akin to touching base with the major population units in maximum number of mauzas that could have access to freshwater seepage from large irrigation channels. Given the number of participating settlements, the issue of sustainability is paramount and so is the water quality. The ultimate service catchment across multiple mauzas is expected to have a population of 25k-30k (6-9 mauzas) where the cost of the

water supply component works is in equal proportion to the number of mauzas constituting the solution. Thus, as part of the multi-village solution, sample mauza is expected to bear its equal share of proportionate cost against overall component estimates of all other participating mauzas. In certain cases, the service population of 25k-30k persons is difficult to meet due to wide scattering of the settlements and the small number of inhabitants per settlement. As such, an MVS solution would fail to achieve the preferred cluster of households per target settlement. In an effort to close the gap towards target population, an MVS solution would not only take the principal settlements, one each, from the mauza cluster but also include secondary settlements that are in geographic proximity to the solution network. Thus, there would be principal settlements (not necessarily 2,000 or more persons) and secondary settlements that would collectively aim to have a larger service population than would have been possible under just the principal settlements. These variant solutions would also be part of the recommendations under MVS configurations.

b) Single Village System

For major settlements that could not benefit from a piped water solution owing to limitations of system hydraulics under MVS and also the inherent large distance from zones of constant seepage, such as canal water source, the service profile conforms to a solution called 'Single Village System' (SVS) that operates under the assumption that:

- there exists a freshwater lens underneath the large settlement (population 1k-2k or less)
- stable water harvest could be realized

The system is capacitated by a tube-well bore and a low-level reservoir of 500-gallon capacity that permits centralized/communal water withdrawals exclusive to drinking water requirements. Under better coverage options, multiple communal supply points may be configured to permit easy access to denizens over short walking distance.

c) Stand Post

For service areas with under 500 resident persons and assuming presence of freshwater lens in the aquifer, a Stand-Post with disinfection facility could be offered. The number of prospective settlements would be identified on singular basis with number of households between 20-50 such that a local arrangement could be retrofitted against a communal point of delivery. The source would be a private bore between 0.05-0.10 cusec discharge. The solution is recognized as a Stand-post in common parlance. This is a low volume delivery system (3-5 Lpcd) with proximal location of network components

d) Skimming Well

Where a solution is required across a recognized saline zone with known pockets freshwater lensing in strata, the main hydrological bearing would be on mining of the water bearing aquifer that does not disturb the delicate water balance. This is realized on the basis of low potency scavenger wells (more like private bores with 1-2-inch delivery pipes) that penetrate the freshwater lends in the periphery of a low head central storage tank. Typically, 3-5 skimming wells, spaced 50-100 ft. apart, jointly contribute to the common storage, preferably in alternating sequence of pumpage. If the water harvest is not irrational in volume, the sustenance of this mechanism is not an issue assuming that local drawdowns would be compensated by lateral flows migrating to the suction points. The flows are typically 3-5 l/s per well. For a total joint operational time of 2 hours per

day (1/2 hr/well), the flow volume is in excess of 6,000 gallons, enough to satisfy a population of 5,000 @ 5 Lpcd (drinking water only). Since the collection is also very likely on account of cooking and utensil wash, the service population would reduce to around 2,000 persons on a daily basis.

e) Rainwater Harvesting

In areas where freshwater availability is acutely short, the Consultants would recommend active recharge mechanism through household level rooftop 'rainwater harvesting'. The collection estimates would vary, but it is safe to assume that rainfall intensity across even the dry zones would enable collection across sporadic events. In design, rooftop water is routed through gutters to an underground brick lined settling tank that serially connects to a commercially available fiberglass tank fitted with a low hp suction pump for draw-off arrangement. The settling tank has a bypass arrangement to avoid overflows in the system. The abovementioned 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.

f) Reverse Osmosis

Provision of safe potable water through Reverse Osmosis process can also be considered for those villages who do not qualify to get water from above given options due to groundwater salinity problems. This option has the highest capital cost per unit of water provided, as well as high O&M costs.

4.1.2 For Wastewater

Consultant has studied various options for collection of sewage from model mouzas. The options include but not limited to the following;

1. RCC Lateral Sewers
2. uPVC Sewer Pipeline (with 8-inch diameter)
3. uPVC Sewer Pipeline (with 6-inch diameter)

For wastewater treatment and disposal, the proposed sewage collection and treatment. The configuration satisfies gravity flow up to the wet well where onwards .is made by taking into consideration many factors. The system is connected in a way that would satisfy the gravity flow up to the pumping station and there onwards to **Anaerobic Baffled Reactor (ABR) / Bio-Trickling Filter (BTF)**. ABRs are septic tanks that have been upgraded with a series of baffles along the treatment chamber. The up-flow chambers provide enhanced removal and digestion of organic matter. ABRs are based on a physical treatment (settling) and a biological treatment (anaerobic digestion).

ABR / BTF have been proposed for local wastewater treatment according to the design criteria. These technologies are easily adaptable to larger catchments.

ABR / BTF are well suited for rural areas as no trained technician is required to operate and maintain the system. The maintenance is limited to the removal of accumulated sludge and scum every 1 to 3 years.

Soakage well configuration is flexible towards volumetric variations and is particularly suited to small catchments. Moreover, the technology is well suited for small catchments of rural areas. Critical design parameters for septic tanks include hydraulic retention time (HRT) of 48 hours against three up-flow chambers. The up-flow chambers provide enhanced removal and digestion of organic matter.

4.1.3 Selection and Rejection Criteria

- In areas, where **sweet water is available** with reasonable quality and quantity, preference would be given to the establishment of a **water source within the project area** to reduce the cost of water transportation to farthest points. The low-cost option of **grouping/clustering** those settlements/villages that are located in near vicinity to each other can also be adopted depending upon the technical feasibility during detailed studies.
- In areas, where **groundwater is brackish**, the problem is more acute. In such areas, piped water supply can be adopted through extracting **shallow seepage groundwater using skimming wells on the banks of canals** where possible. This system will be given the highest priority due to its **cost-effectiveness** and good prospects for **sustainability**. Unlined distributary or minor canals may be considered where main and branch canals are at substantial distances from villages. In this case, it will be ensured that water transported to the residents will be of good quality. The water source will be established for number of villages/settlements based on the concept of grouping/clustering (where possible) depending upon the yield of the aquifer to meet the water requirements of that cluster. Water shall be transported to the residents at their doorstep after proper treatment/disinfection.
- For the project, this is likely to be the preferred source for domestic use water, where feasible. The hope is that, with appropriate treatment (filtration/disinfection), this freshwater lens can provide a reliable, cost-effective and sustainable source of water for domestic use in a majority of rural areas. The assessment of groundwater availability and quality for domestic use will assess this, and other options, from a technical, cost-effectiveness and resource sustainability perspective.

The selection of customized solutions shall consider the following;

- Village profile and topography,
 - including the village size,
 - density of housing units,
 - proximity to a water source,
 - available and suitable water source.
- In rural areas, both options **covering Sewer piped network/drains** to convey the domestic sewage to some centralized disposal location or adopting the **household septic tanks/soakage** well can be deployed depending upon the studies conducted during the design of the project. However, preference would be given to the system which will dispose-off the sewage in **cost effective and environmentally friendly way**. Depending on the treatment option used, septic tanks may be provided. In all cases, safe disposal of fecal sludge will be ensured.

4.1.4 Alternative Project Timelines

Consideration of alternative timings for construction or operation of a project are necessary in cases where there are social, physical or biological receptors that may be sensitive to the project at a particular time and the postponement of the project in these times can avoid any potential significant impacts. No such considerations are necessary for the project as no significant sensitivities exist in the area that cannot be mitigated by management or application of physical controls.

4.2 Site Alternative

Various sites in each village were assessed before the selection of final Project site. The site selection criteria were based on a number of parameters as indicated below:

- Availability of Land
- Availability of Water
- Number of Users in the Area
- Environmental Issues
- Social Issues

Priority will be given to conduct Project activities on Government lands. But if it would not be available then private land will be acquired by;

- Donation from the land lord owners who would not have any negative impact on their housing and business activities.

4.3 Alternative Energy Sources

The following energy sources have been considered for the project:

- a) Solar Energy.
- b) Power from WAPDA;

4.3.1 Power from WAPDA/Grid

For plants power from grid is considered as primary source of energy. As far as Ali Pur Tehsil is concerned, WAPDA power supply is available in every village.

4.3.2 Solar Energy

Installation of solar facility with each should not only reduce the overall electric load on the National Grid but it will also help in reducing the operating cost of the project and making such schemes successful. Solar energy is considered as alternate source of power for plants along with metered connection from WAPDA with approximately 8-10 hours battery backup. Each plant will be operated for maximum eight hours while it is assumed that plant shall be run for at least six hours on solar system power.

4.4 No Development Option

The ‘no-development’ alternative is basically a consideration of the original and undisturbed environment without any development from the proposed project. This option is considered to ensure that all possibilities have been taken into consideration before deciding on a final course of action and also to provide a baseline situation against which the other suggested alternatives can be measured.

Lack of access to safe and clean water and sanitation has led to the spread of waterborne diseases. Particularly, bacteriological and viral diseases have caused high child mortality rate. Common diseases caused by polluted drinking water include diarrheal diseases, cholera, gastroenteritis, dysentery etc. The “No Project or No development” option will result in further worsening of the present situation and increase health risks to residents of Tehsil Ali Pur as the sanitary conditions in the area are already very poor. If analyzed by socio-economic point of view, “No Project” option is not feasible since the residents will be more vulnerable to diseases, they will have to spend a major portion of their earnings on medical treatment. Their earnings will also be reduced due to loss of working hours due to frequent illnesses. A major portion of governmental budget is also spent on health issues raised by water borne diseases. The need of clean and safe water is essential for both health and social well-being of people of Pakistan. Therefore, “No Project” option is not acceptable as it will seriously deteriorate the situation of public health and social welfare of the area.

5 DESCRIPTION OF BASELINE ENVIRONMENT

An environmental baseline study is intended to establish a data base against which potential impacts can be predicted and managed subsequently. The EIA of the proposed project covers a comprehensive description of the project area, including regional resources which are expected to be affected by the project, as well as, those which are not expected to be directly affected by the construction and operation of the project.

Reconnaissance survey of selected revenue villages in Ali Pur was carried out to collect broad baseline data on physical, biological and socio-economic conditions prevailing in the area of each sub-project. The objective of sample survey was to determine the environmental and social sensitivity of the area. For baseline survey, questionnaires were prepared to collect primary data and then were analyzed to determine the social and environmental baseline conditions of the villages. Moreover, secondary data from different sources like census of 2017, hydrogeological studies, meteorological data etc. was also analyzed for a detailed assessment. The findings of the baseline survey is being discussed in this chapter.

The following components form part of the baseline:

- Physical Environment
- Ecological Environment
- Socio-economic Environment

5.1 Physical Environment

5.1.1 Muzaffargarh District

The District is located between 28°57' to 30°46' north latitude and 70°30' to 71°47' east longitude. Geographically, District D.G. Khan and Rajanpur are located on east, District Multan, Bahawalpur and Rahim Yar Khan on West, District Layyah and Rahim Yar Khan are located in the north and south of the district respectively.

The district is located in the form of a strip between two major rivers i.e. Chenab and Indus flowing on its eastern and western side of the district respectively. River Chenab flows for about 125 miles along the eastern side of the district. River is narrow in shape and less swift compare to River Indus. The Indus flows along the western boundary of the district. In the cold weather, it is about 2 miles wide. In the rainy season of monsoon, the river overflows from its banks largely and as a result, the river's width reach generally more than 10KM at some places. The eastern portion of the district consists of Thal desert, while small portion of the district has a forest cover lying along the river Indus. The district is linked with all major cities through network of major roads.

District Muzaffargarh consists of four tehsils namely Muzaffargarh, Kot Addu, Jatoi and Ali Pur, while these tehsils are divided into 111 union councils and 986 Mouza's respectively

5.1.2 Ali Pur Tehsil

Alipur is a city and Tehsil of Muzaffargarh District in the Punjab province. The city is subdivided into 14 Union Councils. It has a population of over 398,053. Tehsil Alipur is one of the oldest Tehsil of Punjab which was established in the year 1928. It is situated at a distance of about 85 km from

Muzaffargarh on the Karachi–Multan National High way. This Tehsil surrounded by rivers on three sides. The river Chenab runs along the eastern side, Indus on the Western and Sutulj /Chenab on the southern side. It is bounded by Tehsil Jatoi on the North /West ,Liaqatpur on the south , Ahmadpur East and Jalalpur Pirwala on the East. The tehsil has five police stations and seven civil courts in total. The area of the tehsil is 1391 sq.km.

5.1.3 Climateⁱ

Much of the area of Muzaffargarh is dry or arid and consists of sand dunes and barren lands known as Thal area while other parts of the area whether flooded from the river or irrigated by inundation canals is less dry. The temperature prevails hot during May to September but mild cool breeze starts during mid August before midnight thus brings temperature down. The months of December and January are cold with severe frost falls during night causing serious 5 injury to cotton, mango, sugarcane and vegetables.

District receives plenty of rainfall during month of July to September when monsoon winds bring heavy cloud. The average rainfall receive during these months are in a range of 45, 32 and 11 mm respectively. Dust storms are a common occurrence within the district in the same months. The weather averages for the month of April, temperature averages around 38°C and at night it feels like 25°C. The table below displays max and min temperature for the whole year as an average taken from last 12+ years of historical data for Alipur.

Table 5.1: Average max and min temperature

Month	Day	Night
January	22°C	10°C
February	26°C	13°C
March	32°C	19°C
April	38°C	25°C
May	43°C	30°C
June	43°C	32°C
July	41°C	33°C
August	39°C	31°C
September	38°C	29°C
October	36°C	23°C
November	29°C	17°C
December	24°C	12°C

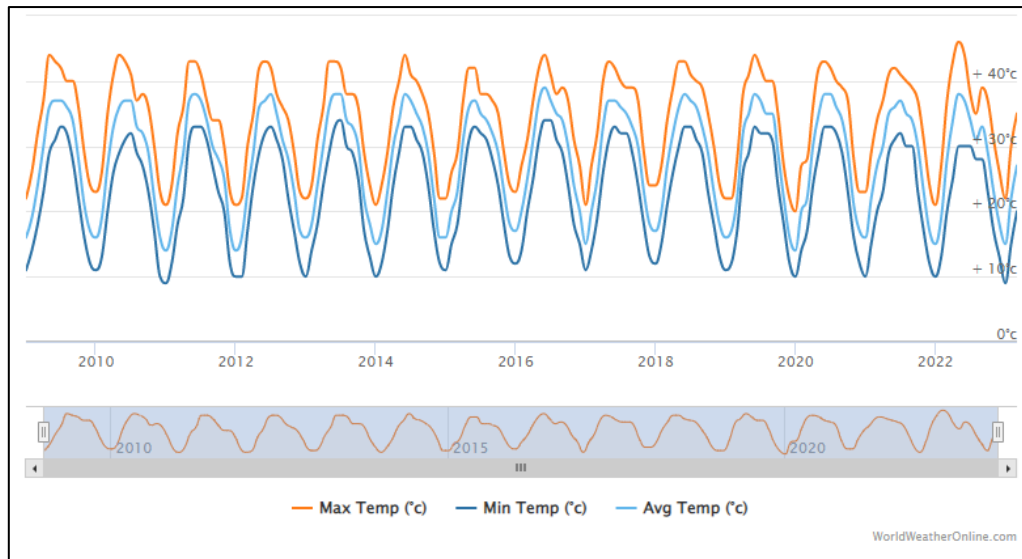


Figure 5.1: Maximum, Minimum and Average Temperature

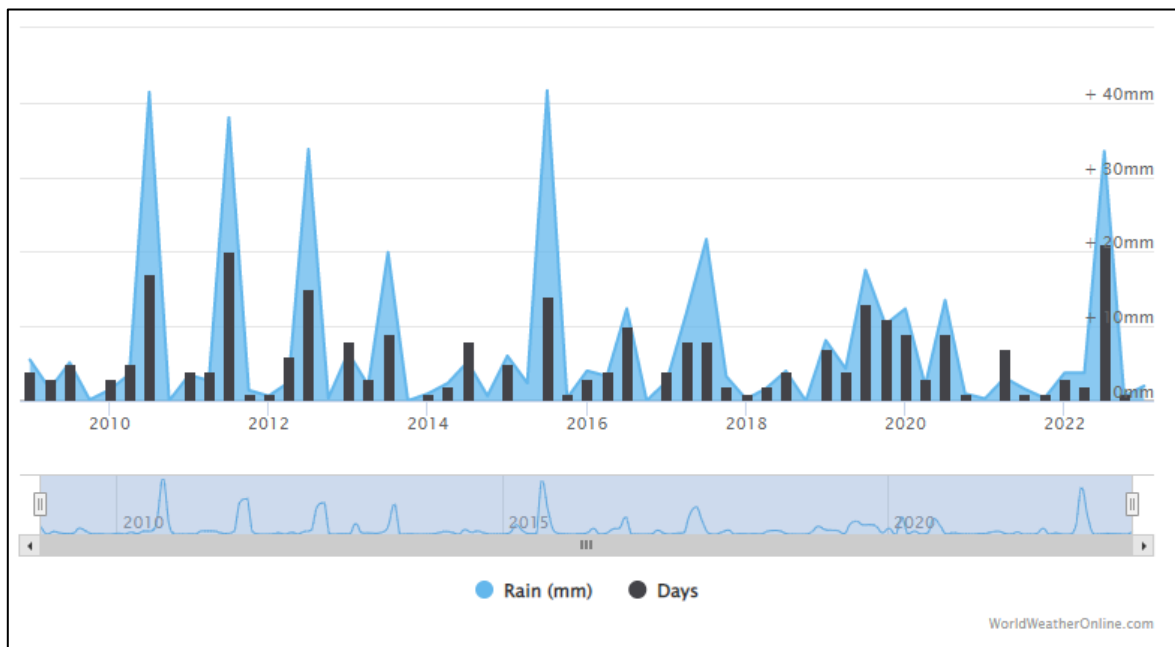


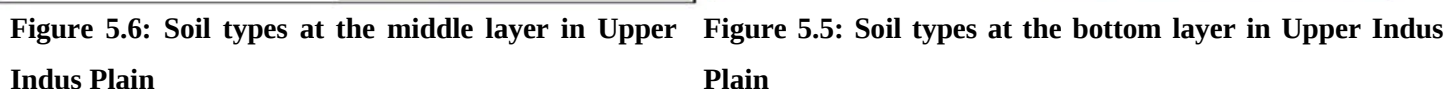
Figure 5.2: Yearly Rainfall Amount (mm) and Rainy Days



The average elevation of the district is 121 meters with minimum elevation of 111 metre to maximum elevation of 131 metre.

The soil type in district Muzaffargarh varies from clay to silty clay and silty clay loam as shown in the figure below:





Muzaffargarh lies in the Thal Doab region which lies between the Indus River and the Jhelum River. Geographically, it is the largest Doab with an area of 37,477 km². It is also known as Sindh Sagar Doab and forms the northwestern and western part of the Punjab plains. The Thal desert falls in this Doab and the Salt Range forms its northern skirt.



The flood plain of the Indus and the Chenab rivers are underlain by thick deposits of sand with rare amount of gravel. Thin lenses of silt and clay occur in the form of incultation with sand which have limited vertical and lateral extent (Khan et al. 2014). Part of the plain adjacent to river which comes under floodwater during heavy floods is called active flood plain. Depth to water table in most of the

area is shallow and is in the range of 0.5 to 9.0 m from ground surface. The Thal Doab aquifer is hydrologically active where the groundwater resource is available in the form of thick alluvium (Shah and Ahmad 2015). The United States Geological Survey (USGS) conducted a study with Water and Power Development Authority (WAPDA), Pakistan in 1961-62 on quality as well as hydraulic characteristics of groundwater (Bennett et al. 1967). The study predicts an average permeability of 0.0033 cfs per square ft in the area. The geological studies concluded that coarse material is on higher side in Thal Doab area (WAPDA 1994). The quality of groundwater up to 200 meters was found generally good (Shamsi and Bilal 1963). Major source of groundwater recharge in the area is the canal system, i.e., main Thal canal and its distributaries, which flows from north to south.

5.1.7 Irrigation Infrastructure

The means of irrigation in the area is by wells and inundation canal system. Muzaffargarh Canal Division covers three tehsils of the District Muzaffargarh, i.e. Muzaffargarh, Alipur and Jatoi and some portion of Tehsil Kot Addu. It comprises Muzaffargarh Canal System and Rangpur Canal System—the former from RD 206+700 to RD 370+700, and later from RD 320+000 to RD 442.025. Both the systems are non-perennial.

5.1.8 Agriculture

Wheat, sugarcane and cotton are the main crops grown in the town and the surrounding district. Rice, jowar, pearl millet, mung bean, masoor, ground nuts, maize, mustard seeds, sunflower seeds and other oil seeds are grown in the area in small amounts.

Mangoes, dates and pomegranates are the main fruits grown in the region. Jamun, pears, falsa, and bananas are also grown in small quantities.

Vegetables grown in the area include onions, carrots, cauliflower, peas, okra, turnips, tomatoes, potatoes, garlic and chilies.

Following table depicts the land statistics for tehsil Ali Pur in terms of agriculture:

Table 5.2: Land statistics of tehsil Ali Pur (acres)

Tehsil	Total Area (Acres)	Cultivated Area (Acres)	Un-cultivated Area (Acres)	Forest area (Acres)	Culture able Land (Acres)	Un-culture able Land (Acres)
338227	229316	108911	1600	229316	55560	338227

5.1.9 Natural hazards

District Muzaffargarh is susceptible to a range of hazards including riverine floods, heat strokes, drought, pest infestation, oil spills, road accidents and industrial hazards. Among these hazards, Riverine floods are more common and severely affecting the district causing substantial losses to life, infrastructure, property and livelihood of the people from time to time. As per NDMA's risk assessment carried out for developing the National Disaster Management Plan 2012-2022, District Muzaffargarh was among the 50 at risk district of Pakistan.

The district belongs to Zone 2A of the Seismic Zone Map of Pakistan which means minor to no damage due to earthquakes.

5.1.9.1 Floods

The flood in 2010 severely affected the cropping areas which is main source of livelihood for rural community of the district. According to district government statistics, around 69% of cultivated areas damaged in tehsil Muzaffargarh, while 56% in tehsil Kot Addu, 46% in tehsil Alipur and 26% in tehsil Jatoi cultivated area were badly affected by flood. The standing crops of kharif have been affected such as rice, cotton, sugarcane, fodder and vegetables. It has been estimated that nearly one million tons of food and seed stocks destroyed during flood. In district, many on-farm watercourses and tube wells badly devastated. Flood also severely affected on the forthcoming Rabi crops of the season, which were not planted because of the stagnant water in many cultivated areas of the region and the following maps highlight the vulnerable settlements in Muzaffargarh. Similarly, majority of the housing units especially in rural areas badly damaged in the same floods. There was an estimation that around 131,293 houses damaged completely while rest of the houses partially destroyed because of the excessive amount of water. Figure below shows the number of affected households:

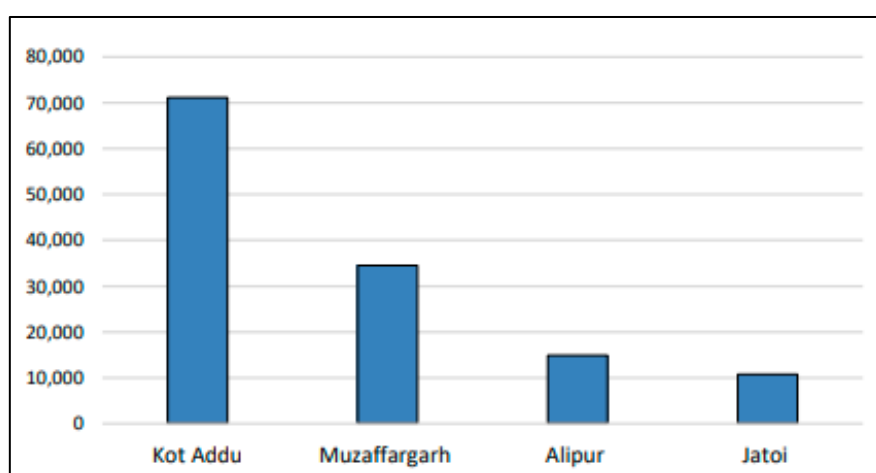


Figure 5.8: Number of households damaged during 2010 floods

Risk Profile:

With fertile soil and best irrigation system available in the district, the agriculture sector remained major sources of livelihood for the people of Muzaffargarh. However, due to frequent flooding by the two mighty rivers most of their livelihood are always at risk. On top of that quick urbanization, lack of social security, poor infrastructure, poverty and harsh climatic conditions are main causes of increasing the vulnerabilities of population. For risk profiling, group works were carried out in two different workshops held at Muzaffargarh and Alipur cities with the government and non-government stakeholders both at district and tehsil level during January-Mar 2018. The participants prepare enlist the prioritized union councils as high, moderate and low at risk.

Union Council	Ranking	Tehsil
Yakewali	Moderate Risk	Ali Pur
Madwala	Moderate Risk	Ali Pur

Bait Mullan Wali	Low risk	Ali Pur
Ali Pur	Low risk	Ali Pur
Nauabad	High risk	Ali Pur

5.1.9.2 Drought

A large area of Muzaffargarh particularly on the south western side of the district is arid and dry. This area is vulnerable to drought conditions in case of long dry spell. So far, no serious drought conditions have been recorded in the district of Muzaffargarh and that is the reason that no damages data is available related with drought or famine.

5.1.9.3 Epidemics

It is commonly observed that after the devastation of floods, the water remains in the street and field for longer period of time thus working as nurseries for Mosquitoes and other insects resulting outbreaks of diseases and epidemics. These diseases spread through;

- Drinking water e.g. diarrhea
- Aerial transmission e.g. influenza
- Through carrier / vector e.g. dengue and malaria etc.
- Spread through several means / contact e.g. HIV AIDS, hepatitis etc.

Stagnant water is also likely to increase the risk of diseases till it dries up and goes back to rivers and nullahs. Layyah, Muzaffargarh, Rajanpur and Dera Ghazi Khan were the most affected areas as over 21,000, 16,000 and 25,000 patients were being treated in these districts respectively.

5.2 Water Resources in AliPur Tehsil

In Ali Pur tehsil, surface water and groundwater sources are available. Detail is given below:

5.2.1 Surface Water Sources in Ali Pur Tehsil Area

Ali pur area is located at tail end of Taleri canal of Muzaffargarh branch. Number of non-perennial distributaries and minor are present in the tehsil area. The detail of the distributaries are given below:

- | | |
|-------------------|----------------------|
| • Ali pur Branch | Discharge 1225 cusec |
| • Ali pur Disty. | Discharge 73 cusec |
| • Lunda Disty. | Discharge 87 cusec |
| • Gohan Disty. | Discharge 77 cusec |
| • Subhai Disty. | Discharge 174 cusec |
| • Qadra Disty. | Discharge 132 cusec |
| • Chundran Disty. | Discharge 74 cusec |

There is a network of minors emerging from the distributaries reported above in the Ali pur tehsil. The canal water quality is generally excellent and ranges from 150 to 200 PPM depending upon the source like directly from the river water or storage water from dams.

Due to non-perennial canal system present in Ali pur tehsil area, canal water cannot be considered for any water supply scheme.

5.2.2 Groundwater Source and its Potential in Ali Pur Tehsil Area

The main water source of Ali pur is ground water. The water table is shallow approximately 10 ft. to 20 ft. depth from natural ground surface. The shallow groundwater quality is fresh to marginal in the central part of the tehsil area. The groundwater quality is fresh in eastern areas of tehsil along Chenab River and poor in western tehsil area along Indus River.

5.3 Water Table and Groundwater Quality in Ali Pur

Punjab Irrigation Research Institute (IRI) monitors the water level and groundwater quality bi-annual of Muzaffargarh irrigation canal area, which is a part of Dera Ghazi khan canal command area. IRI had published the water level and groundwater quality maps of Dera Ghazi canal command area including the Ali Pur tehsil.

5.3.1 Water Table in Ali Pur Tehsil

The water level map of Dera Ghazi Canal Command area including Ali Pur Tehsil published by IRI for post-monsoon year 2014 is given in figure below:

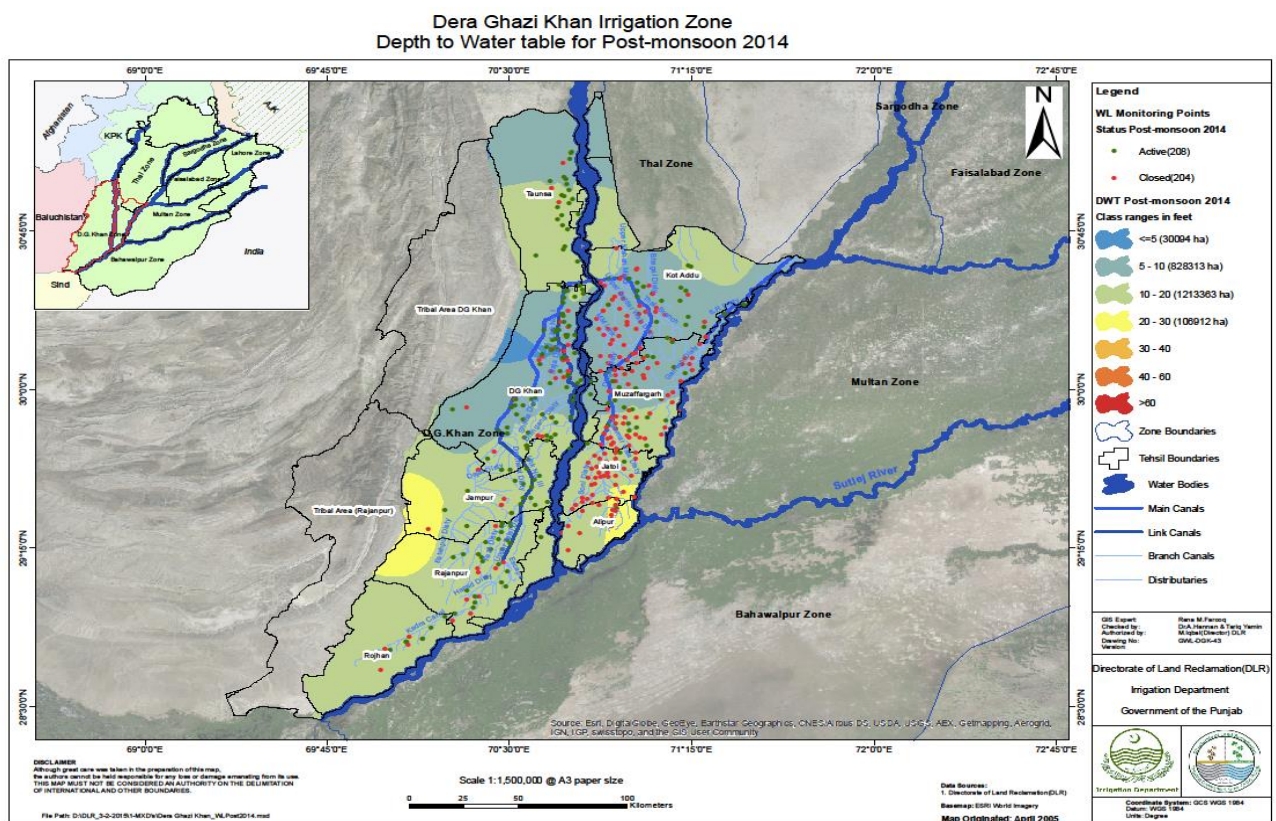


Figure 5.9: Water Level map of Dera Ghazi Canal command area including Ali Pur Tehsil (Post Monsoon year 2014)

From figure 5.9, it is revealed that water level in Ali Pur area is shallow and ranges from 3 m to 10m (10 ft. to 30 ft.) depth from ground level. The water level in the active and abandoned flood plain

areas along Indus and Chenab Rivers is very shallow and becomes around 30 ft.in central part of Ali Pur city.

5.3.2 Groundwater Quality in Ali Pur Tehsil

The groundwater quality map of Muzaffargarh canal command area including Ali Pur tehsil published by IRI for pre-monsoon year 2014 is given in below as Figure-3.

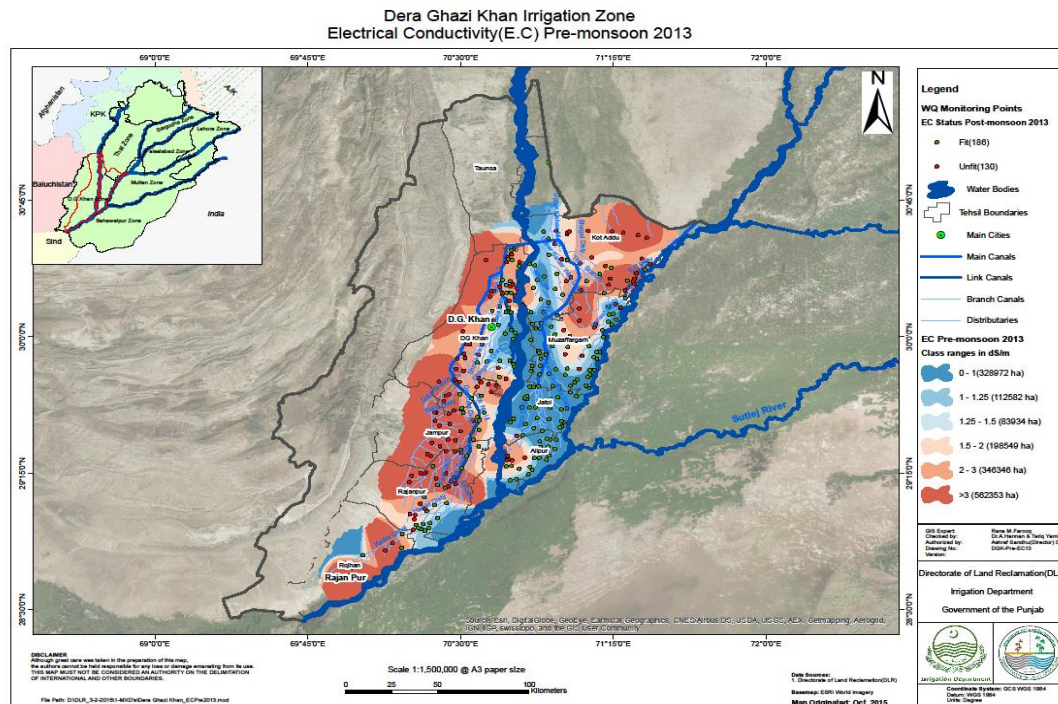


Figure 5.10: Groundwater Quality map of Muzaffargarh canal command area including Ali Pur tehsil (Pre- Monsoon year 2013)

It is revealed from the figure that shallow groundwater quality in Ali pur tehsil is fresh to poor. The groundwater quality is fresh (less than 1000 PPM) in the major eastern part of Ali pur tehsil located along the right bank of Chenab River. The ground water quality is reported poor (1500 to 2000 PPM) along the western part of Ali Pur town along the Indus River. This poor groundwater zone extends across the right bank of Indus River. The discharge of Indus River has been controlled after construction of Tarbell Dam in upstream area and intensity of flood water in river have been reduced. The major part of Indus River bed becomes dry in summer season and gets groundwater from the high land instead of recharging to the river bank areas. Therefore, groundwater quality is poor in western area of Ali Pur tehsil along the Indus River.

Table 5.3: Results of Chemical Analysis of Groundwater Samples in Ali Pur Tehsil

Sr.no	Parameters	Unit	PEQS	Results															
				Mouza Mud Sonara	Mouza Mud Sonara	Mouza Mud Sonara	Sonara Shah	Mouza Walwat	Mouza Walwat	Ghous pur	Ghous Pur	Bait Mullan Wali	Nabi Shah	Nauabad	Nauahbad	Khuroq fazal	Pirawal	Azmatpur	Yake Wali
	Source			T/W	T/W	T/W	T/W	T/W	T/W	T/W	T/W	T/W	T/W	T/W	T/W	T/W	T/W	T/W	T/W
1	Total Dissolved Solid (TDS)	mg/L	<1000	1670	1360	1430	2250	425	480	810	600	720	530	750	885	510	540	430	380
2	Total Hardness	mg/L	<500	540	730	900	270	260	290	350	300	380	340	450	420	310	320	240	270
3	Aluminum	mg/L	50.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4	Antimony	mg/L	50.005	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
5	Arsenic	µg/L	<50	0.0495	BDL	0.689	0.0511	0.0199	0.0003	0.0345	0.0211	0.0245	0.0416	0.394	0.0495	0.0244	0.0299	0.0245	0.0199
6	Barium	mg/L	0.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
7	Boron	mg/L	0.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
8	Cadmium	mg/L	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL		BDL
9	Chloride	mg/L	<250	230	275	450	515	5	40	80	60	70	50	85	70	45	65	30	20
10	Chromium	mg/L	50.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
11	Copper	mg/L	2	BDL	BDL	BDL	BDL	BDL		BDL	0.0176	BDL	BDL	BHL	BDL	BDL	BDL	BDL	BDL
12	Fluoride	mg/L	<1.5	0.7	0.4	0.2	0.6	0.4	0.4	0.6	0.4	0.5	0.3	0.5	0.4	0.4	0.4	0.3	0.2



13	Lead	mg/L	50.005	0.2351	BDL		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14	Manganese	mg/L	50.3	0.2709	0.2087	0.24	0.3588	0.1608	0.1316	0.2482	0.1809	0.2046	0.05	0.0348	0.2292	0.2417	0.1003	0.1854	0.0759
15	Mercury	mg/L	50.001	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16	Nickle	mg/L	50.02	BDL	BDL		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	Nitrate	mg/L	<50	1.14	0.601	3.146	2.496	0.194	0.009	0.325	0.199	0.2	0.184	0.294	0.394	0.208	0.299	0.294	0.142
18	Nitrite	mg/L	<3	0.945	0.841	2.98	1.944	0.146	BDL	0.301	0.236	0.146	0.106	0.146	0.409	0.116	0.188	0.146	BDL
19	Selenium	mg/L	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20	Residual Chlorine	mg/L	02-0.5	0.14	0.12	0.14	0.14	0.11	0.0094	0.02	0.16	0.21	0.16	0.13	0.1	0.12	0.1	0.11	0.16
21	Zinc	mg/L	5	0.0076	0.0084	0.0068	0.0076	0.0074	BDL	0.0084	0.0348	0.035	0.086	0.0214	0.0063		BDL	BDL	BDL
22	Phenolic compound	mg/L	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	Sodium	mg/L	-	138.0295	199.0394	151.9913	456.9711	47.7244	63.77	124.977	83.4044	70.8034	42.6255	82.8444	136.9318	58.8834	65.6801	65.9735	35.07
24	Potassium	mg/L	-	19.1578	21.6234	29.084	29.0753	14.2498	9.7288	17.8044	8.427	40.5904	10.3572	7.0142	15.9718	13.8834	13.326	8.0215	2.9629
25	Total Iron	mg/L	-	0.0318	0.1436	0.0704	0.0942	BDL	1.0460	0.0656	0.1867	BDL	0.201	BDL	BDL	0.0099	0.032	0.0709	0.0402

5.3.3 Sanitation Condition and Wastewater Characteristics

Almost all settlements in the twelve mouzas under study in Shujabad have small open channels (nallies) for carrying sewage from homes. These nallies (usually 30 cm wide and 30 cm height) are notably clogged and are cleaned occasionally through manual sweeping. These open channels are difficult to maintain and are built with insufficient slope to drain properly i.e. they just follow the road level. Thus, they usually quickly become filled with rotting organic material and are also prime breeding grounds for mosquitoes and other disease transmitting pests. Flush toilets connected to septic are the dominant access modality for rural households in Shujabad that have access to improved facilities. The largest increases have been in soakpit toilets and flush-to-open-drain toilets. Many are not engineered septic tanks but simply soak-pits, and almost all are manually emptied, with effluents released into open drains.

The untreated effluent is either being discharged directly into open drains, nearby water course or in nearby agricultural fields. In using wastewater for irrigation, the direct (actual contact with wastewater) health risks are localized within an irrigated area and the exposed group is relatively small. If wastewater is dumped in open water bodies larger populations of downstream water users will be exposed to uncertain health risks such as diarrheal and parasitic infections as well as skin disorders and systemic infectious. In some villages, pits were constructed in each household to collect household waste which was emptied by the members of family exposing them to various health hazards.

People exposed to wastewater are most often categorized into four main groups;

- a) agricultural workers and their families;
- b) crop merchants, handlers, and technical/operational staff;
- c) consumers of farm produce, vegetables, meat, or milk products;
- d) residents of areas irrigated with wastewater, including children, the elderly, and immunocompromised individuals, who are at the highest risks in particular

The detailed results are attached in Annexure III of this report while the summary of results is shown in the table below.

Table 5.4: Summary of Wastewater Quality Results

Location	Physical Parameters	Chemical Parameters	Parameters exceeding PEQS Limits
Main Drain Azmat Pur	In Compliance	Partially Compliance	BOD ₅ (raw) – 233 mg/l COD (raw) – 376 mg/l TSS (raw)– 510 mg/l
Main Drain Yake Wali	In Compliance	Partially Compliance	BOD ₅ (raw) – 238 mg/l COD (raw) – 376 mg/l TSS (raw)– 490 mg/l

Parameter	BOD ₅ (Raw)	BOD ₅ (Settled)	COD (Raw)	TSS (Raw)
PEQS Permissible Limits (mg/l)	80	80	150	200

5.3.4 Air and Noise Quality

The air and noise quality in rural settlements is relatively better than those of urban areas. Since the region is relatively free from industries, it has a relatively clean environment, with the major source of air pollution being vehicular transmissions and dust particles. The visual assessment of the sub-project areas indicated low noise levels (except near operating tubewells and main roads with heavy traffic). The Air Quality Index (AQI) usually remains above 150 which indicates unhealthy air. The concentration of PM_{2.5} and ozone is relatively high in the area. The area suffers from air pollution caused by both natural as well as because of human activities. Air pollution from Natural causes occurs when contaminants drawn from animals, plants and land resources get disseminated in the atmosphere in normal course. Natural contaminants include spores, pollens, moulds, fur, feather, hair, dander, dust, grit and other types of particulate matter. Human activities like burning solid fuel indoors (as natural gas is not available in the area) and tobacco smoking. Agricultural use of pesticides and insecticides also creates a potentially serious air pollution problem in rural areas. Pesticides can enter the human body through inhalation of aerosols, dust and vapor that contain pesticides; through oral exposure by consuming food and water; and through dermal exposure by direct contact of pesticides with skin. Pesticides are sprayed onto food, especially fruits and vegetables, they secrete into soils and groundwater which can end up in drinking water and pesticide spray can also drift and pollute the air.

The construction activities may further degrade the air and noise quality; therefore, mitigation measures are provided in ESMP to minimize the negative impact and monitoring shall be done to check the levels of pollution.

Table 5.5: Air and Noise Quality Data

Sr. No.	Parameter	Results			
		PEQS Limit	Basti Sontry Wala (Ghauspur)	Basti Ghabol (Bait Nabi Shah)	Yaki wala
1	PM _{2.5}	35 (µg/m ³)	39.5 (µg/m ³)	48.1 (µg/m ³)	52.5 (µg/m ³)
2	PM ₁₀	150 (µg/m ³)	140.3 (µg/m ³)	146.6 (µg/m ³)	144.7 (µg/m ³)
3	CO	5 (mg/m ³)	0.556 (mg/m ³)	0.223 (mg/m ³)	0.144 (mg/m ³)
4	NO	40 (µg/m ³)	2.32 (µg/m ³)	2.99 (µg/m ³)	2.35 (µg/m ³)

5	NO ₂	80 (µg/m ³)	3.59 (µg/m ³)	5.19 (µg/m ³)	4.35 (µg/m ³)
6	SO ₂	120 (µg/m ³)	6.02 (µg/m ³)	8.58 (µg/m ³)	8.00 (µg/m ³)
8	O ₃	130 (µg/m ³)	141.8 (µg/m ³)	180.2 (µg/m ³)	192.4 (µg/m ³)
6	Average Noise levels (24 hour)	Day Time (R) 55 Night Time (R) 45	44.92 dB	46.32 dB	44.8 dB

5.2 Ecological Environment

Ecological Environment involves:

- Flora
- Fauna
- Endangered species

5.2.1 Flora

Floral species can be divided into following groups:

- Fruiting Plants
- Non-Fruiting Plants
- Crops

Talhi or shisham (*Dalbergia sissoo*), kikar/ babul (*Acacia Arabica*), siris (*Albizia lebbek*), jhand (*Prosopis spicigera*), ber (*Ziziphus jujube*) and phog (*Calligonum polygonoides*) are the commonly grown trees in the district.

The aquatic vegetation in the seepage lagoons, wetland areas and protected Taunsa Barrage Wetland Area includes water lily (*Nymphaea lotus*), common reed (*Phragmites karka*), aquatic submerged reeds like *Potamogeton crispus*, and *P. pectinatus*, crow foot reed (*Ranunculus aquatilis*), wild sugarcane (*Saccharum spontaneu*), cattail weed (*Typha angustata*), eel grass (*Vallisneria spiralis*), horned pond weed (*Zannichellia palustris*), *Carex fedia* (a type of sedge), water thyme (*Hydrilla verticillata*), and Indian lotus (*Nelumbium speciosum*). Much of the land adjacent to the Taunsa Barrage Reservoir is under cultivation, mainly for cotton, sugarcane, wheat, and fodder crops.

Riverine forests along the Indus are dominated by shisham (*Dalbergia sissoo*) and poplar (*Populus euphratica*) as well as with ghaz or khagal (*Tamarix dioica*). Other natural vegetation includes kikar/

babul (*Acacia nilotica*), jhand (*Prosopis cineraria*), garden pea (*Pisum arvense*), Russian thistle (*Salsola barysoma*) and grasses like *Cynodon dactylon*, *Eleusine compressa*, and *Panicum antidotale*.

There is wild growth of Mesquite bushes and some Eucalyptus trees, in the project area.

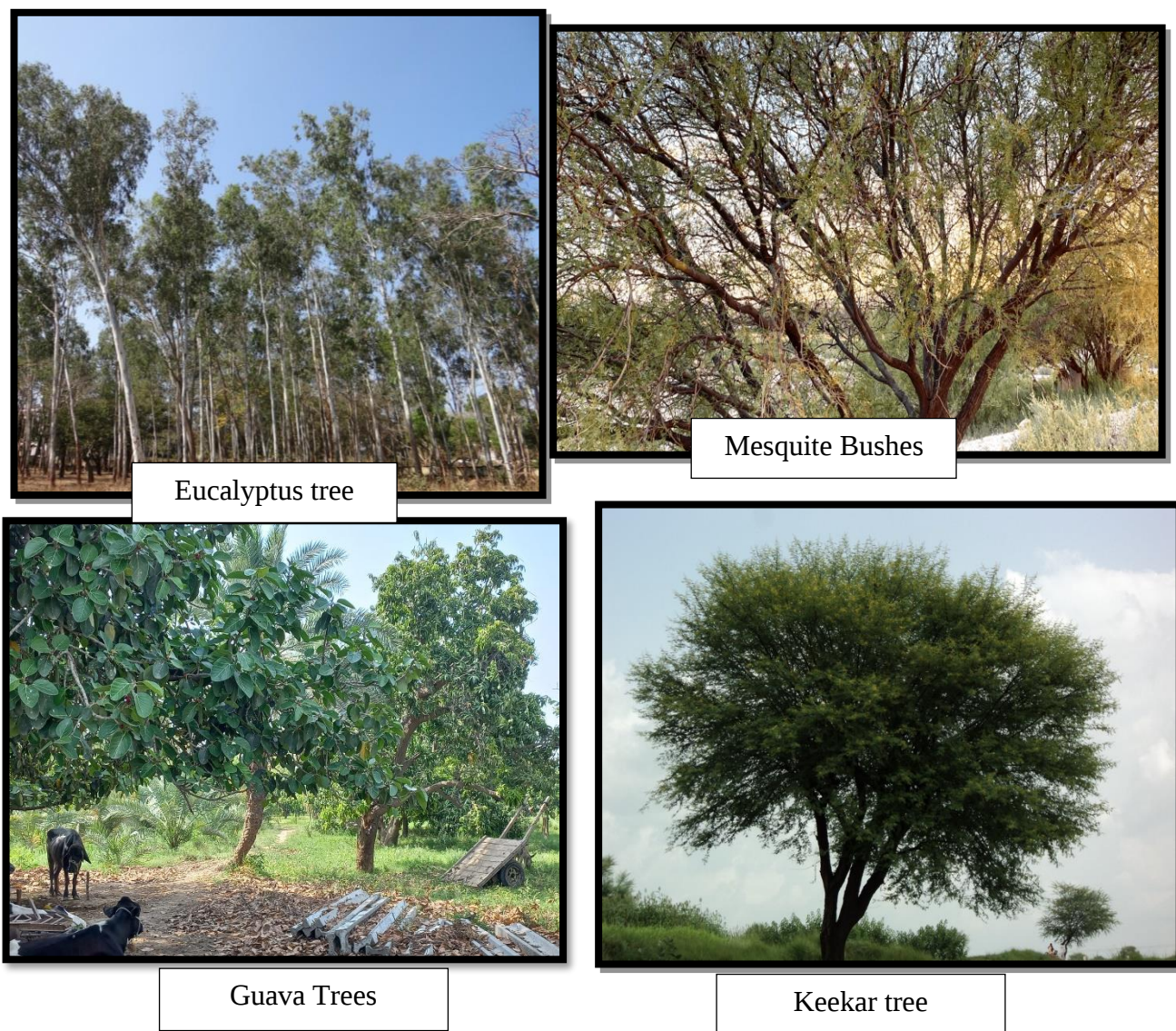


Figure 5.11 Flora of Project Area

5.2.2 Fauna

Fauna of the project area consists of:

- Mammals
- Reptiles
- Amphibians

- Birds

There is no wildlife in the project area except jackals, dogs and snakes etc. Wild boar, hog deer, jackals, and fox are common mammals of the district Muzaffargarh. Doves, sparrows, hoopoe, woodpeckers, pewit, crow, parrots, cuckoo, blue rock pigeons, kites, swallows, coots, shikra (a hawk), king crow, egrets, king fisher, and owls are common birds.

5.2.4 Protected Areas/National Sanctuaries

In Pakistan there are several areas of land devoted to the preservation of biodiversity through the dedication of national parks and wildlife sanctuaries. Following are the protected wildlife areas of the district Muzaffargarh:

- Taunsa Barrage Wildlife Sanctuary (on Ramsar List)
- Part of Thal Game Reserve
- Ghazi Ghat Wetland Complex
- The Rangla Wetland Complex is part of Thal Game Reserve.

The Rangla Wetland Complex, one of two important wetlands in the district, has rich biodiversity in the desert area. The lakes on the western side are mostly freshwater lakes and are located in the agricultural areas, while those in the eastern side are located in the off-shoots of the Thal Desert and are mainly brackish in nature. These lakes were formed as backwaters and seepage ponds, after the construction of Muzaffargarh canal. Another important wetland is the Ghazi Ghat Wetland which was created after the construction of Ghazi Ghat Causeway and Bridge. Both these wetlands support a large variety of fish and wintering birds

Siberian crane; Endangered Indus Dolphin (Bulhan); a total of 253 species of birds are reported in the Taunsa barrage wildlife sanctuary, majority of which are migratory/ Most of these are protected and hunting is not allowed. Other important and threatened wildlife provided protection includes Hog Deer , Smooth-coated Indian Otter, Marbled Teal and Spotted Pond

These provide sanctuary to migratory birds like the Indian pond heron, greater sand plover, Sindh jungle sparrow, rufous-vented prinia (both being indigenous bird species), marbled teal, Jerdon's babbler, bristled grass warbler, pallas fish eagle, and wintering Dalmatian pelican (these birds are endangered in Pakistan). The forests provide sanctuary to hog deer, urial, and other mammals.

However, there are no protected areas in the vicinity of proposed project.

5.3 Socio-Economic Environment

5.3.1 Study objectives

The socio-economic study undertaken for the Environmental Impact Assessment (EIA) was designed and conducted to meet the following objectives:

- To assess the human environment of the area i.e. to determine the quality of life of communities within the region of influence.
- To have an insight into the day to day activities of people especially focusing on their income generating activities viz., agriculture and labor.
- To assess the vulnerabilities of the local communities and the effects of project activities on their quality of life.
- Consultation with communities regarding the proposed project activities and to find out their concerns and aspirations.

In general, the information required for the project and project area relates to verification of demographic characteristics, details topographic survey, geotechnical investigation, confirmation of the land availability, check the site condition and measurements of that proposed areas for the establishment of the Pumping chambers, Over Head Reservoir (OHR), stand posts, Sewage Treatment Units, Septic tanks and waste enclosures etc.

5.3.2 Methodology

Data was collected from published sources such as census reports, previous studies and data from government departments as well as from field survey carried out in the surroundings of the project area.

Our field survey methodology includes transect walks through villages, group interviews and focus group discussions with the local communities. This activity was carried out with the objective of obtaining a clear and complete understanding of the social and economic conditions of the local communities; assessing the vulnerability of the local communities; identifying marginalized strata of the community; and gathering local concerns and inhibitions.

5.3.3 Quality of Life Values

Muzaffargarh district covers an area of 8,249 km² and is subdivided into 4 tehsils as follows:

Alipur Tehsil	30 Union Councils
Jatoi Tehsil	16 Union Councils
Kot Addu Tehsil	28 Union Councils
Muzaffargarh Tehsil	35 Union Councils

5.3.5 Heritage/ Historical Buildings/Tourist attraction

Following are the heritage/ historical buildings of Muzaffargarh district:

- Tomb of Sheikh Sadan Shaheed, Village Sadan (protected); Muzaffargarh district: This is a brick tomb, square in plan, and erected on a high platform, which is about 2 m above the surrounding ground levels
- Tomb of Tahar Khan Nahar (or Tahir Khan Nahar) and nearby mosque in Sitpur (protected); Muzaffargarh district
- Shrine of Hazrat Sakhi Abdul Wahab Bukhari, Dera Din Panah (protected); Muzaffargarh district. The shrine is also known as Deen Panah Bukhari
- Shrine of Hazrat Sheikh Ludho, Muzaffargarh (protected)
- Shrine of Hazrat Sultan Manjhan, at Basti Sultan Manjhan, Muzaffargarh (protected)
- Shrine of Hazrat Bahu Sher, Muzaffargarh (protected)
- Shrine of Hazrat Muhammad Anwar, Kunnal Shareef, Muzaffargarh, (protected)
- Fort of Mahmood Kot, Muzaffargarh (protected)

Non-protected, but important, historical sites include

- Shrine of Hazrat Alam Shah Bukhari, Tehsil Jatoi; Muzaffargarh district
- Victoria Club, Muzaffargarh. It is now called Yadgar Club; Muzaffargarh district
- Masjid Sakina-tus Sughra, Tehsil Jatoi; Muzaffargarh district
- Shah Garh Fort, Muzaffargarh. This is a mud fort
- Shrine of Hazrat Noor Shah Talai, Kot Addu; Muzaffargarh district
- Shrine of Hazrat Baba Baga Sher, Muzaffargarh
- Shrine of Hazrat Pir Jahanian, Muzaffargarh
- Shrine of Hazrat Baba Kashmiri, Muzaffargarh
- Fayyaz Park, Muzaffargarh City. This park is spread over a large area, and is a famous visiting place of Muzaffargarh city. It has its own mosque, broad roads, and a big playground for children
- The Taunsa Barrage Reservoir and banks of River Chenab provide excellent picnic spots

However, none of the above mentioned site is present within the area of influence of the proposes sub-projects.

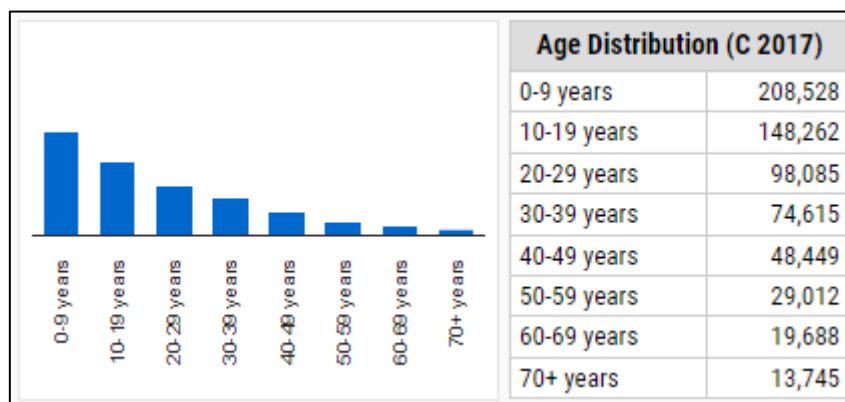
5.3.6 Population Gender and Age Distribution

The total population of the tehsil as per the census of 2017 is 640,384. The rural population being 595,880 while urban population is 44,504 persons.

Gender Statistics (Census 2017) – Ali Pur	
Male	329,881

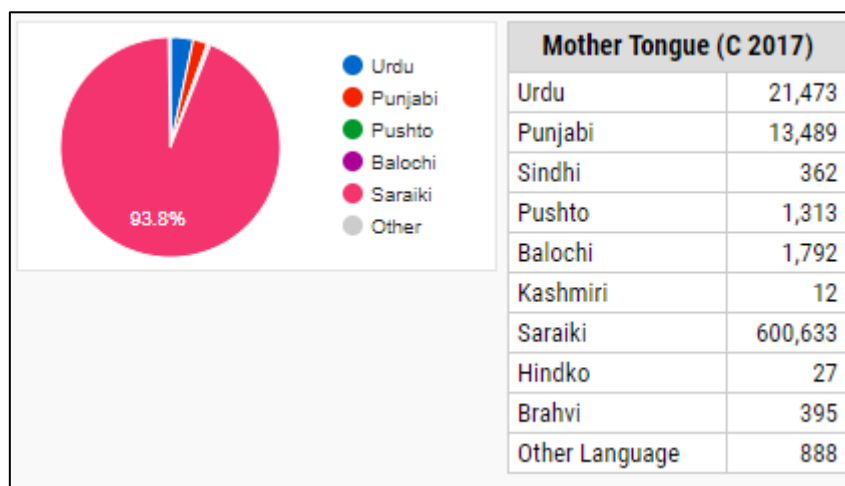
Female	310,457
Transgender	46

Source: PBS



5.3.7 Languages

The major spoken languages are Punjabi, Siraiiki, and Urdu.



5.3.8 Health and well-being

The most common diseases in the area are typhoid, hepatitis B and C, diarrhea, and malaria. These diseases largely occur due to unhygienic living conditions, lack of sanitation and safe drinking water facilities, malnutrition, and lack of ready access to proper healthcare, including preventive healthcare, facilities.

5.3.9 Livestock and fauna

Livestock breeding is the second most important economic activity of the district. Nearly all farmers keep a few heads of cattle and poultry to help increase the family's income. The livestock owned by the villagers includes buffaloes, cows, goats, sheep, oxen, donkeys, chicken. Farmers meet their livestock grazing needs from the nearest rangeland. In addition, fodder is also cultivated on agricultural land.

Wild animals like Jackals, wild cats, Wild rabbits. Partridges, teal, quail, and crane visit the villages in winter.

5.3.10 Utilities

Telephone facility and mobile networks exist in all eleven mouza. All the houses are connected to the national grid for electricity supply for domestic as well as agricultural use. Natural piped gas supply is not available in the sub-project area.

5.3.11 Source of Livelihood and Income

The economy of the tehsil is essentially agrarian, and agriculture is the backbone of the economy of the district. The main employers of Muzaffargarh region are:

- Agriculture with its Allied Livestock Breeding & Fishing, etc. (49.8%)
- Construction (24.6%)
- Community and Personal Services (13.3%)
- Whole Sale/ Retail, Hotel/ Restaurant (7.1%)
- Manufacture (3.2%)
- Transport, Storage, and Communication (1.8%)
- Others (0.2%)

5.3.12 Agriculture

A part of the district belongs to the Sandy Desert and another part to the Northern Irrigated Plains Agro-Ecological Zones of Pakistan. Irrigated areas are irrigated through canals and tube wells. Main crops of the district include sugarcane, wheat, cotton, rice, jowar, bajra, moong, maash, masoor, groundnut, maize, gram, guarseed, rapeseed & mustard, barley, groundnut, sesanum, sugar beet, linseed, sunflower, sunn hemp, and castor seed.

Fruits of the district include mangoes, dates, citrus, pomegranate, jaamun, guava, phalsa, banana, ber, and mulberry.

Main vegetables are onion, carrot, cauliflower, peas, bottle gourd, brinjal, okra, turnip, tomatoes, potatoes, garlic, chilies, coriander, and mint.

5.3.13 Gender Based Violence

The rural setup is patriarchal and perpetuates gender-based violence. 70-90% of married women in Punjab face abuse of one form or another, whether physical, psychological, or economic, from their spouses. Thus, the participation of women in outdoor activities is much limited in the area and literacy rate among female is also very low.

5.3.14 Mode of transportation

There are very limited modes of transportation in the sub-project villages. There is limited concept of public transport; a few wealthier families have their own cars while others have motorcycles.

5.3.15 Modes of communication

In rural settlements of Ali Pur, mobile phones are the major mode of communication. For courier services like TCS or post offices, people have to move to the main town or city. There are 3 post offices and 8 banks in Ali Pur tehsil.

5.3.16 Education

According to Census of 2017, only 38.8% of the people were literate in Tehsil Ali Pur.



5.3.17 Settlement patterns

Different type of houses were observed around the project area during survey i.e., Katcha, Pakka, semi Pakka etc having poor drainage system. Majority of people live in their farmhouses (Deras) while some make their homes on their agricultural land. So there is no formal pattern of settlements. Family composition is dominantly joint family system but a few nuclear families also exist in the area. The facility of electricity was present in the area. People use groundwater obtained via hand-pumps for drinking purposes without any treatment.

6 PUBLIC AND STAKEHOLDER CONSULTATION

6.1 General

Public Consultation refers to the process by which the concerns of the various stakeholders and local community who have a plausible stake in the environmental management and associated impacts of the project or activity are ascertained with a view to taking into account all the design and construction concerns in the project activity as appropriate. According to the IEE and EIA Review Regulations 2000 public consultation is mandatory for any socio-economic environmental study for the commencement of any project.

The objectives of this process were to:

- Share information with stakeholders on the construction of the aforesaid water supply schemes, and expected impacts on the physical, biological and socio-economic environment of the project area
- Understand Stakeholder's concerns regarding various aspects of the project, including construction and installation of the project components and the likely impacts of the construction related activities and operation of the project.
- Understand the perceptions, assessment of social impacts and concerns of local residents.
- Disclose information about contact offices/ officers for any complaints/queries.
- Provide an opportunity to the public to provide valuable suggestions in the project design in a positive manner; and
- Reduce the chances of the conflicts through the early identification of controversial issues and consult them to find acceptable solutions.

This EIA Report includes all the comments, which were taken into account during the social survey and preparing the definitive development concept for the installation and operation of aforesaid project. Public Consultation proformas are attached as **Annexure I**.

6.2 Identification and Classification of Stakeholders

All the people who are directly or indirectly affected or concerned with the project are stakeholders. Besides the living population of the surrounding areas, some other stakeholders were identified and contacted which are enlisted below. They are the key players including; residential community, labors present in the study area in the vicinity of the proposed project area, public and government offices, schools, universities, hospitals, hotels, international agencies and the NGO's. Not only published material, brief or other literature were obtained on request, but also noted their views and the concerns, in an official capacity as well as on the personal basis. Project Affected Persons (PAP's); includes the settled families, shopkeepers, vendors etc.) And employees of the commercial entities. PAP's are of two types, for instance:

6.2.1 Direct Stakeholders

Local community

6.2.2 Indirect Stakeholders

Indirect impact will occur on those who are living or doing business within a Project Area of Influence (AOI). Indirect respondents include:

- Government agencies responsible to deal and supervise the project related activities.
- Government agencies directly, indirectly or widely involved in the execution and monitoring of the aforesaid project including:
 - Local Village Councils
 - Agriculture department
 - Fisheries Department
 - Livestock Department
 - Environmental Protection Department
 - Irrigation Department
 - Tehsil Headquarter Hospital
 - Assistant Commissioner (AC) Office
 - Multan Electric Power Company (MEPCO)
 - Provincial Highways
- Workers of political, cultural, religious or social scientific bodies, directly or indirectly are related to the project.

6.3 Methodology for Consultation

Stakeholder consultation is a two-way flow of information and dialogue between the project proponent and stakeholders, specifically aimed at developing ideas that can help shape project design, resolve conflicts at an early stage assist in implementing solutions and monitor ongoing activities. Various techniques are used worldwide to carry out the stakeholder consultation that includes discussions, meetings and field visits. For public consultations, various informal meetings held with local community during the social and environmental screening between 06-01-23 to 15-01-23. Details of the proposed project and related activities were explained to the local community and their responses were listened and addressed. The issues and suggestions raised were recorded in field notes for analysis, and interpretation, by reaching out to a wider segment of the population and using various communication tools such as participatory needs assessment, community consultation meetings, and focus group discussions.

6.4 Public Disclosure

Public disclosure is the outcome of all such activities where the public is involved at least in the information sharing process. This is an integral part of the process. So, before the proponent applies for NOC to the Punjab-EPA. This disclosure will be distributed properly among all stakeholders. It is the responsibility of the proponent and the consultants to display a public disclosure document in prominent places where community has easy access.

6.5 Consultation Process

Information disclosure, public consultation and discussion regarding the various aspects of the project with the people of the area are necessary. This process is intensified during the EIA Studies

and rounds of Public Consultation were held with local community and various government departments as listed below. Surveys were carried out in order to investigate physical, biological and socio-economic resources falling within the immediate AOI of the project. Primary data collection included:

- Data collection regarding the socio-economic condition of study area.
- Pre-testing of socio-economic survey tools in the field.
- To consult the locals for collection of information on biological environment.

Various meeting with the stakeholders were held in order to fulfill the following objectives:

- Share information with stakeholders on the proposed project and expected impacts on community in the vicinity of the project.
- Understand Stakeholder's concerns regarding various aspects of the project, including the existing condition of the upgrading requirements, and the likely impact of construction & installation and operational activities.
- Provide opportunity to the public to influence the project design in a positive manner.
- Obtain local and traditional knowledge, before decision making.
- Increase public confidence about the proponent, reviewers and decision makers.
- Reduce conflict through the early identification of controversial issues and work through them to find acceptable solutions.
- Dissemination of information through discussions, education and liaison.
- Documentation of information narrated by the stakeholders and mitigation measures proposed by the stakeholders.
- Incorporating the public concerns and their address in the EIA and eliciting their comments and feedback.
- Create a sense of ownership of the proposal in the mind of the stakeholders.

6.6 Views, Concerns and Suggestions of Various Stakeholders

The issues and suggestions raised were recorded in field notes for analysis, and interpretation, by reaching out to a wider segment of the population and using various communication tools such as participatory needs assessment, community consultation meetings, and focus group discussions. The findings of the Community consultations have been addressed in various sections of the EIA report, and the mitigation plans have been incorporated into the EMMP. The summary of the various local community consultations is given in Table below:

Table 6.1: Summary of Response of Public Consultation in eleven revenue villages- Ali Pur

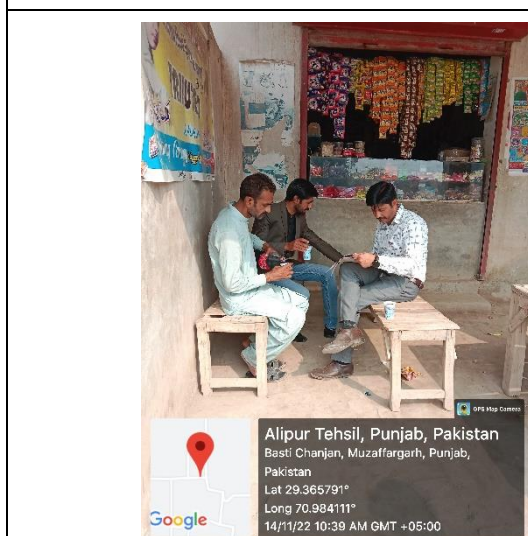
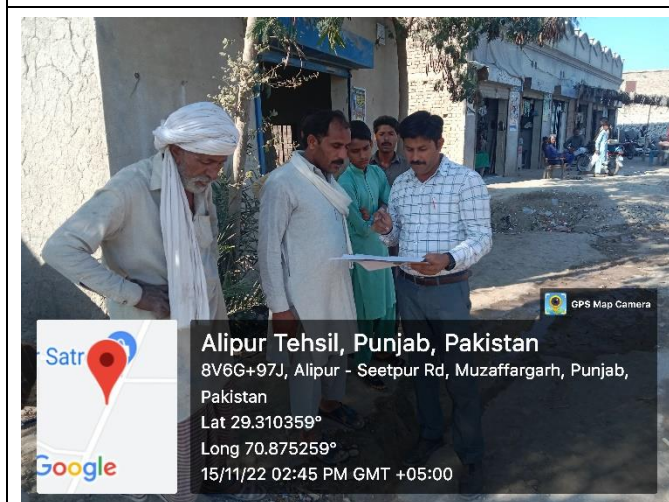
Sr. No	Concerns/Feedback of Stakeholders	Response
1	Cleanliness of the area should be ensured and wastewater should be properly treated prior to final disposal in nearby drain. Solid waste should be managed effectively.	The project will ensure improved service delivery in water and sanitation sector.
2	Farmers raised concerns regarding ABR technology for treatment of sewage and its reuse for irrigation purposes. They wanted to know if the effluent would be safe enough for reuse for agricultural purposes.	Treated sewage effluent has been used for crop irrigation in several countries. the nutrients in the effluent have economic value as a fertilizer where it has potential to be used for agricultural irrigation purposes. Because such communal ABRs receive input from purely domestic sources, the likelihood of heavy metals is very low, unlike wastewater from many sewage treatment plants, making ABR wastewater a very promising source of agricultural irrigation.
3	The available quality and quantity of the drinking water is very low in the villages so the project is much needed in the area and has a major positive impact.	The project will ensure continuous availability of quality water in the area.
4	The site or roads must be restored back to their original conditions after construction phase. There should not be any Damage / loss of public infrastructure / utilities, property, structure, livelihood etc.	The loss will be prevented or minimized by taking corrective measures as proposed in the Environment and social management Plan (ESMP) of the project. Contractor is bound to restore the site back to its original conditions before handing over.
5	Construction activities must not hinder the movement of residents or their domestic animals for farming.	Farming and other activities will not be hindered. Residents will be notified prior to the commencement of construction activities and alternate routes will be provided.
6	The electricity crisis has been devastating in poor rural communities, where load-shedding has left some villages with less than one hour of electricity per day especially during summers so how will tube wells operate to ensure water availability in	There would be provision of solar panels to meet the electricity requirement for running the pump/tubewell in case of non-availability of power from grid.
7	The solid waste is openly dumped and burnt in fields as there is no solid waste collection and disposal system available in the area.	A comprehensive solid waste collection system will be developed and waste shall be collected through carts by sanitary workers appointed by PRMSC and will be transferred to a designated point in the village. Later on, it will be transported to the final disposal site established
8	Construction works would likely cause nuisance in the villages and lack of good housekeeping may results in unusual inconveniences.	Environment and social management plan will be prepared and contractor will follow the guidelines for good housekeeping practices and the site supervisors will ensure its implementation.



9	Any sort of damage to crops or trees is not acceptable to the farmer community. Indigenous trees like Safeda should be planted around the facilities to control air pollution.	The piped network will be placed along the Right of Way (RoW) and agricultural fields will not be disturbed. Only some vegetation or wild bushes may need to be cut during construction works. Contractor shall be instructed not to disturb the existing trees. In case of any loss compensation will be provided.
10	Priority for employment should be given to residing communities;	Yes, opportunities for employment will be generated for the locals and contractor shall be instructed to preferably hire local labour if sufficient skilled labour is available in the project area.

6.7 Pictorial Assessment of Public Consultation

Photolog of Public Consultation Meetings , information disclosures and site visits are shown below:





6.8 Consultant's Conclusions

People in the Tehsil presently have no adequate quality & quantity of water in some villages of the tehsil is not reliable for safe drinking water. Majority population of Tehsil is affected by this problem and of open defecation in the form of open and clogged sewerage drains (nallies). Considering the groundwater quality data from baseline environment, it is determined that problem of unclean drinking water is grave in the Tehsil. During public consultations, people were made aware of the benefits of the project and were invited to express their viewpoints on the subject. Several issues were raised by the community during the consultation, which were immediately addressed by the Consultant. Residents of the city were very much supportive to the implementation of the proposed sub-project.

Keeping in view the proposed development in the Tehsil, it can be anticipated that after the implementation of the proposed sub-project, safe drinking water and safe collection and disposal of sewage will be provided to the residents.

The public consultation and disclosure of information was held to inform public and gather their comments which is necessary to ensure sustainability of the project. Public consultation strongly supports this priority sub-project in the Tehsil Ali Pur. Comments and suggestions by individuals and public representatives highlighted the improvements needed in the area and satisfaction for the proposed sub-project in the area. Comments also revealed that proposed project will have no negative impacts on community and environment and will minimize the public health issues in the



area. No issues related to resettlement / relocation of any single person observed and people were informed about their rights in this context.

7 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This section presents the screening process that identifies the environmental aspects and makes assessment of impact of different activities during the pre-construction, construction and operation phases of the proposed drinking water supply scheme in the mentioned villages of the tehsil Ali Pur. The screening process has been a thorough review of literature, primary as well as secondary baseline data, and expert judgment, made assessment of the potential impacts of the said activities on the physical, biological and socioeconomic environment of the project. Mitigation measures have been proposed to reduce, minimize or compensate for the identified potential negative impacts. The proposed project will involve the construction and operation phase impacts associated with the activities of the project at the proposed sites. The environmental impacts of the project is identified situation analysis which are based on the following:

- Physical environment, particularly siting of the project
- Biological environment and
- Socio- economic environment

7.1 Purpose of Environmental Mitigation Measures

For the project to be running successfully and compliance with environmental regulations mitigation of impacts caused by the project is required. The purpose of the need of mitigation can be answered by various questions as follows:

1. What is the problem?

By the commencement of the aforesaid project, the drinking water demand in the mentioned villages of Ali Pur needs to be catered in the near future. The study area is agricultural and residential in nature and is located at adequate distance from various sensitive receptors. In addition, to the noise and fugitive dust emissions anticipated to be generated during the construction phase, solid waste management and disposal issues may arise at the project site. When the resources of environment are being used ruthlessly, it results in degradation of the environment to the extent that environment loses its resilience and the carrying capacity reduces the resources are found reduced and the recovery process is too slow or nearly no recovery is possible.

2. When will the problem occur and when should it be addressed?

The problems that would occur fall within the project premises, and near the boundaries of the project location. The impacts would range up to the distance where project related activities are performed or upto the geographical zone where the effects spread. The impacts from the aforesaid project activities will occur during the installation and operational phase due to the civil works involved and the people residing in the project area. These issues include; noise generation, fugitive dust emission, solid waste management, construction debris management, top-soil removal, health



and safety issues and change in the geometric features of area. These all problems should be addressed on-site where they are being generated, to avoid the residual or adverse impacts.

3. Where the problem should be addressed?

The problems should be addressed where they are originated. That is at the project location.

4. How the problem should be addressed?

Problems can be addressed by using environment friendly practices. Such practices can be followed by following mitigation plan. Proper mitigation 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 and to manage the construction debris from the aforesaid project activities.

7.2 Ways of Achieving Mitigation Measures

The proposed project design will follow the principle of sustainable development;

- Improved management and monitoring practices;
- By providing adequate mitigation measures for air, noise and land pollution during constructional and operational phases of the project; and
- Replacement / Relocation / Rehabilitation

7.2.1 Changing in Planning and Design

The proposed project is being introduced in Tehsil Ali Pur of Muzaffargarh District, Punjab and no sensitive area, or preserved natural resource is present which could be impacted due to the commencement of aforesaid project as it is located in rural area. No replacement, relocation and rehabilitation will be required for the commencement of the aforesaid project. The lands on which any construction is proposed would be acquired by the government; donated voluntarily by the owners. There is no endangered and threatened species reported in the project & study area. Moreover, there is no settlement or infra-structure present on-site that will be dislocated or dismantled due to the establishment of aforesaid project. Hence, there is no need to change the location of the project.

The anticipated impacts had been reduced significantly by adopting better management activities, as it will be carried out for betterment of the society.

7.2.2 Compensation in Monetary Terms

As a result of the aforesaid project, at the proposed locations, no vegetation needs to be removed during the construction activities. No negative impact on the geography / landscape of area will be envisaged due to the installation of aforesaid project. Instead, landscape of the proposed sites shall be improved. Hence, no compensation in the monetary terms will be required. However, in case of the removal of one tree from the project area, 10 trees will be planted as the compensation.

7.2.3 Replacement, Relocation and Rehabilitation

The proposed project is being constructed in rural areas of Tehsil Ali Pur, and no sensitive area, human population or preserved natural resource is present which could be impacted due to the

commencement of aforesaid project and the purpose of project is to provide potable (safe drinking) water and sanitation facilities to the residents of the mentioned areas. Therefore, no major replacement, relocation and rehabilitation will be required for the commencement of the aforesaid project activity.

7.2.4 Improved Monitoring and Management Practices

In order to mitigate negative impacts envisaged due to the aforesaid project will require adaptation of some improved monitoring and management practices which are covered in detail in the given EMP plan in this EIA report.

7.2.5 Evaluation of the residual impacts:

Incorporation of the suggested mitigation measures reduces the adverse impact of the project and brings it within the acceptable limit. This step refers to the identification of the anticipated remaining impacts after mitigation measures have been applied. These impacts are referred as residual impacts. The said project will pose not any adverse impact or threat on any component of the environment. The impact assessment criteria are given below along with their impacts:

Table 7.1 Impact Assessment Criteria

Impact	Criteria
No Impact	When the proposed activity will have no impact on biotic and abiotic factors.
Long Terms	When the impact is of high intensity with high spread and high duration or of high intensity with medium spread and medium duration
Moderate	When the impact is of moderate intensity with high spread and high duration or of high intensity with low / moderate spread and low duration.
Short Term	When the impact is of low intensity but with moderate spread and moderate duration or of moderate intensity.
Insignificant	When the impact is of low intensity, low spread and low duration.

The evaluation of impacts has been carried out on the basis of developing impact matrix, in which impacts have been rated on the basis of their significance. For rating impact significance, the following criterion has been developed.

The following scale has been used for the evaluation of impacts:

LA = Low Adverse (low / short-term damage to the environment)

MA = Medium Adverse (Moderate damage to the environment)

HA = High Adverse (severe damage to the environment)

LB = Low Beneficial (Less beneficial to the environment)

MB = Medium Beneficial (Moderately beneficial to the environment)

HB = High Beneficial (Highly beneficial to the environment)

N / A = Not Applicable

O = Insignificant / No Impact

Table 7.2 Impact Evaluation Matrix for Construction Phase

Sr. No.			Physical Environment							Biological Environment			Socio-economic Environment								
	Environmental Components Project Activities	Topography	Soil Erosion/Contamination	Landscape	Air Quality	Noise And Vibrations	Hydrology and Drainage	Surface Water Quality	Groundwater Quality	Habitat Change	Vegetation	Fauna Movement	Public Health & Safety	Disruption of Public Utilities	Employment	Population Disturbance	Social Disorder	Cultural/Religious Values	Women Mobility	Local Economy/Benefits to Community	Traffic Management
1	Vegetation Clearing	O	LA	MA	MA	LA	O	O	O	MA	MA	O	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	Construction camps	O	LA	LA	LA	LA	LA	O	O	O	O	MA	LA	O	MB	LA	LA	LA	MA	MB	MA
3	Excavation operations (for laying pipes and OHR foundation)	MA	MA	MA	MA	LA	LA	LA	O	O	LA	MA	LA	LA	MB	MA	O	O	LA	LB	MA
4	Transportation of construction materials	O	LA	O	MA	LA	O	LA	O	O	O	LA	LA	O	LB	O	LA	O	LA	LB	MA
5	Use of construction materials etc.	O	LA	O	LA	LA	O	LA	O	O	O	LA	LA	O	LB	LA	O	O	O	LB	O
6	Earthwork/concrete work operations	O	LA	LA	LA	MA	LA	LA	O	O	LA	LA	LA	LA	LB	LA	O	O	LA	O	LA
7	Solid Waste Management	O	LA	O	LA	O	O	LA	LA	O	O	O	LA	O	LB	O	O	O	O	O	O

Legend:

O-Insignificant/No Impact, NA – Not Applicable, LA- Low Adverse, MA-Medium Adverse, LB – Low Beneficial, MB- Medium Beneficial

Table 7.3 Impact Evaluation Matric for Operational Phase

Sr. No.		Physical Environment							Biological Environment			Socioeconomic Environment								
		Hydrology Drainage	Soil Erosion/ Quality	Surface Runoff	Air Quality	Landscape	Surface Water Quality	Groundwater Quality	Habitat Change	Vegetation	Fauna Movement	Public Health	Public Behavior	Employment	Community Development	Economic Activity	Communication System	Women Mobility	Local Economy/Benefi	Traffic Management
	Environmental Components Project Activities																			
1	Energy Conservation	O	O	O	O	O	O	O	O	O	O	O	LB	MB	MB	MB	O	O	LB	O
2	Impact of Poor Chemical Storage and Handling	O	O	LA	O	O	LA	LA	O	O	O	MA	O	O	O	O	O	O	O	O
3	Air Emissions	NA	NA	NA	LA	NA	NA	NA	NA	NA	NA	LA	NA	NA	NA	NA	NA	NA	NA	NA
4	Maintenance of equipment's & machinery	O	O	O	LA	O	LA	LA	O	O	LA	LA	O	MB	MB	LB	O	O	LB	O
5	Leakage from installed pipes	MA	O	LA	O	LA	MA	MA	O	O	O	LA	LA	O	O	O	O	O	O	O
6	Disposal of brine from RO	MA	MA	O	O	O	MA	O	O	LA	O	O	O	O	O	O	O	O	O	O
7	Improper Solid Waste storage and handling	O	O	O	LA	MA	O	MA	O	O	O	MA	MA	LA	LA	LA	O	O	O	O

Legend:

O-Insignificant/No Impact, NA – Not Applicable, LA- Low Adverse, MA-Medium Adverse, LB – Low Beneficial, MB- Medium Beneficial.



7.2.6 Impact Screening Checklist

The impact screening checklist is developed to screen out potentially insignificant environmental and social impacts from potentially significant adverse environmental and social impacts during planning & designing, construction & installation and operational phases of the project. The objective of impact screening process is to assess the significance of issues related to the air, water, noise, soil, transportation, civil work, communication, the hazards and external constraints. The beneficial and adverse impacts of project during planning & designing, renovation & installation and operational phases are identified based on their duration, location, frequency, extent, significance and reversibility. The impact of each activity on various environmental parameters is given below:

Table 7.4: Impact Screening Checklist

Sr.No	Environmental Component	Impact Characteristics												
		Duration		Location		Frequency		Extent		Significance			Reversibility	
		Long	Short	Direct	Indirect	Cont.	Intermittent	Wide	Local	Large	Moderate	Minor	Rev.	Irrev.
Beneficial Impacts														
1	Employment Opportunity	☑		☑		☑		☑			☑		☑	
2	Economic Uplift in Country	☑		☑			☑		☑		☑			☑
3	Tree Plantation	☑		☑		☑			☑		☑		☑	
4	Water Quality	☑		☑		☑		☑		☑			☑	
5	Infrastructure development	☑		☑		☑			☑	☑				☑
Adverse Impacts														
1	Air Pollution		●	●			●		●			●	●	
2	Wastewater		●	●		●			●		●			●
3	Solid Waste/Construction Debris		●	●		●			●		●			●
4	Health and Safety		●		●		●		●			●		●
5	Energy Consumption		●	●			●	●			●			●

7.2.7 Approaches for Mitigation Measures

Following approaches may be used to mitigate the impacts of the project:

Avoid: Change of route or site details, to avoid damage to important ecological or Archaeological features.
Replace: Regenerate similar habitat of equivalent ecological value in different location.
Reduce: Filters, noise barriers, dust, enclosures, visual screening, wildlife corridors and changed time of activities to reduce the impact.
Restore: Site restoration at the end of the operational activities.
Compensate: Relocation of displaced communities, facilities for the affected communities, financial compensation for the affected individuals, etc.

7.3 Impacts and Mitigation Measures during Design/pre-construction Phase

1) Inadequate Design

Inadequate design may affect the proposed project due to deficiencies like improper estimation, pumping equipment and accessories, selection of improper pipe material and accessories vulnerable to leakages. At the design stage, correct water demand by considering population projection for the required design period corresponding to the Project Area will be calculated. The selection of machinery will be for at least 15 years for smooth functioning of the system.

Nature of Impact

The nature of proposed impact will be direct, low, long-term and hence significant.

Mitigation Measures

The leakages will be controlled by appropriate selection of materials for pipe and accessories suitable for local conditions and provision of optimum pipe sizes. Life time of machinery will be 15 years for proper functioning of filtration plants in the long run.

2) Inadequate design of Tube well components

Design of tube-well components must be appropriate for the proper functioning of the water supply schemes in the mentioned villages of the tehsil.

Nature of Impact

The impact is moderate, adverse and permanent in nature.

Mitigation Measures

Design of the strainer of the tube well must be accurate to ensure the proper functioning of the tube well and water supply schemes. Depletion of water table must also be accounted in this respect.

3) Inadequate Buffer Zone

Inadequate buffer zone around the project sites may cause inconvenience to the local population due to the running of heavy-duty pumps resulting in noise levels and odor generated by any chemical handling or storage.

Nature of Impact

The magnitude of this impact is high, adverse and permanent in nature.

Mitigation Measures

The mitigation measures will include:

- Provision of buffer zone in the form of raised walls / plantation and round the clock maintenance in the form of oiling of parts producing noise and vibrations.
- Landscaping and plantation will improve the aesthetic value and ecological habitat of the project area as well as reducing the impact of noise on the surrounding environment.

4) Land Use

The present land use of the area available for the construction of the proposed project components at different locations is vacant land. The remaining land other than the built-up structures will be utilized for landscaping and tree plantation.

Mitigation Measures

A proper landscape plan will be designed for the proposed action to minimize the impact. Landscaping and plantation will improve the aesthetic value and ecological habitat of the project area as well as reducing the impact of noise on the surrounding environment.

7.4 Impacts and Mitigation Measures during Construction Phase

Construction activities will involve acquisition of small pieces of land, establishment of contractor's camps, generation of dust, noise, soil erosion and contamination, waste water and solid waste generation from labor camps. Each impact of construction activities and their mitigation measures accordingly is discussed here under:

1) Impact of Earth fill Material

To raise the plinth level of selected plots to protect them against flooding, soil would be needed to collect from nearby areas for filling. This may result in slope failure and water ponding.

Nature of Impact

The magnitude of this impact is moderate negative and temporary in nature.

Mitigation Measures

A small quantity of earth fill material will be required for raising plots plinth level, so existing sources for earth fill material will be used to minimize the impacts on natural environment of the area. In addition, earth will be leveled after borrow of material to avoid any slope failure and ponding of the area during rain.

2) Topography and Geology

There will be area requirement for the construction of OHRs and ABRs so minor changes in topography will be expected.

Nature of Impact

This impact is considered negative of minor magnitude.

Mitigation Measures

All the mitigation measures mentioned below should be taken in order to minimize the impacts on topography in the Project Area. These measures include, but are not limited to the following:

With the construction of proposed infrastructure and by providing plenty of plantation the topography of the area will be improved. Plantation of trees in the plain areas will be carried out to increase aesthetic value of the area.

3) Impact of Laying of Water and Sewerage Pipelines

This project involves laying of water supply lines (i.e. water distribution network pipelines) from water source to Over Head Reservoir and then to distribution point standposts or to the houses within the area and laying of Sewerage network connected to septic tank or ABR.

Mitigation Measures

The laying of water supply lines should be as per standard specifications. Fence should be installed as protection during lying of pipelines to avoid access of people and animals to pipeline trenches.

4) Impact of Contractor`s Camps

Contractor camps will not be preferably established rather some house on rent will be arranged by the contractor near the Project site to carry out the Project activities. Though the number of labor and size of camp will not be large, even then this will have an impact on the surrounding environment. The transportation of construction material, fuel, construction plants and daily use items may also create disturbance to the local community.

Nature of Impact

The magnitude of this impact is moderate adverse and temporary in nature.

Mitigation Measures

The Contractor camp size should be as per standard specifications and should be established at least 500 m away from settlements to avoid/minimize the construction impacts. Traffic signs and safety warnings will be installed at Project site to avoid disturbance to local communities. In addition to that the night time deliveries will also be restricted and normal working hours will be observed for such deliveries.

5) Soil Erosion

The project area is plain with earthen compacted roads. Soil erosion and contamination may occur on roadside, at contractor`s camps due to the following likely impacts:

- Excavation process can destabilize the surrounding land surface, particularly if excavated area is left unfilled for a long time, which may lead to rainfall induced soil erosion.
- Leakages of oils, lubricants, chemicals and other similar substances from their storage sites and from engines of the generators, machines, equipment and vehicles.
- Non – provision of septic tanks with the temporary work site toilets, constructed for the labors and others, can contaminate the receiving soils because of raw nature of the effluents; and
- Also washing of the machinery and equipment without proper drainage of the washout water can adversely affect the soil quality.

Mitigation Measures

Mitigation measures will include:

- Ensure that surface run-off controls are installed and maintained so as to minimize erosion.
- Ensure adherence to the speed limit of 40 km/hr. on access roads.
- Ensure that no contaminated effluent is released in to the environment.
- Ensure spills are avoided during fuel and oil transfer operations. Appropriate arrangements, such as concrete base or drip pans, should be used to avoid spills.
- Ensure that the maintenance of vehicles and other equipment takes place only in designated areas underlined with concrete slabs and a system to collect runoff in to mud pit.
- Ensure fuels, oil and chemical storage is daily checked for leakage.
- Ensure that shovels, plastic bags, sand bags and absorbent materials, are kept available near fuel and oil storage areas.
- Ensure that operating vehicles are checked regularly for any fuel, oil or battery fluid leakage.
- Ensure that leak / spill record is maintained for each vehicle and such vehicles are operated after proper repair.
- Soil contaminated by minor spill (covering an area up to 1 m² and 7.5 mm deep) will be collected and disposed at burn pit.
- Ensure that soil contaminated by moderate spills or leaks (up to 200 liters) is controlled using shovels, sand and mud. The contaminated soil if any will be removed from the site and disposed off at landfill or burn pit as required.
- Loose soil and side slopes will be planted with grass to retain the upper soil and reduce the rainwater velocity.
- Rainy season should be avoided for earth fill as far as practicable.
- Heavy machinery movement should be avoided where the structure of the soil is expected to be destroyed in agriculture areas of the project, and
- A plantation program for grassing slopes will be launched to stabilize soil structure and to reduce soil erosion.

6) Impact of Dust

Air quality is expected to deteriorate locally at active construction sites due to mainly fugitive dust emission and exhaust emission from construction vehicles and equipment, which will have short

term but moderate impacts on local communities. Construction sites activities may generate soil disturbance in a small area and prone to open space for wind to pick up dust particles. Light construction machinery and vehicles will be used during the construction phase. This construction machinery will generate dust, smoke and other potential pollutants in the air.

Nature of Impact

The impacts are considered to be moderate adverse and temporary in nature.

Mitigation Measures

The dust control measures that are implemented at Project site will depend on the topography and land cover of that particular site and its soil characteristics and expected rainfall. The Contractor will be responsible to determine that which practice accommodate their needs according to specific site and weather conditions. The following is a brief list of some control measures:

- All sections of the access tracks that are prone to dust emission and where sensitive receptors are located within 150 m should be identified and marked on the map of the project area.
- Ensure that the access tracks which are prone to dust emissions and marked on the map should be maintained by water spraying daily.
- Regular water sprinkling will be carried out in nearby residential areas during earth fill and construction machinery movement.
- Ensure that all equipment, generators and vehicles used during the project are properly tuned and maintained in good working condition, in order to minimize the exhaust emissions.
- Ensure that dust emission at the construction sites is minimized by implementing best management practices.
- Air quality monitoring and analysis for NO_x, SO_x and PM will be done during the construction / installation phase.

7) Impact of Noise

Construction activities may increase noise levels at active construction sites particularly near residential areas. There are residential colonies where number of sensitive receptors may expose to the noise pollution. Noise impact on construction workers/ laborers may be avoided in case of loud noise by provision of adequate Personal Protective Equipment's (PPEs) like ear muffs, ear plugs, etc.

Nature of Impact

This impact is considered negative of minor magnitude.

Mitigation Measures

Following measures should be adopted to minimize the noise levels:

- Construction activities should be managed to minimize the impacts on nearby community.
- Noise barriers (paneled fencing) should be installed where possible to keep the noise levels within the permissible limits.
- Ensure prohibition of use of vehicle horns anywhere inside the fenced areas or on the access roads is strictly observed.
- Noise reducing devices (silencers and baffles) should be used for the construction machinery.
- Engines should be turned off when they are not in use.
- Contractor obligation is to use appropriate and fit machinery.
- Noise analysis should be done every month during construction phase.

8) Disposal of Mucking Material

Inevitable earthwork operations during construction will open scars on the land around the project area.

Nature of Impact

This impact is temporary and minor negative in nature.

Mitigation Measures

Mitigation measures will include landscaping, which should be given due consideration along the re-establishment of the local/indigenous vegetation. The excavated materials that are unsuitable for use will need to be stored, transported and disposed of appropriately at designated sites.

9) Accidental damage to Utilities in Excavated Areas

The excavation operations may result in accidental damage to existing utilities like Sui gas, telephone etc. causing inconvenience to the local people. However, most of the residential settlements do not have sui gas or telephone facility in the area.

Nature of Impact

The impacts on the loss of resource are considered to be moderate adverse and temporary in nature.

Mitigation Measures

- Coordination between different utility departments shall be maintained to get the details of existing underground utilities before starting construction of the proposed project.
- The contractor will made arrangement to avoid any accidental damage to the utilities.
- Provision shall be made in the cost estimate for restoration / replacement of damaged utilities and relocation to minimize the adverse impact and restoration of excavated road to its original condition.

10) Obstructions to Traffic Flow

Excavation operations for pipe laying may result in temporary blockage of some roads/streets, which may result in hindrance to normal traffic flow. The operation of excavator and movement of vehicles carrying construction materials will certainly hamper the existing traffic movement.

The impacts on vehicle travelers will include the following:

- Increase in traffic congestion; and
- Longer waiting times at intersections.

Nature of Impact

The impacts are regarded as adverse if measures are not implemented to mitigate and control traffic movements and routes.

Mitigation Measures

Mitigation measures to reduce transport and accessibility impacts during construction will be addressed as part of a detailed EMP to include the following traffic management measures.

- Inclusion of further access routes to facilitate the accessibility of vehicles and pedestrians to and from the proposed project areas.
- Close liaison with contractors to ensure minimal interruptions.
- Implementation of site speed limits along with introduction of speed humps.

11) Solid and Hazardous Waste

Construction activities such as excavation, laying of pipes, construction of operator rooms and construction of tube-wells etc. will generate waste materials like excavated soil and domestic waste from workers. Other types of waste that are likely to be generated during construction include:

- Recyclables - paper, cardboard, glass, plastic, wood, metals.
- Organic waste - food waste, vegetation; and
- Hazardous waste – including for example, chemical wastes such as coating substances, solvents, used chemical drums and used spill kit materials.

Any surplus construction waste will be sent to the nearby solid waste landfill site. Assuming that excavation and demolition will be kept to a minimum and considering the construction will only be temporary and will be disposed of to landfill.

Nature of Impact

The waste generated during construction would have a moderate, adverse effect and is temporary in nature.

Mitigation Measures

Construction debris and demolition material will not be allowed to accumulate during construction phase. All such material is to be disposed of on daily basis. Waste piles will only be allowed if the contractors meet the following requirement at the site:

- Pile only contains passive waste (e.g. wood, metal, plastic, dry concrete) and no food waste, hazardous waste or wastewater.
- Waste pile is controlled so that it does not spread and start to impede other activities and stays at a height that it does not become a safety hazard. Barricades may also be placed around the pile to delineate the safe distance for other workers.
- Waste piles are positioned so that they are not visible to the general public where they could have a negative visual impact.
- If the waste pile contains plastic, paper or other light-weight material it needs to be covered with a tarpaulin; and
- Liquid waste, such as grey water, sewage, slurry and other wastewater will be collected from source by a designated tanker and taken off-site for disposal at safe disposal facility.

12) Flora

The conversion of agriculture land will have moderate negative impact on the floral species and vegetation. However, the impact will be minimized after the landscaping.

Mitigation Measures

The proposed mitigation measures will include:

- Incorporate technical design measures to minimize removal of the trees, if possible.
- Landscaping and plantation will improve the aesthetic value and ecological habitat of the project area.
- A landscape will be properly designed with provision of new trees/ plantations around the boundary, roadside and stretches of open land. The vegetation for the attenuation of air pollution would be most needed in the areas where ground level concentrations of the pollutants are expected to rise.

13) Fauna

During construction, any existing species of fauna could be affected by disturbance and fragmentation, as the construction area may represent a barrier to the species and result in the splitting up of populations. During the construction phase, there will be adverse impact on the mammals, birds and reptiles of the area, due to the construction activities involving excavation, movement of labor, carriageway of goods and machinery to various sites along the project area.

Given that the species of fauna are thought to be present at low density, the number of individuals affected by the proposed Project is likely to be relatively low. Furthermore, the loss of this habitat would not constitute a large impact.

Nature of Impact

The magnitude of this impact is expected to be low adverse and temporary in nature.

Mitigation Measures

- The camps will be properly fenced and gated to check the entry of animals in search of eatable goods. Similarly, wastes of the camps will be properly disposed of to prevent the chances of eating by animals, which may become hazardous to them.
- Special measures will be adopted to minimize impacts on birds, such as avoiding noise generating activities during the critical periods of breeding.
- Staff working on the project should be given clear orders, not to shoot, snare or trap any bird; and

- The Contractor will decide to minimize the vibration, noise pollution through good engineering practices.

14) Impact of Transferrable Diseases

Presence of labor from outside at project site may pose hazard of communicable diseases, which can also spread to the surrounding community.

Nature of Impact

This impact is considered negative of moderate magnitude.

Mitigation Measures

Following must be ensured during project implementation:

- Ensure project staff interaction with local community is minimized.
- Ensure that field crew is medically screened before employed on site.
- Ensure that periodic awareness campaigns for HIV / AIDS are undertaken for the project staff.
- Ensure that guidelines are prepared and implemented to sensitize non-local laborers to local norms and customs in order to minimize cultural tensions.
- When operating in residential areas, display project contact details in prominent locations. This will give local residents a point of contact and should allow you to address any nuisance issues that may arise.

15) Health and Safety of Workers

The health and safety issues are associated with the operation of construction machinery and equipment and storage of flammable materials which may cause minor and severe injuries to workers. Moreover, concrete releasing agents and cleaning agents may cause toxic effects on the workers.

Nature of Impact

The magnitude of this impact is moderately adverse.

Mitigation Measures

- Occupational safety measures such as use of well-maintained machinery and equipment and training of workers in the construction safety shall be taken.



- Ensure provision of protective clothing for laborers handling hazardous materials, e.g. helmet, adequate footwear, gloves etc.
- The safety of the public at all stages of the construction will be ensured through appropriate public education and safety measures such as use of sign boards, barriers and flags and proper illumination at night.
- The flammable and combustible substances will be properly stored in designated areas and Material Safety Data Sheets (MSDS) will be used for proper handling.
- Firefighting equipment will be placed at an easily accessible place and inspected on regular basis.

16) Impacts of Heavy Machinery on Existing Road Networks

The plying of heavy vehicles on existing road network may result in air pollution (if unpaved roads), noise pollution due to tire-road friction especially near sensitive receptors (residential areas, school, mosque, health facility etc.), and damage to roads and traffic congestion.

Nature of Impact

The impact would be temporary and moderately negative in nature.

Mitigation Measures

- Any vehicle with an open load carrying area used for transport of potentially dust producing materials shall have properly fitted side and tailboards. Materials having potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with clean tarpaulin in good condition.
- The Contractor shall not use any vehicles either on or off road with grossly excessive noise pollution. In case of built-up areas, noise mufflers shall be installed and maintained in good condition on all motorized equipment under the control of the Contractor.
- The traffic on the existing road shall be managed in cooperation with the local traffic police department in order to avoid traffic accidents and congestions causing unnecessary delays.

17) Socio – Economic Impacts

1. Damage to Crops and Infrastructure

Impacts - The works may cause some damage to agricultural crops and public or private

infrastructure may get damaged.

Mitigation Measures

- All such impacts on crops will be mitigated by payment of market price of crops.
- The damage to infrastructure will be minimized by relocating them. The infrastructure which cannot be relocated will be compensated or restored back to its original form.
- The contractor is bound to restore the site back to its original conditions before handing over e.g. restoration of roads and converting the existing open sewerage drains to storm water drains while providing brick soling.
- However, no relocation of any kind of infrastructure is involved as a result of sub-project.

2. Impact on Livelihood and Economy

Impact - The proposed sub-project will provide job opportunities for locals during the duration of the civil works where very low to low-income communities are living. Hence, the sub-project development will enhance employment and business opportunities for the locals, the impact on livelihood is assessed to be positive in terms of access to better sanitation facilities, increased employment opportunities and better livelihood. It is estimated up to 60 labourers will be required for carrying out construction activities. Out of the total, 75% of labourers (unskilled or skilled if available) will be from local community.

3. Workers Health and Safety

Impacts - The construction phase will include various activities such as; excavations, earthworks, works at height, movement of various heavy machines and manual handling. During loading-unloading operation, bad management, improper storage of hazardous materials, (i.e. petrol, admixtures, etc.), working at heights etc could result in adverse effects on the health and safety of staff as well as on the environment and nearby community. There may also be an issue of hiring under-age labour during construction.

The sub-project staff can also easily contract COVID-19 if they are sitting together and inadvertently, inhale droplets from a sick person. Keeping in view the above stated factors, the potential impacts is negative that can occur during the construction activities.

Mitigation Measures

- Train all construction workers in basic sanitation and health care issues (HIV/AIDS, COVID- 19).
- Prepare a Worker Health and Safety Plan for the construction phase covering documentation and reporting of occupational accidents, diseases and incidents with complete record for supply of personal protective equipment for all staffs and visitors.
- Identification of potential hazards to workers, particularly those that may be life threatening.
- Ensure health care facilities especially first aid facilities are readily available. Appropriately equipped first-aid stations should be easily accessible throughout the sub-project area.

- Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.
- Document and report occupational accidents, diseases, and incidents.
- Provide awareness to the construction drivers to strictly follow the driving rules.
- Safe storage facilities for petroleum and other chemicals at sub-project site.
- The contractor should provide drinking water facilities to the construction workers at all the construction sites.
- Ensuring that children and minors are not employed directly or indirectly on the sub-project.
- Children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Pakistani Labour Laws and Employment of Child Act (1977)¹.

4. Public Health and Safety

Impacts – Construction activities and movement of heavy vehicles at construction sites and service roads may result in road-side accidents, particularly with the local community who may not be familiar with the presence of heavy equipment. Additionally, in order to address the community concerns about the presence of non-local workers, or the risks posed to the community by local workers presence on the sub-project site², the following good practice should be considered:

Mitigation Measures

- It is estimated up to 60 labourers will be required for carrying out construction activities. Out of the total, 75% of labourers will be local residents and will return to their homes at night, while 25% (skilled) will have overnight stay. Preferably, accommodation will be rented out nearby the sub-project site as per available number of workers rather than labour camp.
- Train drivers operating heavy vehicles in road and pedestrian safety.
- Set appropriate speed limits to avoid accidents.
- Placement of construction signage, particularly at populated area.
- Provision of alternate facilities or routes for use by the public where disrupted.

5. Labour Influx

Impacts - The influx of workers and followers can lead to adverse social and environmental impacts on local communities, especially if the communities are rural, remote or small. Such adverse impacts may include increased demand and competition for local social and health services, as well as for goods and services, which can lead to price hikes and crowding out of local consumers, higher risk of accidents, increased demands on the ecosystem and natural resources, social conflicts within and between communities, increased risk of spread of communicable diseases, and increased rates of illicit behavior and crime. Such adverse impacts are usually amplified by local-level low

¹ ECP 16: Worker Health and Safety

² The project should set out risk-based procedures to be followed, which may reflect WHO guidance (for further information see WHO Risk Communication and Community Engagement (RCCE) Action Plan Guidance COVID-19 Preparedness and Response).

capacity to manage and absorb the incoming labor force, and specifically when civil works are carried out in, or near, vulnerable communities and in other high-risk situations.

- **Risk of social conflict:**

Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources. Tensions may also arise between different groups within the labor force, and pre-existing conflicts in the local community may be exacerbated. Ethnic and regional conflicts may be aggravated if workers from one group are moving into the territory of the other.

- **Increased risk of illicit behavior and crime:**

The influx of workers and service providers into communities may increase the rate of crimes and/or a perception of insecurity by the local community. Such illicit behavior or crimes can include theft, physical assaults, substance abuse, prostitution and human trafficking. Local law enforcement may not be sufficiently equipped to deal with the temporary increase in local population.

- **Increased burden on and competition for public service provision:**

The presence of construction workers and service providers (and in some cases family members of either or both) can generate additional demand for the provision of public services, such as water, electricity, medical services, transport, education and social services. This is particularly the case when the influx of workers is not accommodated by additional or separate supply systems.

- **Increased risk of communicable diseases and burden on local health services:**

The influx of people may bring communicable diseases to the project area, including sexually transmitted diseases (STDs), or the incoming workers may be exposed to diseases to which they have low resistance. This can result in an additional burden on local health resources. Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the project's medical facility and instead go anonymously to local medical providers, thereby placing further stress on local resources. Local health and rescue facilities may also be overwhelmed and/or ill equipped to address the industrial accidents that can occur in a large construction site.

- **Gender-based violence:**

Construction workers are predominantly younger males. Those who are away from home on the construction job are typically separated from their family and act outside their normal sphere of social control. This can lead to inappropriate and criminal behavior, such as sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors⁴ from the local community.

- **. Child labor and school dropout:**

Increased opportunities for the host community to sell goods and services to the incoming workers can lead to child labor to produce and deliver these goods and services, which in turn can lead to enhanced school dropout.

- **Local inflation of prices:**

A significant increase in demand for goods and services due to labor influx may lead to local price hikes and/or crowding out of community consumers.

- **Increased pressure on accommodations and rents:**

Depending on project worker income and form of accommodation provided, there may be increased demand for accommodations, which again may lead to price hikes and crowding out of local residents.

- **Increase in traffic and related accidents:**

Delivery of supplies for construction workers and the transportation of workers can lead to an increase in traffic, rise in accidents, as well as additional burden on the transportation infrastructure.

Mitigation Measures

- Consultations with and involvement of local communities in project planning and implementation;
- Awareness-raising among local community and workers
- Instruction and equipping of local law enforcement to act on community complaints;
- Information and awareness raising campaigns for community members, specifically women and girls;
- Provision of information to host community about the contractor's policies and Worker Code of Conduct (where applicable).
- Communication on hiring criteria, minimum age, and applicable laws.
- Establishment and operation of an effective GRM accessible to community members—ideally with involvement of VCs—to facilitate early identification of problems and targeted mitigating interventions by Borrower;
- Provision of information to communities on how to use the GRM to report issues;
- Monitoring and taking appropriate actions to ensure EMMP provisions are met;
- Inclusion of relevant provisions in the EMMP and contract;
- Contingency plans for temporary rise in demand for utilities and public service provision.

7.5 Impacts and Mitigation Measures during Operational Phase

1) Impact of Water Intake

Water source for project will be groundwater at places where seepage water of canal is not available and groundwater quality is good. The population of the villages use water from two basic sources

i.e. Surface waters, such as canals / rivers and Groundwater for drinking purposes. All these sources of water contain natural contaminate particularly inorganic contaminants that arise from the geological strata through which water flows and, to a varying extent, anthropogenic pollution by both microorganisms and chemicals. In general, groundwater is less vulnerable to pollution than surface waters. Water sources will not be depleted by using it as source intake, because community will use treated water from shallow tube wells along canals instead of directly using the ground water. The water from shallow tube wells is contaminated by chemical and biological contaminants. Thus treatment of this water by chlorine will lead a positive impact on health of the local community. So there is no negative impact envisaged and no mitigation is required accordingly.

Nature of Impact

This is considered as a significant long term positive impact.

2) Impact of Air Emissions

The air may be polluted due to increase in movement of vehicles and dust producing activities during the operational phase of the project.

Nature of Impact

This impact is considered negative of moderate magnitude.

Mitigation Measures

Monitoring of air quality (SO_x, NO_x and PM) should be carried out effectively on quarterly basis during operational phase of the project.

3) Impact of Clean drinking water

Clean drinking water will be available in remote areas of Punjab during operational phase of this Project; where contaminated water was used earlier for drinking purposes. Project Area community will get rid of the water borne diseases with provision of clean drinking water. This is a significant positive impact of this Project.

4) Impact on Infrastructure / Rehabilitation / Restoration

So far it is anticipated that no harm or damage will be done to any infrastructure. In case of any damage to any structure during the operational phase of the project the client will be the responsible authority.

Mitigation Measures



Restoration and Rehabilitation through

- Disposal of debris as per regulatory requirements given in earlier sections.
- Disposal of waste products, solids and liquid in accordance with regulatory requirements given in earlier sections.
- Backfilling and closing of all solid waste disposal pits as per regulatory requirements given in earlier sections.
- Removal of fencing and gates.

5) Occupational Health and Safety Issues

The occupational health and safety issues are mostly associated with the operation of machinery and equipment, handling of fuel, noise, odour, exposure to disease vectors etc.

Nature of Impact

The magnitude of this impact is considered to be major adverse, short-term.

Mitigation Measures

- The issues related to operation of machinery and equipment will be controlled by efficient management, staff training, maintenance of machinery and equipment, and other preventive measures.
- Proper Storage and Handling of fuel.
- First Aid kit should be provided at operator rooms
- Provision of PPE's to the employees including masks, gloves etc.

6) Ecological Resources

No negative impacts are envisaged on the flora of the area during the operational phase. New trees/plants will render a positive impact on the flora of the area and will also cause positive impact on the landscape of the area, which will be permanent in nature.

Presence of adequate flora will absorb emissions, through photosynthesis.

Nature of Impact

The magnitude of impact is moderate beneficial

Mitigation Measures

This aspect is considered to be beneficial; hence no mitigation measure is required.

7) Emergency Preparedness and Response

The operation of the project may encounter emergencies like operation failure of the operator's room/control room. In addition, disasters such as earthquakes and fires may occur which have to be considered for minimizing their impacts.

Nature of Impact

This impact is moderate inverse.

Mitigation Measures

- An Emergency Response Plans for floods, earthquakes, and manmade disasters will be developed by management. Emergency Response Plan will be implemented in close consultation with Fire Fighting Department and paramedics. In addition, training of staff/employees regarding the emergency procedures/plans should be regularly conducted.
- Responsible person to implement the Emergency Response Plan should be clearly designated.
- The staff should be trained timely and concise response procedures.
- Emergency numbers should be clearly posted so that a quick action is taken when an emergency arises.
- Firefighting systems should be calibrated and maintained regularly; and
- Regular drills for fire emergencies should be carried out.

8) Delivery of Unsafe Water to Distribution System due to O&M Maintenance

Supply of contaminated water to the distribution network may result in causing communicable diseases in the service area. This may be a major public health hazard due to intrusion of contamination from leaking pipes and deficiency in operation & maintenance procedures of PRMSC.

Nature of Impact

The aforesaid impact is considered to be negative and will have a long-term, direct and major impact.

Mitigation Measures

Supply of unsafe water can be detected and stopped only if the concerned staff of contractors working on site regularly checks the water quality at source and before its entry into distribution network. Any leaking pipes in the water distribution will be immediately repaired.

9) Hazards Due to Chlorination

It is very important to apply adequate dose of disinfectant (chlorine) to ensure supply of safe drinking water to the community. Also any accidental leakages at the source may waste considerable quantity of water.

Mitigation Measures

- Regular monitoring of chlorine content at the source and in the distribution network and ensure adequate chlorination for safe delivery of water,
- Training of operation staff to handle chlorine, use of chlorine detectors with alarms inside the chlorination chambers.

10) Impact of Brine Disposal

In case of operation of RO filtration Plants, around 75% of water is rejected and 25% is consumed as treated product water. It means that for every 2000 lph capacity RO plant; we require 6000 lph of raw water to be treated from which 4000 lph will be the RO reject or brine. So, per day 32000 litres of wastewater will be generated from a single RO. The rejected water is free from bacteria, viruses and other pathogens but has only dissolved particles in it. RO concentrate disposal issues present significant design and operational challenges that must be addressed. Conventional disposal techniques mostly suffer from direct or indirect contamination of water/soil.

Mitigation Measures

- This water should not be thrown into municipal sewer, rather it should be reused. The reject water pipe must be connected to a tank where small submersible pump might be installed (like the ones used in water coolers) for taking water from this tank, after dilution it can be shared with the local community for their domestic use.
- Else, brine treatment options must be considered like using ultra-high pressure RO (UHP RO) membranes which can reduce brine volume to half that of RO or thermal treatment like evaporators or crystallizers. Another way is deep well injection of Waste brine. These injection wells are installed hundreds of feet underground, away from the upper aquifers that feed drinking water sources.

7.6 Environmental Enhancement Measures

The said project will be resulting in following benefits:

- Direct and Indirect Employment Opportunities
- Gains in local and national economy
- Increase in aesthetics of commercial and residential areas
- Contribution to UN Sustainable Development Goals
- Provision of clean and safe drinking water and sanitation to the residents
- Improvement of hygiene conditions and reducing the prevalence of waterborne diseases

To consolidate these positive impacts, a series of measures are planned. They mainly consist of:

- Ensuring rational demand management,
- Ensuring a regular supply of the right quantity and quality of water through maintenance of water supply systems and compliance with quality standards,
- Supporting the service by encouraging the adoption of appropriate sanitation measures in rural areas,
- Formulating a communication and awareness-raising strategy for users with a view to encouraging them to save water.

Tree plantation within the project area will also act as environmental enhancement measure. Trees of native species will be grown on all open spaces and along boundary of project.

8 ENVIRONMENTAL MANAGEMENT & MONITORING PLAN (EMMP)

A comprehensive management plan is necessary to implement the recommendations and suggestions for environmental protection included in chapter 7.

The objective of the Environmental Management and Monitoring Plan (EMMP) is to address all the major environmental issues and provide framework for the implementation of the proposed mitigation measures during the construction and operational phases of the project. The proper implementation of the EMP will ensure that all the adverse environmental impacts identified in the EIA report are adequately mitigated, either totally prevented or minimized to an acceptable level and required actions to achieve those objectives are successfully adopted by the concerned institutions or regulatory agencies.

The implementation of EMMP should be carefully coordinated with the design and construction program of the project to ensure that relevant mitigation measures are implemented at the appropriate stage and that adequate resources are properly allocated to achieve the desired results. This EMMP has been prepared to satisfy the requirements of the Pakistan Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) Review Procedures, 2000.

For effective environmental management, the management of the project should assign the necessary responsibilities to its Health, Safety and Environment team, which should be responsible for environmental monitoring of the project.

8.1 Objectives of EMMP

The EMMP provides a delivery mechanism to address potential impacts of the project activities, to enhance project benefits and to introduce standards of good practice to be adopted for all project works. The EMMP has been prepared with the objectives of:

- Defining roles and responsibilities of the project proponent for the implementation of EMMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project.
- Outlining mitigation measures required for avoiding or minimizing potential impacts assessed in the EIA report.
- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the EIA report.
- Defining the requirements for communication, documentation, training and monitoring, management and implementation of the mitigation measures.
- Identify the resources required to implement the EMP and outline corresponding financing arrangements; and
- Providing a cost estimate for all the proposed EMP actions.

8.2 Capacity Building and Institutional Responsibilities

Capacity building is an evidence-driven process of strengthening the abilities of individuals, organizations, and systems to perform core functions sustainably, and to continue to improve and

develop over time. Individual/workforce level capacity building activities improve the performance of staff according to EMMPs depending on specified activities and executing body.

Therefore, a comprehensive training program will be followed, to strengthen the technical and institutional capacities of the executing agency, contractors and labourers. Training program will be scheduled after approval of EMMP from EPD and site handing over to contractors.

Trainings for contractors will be organized when the bidding process will be completed. It will be suggested to develop inventory at sub-project site to address potential impact during construction. Contractors shall be bound for environmental and social compliance otherwise cost will be deducted as per break-down of environmental mitigation cost (item wise) in EMMPs. Training program will be planned as per requirement.

Table 8.1: Potential Stakeholders for Consultation

Stages for capacity building	Strategic Works	Mode of Consultation	Key Stakeholders
Screening	Sub-project Site Visits	• Meeting with line department • Public meetings • Awareness sessions for Contractors and labour force • Site Survey	• PHE department • Irrigation Department • Residents near and at sub- project site
Project formulation	• General sub-project and S • Safeguards Information • Mitigation Measures • Allocation of EMMP cost		
Impact Assessment	Scoping, assessment and management process, alternative options and mitigation measures		
Implementation and monitoring	• Consultation and collaboration on the basis of sub-project activities		

Environmental Specialist and Social Safeguard and Gender Specialist will execute the following training programs for the overall effective implementation of the EMMP. A tentative training Framework is given below:

Table 8.2: Tentative Training Details

Training Activity	Participants	Type of Training	Content	Scheduling	Amount (PKR)
Construction Phase (10 months)					
Environment code of practices	Contractor Staff	Presentation	Awareness & applicability of environmental code of practices	Once	2,700,000
Revision of Environment code of practice	Contractor Staff	Presentation	Revision on Awareness & applicability of environmental code of practices	Once	

Waste Management	Contractor Staff	Lecture	Awareness associated with waste Storage, collection and safe disposal	Once	
Workers Code of Conduct	Contractor Staff	Presentation & FGD	Do's and don't's of community interaction	twice	3,600,000
Greivance Redress Mechanism	All relevant project staff including contractor	Presentation & FGD	roles and procedures of GRM		
Awareness workshop regarding Covid 19 and other vector borne diseases	Contractor Staff	Presentation	Risk, Prevention and available treatment	Once	1,800,000
Community/ occupational health and safety	Contractor Staff	Lecture	Awareness on EHS Guidelines	Once	
Emergency Response	Contractor Staff	Workshop	Potential natural and other hazard/emergencies and dealing with emergency to minimize damage	Once	
WB OPs & PEPA Regulations	Managerial Staff of Contractor	Lecture	Awareness on World Bank OPs, PEPA rules, guidelines, regulation and standards for satisfactory compliance	Once	1,350,000
Resettlement Related Issues	Contractor and ESC Staff of PIMU	Lecture	Awareness on OP 4.12 (Involuntary Resettlement)	Once	2,700,000

Labour Code of Practise	Contractor Staff	Lecture	Awareness & applicability of Labour code of practices	Once	
Gender Aspects	Contractor Staff	Lecture	Awareness on gender inequalities/GBV OP 4.20	Once	
Sub project total					12,150,000

Strengthening Cost					
Sr. No.	Description (Position)	Quantity	Unit	Rate	Amount
				(PKR)	(PKR)
Construction Phase - 10 months (for the Contractor)					
1	Environmental Expert/ HSE Expert	300	Days	10,000	3,000,000
2	Social / Resettlement Expert	300	Days	10,000	3,000,000
3	Gender Expert	300	Days	10,000	3,000,000
					9,000,000

Following table is giving an overview regarding awareness sessions to be held at sub-project site on regular basis.

Table 8.3: Summary of Awareness Sessions for Contractors/Labour force

Potential Impact Proposed Avoidance and Mitigation	Measures
Environmental Aspects	
• Temporary habitat loss or • Temporary visual intrusion • Noise level increase at a single location • Waste generation • Discharge of sanitary effluent	• Limit the working hours of noisy activities when near identified sensitive receptors to normal daytime working hours. • Operate equipment in a manner sympathetic to the ambient noise environment. • Do not leave equipment idling unnecessary. • Eliminate tonal, impulsive or low frequency noise through noise control engineering

	techniques where practicable (fitting of mufflers, damping, etc.), and substitute for a different method if necessary (e.g., instead of hammering actions, use hydraulics). • Provide adequate warnings of impending works to all potential receptors • Implement Waste Management Plan to include procedures for proper disposal of solid waste • Ensure that discharge of sewage from temporary construction facilities to surface • courses does not impact surface
Social Aspects	
• Gender-based Violence Issues • Obstruction of public access • Privacy issues • Tension between Communities and Workers: cultural differences, behaviour of construction workers, potential disregard for local cultural norms,	The sub-project will seek to avoid placement of camps where their presence might contribute to any conflicts, or intrude on privacy. The construction contractor is required to develop a Site Management Plan to address: • Discipline • Community liaison • Ethnic tensions • Code of Conduct on ethical behavior and Gender-based Violence • Local culture and norms

Site Staff: Relevant personnel at site must be trained for the following:

- Techniques for waste minimization and water conservation
- Applicable environmental, health and safety compliance
- Water sprinkling at connective intervals
- Catering of Privacy issues

Contractors shall also provide safety equipment i.e., PPEs, safe drinking water, first aid boxes etc. to the workforce as per the nature of their jobs. By ensuring all these mitigation measures; not only their company profile will boost up, but it will also enable them to qualify and win future sub-projects. It will also be briefed, that the contractors having environmental and social safeguards experience in their company will be preferred during evaluation.

8.3 Institutional Arrangements

The mitigation of environmental issues and monitoring of EMMP will improve the existing environmental conditions. By the presence of environmental and social safeguards specialists the Project Implementation & Management Unit (PIMU) and local government will be technically strengthened. Coordination and Team Building. There would be generation of skilled and trained HR and presence of Environment and Social Safeguards team and Gender Specialist will be an asset for LG&CDD as currently Tehsil Officers have no technical capacity for compliance of social and

environmental safeguards. Awareness raising will be done through dissemination of information, virtual training, and communications. Community feedback and complaint redressal mechanism will be strengthened.

Environment Specialist and Social Safeguard and Gender Specialist will ensure the implementation of EMMP through the contractor and will submit the EMMP implementation progress report. Both will be directly responsible for the internal monitoring and progress reporting by doing site visits regarding the compliance of EMMP.

Following will be the implementation arrangement under the project:

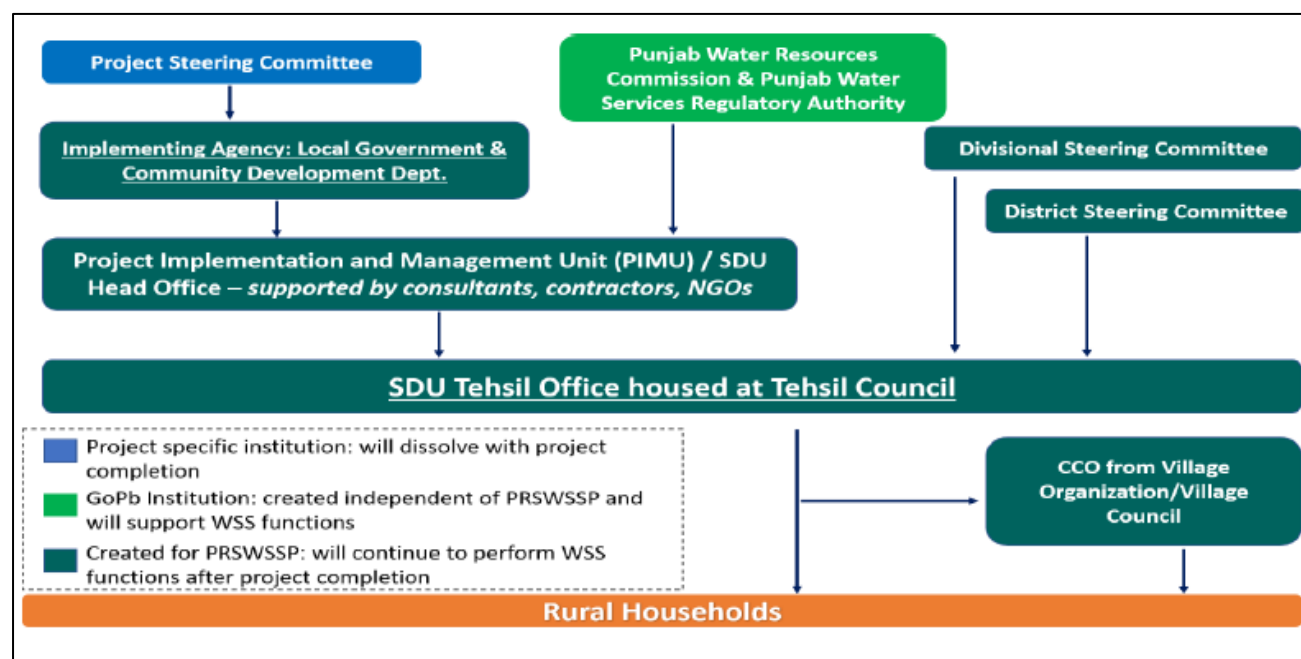


Figure 8.1: Project Implementation Arrangement and Transition to Post-Project Service Delivery

Source: ESMF-PRSWSSP

8.3.1 Project Management & Implementation Unit-at LG&CDD

There will be the Project Director (PD) of PRSWSSP based at PIMU of LG&CDD, who will be assisted with team of experts, officers and supporting staff. Project management and administration of funding;

- Ensuring execution of the project as per action plan
- Overall implementation and monitoring of ESMF and ensure the hiring of Consultants/consultancy firm to conduct TPV Reports
- Capacity building of the staff and personnel.

8.3.2 Service Delivery Units (SDU) at Tehsil level (SDU-TO)

The SDU will generally be responsible for:

- Ensuring execution of the project as per action plan
- Support and coordinate with ESS and SSS throughout implementation of ESMF at district/field level
- E&S Screening
- ESMP/EIA preparation

- Inclusion of cost in BOQs of Contractor
- Monitoring
- Reporting to the Project Director on progress and strategies

8.3.3 Monitoring Mechanism

EMMP monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be carried out at four levels. Safeguard Team of PIMU/PRMSC will carry out EMMP monitoring to ensure that the mitigation plans are being effectively implemented and will conduct field visits on regular basis. An independent firm will be hired for Third Party Validation (TPV) of the entire project including EMMP implementation as per EMMP requirements. The effectiveness of the safeguards implementation will be reviewed and assessed 3 times during the life of the project by engaging third party validation/ monitoring.

8.3.4 Documentation and Reporting

The Environment Specialist and Social Safeguard and Gender Specialist will produce monthly and quarterly progress reports based on the information collected. These reports will include all aspects of the EMMP, including:

- Minutes of Meetings with contractors
- Laboratory analysis during construction phase
- Safety attributes compliance
- Implementation of mitigation measures
- Capacity building sessions
- GRM implementation
- Any other EMMP implementation activity carried out during the reporting period

8.3.5 Information Disclosure

The EMMP report will be uploaded on the MIS managed by PRMSC and it will be made available in the local offices of Tehsil Administration, and at a central point/place at the sub-project. EMMP will also be the part of contract agreement with the contractors. Briefing session with contractors regarding effective implementation of EMMP would be arranged. Safeguard Team will keep the stakeholders informed about the environmental and social impacts throughout the sub-project construction phase and facilitate in addressing grievance (s).

8.2.4 Role of Contractor in EMP

The Contractor will be responsible for the implementation of the Proposed Project under the supervision of the PRMSC & Consultant. The Contractor will be bound to follow the provisions of the contract documents especially about environmental protection and apply good construction / installation techniques and methodology without damaging the environment. Obligation of the contractor, to safeguard, mitigate adverse impacts and rehabilitate the environment should be addressed through environmental provisions in the contract document and through adequate implementation at site.

The organizational roles and responsibilities of the key managers are summarized as below:

Sr.#	Managers	Responsibilities
1.	Contract Manager	• Ensure EMP development. • Implementation of EMP with true spirit. • Environmental issues identification within pre-construction phase. • Communication of EMP with other employees.
2.	Contractor	• Ensuring that the control measures identified from environmental surveys are implemented as they are relevant to their work/visit. • Ensuring that the project management team is notified of any non-conformance of control measures or environmental incident where the environment has been put at risk.
3.	Site Manager	• Ensure site material and chemicals are safe. • Controlled access arrangement to avoid hazards. • Emergency egress arrangements to avoid dangerous situation. • Provide first aid facilities.
4.	Site HSE Advisor	• Ensure work is carried out in safe manner. • Ensure good standards of workmanship. • Health and safety advisor to complete the site waste management plan to be followed. • Ensure EMP implementation. • Daily checks and weekly checks. • Consultation with workers.
5.	Site Environment Advisor	• According to legislation and consent develop EMP. • Ensure application of EMP. • Carry out site inspection.

8.4 Environmental Management and Monitoring Plan:

The Environmental Management and Monitoring Plan (EMMP) will be used as a management and monitoring tool for implementation of the mitigation measures identified in the EIA report.

The EMMP matrix lists down:

- The required mitigation measures recommended in the EIA 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.
- Project proponent will hold primary and overall responsibility for ensuring full implementation of the EMMP.

The Environmental Management and Monitoring Plan have been provided for construction and operational phases of the project in the Table below:

**Legend:**

ES – Environment Specialist; SS-Social Specialist; EPD- Environment Protection Department

GS – Gender Specialist; HSE – Health and Safety Expert

RE – Resident Engineer; PRMSC- Punjab Rural Municipal Services Company

Table 8.4: Environmental Management and Monitoring Plan

Sr. #	Proposed Sub-project Activities	Potential Impacts	Mitigation Measures	Implementing Agency	Monitoring Responsibility	Monitoring Frequency	Cost (all mouzas)
A. Design Phase							
1.	Site Selection	• Resettlement issues of local people • Disturbance to properties/ businesses • Tree cutting	• Sub- project suggests physical works to lay piped networks of water supply and sewerage within the major settlements in the revenue villages and within existing ROW for which no land acquisition is involved. • Site selection will be done in a way such that the land acquired through VLD process is either vacant or barren piece of land. • If it is not, construction activities would be halted	Contractor	ES/SS and GS	Once during VLD process	N/A

			until the existing crop is harvested at the end of its season. The exposed soil will be re-vegetated quickly and compensatory plantation will be followed, i.e. 10 trees to be planted for every tree cut. Removal of vegetation and trees will be avoided to the extent possible.				
2.	Public Cultural Properties and	Disturbance to people visiting public properties i.e. mosques, schools, graveyards etc.	- In case of unavoidable interference prior notification will be issued and consultation needs to be done to reach consensus on procedures and options or any other form of agreed compensation. - Alternate routes will be opened for traffic during the duration of sub-project. - Ensuring that half part of road is rehabilitated, and remaining half is left for routine movement to avoid any inconveniences for pedestrians.	Contractor	ES/SS and GS	Once before starting construction	N/A



1.	Identification of Site for Labour Camps, Material Storage Points and Vehicle/Machinery Parking	Loss of agricultural land, and resettlement Issues	• Preferably, accommodation will be rented out nearby the sub-project site as per available number of workers rather than labour camp. • Construction Material storage and parking of vehicles would also be done after consultation with the land owners or residents at some suitable vacant site. • Sub-project is of small duration of 08 months. In case of any kind of loss during construction works, compensation will be paid (if loss of agricultural land or any economic loss is observed). Abbreviated Resettlement Action Plan will be prepared accordingly as per WB OP 4.12.	Contractor	ES/SS and GS	Once before starting construction	N/A
B. Construction Phase							



4.	Laying of Water or Sewerage Pipelines	Falls and slips, trench collapse, contact with viruses, bacteria, and other microorganisms in sewage.	- The laying of pipelines should be according to the specifications. - Fence should be installed as protection during lying of pipelines to avoid access of people and animals to pipeline trenches.	Contractor	PRMSC, Consultant (JERS)	Daily Inspection during construction	Budget breakdown included in working site safety cost in ESMP
		High volume of excavation and filling may alter flow paths within the portions under construction	- Re-use any excess excavation material generated by the construction within the site or on the other nearby projects. - The deposit of waste to landfill is a last resort. - Reduce as much as possible difference between cut and fill	Contractor	PRMSC, Consultant (JERS)	Daily Inspection during construction	N/A
		Contamination of storm water from exposed soils sediments	- The height and slope of stockpiles should be limited to minimize erosion of unconsolidated materials during rainfall events. - Locating stockpiles on flat areas, away from storm water. Ensure that sediment or erosion cannot	Contractor	PRMSC, RE, JERS	Daily Inspection during construction	N/A



			reach a waterway; Diversion of overland flow around work areas / construction sites.				
5.	Material handling	Spills or leaks of fuels, lubricants or chemicals from machinery and vehicles may contaminate groundwater. Water for wash down of vehicles and machinery on site may contaminate groundwater	- Spill control measures should be implemented to prevent spills from infiltrating into the groundwater table. - Measures should include appropriate materials handling and storage procedures, and development of contingency plans in the event of a spill. - Provision of uncontaminated water for dust suppression and wash down of vehicles and machinery	Contractor	PRMSC, RE, HSE	Daily Inspection during construction	Budget breakdown included in working site safety cost in ESMP
6.	Movement of vehicles	Traffic Congestion	- Provision of shared worker's transport from workers accommodation to the proposed Project site. - Installation of warning signs and specified speed limits (site roads should reduce traffic speeds to 20 km/hr).	Contractor	PRMSC, RE	Daily Inspection during construction	N/A



			• The use of local construction materials where practical to avoid long journeys. • Timing of construction activity, such as restricting construction traffic to designated roads during designated times, avoiding peak hour traffic. • Design a traffic plan to make sure that traffic avoids, where possible, congested and heavily populated areas and dusty roads				
7.	Noisy Activities during construction works	Heavy noises near schools and mosques can affect learning and prayers	• Construction works within 100m of schools should be restricted to outside school hours (such as before and after school, during school holidays or weekends, or left as the final stage of works); • The access points for construction vehicles should be a minimum of 100m from school or mosque access. • Ear Plugs must be given to	Contractor	PRMSC, RE, ES/HSE	Daily during construction	Cost of ear plugs included in ESMP budget



			the workers for safety				
8.	Air Pollution	Dust emissions generated from earthworks due to loading and unloading of materials on site and from uncovered truckload in addition to the potential dust emissions that could occur as a result of excavation for the piped networks or other construction works.	- Minimizing the height and slope of stockpiles to ensure erosion of unconsolidated materials during rainfall events does not occur - Side enclosure and covering, by impervious sheeting, of any aggregate or other dusty material stockpiles. - Dusty vehicle loads transported to, from and within the Project site should be covered by sheets and should not be overloaded. - Wire fence meshing, dust screens or wooden hoardings should be installed to delineate the construction area and therefore decrease impacts; - Use of water sprays to decrease dust generation	Contractor	PRMSC, RE, ES/HSE	Daily during construction	Water Sprinkling (Dust Abatement) cost is provided in ESMP budget

9.	Surface and Groundwater	Construction waste and oil spills, if left unattended will result in forming leachate that will percolate through the soil strata and may contaminate the groundwater table. Wastewater from sanitation facilities in the workers' camps may also result in contamination of subsoil water. Hand pumps and wells are commonly used sources of subsoil/groundwater for communities in these areas.	• Proper disposal of solid waste at the designated site to sustain the water and land quality for domestic requirements. • Water required for construction should be obtained in a way so that water availability and supply to nearby communities remains unaffected. • Contractor will ensure that construction debris does not find its way into the drainage or irrigation canals which may get clogged. • Prohibit washing of machinery and vehicles in surface waters, provide sealed washing basins and collect wastewater in • Construction work close to streams or other water bodies will be avoided, especially during monsoon period. • Contractor will conduct the mandatory water testing and obtain all necessary permits as per regulations from	Contractor	PRMSC, RE, ES	Daily inspection during construction. Testings on quarterly basis	Lab testing cost and campsite management cost provided in ESMP budget
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			the Local Authority.				
10.	Change in Land Use	Deterioration of landscape (trees and plants) that exists at the proposed site location	Plant trees and shrubs around facility at the end of construction works	Contractor	PRMSC, ES	Once at the end of construction works	Tree plantation cost provided in ESMP budget
11.	Workers' safety on-site	Falls and slips, trench collapse, electric shock, sprains and back pain, respiratory issues, and repetitive motion injuries. Un-awareness regarding usage of PPEs may have serious outcomes	- Wearing of work and personal protection equipment - Presence of absorbent material on-site - Existence of first aid kit on-site - Permanent presence of vehicle on the site for rescue and emergency purposes - Presence of notices posted at the sight of workers showing the names and phone numbers of officials and describing the early warning system	Contractor	ES/SS/HSE, PRMSC	Daily	Working site safety budget breakdown Provided in ESMP
12.	Waste disposal	Construction activities can result in the generation of wastewater, oil spillage from machinery, domestic waste.	Solid Waste Management Plan for the construction site must be followed (refer to Section 5, point 5 for detailed instructions)	Contractor	ES/SS/HSE, PRMSC	Daily	N/A



		Improper solid waste disposal can result in increased air pollution through burning of waste, vector borne diseases, and contamination of water sources.					
13.	Restoration of Sites	Disposal of contaminated construction wastes and left-over construction material can lead to soil contamination.	- Contractor is bound to restore the site back to its original conditions before handing over. - All paved or earthen roads must be restored back. - Existing open drains must be rehabilitated to serve as storm water drains, - Brick Soling may be provided	Contractor	RE, PRMSC	Once at the end of construction works	Restoration Cost included in PC-1
	C. General Social issues						
14.	Job opportunities	It will lead to temporary increase in local employment and economic activity.	Priority will be given to local area inhabitants for skilled and unskilled labour jobs. Majority of labour need will be met from the sub-project areas. The sub-project will also require skilled workers, and these may be available from the	Contractor	SS, PRMSC	N/A	N/A



			community. It is anticipated that approximately 75% of the workforce will be from the sub-project area while some 25% of labour (skilled) would be hired from outside the sub-project area. This labour influx may have a positive impact on economy of the area.				
15.	Gender issue	- Sub-project activities may cause hindrance to normal passage especially for women. - Privacy of the community may be disturbed.	- Workers should be trained to address privacy issues and be behave ethically. - Labours would be instructed to respect privacy of local population especially women and children. - Staff capacity-building.	Contractor	SS and GS	Monthly basis	Training cost included in ESMP budget
16.	Economic Issues	Economic issues may arise due to; - loss of land, - structures/assets, - productive plants, - livelihood, - shopkeepers, - vendors (Mobile/permanent).	- No land acquisition is involved. - No Public structures are found to be affected in the sub-project area because they are not fallings in ROW; only roads would be dismantled during excavation works but will be restored at the end. - No tree plantation is found.	Contractor	SS	N/A	N/A



			• No livelihood will be affected by sub-project activity. • No shops were found to be affected. • No permanent vendors were observed during social and environmental assessment survey. • In case of any complaint, the focal person of GRC may contact and his contact details will be provided at sub-project site.				
	D. Operational Phase						
17.	Energy Consumption	Additional use of energy to operate the facility (electricity) OR Halted operation due to electricity cuts	• Use alternate sources of energy such as solar power	PRMSC	EPD, MEPCO	As and when required	Cost of solar included in PC-1
18.	Extraction of Groundwater	Water drawdown rate	• Control water extraction to match as close as groundwater recharge rate	PRMSC	EPD, Irrigation Department	-	N/A
19.	Chlorination	Improper chlorination dosage may alter water quality	• Regular monitoring of water content and of chlorination performance	PRMSC	EPD	Quarterly basis water testing during operation	N/A

		Potential hazard from the use of chlorine	• Regular monitoring of chlorination performance and appropriate disposal of wastes	PRMSC	EPD	Quarterly basis water testing during operation	N/A
20.	Pump operation	Noise pollution during operation	• Plant trees and shrubs around facility and fitting of mufflers on equipment • Greasing the equipment to prevent noise • Providing some buffer around the pumping room	PRMSC	EPD	Quarterly basis noise testing during operations Or visual inspections	N/A
21.	Occupational Health and Safety	Occupational Health and Safety Issues	• The issues related to operation of machinery and equipment will be controlled by efficient management, staff training, maintenance of machinery and equipment, and other preventive measures. • Proper storage and handling of fuel. • First Aid kits should be provided. • Provision of safe drinking water. • Provision of PPE's to the	HSE	PRMSC	Daily	-



			employees including masks, gloves etc.				
22.	Emergency Preparedness and Response	The operation of the project may encounter emergencies like operation failure	• An Emergency Response Plans for floods, earthquakes, and manmade disasters will be developed by management. • Responsible person to implement the Emergency Response Plan should be clearly designated. • The staff should be trained timely and concise response procedures. • Emergency numbers should be clearly posted so that a quick action is taken when an emergency arises. • Fire-fighting systems should be calibrated and maintained regularly.	HSE	PRMSC	One day training session	Training cost included in budget

8.5 Equipment Maintenance Details

PPE's and other required machinery of latest technology with high efficiency will be purchased by the proponent. Maintenance of equipment such as pumps, solar panels, motors, taps, pipelines, Check valves, gates etc. will be done twice a year for the smooth operation of disposal station's and water filtration plants.

Table 8.5: Equipment Maintenance Details

Task	Weekly	Monthly	Semi - Annually	Annually
Testing and Inspection		✓		
Check for Leakage		✓		
Recharging				✓
Pipelines		✓		
Machinery			✓	
Solar panels			✓	

8.6 Environmental Budget

For an effective implementation of environmental mitigation measures, it is very important to provide sufficient funds for implementation of environmental mitigation measures, monitoring and training. The cost of mitigation measures and institutional strengthening program will be included in BOQ for the project and No additional Payments need to be made. The environmental budget includes the cost for plantation and landscaping, PPEs, air, noise and water quality testing, management of labour camps, trainings and awareness campaigns and various other miscellaneous costs. The total environmental/health and safety budget for all ten mouzas is estimated to be **39 million** PKR.

8.7 Change Management Plan

The EIA report recognizes that changes in the operations or the EMMP may be required during the operation and therefore a Change Management Plan has been provided to manage such changes. The management of changes is discussed under two separate headings, changes to the EMMP and changes to the operation.

8.7.1 Changes to the EMMP

The EIA report and the EMMP have been developed based on the best possible information available at the time of the EIA study. However, it is possible that during the construction and operational



phase, some aspects of the EMMP may need to be changed owing to their non-applicability in a certain area of operation or the need for additional mitigation measures based on the findings of environmental monitoring during the construction and operational phases. In such cases following actions shall be taken.

- A meeting will be held between management and the concerned contractor. During the meeting the proposed deviation from the EMMP, planning and designing will be discussed and agreed upon by all parties.
- Based on the discussion during the meeting, a change report will be produced collectively, which will include the original EMMP clause/plan or design, the change that has been agreed upon, and the reasons for the change.
- The report will be signed by all the parties and will be filled at the site office. A copy of the report will be sent to the management of the project and contractor head offices.
- All relevant project personnel will be informed of the change.

8.7.2 Changes to the Operation

The change management system recognizes three orders of changes.

- **First Order Change:**

A first order change is one that leads to a significant departure from the project described or the impacts assessed in the EIA report and consequently require a reassessment of the environmental impacts associated with the change. Examples of such change include change in location of the proposed project.

In such an instance, the environmental impacts of the proposed change will be reassessed, and the results sent to the Punjab EPA for approval.

- **Second Order Change:**

A second-order change is one that entails project activities not significantly different from those described in the EIA, and which may result in project impacts whose overall magnitude would be similar to the assessment made in this report.

In case of such changes, the environmental impact of the activity will be reassessed, additional mitigation measures specified if necessary, and the changes reported to the Punjab EPA.

- **Third Order Change:**

A third-order change is one that is of little consequence to the EIA report findings. This type of change does not result in impact levels exceeding those already assessed in the EIA;

rather these may be made onsite to minimize the impact of an activity. The only action required in this case will be to record the change in the change record register.

8.8 Resettlement or Relocation Plan

In contrast to the environmental legislation which exists in Pakistan and provides a reference for the environment section of the ESR, no similar framework or legislation exists for general social impacts of urban or rural infrastructure projects - Resettlement and Rehabilitation (R&R) in particular. A resettlement action plan is required only when following basic 8 categories of issues and impacts are occurring.

- a) Loss of land;
- b) Loss of structure;
- c) Loss of source of livelihood;
- d) Loss of access to common resources and facilities;
- e) Loss of standing crops, trees and perennial trees;
- f) Loss of public infrastructure;
- g) Losses during transition of displaced persons / establishments;
- h) Losses to host communities;

When considering these aspects against the impacts identified during the social management plan, it is determined that no category of social impacts is evoked. **Therefore, it is concluded that no detailed Resettlement Action Plan is required for Tehsil Ali pur.**

8.9 Compensation in Money Terms

The acquisition of land for public purposes and provides compensation in the form of cash, an alternative land allocation, or through other equitable arrangements is given in Section 31 of the Land Acquisition Act of 1894. Since the land for the proposed project and its associated activities is already owned by the government and few of the land pieces were donated by the owners by their own free will, therefore no monetary compensation needed to be made to anyone for the proposed project. In case of unavailability of vacant land, agricultural land will be acquired through volunteer donation. However, the construction activities on such site will commence only when the already sown crop would be harvested at the end of growing season.

8.10 Grievance Redress Mechanism

The Project's Citizen Engagement (CE) strategy includes establishing a Grievance Redress Mechanism (GRM) in the PIMU (PRMSC) and in all the nominated project districts. The Grievance Redress Mechanism (GRM) is directly linked to the transparent implementation of ESMF. This GRM is proposed as a requirement of WB GRM policy to address the public grievances regarding environmental and social issues that may emerge during and after PRSWSSP sub-projects implementation. It will also cater to manage any disconnects that emerge from the field level and that has significant implications for effective implementation of the sub-project interventions. A key objective of the GRM is to establish procedures for filing any grievances and disputes on social and

environment issues and other entitlement issues arising out of the implementation of EMMP or ARAP/RAP.

A multi-tier GRM has been proposed by the consultant in Environment and Social Management Framework (ESMF) and the same will be followed in this EIA. The lowest tier of GRM will be at community level and the Panchayat/Village Councils will serve as an appeals mechanism and be the highest forum for resolution of any complaint. A matter reported to this forum will be decided in not more than one month. The PIMU at LG&CDD level will serve as the Secretariat for the Grievance Redressal Committee (GRC Directorate) that will be responsible for providing oversight on the entire GRM process at a strategic level and monitoring of complaints management.

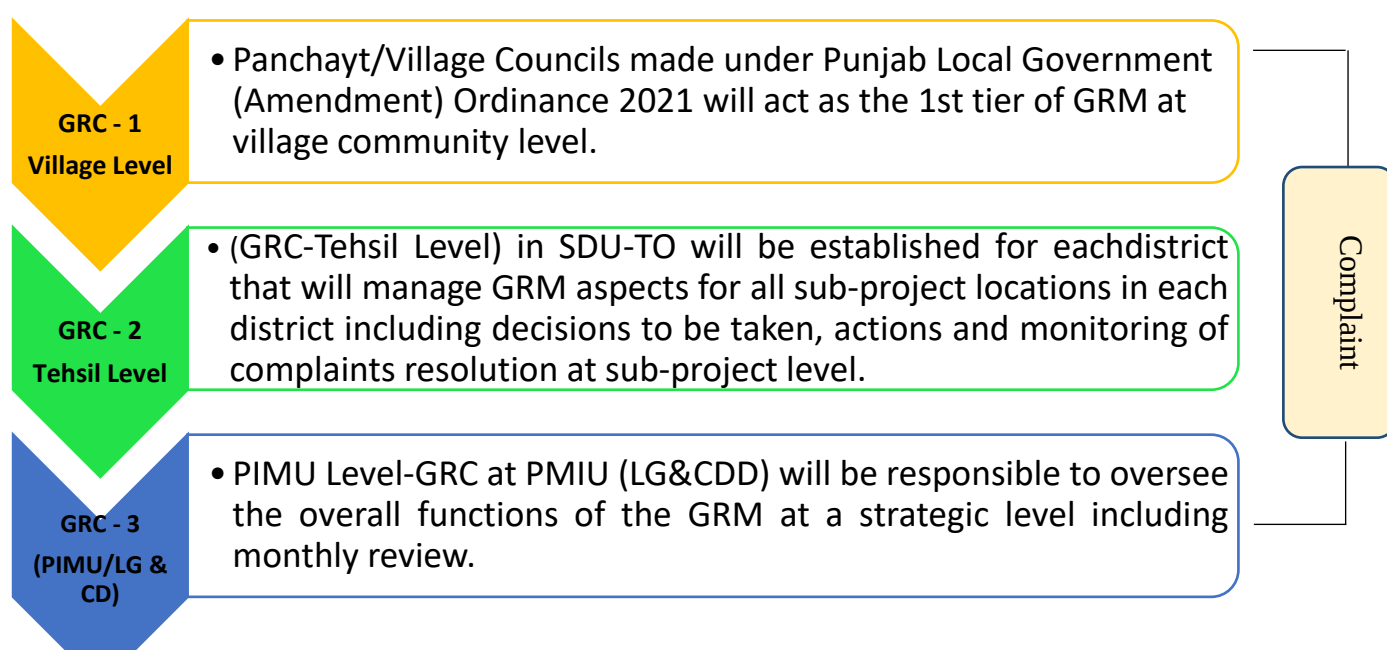


Figure 8.2: Three Tiers of Grievance Redress mechanism

8.11 Legal and Policy Reforms

Grievance Redress will be convened as per the World Bank OP 4.12 which requires an appropriate and accessible grievance redress mechanism for affected persons, including displaced persons and host communities.

Table 8.6: Types of Grievances

• Loss of livelihood • Compensation issues • Local Culture and norms • Dust, noise and air pollution from construction activities	• Water Pollution • Waste disposal • Health and safety • Criminal activities • Loss of business/income • Traffic Movement	• Damage to structure/properties • Impacts on livelihood • Obstruction in access etc. • Resettlement issues and land acquisition • Privacy issues
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No resettlement is involved therefore, no Resettlement Action Plan is prepared for the sub-project. The EIA/EMMP prepared addresses all such other types of complains or grievances.

8.12 GRM Implementation Procedure

1. Through the envisaged system, complainant would be able to launch complaint on a toll-free number, app, message or call. (GRM will be accepted the anonymous grievances)
2. Details of the complaints and the complainants will be entered in the system and a complaint number will be provided to the complainant through SMS.
3. In SDU a specific person will be designated to monitor the system and issue necessary instruction to relevant quarter for necessary action.
4. The GRM will provide an interface to complainants to check the status of their complaint and a dashboard for SDU & PIMU to monitor the progress on the complaints.
5. The system will bridge the gap between the masses and the service provider.
6. Monitoring officers will precisely know the details of pending complaints in every SDU. Performance of the SDU could also be easily monitored through it.
7. The GRM will have a built-in escalation system for moving unresolved complaints to higher levels.
8. If the complainant is not satisfied, the complaint will have the option to seek redress through court of law.

8.12.1 Timelines

1. GR (Village level) will be responsible to receive, log, and resolve complaints at village level. The Grievance Redress Committee at the village Panchayts will review and identify actions to be taken to address the complaints at its weekly meeting. If not resolved timely then complaint would be referred to GRC-Tehsil Level (SDU-TO) **within 3 days after receiving**.
2. GRC-SDU-TO will try to resolve the complaints in a satisfactory manner anyhow, If not satisfactorily resolved by the village Panchayts/councils and Tehsil level, then the grievance will be referred for consideration by GRC at the PIMU/LG&CDD level **within one week**.
3. Acknowledgement of a written submission will be issued to the complainant **within three working days**.

8.13 Communication and Awareness

The final processes and procedures for the GRM will be translated in to local languages and disseminated at all sub-project locations. These shall be made available (in both leaflet and poster format) to all subproject locations through the offices of each SDU. Dedicated male and female Grievance Focal Persons for each sub-project location will play an instrumental role in spreading awareness regarding the GRM, including the use of information technology for reporting and monitoring of complaints.

9 Conclusion

After a thorough investigation of the environmental impacts, it can be concluded that the physical and biophysical features will not be impacted significantly on the long term. Short term impacts on noise, air quality and other physical features will be mitigated during construction. For social impacts, no major issues are identified. The minor social issues like safety of general public and workers, security problems, risk of transferable diseases are of temporary nature and can be resolved with adequate mitigation measures. The long term impact on drinking water supply is a positive one which is the increase in potable water supply to the population, the expansion in area coverage and the amelioration of the drinking water quality in Tehsil Ali pur

All upgrades to existing infrastructure and new works are proposed within existing landholdings, existing structures or existing rights of way. There are accordingly no cumulative impacts on physical, ecological or social resources in any of the areas subject to development or redevelopment, since all of these areas have yet to be intensively developed in the area;

Sewerage improvements are designed to reduce underground water contamination and better sanitation facility, notwithstanding that such improvements may increase overall sanitation benefits; The overall impacts are considered as positive due to the implementation of projects. However, monitoring and proper employment of the Environmental Management Plan are necessary for the successful implementation of the project. After the completion of the proposed project, residents of the project area will get the following benefits;

- Improvement in environmental conditions of the project area.
- Direct employment of approximately 120 to 150 local people during construction phase and direct employment of approximately 100 employees is anticipated during the operational phase. The development will also generate indirect employment. This represents a significant and positive, both direct and indirect, long term impact.
- Other than providing direct & indirect employment and revenue source, the development shall lead to an improvement of infrastructure of the rural area. These are important direct and lasting positive impacts on the community.
- Socioeconomic conditions of the area will be enhanced along with the overall boost to the environment of the project area.
- The project activity will fulfill the growing demand of potable drinking water and sanitation in rural areas of Tehsil.

- Treated potable water will reduce the chances of pathogenic diseases such as typhoid, dysentery, hepatitis etc.
- At the end of the construction phase, 02 – 03 times of removed trees will be planted in the designated green areas, this will enhance the aesthetic beauty of the project areas.
- Due to aforesaid project sustainable development goals in Pakistan will be achieved on a minor scale with the passage of time.
- With the construction of the proposed project and subsequent development of infrastructure in the area, the lifestyle of the community will be improved. This is considered a positive impact.
- Improvement in health conditions of the residents of the project area.
- Decrease in health budget of the residents of the project area.
- Business will spin – off in the water sector and also for solar panel providers.

9.1 Recommendations

- The Contractor should carry out the mitigation measures according to the guidelines and satisfaction of the Client. Environmental Management and Monitoring is to be performed as per Environmental Management and Monitoring Plans.
- The construction activities shall be phased to confine the disruption of traffic. Traffic diversion / re – routing plans, if found necessary, shall be made with the help of traffic police for smooth flow of traffic. The vehicles carrying the construction materials will not be allowed to enter the town during rush hours.
- Inclusion of further access routes to facilitate the accessibility of vehicles and pedestrians to and from the proposed Project site.
- Strict supervision of the excavation process should be carried out and residents should be informed in advance about the excavation activity.
- Noise measurements will be carried out at locations and schedule specified to ensure the effectiveness of mitigation measures.
- The Contractor should, subject to availability and workability, employ maximum number of workers from local area.
- The contractor should be bound to:
 - a) Ensure that no damage or disruption is caused to the social infrastructure or public services being provided to the people e.g., education, health, electricity supply, drinking water supply facilities for public gathering or religious congregations.



- b) Ensure the Contractor or his employees remain above the local Tribal tensions
- c) Ensure that existing ownership of land around the Sub-project is respected.
- d) Ensure that if some construction material, has to be procured from or through a member of local community, it must be by a proper Social Framework Agreement.
- e) Ensure that no damage or adverse effect is caused to archaeological (present or chance find) sites, graveyards and burial places.
- f) Ensure that privacy of local women is respected and any violator is strictly disciplined

Sources of Data

ⁱ Multi Hazard Vulnerability & Risk Assessment Report (MHVRA) – Multan District, Project Management Unit National Disaster Management Authority Islamabad, Pakistan

Pakistan social and Living Standards Measurement (no date) Pakistan Bureau of Statistics. Available at: <https://www.pbs.gov.pk/content/pakistan-social-and-living-standards-measurement>

Population census (no date) Pakistan Bureau of Statistics. Available at: <https://www.pbs.gov.pk/content/population-census> (Accessed: December 28, 2022).

Punjab Environmental Protection (Amendment) Act 2012 (PEPA)

Guidelines for the preparation and review of Environmental Reports, October 1997

Review of IEE/ EIA Regulation, 2022

<https://pakistanalmanac.com/>

Annexure I

**Community Response and Need
Assessment Proforma**

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT
PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT (PRSWSSP)
LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT DEPARTMENT PUNJAB
Public Consultation Proforma

Personal Information:

1. Name of Respondent: Malik Nadeem
2. Gender: male female
3. Age: 50
4. Education: mauric
5. Occupation: Petrol Pumpowner
6. Address: Azmatpur
7. Marital Status: M
8. Contact/CNIC No. : 03006862334

Project Related Information:

1. Are you aware that local government has proposed the project (Punjab Rural Sustainable Water Supply & Sanitation Project) for the provision of clean drinking water, sewerage system and solid waste management in your area?

Yes

☒ No

2. How you were informed about this project?

3. In your opinion do you think this project should be implemented?

☒ Yes

No

4. Do you experience any difficulties regarding availability of safe drinking water and sanitation in your area?

☒ Yes

No

5. Do you experience the spread of pathogenic diseases (diarrhea, typhoid, cholera) and vector-borne diseases (malaria, dengue) etc due to unsafe drinking water and poor sanitation?

☒ Yes

No

6. Do you experience any taste, color or odour in the drinking water of your locality?

☒ Yes

No

7. In your opinion what are the possible impacts of this project?

Impacts	Response	Impacts	Response
Land acquisition or resettlement	No	Employment opportunities	Yes
Air pollution, dust and noise pollution	No	Value enhancement of project area	Yes
Odour problems	No	Health benefits to the residents	Yes
Any social issues	No	Overall improvement of potable water supply and sanitation in the area	Yes.

8. Facilities nearby proposed project area?

Facilities	yes	no
Educational Institutions	✓	
Healthcare centers	✓	
Mosques	✓	
Historical/archeological sites		
Commercial market	✓	✓

9. In your opinion what are the pressing needs of the project area?

Pressing needs	Response
Provision of clean drinking water	Yes, main problem.
Upgradation of roads	Upto some extent
Provision of commercial markets	Not that much
Provision of solid waste collection and disposal system	Yes.
Provision of recreational facilities	Yes
Provision of educational institutes	Already exist, but can be improved.
Others	

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT
PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT (PRSWSSP)
LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT DEPARTMENT PUNJAB
Public Consultation Proforma

Personal Information:

1. Name of Respondent: Malik Jameel
2. Gender: male female
3. Age: 35
4. Education: Matric
5. Occupation: Chairman
6. Address: Khayra Fazal
7. Marital Status: M
8. Contact/CNIC No. : 050-6860086

Project Related Information:

1. Are you aware that local government has proposed the project (Punjab Rural Sustainable Water Supply & Sanitation Project) for the provision of clean drinking water, sewerage system and solid waste management in your area?

Yes

☒ No

2. How you were informed about this project?

3. In your opinion do you think this project should be implemented?

☒ Yes

No

4. Do you experience any difficulties regarding availability of safe drinking water and sanitation in your area?

☒ Yes

No

5. Do you experience the spread of pathogenic diseases (diarrhea, typhoid, cholera) and vector-borne diseases (malaria, dengue) etc due to unsafe drinking water and poor sanitation?

☒ Yes

No

6. Do you experience any taste, color or odour in the drinking water of your locality?

☒ Yes

No

7. In your opinion what are the possible impacts of this project?

Impacts	Response	Impacts	Response
Land acquisition or resettlement	No	Employment opportunities	Yes
Air pollution, dust and noise pollution	No	Value enhancement of project area	Yes
Odour problems	No	Health benefits to the residents	Yes
Any social issues	No	Overall improvement of potable water supply and sanitation in the area	Yes.

8. Facilities nearby proposed project area?

Facilities	yes	no
Educational Institutions	✓	
Healthcare centers		✓
Mosques	✓	
Historical/archeological sites		✓
Commercial market	✓	

9. In your opinion what are the pressing needs of the project area?

Pressing needs	Response
Provision of clean drinking water	✓
Upgradation of roads	✓
Provision of commercial markets	✓
Provision of solid waste collection and disposal system	✓
Provision of recreational facilities	✓
Provision of educational institutes	✓
Others	✓

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT
PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT (PRSWSSP)
LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT DEPARTMENT PUNJAB
Public Consultation Proforma

Personal Information:

1. Name of Respondent: Muhammad Azam
2. Gender: ☒ male ☐ female
3. Age: 45
4. Education: Primary
5. Occupation: Farmer
6. Address: Mud Sarara Shah
7. Marital Status: M
8. Contact/CNIC No. : 0333-6457836/0302-6680767

Project Related Information:

1. Are you aware that local government has proposed the project (Punjab Rural Sustainable Water Supply & Sanitation Project) for the provision of clean drinking water, sewerage system and solid waste management in your area?

Yes ☐ No ☒
2. How you were informed about this project?
3. In your opinion do you think this project should be implemented?

Yes ☒ No ☐
4. Do you experience any difficulties regarding availability of safe drinking water and sanitation in your area?

Yes ☒ No ☐
5. Do you experience the spread of pathogenic diseases (diarrhea, typhoid, cholera) and vector-borne diseases (malaria, dengue) etc due to unsafe drinking water and poor sanitation?

Yes ☒ No ☐
6. Do you experience any taste, color or odour in the drinking water of your locality?

Yes ☒ No ☐

7. In your opinion what are the possible impacts of this project?

Impacts	Response	Impacts	Response
Land acquisition or resettlement	No	Employment opportunities	Yes
Air pollution, dust and noise pollution	No	Value enhancement of project area	Yes
Odour problems	No	Health benefits to the residents	Yes
Any social issues	Might occur while installation as it is across river and gangs are there.	Overall improvement of potable water supply and sanitation in the area	Yes.

8. Facilities nearby proposed project area?

Facilities	yes	no
Educational Institutions	✓	
Healthcare centers		✓
Mosques	✓	
Historical/archeological sites		✓
Commercial market		✓

9. In your opinion what are the pressing needs of the project area?

Pressing needs	Response
Provision of clean drinking water	✓
Upgradation of roads	✓
Provision of commercial markets	✓
Provision of solid waste collection and disposal system	✓
Provision of recreational facilities	✓
Provision of educational institutes	✓
Others	No direct access to Alipur Tehsil as there is river b/w.

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT
PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT (PRSWSSP)
LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT DEPARTMENT PUNJAB
Public Consultation Proforma

Personal Information:

1. Name of Respondent: Liaquat Ali
2. Gender: ☒ male ☐ female
3. Age: 40
4. Education: Matric
5. Occupation: Farmer
6. Address: Beit Mullan wali
7. Marital Status: M
8. Contact/CNIC No : 0301-6982085

Project Related Information:

1. Are you aware that local government has proposed the project (Punjab Rural Sustainable Water Supply & Sanitation Project) for the provision of clean drinking water, sewerage system and solid waste management in your area?

Yes

☒ No

2. How you were informed about this project?

3. In your opinion do you think this project should be implemented?

☒ Yes

☐ No

4. Do you experience any difficulties regarding availability of safe drinking water and sanitation in your area?

☒ Yes

☐ No

5. Do you experience the spread of pathogenic diseases (diarrhea, typhoid, cholera) and vector-borne diseases (malaria, dengue) etc due to unsafe drinking water and poor sanitation?

☒ Yes

☐ No

6. Do you experience any taste, color or odour in the drinking water of your locality?

☒ Yes

☐ No

7. In your opinion what are the possible impacts of this project?

Impacts	Response	Impacts	Response
Land acquisition or resettlement	NO	Employment opportunities	yes
Air pollution, dust and noise pollution	NO	Value enhancement of project area	yes
Odour problems	NO	Health benefits to the residents	yes
Any social issues	NO	Overall improvement of potable water supply and sanitation in the area	yes.

8. Facilities nearby proposed project area?

Facilities	yes	no
Educational Institutions	✓	
Healthcare centers		✓
Mosques	✓	
Historical/archeological sites		✓
Commercial market	✓	

9. In your opinion what are the pressing needs of the project area?

Pressing needs	Response
Provision of clean drinking water	✓
Upgradation of roads	✓
Provision of commercial markets	✓
Provision of solid waste collection and disposal system	✓
Provision of recreational facilities	✓
Provision of educational institutes	✓
Others	

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT
PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT (PRSWSSP)
LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT DEPARTMENT PUNJAB
Public Consultation Proforma

Personal Information:

1. Name of Respondent: Fazal Hussain.
2. Gender: ☒ male ☐ female
3. Age: 39
4. Education: Middle
5. Occupation: Farmer.
6. Address: Bait Nabishah
7. Marital Status: Married
8. Contact/CNIC No. : 0300-6864604

Project Related Information:

1. Are you aware that local government has proposed the project (Punjab Rural Sustainable Water Supply & Sanitation Project) for the provision of clean drinking water, sewerage system and solid waste management in your area?

Yes

☒ No

2. How you were informed about this project?

3. In your opinion do you think this project should be implemented?

☒ Yes

No

4. Do you experience any difficulties regarding availability of safe drinking water and sanitation in your area?

☒ Yes

No

5. Do you experience the spread of pathogenic diseases (diarrhea, typhoid, cholera) and vector-borne diseases (malaria, dengue) etc due to unsafe drinking water and poor sanitation?

☒ Yes

No

6. Do you experience any taste, color or odour in the drinking water of your locality?

☒ Yes

No

7. In your opinion what are the possible impacts of this project?

Impacts	Response	Impacts	Response
Land acquisition or resettlement	No	Employment opportunities	Yes
Air pollution, dust and noise pollution	No	Value enhancement of project area	Yes
Odour problems	No	Health benefits to the residents	Yes
Any social issues	No	Overall improvement of potable water supply and sanitation in the area	Yes.

8. Facilities nearby proposed project area?

Facilities	yes	no
Educational Institutions	6	
Healthcare centers	2	
Mosques	12	
Historical/archeological sites		—
Commercial market	✓	

9. In your opinion what are the pressing needs of the project area?

Pressing needs	Response
Provision of clean drinking water	
Upgradation of roads	
Provision of commercial markets	
Provision of solid waste collection and disposal system	
Provision of recreational facilities	
Provision of educational institutes	
Others	

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT
PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT (PRSWSSP)
LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT DEPARTMENT PUNJAB
Public Consultation Proforma

Personal Information:

1. Name of Respondent: Nazir Ahmad
2. Gender: ☒ male ☐ female
3. Age: 52
4. Education: Primary
5. Occupation: Teacher
6. Address: Yake wali
7. Marital Status: Married
8. Contact/CNIC No.: 0300-8605593

Project Related Information:

1. Are you aware that local government has proposed the project (Punjab Rural Sustainable Water Supply & Sanitation Project) for the provision of clean drinking water, sewerage system and solid waste management in your area?
Yes ☐ No ☒
2. How you were informed about this project?
3. In your opinion do you think this project should be implemented?
Yes ☒ No ☐
4. Do you experience any difficulties regarding availability of safe drinking water and sanitation in your area?
Yes ☒ No ☐
5. Do you experience the spread of pathogenic diseases (diarrhea, typhoid, cholera) and vector-borne diseases (malaria, dengue) etc due to unsafe drinking water and poor sanitation?
Yes ☒ No ☐
6. Do you experience any taste, color or odour in the drinking water of your locality?
Yes ☒ No ☐

7. In your opinion what are the possible impacts of this project?

Impacts	Response	Impacts	Response
Land acquisition or resettlement	No	Employment opportunities	Yes
Air pollution, dust and noise pollution	No	Value enhancement of project area	Yes
Odour problems	No	Health benefits to the residents	Yes
Any social issues	No	Overall improvement of potable water supply and sanitation in the area	Yes

8. Facilities nearby proposed project area?

Facilities	yes	no
Educational Institutions	✓	
Healthcare centers		✓
Mosques	✓	
Historical/archeological sites		✓
Commercial market	✓	

9. In your opinion what are the pressing needs of the project area?

Pressing needs	Response
Provision of clean drinking water	✓
Upgradation of roads	✓
Provision of commercial markets	✓
Provision of solid waste collection and disposal system	✓
Provision of recreational facilities	✓
Provision of educational institutes	✓
Others	

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT
PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT (PRSWSSP)
LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT DEPARTMENT PUNJAB
Public Consultation Proforma

Personal Information:

1. Name of Respondent: Abdul-Qayyum
2. Gender: ☒ male ☐ female
3. Age: 40
4. Education: Nil
5. Occupation: Farmer
6. Address: Nauababad
7. Marital Status: M
8. Contact/CNIC No.: 0301-3873119

Project Related Information:

1. Are you aware that local government has proposed the project (Punjab Rural Sustainable Water Supply & Sanitation Project) for the provision of clean drinking water, sewerage system and solid waste management in your area?

Yes

☒ No

2. How you were informed about this project?

3. In your opinion do you think this project should be implemented?

☒ Yes

☐ No

4. Do you experience any difficulties regarding availability of safe drinking water and sanitation in your area?

☒ Yes

☐ No

5. Do you experience the spread of pathogenic diseases (diarrhea, typhoid, cholera) and vector-borne diseases (malaria, dengue) etc due to unsafe drinking water and poor sanitation?

☒ Yes

☐ No

6. Do you experience any taste, color or odour in the drinking water of your locality?

☒ Yes

☐ No

7. In your opinion what are the possible impacts of this project?

Impacts	Response	Impacts	Response
Land acquisition or resettlement	No	Employment opportunities	Yes
Air pollution, dust and noise pollution	No	Value enhancement of project area	Yes
Odour problems	No	Health benefits to the residents	Yes
Any social issues	No	Overall improvement of potable water supply and sanitation in the area	Yes.

8. Facilities nearby proposed project area?

Facilities	yes	no
Educational Institutions	☒	
Healthcare centers		☒
Mosques	☒	
Historical/archeological sites		☒
Commercial market		☒

9. In your opinion what are the pressing needs of the project area?

Pressing needs	Response
Provision of clean drinking water	☒
Upgradation of roads	☒
Provision of commercial markets	☒
Provision of solid waste collection and disposal system	☒
Provision of recreational facilities	☒
Provision of educational institutes	☒
Others	☒

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT
PUNJAB RURAL SUSTAINABLE WATER SUPPLY & SANITATION PROJECT (PRSWSSP)
LOCAL GOVERNMENT & COMMUNITY DEVELOPMENT DEPARTMENT PUNJAB
Public Consultation Proforma

Personal Information:

1. Name of Respondent: Fayyaz Hussain.
2. Gender: ☒ male ☐ female
3. Age: 35
4. Education: Primary
5. Occupation: Farmer
6. Address: Wailwat
7. Marital Status: M
8. Contact/CNIC No.: 0334-6686352

Project Related Information:

1. Are you aware that local government has proposed the project (Punjab Rural Sustainable Water Supply & Sanitation Project) for the provision of clean drinking water, sewerage system and solid waste management in your area?

Yes

☒ No

2. How you were informed about this project?

3. In your opinion do you think this project should be implemented?

☒ Yes

No

4. Do you experience any difficulties regarding availability of safe drinking water and sanitation in your area?

☒ Yes

No

5. Do you experience the spread of pathogenic diseases (diarrhea, typhoid, cholera) and vector-borne diseases (malaria, dengue) etc due to unsafe drinking water and poor sanitation?

☒ Yes

No

6. Do you experience any taste, color or odour in the drinking water of your locality?

☒ Yes

No

7. In your opinion what are the possible impacts of this project?

Impacts	Response	Impacts	Response
Land acquisition or resettlement	No	Employment opportunities	Yes
Air pollution, dust and noise pollution	No	Value enhancement of project area	Yes
Odour problems	No	Health benefits to the residents	Yes
Any social issues	Might occur due to dangerous area due to gangs as its across river.	Overall improvement of potable water supply and sanitation in the area	Yes.

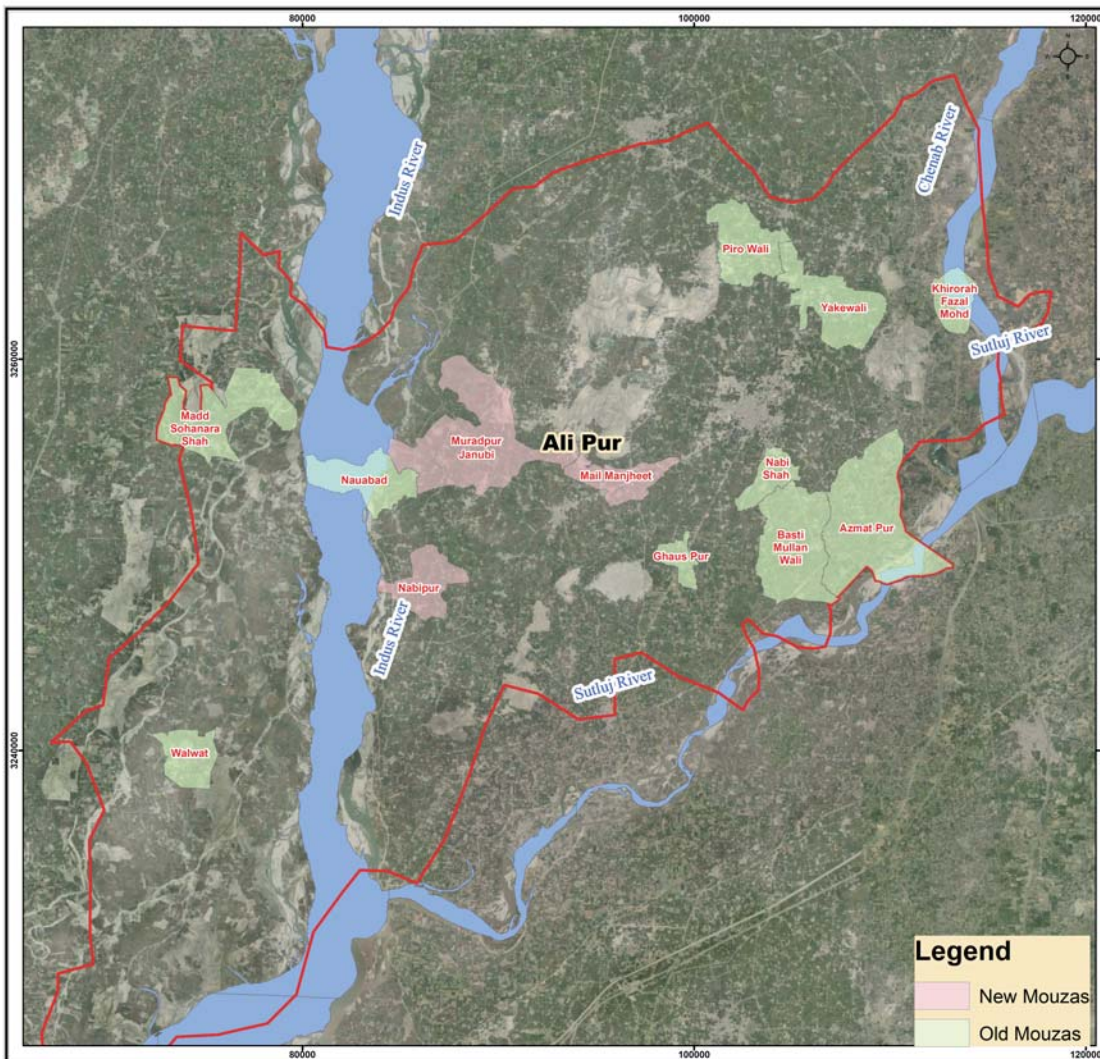
8. Facilities nearby proposed project area?

Facilities	yes	no
Educational Institutions		✓
Healthcare centers		✓
Mosques	✓	
Historical/archeological sites		✓
Commercial market		✓

9. In your opinion what are the pressing needs of the project area?

Pressing needs	Response
Provision of clean drinking water	✓
Upgradation of roads	Yes, No road here
Provision of commercial markets	Yes
Provision of solid waste collection and disposal system	Yes
Provision of recreational facilities	Yes
Provision of educational institutes	Yes
Others	No road, security concerns, No electricity.

Annexure - II
Location Map Alipur Tehsil



Annexure - III
Laboratory Results for air, water, wastewater and noise

TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Khiroq fazal N 29° 26' 4.05"E 70° 0' 40.65"
Sample source	Tubewell
Sample Code	GW-470
Date of sampling	28-Feb-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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- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
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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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.812 at 22.1 ^o C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	1.40	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	510	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
7.	Total Hardness	mg/L	-	<500	310	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
10.	Arsenic	µg/L	10	≤50	0.0244	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
13.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
14.	Chloride (Cl ⁻¹)	mg/L	250	<250	45	APHA-4500-Cl B
15.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
16.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
17.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.4	APHA-4500-F-C
18.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
19.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.2417	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
21.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
22.	Nitrate	mg/L	50	≤50	0.208	APHA-4500-NO ₃ ⁻¹ E
23.	Nitrite	mg/L	0.02	≤3	0.116	APHA-4500-NO ₂ ⁻¹ E
24.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine	mg/L	-	0.2-0.5	0.12	APHA-4500 B
26.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	BDL	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	200	-	58.8834	APHA-3111 B
29.	Potassium (K) [^]	mg/L	200	-	13.8834	APHA-3111 B
30.	Total Iron (Fe) [^]	mg/L	0.3	-	0.0099	APHA-3111 B

Biological Parameters Analysis Results:

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

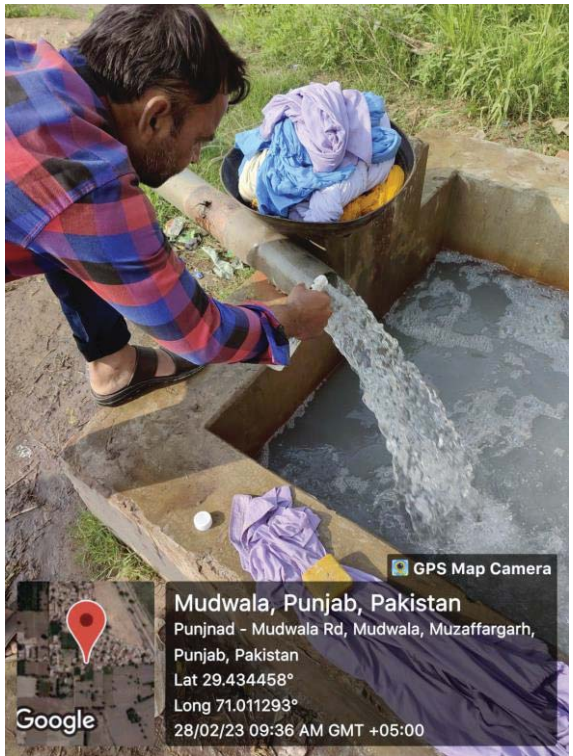
.....End of Report.....

PEQS: Punjab Environmental Quality Standards

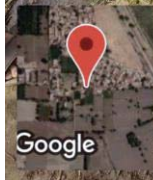
[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



GPS Map Camera



Google

Mudwala, Punjab, Pakistan

Punjad - Mudwala Rd, Mudwala, Muzaffargarh,
Punjab, Pakistan

Lat 29.434458°

Long 71.011293°

28/02/23 09:36 AM GMT +05:00

TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Pirowal 29° 26' 30.43" E 70° 54' 12.07"
Sample source	Tubewell
Sample Code	GW-471
Date of sampling	28-Feb-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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.786 at 21.9°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	1.50	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	540	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	320	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0299	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻¹)	mg/L	250	<250	65	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.4	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.1003	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.299	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	0.188	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.10	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	BDL	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	65.6801	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	12.3260	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	0.0320	APHA-3111 B

Biological Parameters Analysis Results:

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

.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



GPS Map Camera



Alipur Tehsil, Punjab, Pakistan
Unnamed Road, Muzaffargarh, Punjab, Pakistan
Lat 29.441619°
Long 70.903441°
28/02/23 08:12 AM GMT +05:00

TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Azmat Pur N 29° 20' 8.89"E 70° 57' 27.01"
Sample source	Tubewell
Sample Code	GW-472
Date of sampling	28-Feb-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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.790 at 21.4°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	0.75	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	430	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	240	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0245	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻¹)	mg/L	250	<250	30	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.3	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.1854	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.294	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	0.146	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.11	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	BDL	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	65.9735	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	8.0215	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	0.0709	APHA-3111 B

Biological Parameters Analysis Results:

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

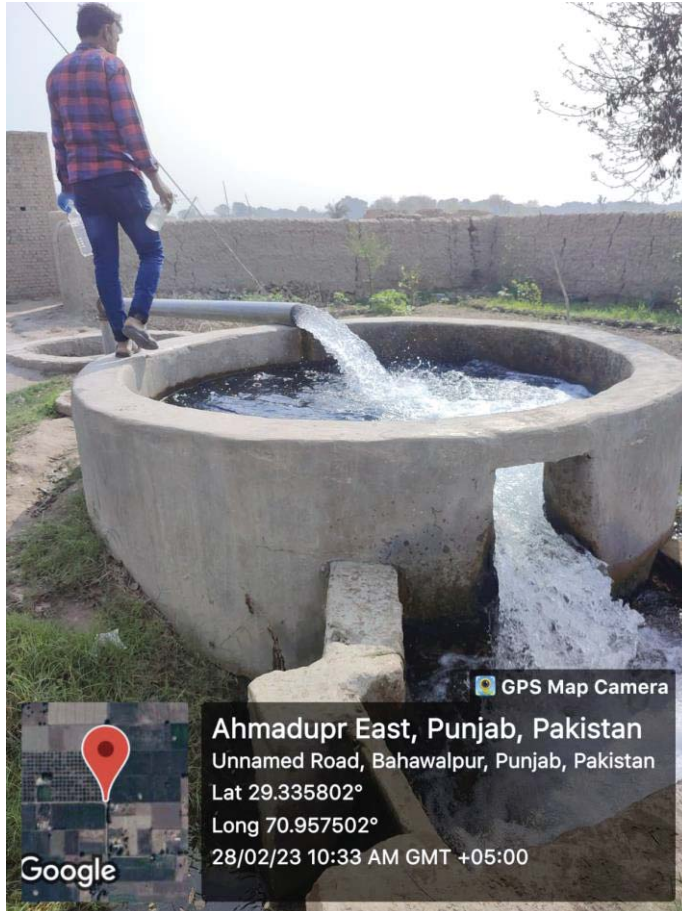
.....End of Report.....

PEQS: Punjab Environmental Quality Standards

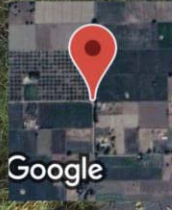
[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



GPS Map Camera



Ahmadupr East, Punjab, Pakistan
Unnamed Road, Bahawalpur, Punjab, Pakistan
Lat 29.335802°
Long 70.957502°
28/02/23 10:33 AM GMT +05:00

TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Yake Wali N 29° 26' 52.15"E 71° 20' 54.7"
Sample source	Tubewell
Sample Code	GW-473
Date of sampling	28-Feb-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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.704 at 21.6°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	1.00	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	380	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	270	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0199	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻¹)	mg/L	250	<250	20	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.2	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.0759	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.142	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	BDL	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.16	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	BDL	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	35.0700	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	5.9629	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	0.0402	APHA-3111 B

Biological Parameters Analysis Results:

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

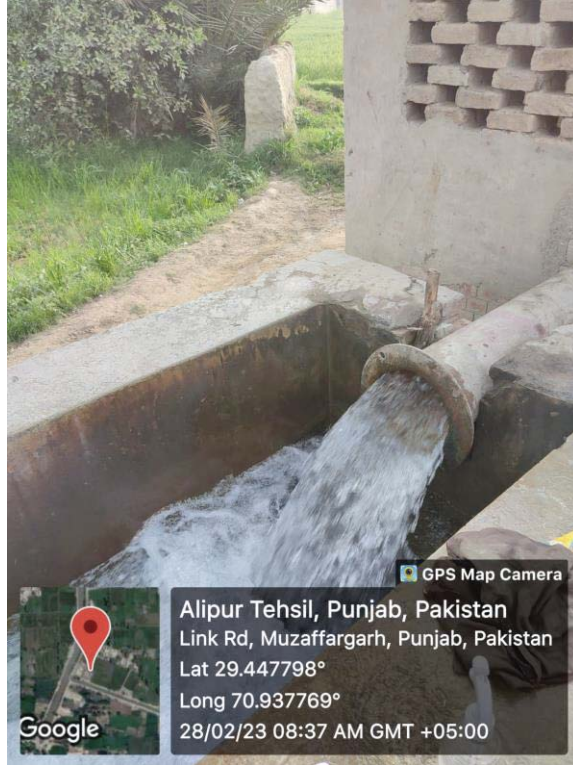
.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



GPS Map Camera

Alipur Tehsil, Punjab, Pakistan
Link Rd, Muzaffargarh, Punjab, Pakistan
Lat 29.447798°
Long 70.937769°
28/02/23 08:37 AM GMT +05:00

Google

TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Mouza Mud Sonara Shah 4 N 29° 23' 15.55"E 70° 38' 28.96"
Sample source	Tube well
Sample Code	GW-449
Date of sampling	26-Feb-23

Summary of Test Result:

Physical Parameters	Partially 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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.535 at 22.4°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	0.60	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	1670*	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
7.	Total Hardness	mg/L	-	<500	540	APHA-2340 C
8.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
9.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
10.	Arsenic	µg/L	10	≤50	0.0495	APHA-3114 B
11.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
12.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
13.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
14.	Chloride (Cl ⁻¹)	mg/L	250	<250	230	APHA-4500-Cl B
15.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
16.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
17.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.7	APHA-4500-F-C
18.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
19.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.2351	APHA-3111 B
20.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
21.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
22.	Nitrate	mg/L	50	≤50	1.140	APHA-4500-NO ₃ ⁻¹ E
23.	Nitrite	mg/L	0.02	≤3	0.945	APHA-4500-NO ₂ ⁻¹ E
24.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

25.	Residual Chlorine	mg/L	-	0.2-0.5	0.14	APHA-4500 B
26.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0076	APHA-3111 B
27.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
28.	Sodium (Na) [^]	mg/L	200	-	138.0295	APHA-3111 B
29.	Potassium (K) [^]	mg/L	200	-	19.1578	APHA-3111 B
30.	Total Iron (Fe) [^]	mg/L	0.3	-	0.0318	APHA-3111 B

Biological Parameters Analysis Results:

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

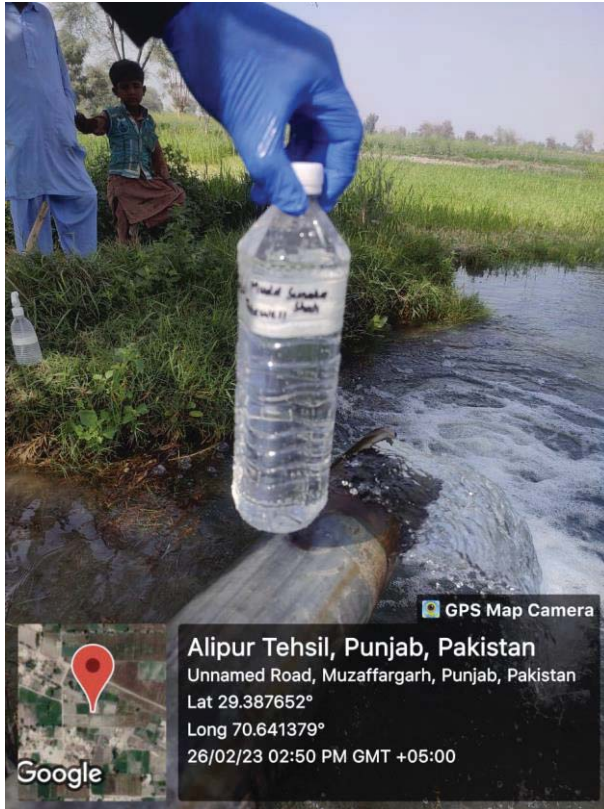
.....End of Report.....

PEQS: Punjab Environmental Quality Standards

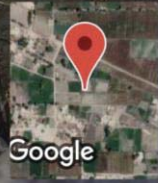
[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



GPS Map Camera



Alipur Tehsil, Punjab, Pakistan
Unnamed Road, Muzaffargarh, Punjab, Pakistan
Lat 29.387652°
Long 70.641379°
26/02/23 02:50 PM GMT +05:00

TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Mouza Mud Sonara Shah 1 29°23'16.9"N 70°38'01.7"E
Sample source	Tubewell
Sample Code	GW-450
Date of sampling	26-Feb-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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.323 at 22.4°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	2.60	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	1360*	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	730	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0396	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻)	mg/L	250	<250	275*	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.4	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.2087	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.601	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	0.841	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.12	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0084	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	199.0394	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	21.6234	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	0.1436	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	Nil	APHA-9221 D
2.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	95.0*	APHA-9221 E
3.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	Nil	APHA-9221 F

.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Mouza Mud Sonara Shah 2 29°23'15.6"N 70°37'59.8"E
Sample source	Tubewell
Sample Code	GW-451
Date of sampling	26-Feb-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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.307at 21.4°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	0.0689	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	430	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	900*	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0689	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻)	mg/L	250	<250	450*	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.9	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.2400	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	3.146	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	2.980	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.14	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0068	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	151.9913	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	29.0840	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	0.0704	APHA-3111 B

Biological Parameters Analysis Results:

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

.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Sonara Shah-3 29°23'16.2"N 70°38'01.4"E
Sample source	Tube well
Sample Code	GW-452
Date of sampling	26-Feb-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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.171 at 22.6°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	6.30*	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	2250*	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	270	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0511	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻¹)	mg/L	250	<250	515	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.6	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.3588	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	2.496	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	1.994	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.14	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0076	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	456.9711	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	29.0753	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	0.0942	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	Nil	APHA-9221 D
2.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	35.9*	APHA-9221 E
3.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	Nil	APHA-9221 F

.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Mouza Walwat N 29° 12' 36.1"E 70° 37' 10.49"
Sample source	Tubewell
Sample Code	GW-453
Date of sampling	27-Feb-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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.505 at 23.1°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	0.75	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	425	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	260	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0199	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻¹)	mg/L	250	<250	05	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.4	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.1608	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.194	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	0.146	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.11	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0074	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	47.7244	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	14.2498	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	BDL	APHA-3111 B

Biological Parameters Analysis Results:

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

.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Mouza Walwat N 29° 12' 29.71 E 70° 36' 50.72"
Sample source	Tubewell
Sample Code	GW-454
Date of sampling	27-Feb-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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.366 at 24.5°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	0.80	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	480	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	290	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0003	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻¹)	mg/L	250	<250	40	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.4	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.1316	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.009	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	BDL	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	BDL	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0094	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	63.7700	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	9.7288	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	BDL	APHA-3111 B

Biological Parameters Analysis Results:

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

.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Ghous Pur 29°18'41.1"N 70°52'35.7"E
Sample source	Tubewell
Sample Code	GW-455
Date of sampling	27-Feb-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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.430at 22.5°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	2.10	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	810	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	350	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0345	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻¹)	mg/L	250	<250	80	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.6	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.2482	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.325	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	0.301	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.02	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0084	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	124.9770	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	17.8044	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	0.0656	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	Nil	APHA-9221 D
2.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	35.9*	APHA-9221 E
3.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	Nil	APHA-9221 F

.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Ghous Pur N 29° 18' 39.3"E 70° 52' 31.9"
Sample source	Tubewell
Sample Code	GW-456
Date of sampling	27-Feb-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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.440 at 23.1°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	7.40	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	600	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	300	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0211	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻¹)	mg/L	250	<250	60	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.4	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.1809	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.199	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	0.236	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.16	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0348	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	83.4044	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	8.4270	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	0.1867	APHA-3111 B

Biological Parameters Analysis Results:

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

.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



GPS Map Camera

Alipur Tehsil, Punjab, Pakistan

8V6G+97J, Alipur - Seetpur Rd, Muzaffargarh,
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TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Bait Mullan Wali N 29° 21' 16.36"" E 70° 55' 3.26"
Sample source	Tubewell
Sample Code	GW-457
Date of sampling	27-Feb-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Non-Compliance
Chemical Parameters	Compliance
Remarks: Parameters with * are not in compliance with PEQS Limits.	

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- The report is not valid for any negotiations.

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

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.273 at 22.6°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	3.80	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	720	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	380	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0245	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻¹)	mg/L	250	<250	70	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.5	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.2046	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.200	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	0.146	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.21	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0350	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	70.8034	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	40.5904	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	BDL	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	286.2*	APHA-9221 D
2.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	97.8*	APHA-9221 E
3.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	78.4*	APHA-9221 F

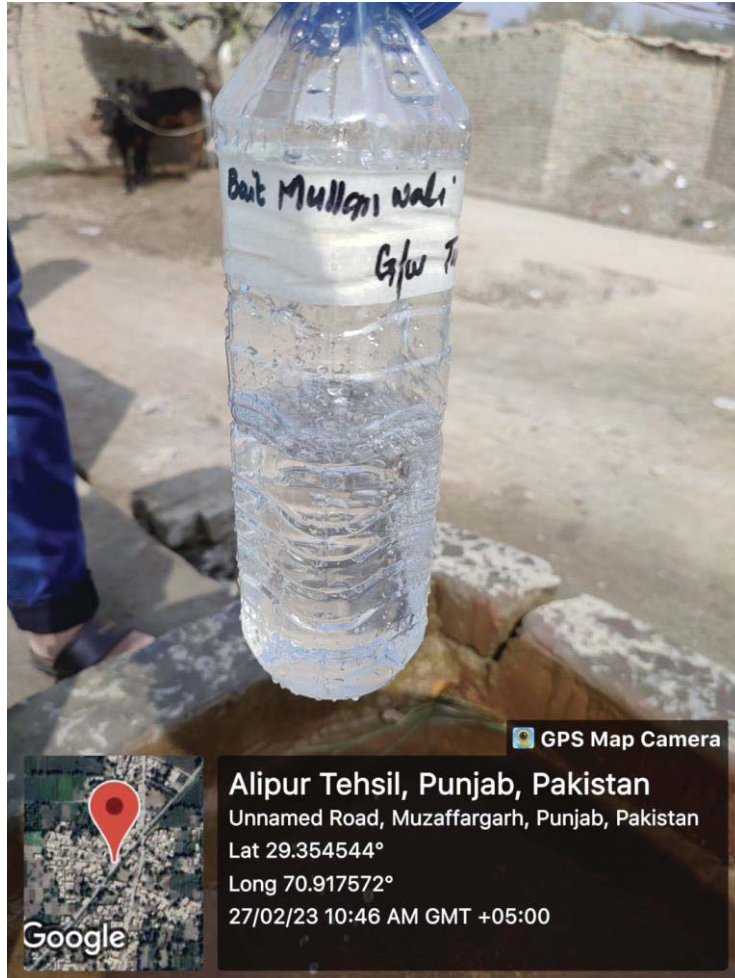
.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Bait Nabi Shah N 29° 21' 5"E 70° 54' 51.47"
Sample source	Tubewell
Sample Code	GW-458
Date of sampling	27-Feb-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Non-Compliance
Chemical Parameters	Compliance
Remarks: Parameters with * are not in compliance with PEQS Limits.	

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

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.315 at 21.9°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	3.80	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	530	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	340	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0416	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻)	mg/L	250	<250	50	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.3	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.0500	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.184	APHA-4500-NO ₃ ⁻ E
17.	Nitrite	mg/L	0.02	≤3	0.106	APHA-4500-NO ₂ ⁻ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.10	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0860	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	42.6255	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	10.3572	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	0.2010	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	104.7*	APHA-9221 D
2.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	45.1*	APHA-9221 E
3.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	36.5*	APHA-9221 F

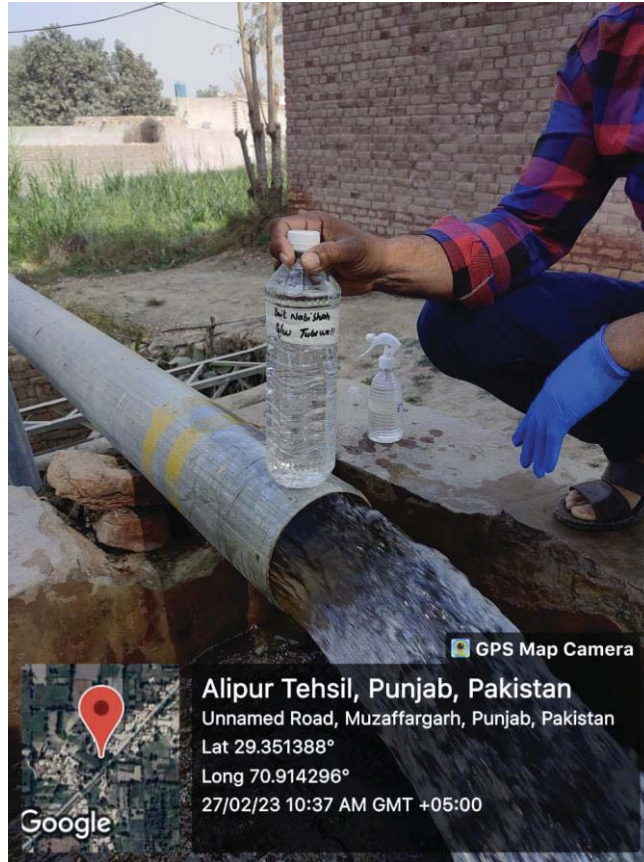
.....End of Report.....

PEQS: Punjab Environmental Quality Standards

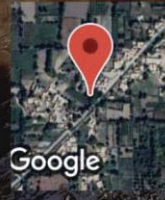
[^]PNAC Accredited

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GPS Map Camera



Alipur Tehsil, Punjab, Pakistan
Unnamed Road, Muzaffargarh, Punjab, Pakistan
Lat 29.351388°
Long 70.914296°
27/02/23 10:37 AM GMT +05:00

TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Nauabad N 29° 20' 42.14"E 70° 43' 59.02"
Sample source	Hand Pump
Sample Code	GW-459
Date of sampling	27-Feb-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Non-Compliance
Chemical Parameters	Compliance
Remarks: Parameters with * are not in compliance with PEQS Limits.	

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

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.346 at 22.6°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	0.85	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	750	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	450	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.394	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻¹)	mg/L	250	<250	85	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ¹⁻)	mg/L	1.5	≤1.5	0.5	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.0348	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.294	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	0.146	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.13	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0214	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	82.8444	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	7.0142	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	BDL	APHA-3111 B

Biological Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Coli-form	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	105.6*	APHA-9221 D
2.	E Coli	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	36.9*	APHA-9221 E
3.	Fecal Coliform	-	Must not be detected in 100 ml sample	Must not be detected in 100 ml sample	40.9*	APHA-9221 F

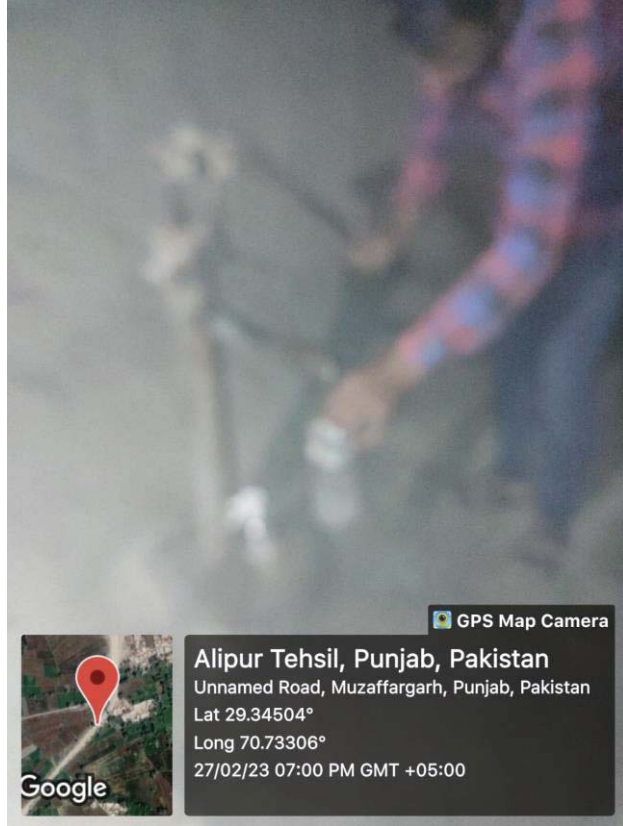
.....End of Report.....

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BDL: Below Detection Limit

WHO: World Health Organization



TEST REPORT

Ref#: PGG/LAB/2023-0/GW

Issue Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services for Engineering Design and Construction Supervision of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	AliPur

Sample Description:

Nature of sample	Ground water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Nauabad 29°20'43.7"N 70°44'03.7"E
Sample source	Tubewell
Sample Code	GW-460
Date of sampling	27-Feb-23

Summary of Test Result:

Physical Parameters	Compliance
Biological Parameters	Compliance
Chemical Parameters	Compliance
Remarks: All Parameters are in compliance with PEQS Limits.	

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

Ref#: PGG/LAB/2023-0278/DW

Issue Date: 09-Mar-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	pH	-	-	6.5-8.5	7.381 at 22.6°C	APHA-4500-H ⁺ B
2.	Color	TCU	≤15	≤15	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	1.20	APHA-2130 B
6.	Total dissolved Solids (TDS)	mg/L	1000	<1000	885	APHA-2540 C

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Results	Method / Technique
1.	Total Hardness	mg/L	-	<500	420	APHA-2340 C
2.	Aluminum (Al)	mg/L	0.2	≤0.2	BDL	APHA-3111 D
3.	Antimony (Sb)	mg/L	0.02	≤0.005	BDL	APHA-3111 B
4.	Arsenic	µg/L	10	≤50	0.0495	APHA-3114 B
5.	Barium (Ba)	mg/L	0.7	0.7	BDL	APHA-3111 D
6.	Boron (B)	mg/L	0.3	0.3	BDL	APHA-3111 D
7.	Cadmium	mg/L	0.003	0.01	BDL	APHA-3111 B
8.	Chloride (Cl ⁻)	mg/L	250	<250	70	APHA-4500-Cl B
9.	Chromium (Cr)	mg/L	0.05	≤0.05	BDL	APHA-3500-Cr B
10.	Copper (Cu)	mg/L	2	2	BDL	APHA-3111 B
11.	Fluoride (F ⁻)	mg/L	1.5	≤1.5	0.4	APHA-4500-F-C
12.	Lead (Pb)	mg/L	0.01	≤0.005	BDL	APHA-3111 B
13.	Manganese (Mn ²⁺)	mg/L	0.5	≤0.5	0.2292	APHA-3111 B
14.	Mercury (Hg)	mg/L	0.001	≤0.001	BDL	APHA-3112 B
15.	Nickle	mg/L	0.02	≤0.02	BDL	APHA-3111 B
16.	Nitrate	mg/L	50	≤50	0.394	APHA-4500-NO ₃ ⁻¹ E
17.	Nitrite	mg/L	0.02	≤3	0.409	APHA-4500-NO ₂ ⁻¹ E
18.	Selenium	mg/L	0.01	0.01	BDL	APHA-3111 B

Ref#: PGG/LAB/2023-0278/DW

Date: 11-Jan-23

Issue Date: 09-Mar-23

Chemical Parameters Analysis Results:

19.	Residual Chlorine	mg/L	-	0.2-0.5	0.10	APHA-4500 B
20.	Zinc (Zn ⁺²)	mg/L	3.0	5.0	0.0063	APHA-3111 B
21.	Phenolic Compound (As Phenol)	mg/L	0.002	-	BDL	APHA-5530 D
22.	Sodium (Na) [^]	mg/L	200	-	136.9318	APHA-3111 B
23.	Potassium (K) [^]	mg/L	200	-	15.9718	APHA-3111 B
24.	Total Iron (Fe) [^]	mg/L	0.3	-	BDL	APHA-3111 B

Biological Parameters Analysis Results:

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

.....End of Report.....

PEQS: Punjab Environmental Quality Standards

[^]PNAC Accredited

BDL: Below Detection Limit

WHO: World Health Organization



TEST REPORT

Ref #: PGG/LAB/2023-0175/WW

Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services For Engineering Design And Construction Supervision Of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	Ali Pur

Sample Description:

Nature of sample	Waste water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Azmat Pur N 29° 20' 25.43"E 70° 57' 14.5"
Sample source	Main Drain
Sample Code	WW-474
Date of sampling	28-Feb-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

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

Ref #: PGG/LAB/2023-0175/WW

Date: 13-Jan-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	Results	Method / Technique
1.	Temperature	°C	-	22.4	APHA-2550 B
2.	pH	-	6.5-8.5	7.445 at 22.4°C	APHA-4500-H ⁺ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	Results	Method / Technique
1.	Biological Oxygen Demand (BOD ₅ at 20 °C) (Raw)	mg/L	80	233*	APHA-5210 D
2.	Biological Oxygen Demand (BOD ₅ at 20 °C) (Settled)	mg/L	80	72*	APHA-5210 D
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) (Filter)	mg/L	80	46	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^ (Raw)	mg/L	150	376*	APHA-5220 B
5.	Chemical Oxygen Demand (COD) ^ (Settled)	mg/L	150	118	APHA-5220 B
6.	Chemical Oxygen Demand (COD) ^ (Filter)	mg/L	150	76	APHA-5220 B
7.	Total Suspended Solids (TSS) ^ (Raw)	mg/L	200	510*	APHA-2540 D
8.	Total Suspended Solids (TSS) ^ (Settled)	mg/L	200	120	APHA-2540 D
9.	Total Dissolved Solids (TDS) ^	mg/L	3500	1840	APHA-2540 C
10.	Greases & Oil	mg/L	10	BDL	APHA-5520 B
11.	Phenolic Compound (As Phenol)	mg/L	-	BDL	APHA-5530 D
12.	Chloride (Cl ⁻)	mg/L	<250	250	APHA-4500-Cl B
13.	Fluoride (F ⁻)	mg/L	≤1.5	0.6	APHA-4500-F-C
14.	An Ionic detergent as MBAs	mg/L	20	0.669	APHA 5540 C

Ref #: PGG/LAB/2023-0175/WW

Date 13-Jan-23

Chemical Parameters Analysis Results:

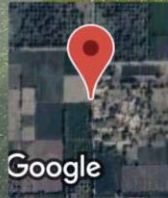
Sr. No.	Parameters	Unit	PEQS	Results	Method / Technique
15.	Sulphate (SO ₄ ²⁻) ^	mg/L	600	160	APHA-4500-SO ₄ C
16.	Sulphide (S ²⁻)	mg/L	1.0	BDL	APHA-4500-S ²⁻ F
17.	Ammonia (NH ₃) ^	mg/L	40	29.6	APHA-4500NH ₃ C
18.	Cadmium	mg/L	0.01	BDL	APHA-3111 B
19.	Chromium (Cr)	mg/L	≤0.05	BDL	APHA-3500-Cr B
20.	Copper (Cu)	mg/L	2	0.0164	APHA-3111 B
21.	Lead (Pb)	mg/L	≤0.005	BDL	APHA-3111 B
22.	Mercury (Hg)	mg/L	≤0.001	BDL	APHA-3112 B
23.	Selenium	mg/L	0.01	BDL	APHA-3111 B
24.	Nickle	mg/L	≤0.02	BDL	APHA-3111 B
25.	Silver (Ag)	mg/L	1.0	BDL	APHA-3111 B
26.	Zinc (Zn ²⁺)	mg/L	5.0	0.1045	APHA-3111 B
27.	Arsenic	µg/L	≤50	0.0496	APHA-3114 B
28.	Barium (Ba)	mg/L	0.7	BDL	APHA-3111 D
29.	Total Iron (Fe)^	mg/L	8.0	3.1971	APHA-3111 B
30.	Manganese (Mn ²⁺)	mg/L	≤0.5	0.4392	APHA-3111 B
31.	Boron (B)	mg/L	6.0	BDL	APHA-3111 D
32.	Chlorine (Cl ₂)	mg/L	1.0	0.25	APHA-4500 Cl B
33.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	0.0660	-
34.	Sodium	mg/L	-	146.4589	APHA-3111 B
35.	Cyanide (as CN ¹⁻) Total	mg/L	1.0	BDL	APHA-4500-CN F

.....End of Report.....

PEQS: Punjab Environmental Quality Standards ^PNAC Accredited BDL: Below Detection Limits



GPS Map Camera



Ahmadupr East, Punjab, Pakistan
Unnamed Road, Bahawalpur, Punjab, Pakistan
Lat 29.340396°
Long 70.954028°
28/02/23 10:50 AM GMT +05:00

TEST REPORT

Ref #: PGG/LAB/2023-0175/WW

Date: 09-Mar-23

Name of Client	Jers Consultancy (Pvt) Ltd.
Project Name	Consultancy Services For Engineering Design And Construction Supervision Of Punjab Rural Sustainable Water Supply & Sanitation Project (PRSWSS)
Project Site	Ali Pur

Sample Description:

Nature of sample	Waste water
Sampling By	Pak Green Enviro Engineering & Laboratories Pvt. Ltd.
Station Name & Location	Yake wali N 29° 26' 45.02"E 70° 55' 53.41"
Sample source	Main Drain
Sample Code	WW-475
Date of sampling	28-Feb-23

Summary of Test Result:

Physical Parameters	Compliance
Chemical Parameters	Partially Compliance
Remarks: Parameters with * are not in compliance with PEQS Limit.	

- Analysis was conducted on the request of proponent for his own use.
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- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The 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	MUHAMMAD RAZAULLAH	IFTIKHAR AHMED
Lab Analyst	Chief Analyst	Laboratory Incharge

Ref #: PGG/LAB/2023-0175/WW

Date: 13-Jan-23

Physical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	Results	Method / Technique
1.	Temperature	°C	-	21.9	APHA-2550 B
2.	pH	-	6.5-8.5	7.343 at 21.9°C	APHA-4500-H ⁺ B

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	Results	Method / Technique
1.	Biological Oxygen Demand (BOD ₅ at 20 °C) (Raw)	mg/L	80	238*	APHA-5210 D
2.	Biological Oxygen Demand (BOD ₅ at 20 °C) (Settled)	mg/L	80	69*	APHA-5210 D
3.	Biological Oxygen Demand (BOD ₅ at 20 °C) (Filter)	mg/L	80	48	APHA-5210 D
4.	Chemical Oxygen Demand (COD) ^ (Raw)	mg/L	150	376*	APHA-5220 B
5.	Chemical Oxygen Demand (COD) ^ (Settled)	mg/L	150	1112	APHA-5220 B
6.	Chemical Oxygen Demand (COD) ^ (Filter)	mg/L	150	80	APHA-5220 B
7.	Total Suspended Solids (TSS) ^ (Raw)	mg/L	200	490*	APHA-2540 D
8.	Total Suspended Solids (TSS) ^ (Settled)	mg/L	200	80	APHA-2540 D
9.	Total Dissolved Solids (TDS) ^	mg/L	3500	1030	APHA-2540 C
10.	Greases & Oil	mg/L	10	BDL	APHA-5520 B
11.	Phenolic Compound (As Phenol)	mg/L	-	BDL	APHA-5530 D
12.	Chloride (Cl ⁻)	mg/L	<250	95	APHA-4500-Cl B
13.	Fluoride (F ⁻)	mg/L	≤1.5	0.4	APHA-4500-F-C
14.	An Ionic detergent as MBAs	mg/L	20	0.586	APHA 5540 C

Ref #: PGG/LAB/2023-0175/WW

Date 13-Jan-23

Chemical Parameters Analysis Results:

Sr. No.	Parameters	Unit	PEQS	Results	Method / Technique
15.	Sulphate (SO ₄ ²⁻) ^	mg/L	600	125	APHA-4500-SO ₄ C
16.	Sulphide (S ²⁻)	mg/L	1.0	BDL	APHA-4500-S ²⁻ F
17.	Ammonia (NH ₃) ^	mg/L	40	32.6	APHA-4500NH ₃ C
18.	Cadmium	mg/L	0.01	BDL	APHA-3111 B
19.	Chromium (Cr)	mg/L	≤0.05	BDL	APHA-3500-Cr B
20.	Copper (Cu)	mg/L	2	0.0126	APHA-3111 B
21.	Lead (Pb)	mg/L	≤0.005	BDL	APHA-3111 B
22.	Mercury (Hg)	mg/L	≤0.001	BDL	APHA-3112 B
23.	Selenium	mg/L	0.01	BDL	APHA-3111 B
24.	Nickle	mg/L	≤0.02	BDL	APHA-3111 B
25.	Silver (Ag)	mg/L	1.0	BDL	APHA-3111 B
26.	Zinc (Zn ²⁺)	mg/L	5.0	0.1044	APHA-3111 B
27.	Arsenic	µg/L	≤50	0.0098	APHA-3114 B
28.	Barium (Ba)	mg/L	0.7	BDL	APHA-3111 D
29.	Total Iron (Fe)^	mg/L	8.0	2.0372	APHA-3111 B
30.	Manganese (Mn ²⁺)	mg/L	≤0.5	0.3069	APHA-3111 B
31.	Boron (B)	mg/L	6.0	BDL	APHA-3111 D
32.	Chlorine (Cl ₂)	mg/L	1.0	0.21	APHA-4500 Cl B
33.	Total Toxic Metals (Cd, Cr, Cu, Pb, Hg, Se, Ni, Ag, As, Ba, B)	mg/L	2.0	0.0224	-
34.	Sodium	mg/L	-	79.9404	APHA-3111 B
35.	Cyanide (as CN ¹⁻) Total	mg/L	1.0	BDL	APHA-4500-CN F

.....End of Report.....

PEQS: Punjab Environmental Quality Standards ^PNAC Accredited BDL: Below Detection Limits



GPS Map Camera



Chowk Permit, Punjab, Pakistan

CWWJ+439, Chowk Permit, Muzaffargarh,

Punjab, Pakistan

Lat 29.445838°

Long 70.931502°

28/02/23 08:54 AM GMT +05:00



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

EPA Certified

Ref. #: PGG/LAB/2023-3078/AA

TEST REPORT

Issue date: 03-June-23

Name of Client:

Project Name:

Jers Consultancy (Pvt) Ltd.

Consultancy Services for Engineering Design and Construction
Supervision of Punjab Rural Sustainable Water Supply &
Sanitation Project (PRSWSS)

Site Location:

Alipur

Nature of Monitoring:

Ambient Air

Monitoring By:

Pak Green Laboratories

Monitoring Location:

Basti Sontry Wala

Monitoring Coordinates:

N 29.318221' E 70.879043'

Name of Sampling Person:

Mr. Adil

Monitoring Instrument:

AQMS

Monitoring Duration:

24 hours

Monitoring Date:

22-May-23 to 23-May-23

Monitoring Validated By:

Miss Saiqa, RO, EPA(Lab) Multan.

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM10	PM2.5	SPM	O ₃
		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.	9:00 AM	0.123	2.38	3.25	5.64				
2.	10:00 AM	0.111	2.38	3.65	6.20				
3.	11:00 AM	0.086	2.24	4.06	5.92				
4.	12:00 PM	0.074	2.51	5.08	10.43				
5.	1:00 PM	0.049	2.24	3.86	6.49				
6.	2:00 PM	0.123	2.11	2.84	5.64				
7.	3:00 PM	0.160	1.98	2.23	5.36				
8.	4:00 PM	0.185	2.11	3.05	5.92				
9.	5:00 PM	0.209	2.11	3.65	6.49				
10.	6:00 PM	0.234	2.24	5.08	8.18				
11.	7:00 PM	0.234	2.24	3.05	6.20				
12.	8:00 PM	0.209	2.24	3.25	6.49				
13.	9:00 PM	0.209	2.38	3.86	8.18				
14.	10:00 PM	0.185	2.64	5.08	6.20	140.3	39.5*	338.5	141.8*
15.	11:00 PM	0.160	2.11	4.47	6.49				
16.	12:00 AM	0.148	2.51	4.67	5.92				
17.	1:00 AM	0.123	2.38	4.47	5.64				
18.	2:00 AM	0.135	2.77	4.06	5.08				
19.	3:00 AM	0.111	2.24	3.86	5.64				
20.	4:00 AM	9.840	2.11	3.45	5.36				
21.	5:00 AM	0.086	2.38	1.62	4.51				
22.	6:00 AM	0.197	2.51	1.42	4.79				
23.	7:00 AM	0.160	2.64	3.25	3.67				
24.	8:00 AM	0.197	2.24	3.05	3.95				
Average (24 Hours)		0.556	2.32	3.59	6.02				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	500 24hours	130 1 hour





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

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Ref. #: PGG/LAB/2023-3078/AA

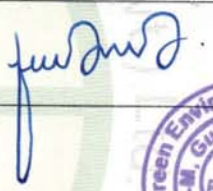
Issue date: 3-June-23

PEQS: Punjab Environmental Quality Standards

Remarks: Parameters with * are exceeding PEQS Limits.

Terms & Conditions:

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- The report is not valid for any negotiations

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

EPA Certified

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

TEST REPORT

Ref. #: PGG/LAB/2023-3081/NL

Issue date: 03-June-23

Name of Client:
Name of Project:

Jers Consultancy (Pvt) Ltd.
Consultancy Services for Engineering Design and
Construction Supervision of Punjab Rural Sustainable
Water Supply & Sanitation Project (PRSWSS)

Site Location:
Nature of Monitoring:
Monitoring By:
Monitoring Location:
Monitoring Coordinates:
Name of Sampling Person:
Monitoring Instrument:
Monitoring Duration:
Monitoring Date:
Monitoring Validated By:

Alipur
Noise Level
Pak Green Laboratories
Basti Sontry Wala
N 29.38271' E 70.879194
Mr. Adil
Noise Level Land Tech SL-5868 P
24 hours
22-May-23 to 23-May-23
Miss Saiqa, RO, EPA(Lab) Multan

Results:

Sr. No.	Time	Equivalent Noise
		dB (A)
1.	9:00 AM	51.3
2.	10:00 AM	50.1
3.	11:00 AM	49.4
4.	12:00 PM	50.1
5.	1:00 PM	51.1
6.	2:00 PM	50.6
7.	3:00 PM	52.9
8.	4:00 PM	50.4
9.	5:00 PM	47.0
10.	6:00 PM	45.0
11.	7:00 PM	40.4
12.	8:00 PM	46.6
13.	9:00 PM	43.8
14.	10:00 PM	44.4
15.	11:00 A M	40.8
16.	12:00 AM	39.5
17.	1:00 AM	36.9
18.	2:00 AM	39.5
19.	3:00 AM	36.2
20.	4:00 AM	39.1
21.	5:00 AM	40.0
22.	6:00 AM	43.1
23.	7:00 AM	41.8
24.	8:00 AM	48.1
Average		44.92

.....End of Report.....





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

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EPA Certified Ref. No. PGG/LAB/2023-3081/NL

Issue date: 03-June-23

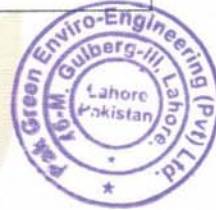
PEQS: Punjab Environmental Quality Standards

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





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

EPA Certified

Ref. #: PGG/LAB/2023-3077/AA

TEST REPORT

Issue date: 03-June-23

Name of Client:

Project Name:

Jers Consultancy (Pvt) Ltd.

Consultancy Services for Engineering Design and Construction
Supervision of Punjab Rural Sustainable Water Supply &
Sanitation Project (PRSWSS)

Site Location:

Alipur

Nature of Monitoring:

Ambient Air

Monitoring By:

Pak Green Laboratories

Monitoring Location:

Ghabol

Monitoring Coordinates:

N 20.322464' E 70.946221'

Name of Sampling Person:

Mr. Adil

Monitoring Instrument:

AQMS

Monitoring Duration:

24 hours

Monitoring Date:

23-May-23 to 24-May-23

Monitoring Validated By:

Miss Saiqa, RO, EPA(Lab) Multan.

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM10	PM2.5	SPM	O ₃
		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.	9:00 AM	0.209	2.38	2.84	7.05				
2.	10:00 AM	0.172	1.98	3.25	7.61				
3.	11:00 AM	0.185	1.98	2.84	6.49				
4.	12:00 PM	0.160	1.72	2.64	7.33				
5.	1:00 PM	0.246	2.24	2.23	7.90				
6.	2:00 PM	0.221	3.04	2.44	10.15				
7.	3:00 PM	0.221	12.41	17.05	28.48				
8.	4:00 PM	0.185	5.94	6.29	13.82				
9.	5:00 PM	0.197	2.38	4.87	6.77				
10.	6:00 PM	0.246	2.11	4.47	7.05				
11.	7:00 PM	0.283	2.38	5.28	5.92				
12.	8:00 PM	0.234	2.51	5.08	7.33				
13.	9:00 PM	0.209	2.24	4.26	7.90				
14.	10:00 PM	0.185	1.98	4.06	7.05	146.6	48.1*	349.2	180.2*
15.	11:00 PM	0.221	1.98	4.26	6.49				
16.	12:00 AM	0.246	2.24	5.28	7.33				
17.	1:00 AM	0.000	2.51	4.06	5.92				
18.	2:00 AM	0.258	2.11	4.87	7.90				
19.	3:00 AM	0.271	2.38	5.68	7.05				
20.	4:00 AM	0.308	2.90	5.89	8.18				
21.	5:00 AM	0.283	2.77	6.29	9.02				
22.	6:00 AM	0.332	3.17	6.70	8.74				
23.	7:00 AM	0.258	3.30	7.11	7.61				
24.	8:00 AM	0.221	3.04	6.90	6.77				
Average (24 Hours)		0.223	2.99	5.19	8.58				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	500 24hours	130 1 hour





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

EPA Certified

Ref. #: PGG/LAB/2023-3077/AA

Issue date: 3-June-23

PEQS: Punjab Environmental Quality Standards

Remarks: Parameters with * are exceeding PEQS Limits.

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- The report is not valid for any negotiations

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

EPA Certified

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

TEST REPORT

Ref. #: PGG/LAB/2023-3080/NL

Issue date: 03-June-23

Name of Client:
Name of Project:

Jers Consultancy (Pvt) Ltd.
Consultancy Services for Engineering Design and
Construction Supervision of Punjab Rural Sustainable
Water Supply & Sanitation Project (PRSWSS)

Site Location:
Nature of Monitoring:
Monitoring By:
Monitoring Location:
Monitoring Coordinates:
Name of Sampling Person:
Monitoring Instrument:
Monitoring Duration:
Monitoring Date:
Monitoring Validated By:
Results:

Alipur
Noise Level
Pak Green Laboratories
Ghabol
N 29.322533" E 70.946252"
Mr. Adil
Noise Level Land Tech SL-5868 P
24 hours
23-May-23 to 24-May- 23
Miss Saiqa, RO, EPA(Lab) Multan

Sr. No.	Time	Equivalent Noise
		dB (A)
1.	9:00 AM	52.7
2.	10:00 AM	51.5
3.	11:00 AM	50.8
4.	12:00 PM	51.5
5.	1:00 PM	52.5
6.	2:00 PM	52
7.	3:00 PM	54.3
8.	4:00 PM	51.8
9.	5:00 PM	48.4
10.	6:00 PM	46.4
11.	7:00 PM	41.8
12.	8:00 PM	48
13.	9:00 PM	45.2
14.	10:00 PM	45.8
15.	11:00A M	42.2
16.	12:00 AM	40.9
17.	1:00 AM	38.3
18.	2:00 AM	40.9
19.	3:00 AM	37.6
20.	4:00 AM	40.5
21.	5:00 AM	41.4
22.	6:00 AM	44.5
23.	7:00 AM	43.2
24.	8:00 AM	49.5
Average		46.32

End of Report.....





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

Ref. #: PGG/LAB/2023-3080/NL

Issue date: 03-June-23

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

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

Terms & Conditions:

- Analysis was conducted on the request of project proponent for his own use/PEQS Compliance.
- 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.
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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





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

EPA Certified

Ref. #: PGG/LAB/2023-3079/NL

TEST REPORT

Issue date: 03-June-23

Name of Client:
Name of Project:

Jers Consultancy (Pvt) Ltd.
Consultancy Services for Engineering Design and
Construction Supervision of Punjab Rural Sustainable
Water Supply & Sanitation Project (PRSWSS)

Site Location:
Nature of Monitoring:
Monitoring By:
Monitoring Location:
Monitoring Coordinates:
Name of Sampling Person:
Monitoring Instrument:
Monitoring Duration:
Monitoring Date:
Monitoring Validated By:
Results:

Alipur
Noise Level
Pak Green Laboratories
Yakki wala
N 29.444427" E 70.92813"
Mr. Adil
Noise Level Land Tech SL-5868 P
24 hours
24-May-23 to 25-May-23
Miss Saiqa, RO, EPA(Lab) Multan.

Sr. No.	Time	Equivalent Noise
		dB (A)
1.	9:30 AM	52.2
2.	10:30 AM	51.0
3.	11:30 AM	50.3
4.	12:30 PM	51.0
5.	1:30 PM	52.0
6.	2:30 PM	51.5
7.	3:30 PM	53.8
8.	4:30 PM	52.4
9.	5:30 PM	49.0
10.	6:30 PM	47.0
11.	7:30 PM	42.4
12.	8:30 PM	43.5
13.	9:30 PM	44.7
14.	10:30 PM	37.3
15.	11:30 PM	37.7
16.	12:30 AM	36.4
17.	1:30 AM	33.8
18.	2:30 AM	36.4
19.	3:30 AM	33.1
20.	4:30 AM	36.0
21.	5:30 AM	39.9
22.	6:30 AM	43.0
23.	7:30 AM	51.0
24.	8:30 AM	49.7
Average		44.8

End of Report





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

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EPA Certified: PGG/LAB/2023-3079/NL

Issue date: 03-June-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





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

EPA Certified

TEST REPORT

Ref. #: PGG/LAB/2023-3076/AA

Issue date: 03-June-23

Name of Client:

Project Name:

Jers Consultancy (Pvt) Ltd.

Consultancy Services for Engineering Design and Construction

Supervision of Punjab Rural Sustainable Water Supply &

Sanitation Project (PRSWSS)

Site Location:

Nature of Monitoring:

Monitoring By:

Monitoring Location:

Monitoring Coordinates:

Name of Sampling Person:

Monitoring Instrument:

Monitoring Duration:

Monitoring Date:

Monitoring Validated By:

Alipur

Ambient Air

Pak Green Laboratories

Yakki wala

N 29.444412° E 70.928219°

Mr. Adil

AQMS

24 hours

24-May-23 to 25-May-23

Miss Saiqa, RO, EPA(Lab) Multan.

Results:

Sr. No.	Time	CO	NO	NO ₂	SO ₂	PM10	PM2.5	SPM	O ₃
		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.	9:30 AM	0.135	2.24	4.47	7.05				
2.	10:30 AM	0.172	2.77	4.87	6.49				
3.	11:30 AM	0.160	2.51	5.08	7.61				
4.	12:30 PM	0.185	2.64	5.68	6.77				
5.	1:30 PM	0.148	2.38	4.87	10.43				
6.	2:30 PM	0.148	2.38	4.87	8.46				
7.	3:30 PM	0.123	2.77	3.25	8.74				
8.	4:30 PM	0.148	1.98	3.45	7.90				
9.	5:30 PM	0.111	2.24	4.06	9.59				
10.	6:30 PM	0.135	2.51	4.47	8.46				
11.	7:30 PM	0.160	2.11	4.26	7.61				
12.	8:30 PM	0.172	2.64	4.87	8.18				
13.	9:30 PM	0.148	2.24	4.26	9.02				
14.	10:30 PM	0.111	2.64	4.26	7.90	144.7	52.5*	345.9	192.4*
15.	11:30 PM	0.135	2.11	4.67	7.05				
16.	12:30 AM	0.172	1.72	4.47	7.90				
17.	1:30 AM	0.148	2.24	4.06	7.33				
18.	2:30 AM	0.160	2.24	3.65	7.61				
19.	3:30 AM	0.123	2.51	4.06	8.46				
20.	4:30 AM	0.086	2.11	3.86	7.05				
21.	5:30 AM	0.172	2.38	4.67	7.61				
22.	6:30 AM	0.148	2.38	4.06	7.90				
23.	7:30 AM	0.123	2.51	4.47	8.46				
24.	8:30 AM	0.135	2.24	3.65	8.46				
Average (24 Hours)		0.144	2.35	4.35	8.00				
PEQS		5 8hours	40 24hours	80 24hours	120 24hours	150 24hours	35 24hours	500 24hours	130 1 hour



LAB 180
17025





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

EPA Certified

Ref. #: PGG/LAB/2023-3076/AA

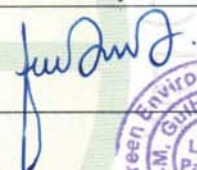
Issue date: 3-June-23

PEQS: Punjab Environmental Quality Standards

Remarks: Parameters with * are exceeding PEQS Limits.

Terms & Conditions:

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 - This report should be reproduced as a whole and not in parts.
 - The responsibility for 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

Field Analyst	Chief Analyst	Laboratory Incharge
		



Annexure - IV
Terms of Reference

TERMS OF REFERENCE

ENGINEERING DESIGN AND CONSTRUCTION SUPERVISION CONSULTANT (EDCS) **Pilot Phase – Cluster South - II**

1. Introduction

The Government of Punjab has launched a project for service improvement in rural areas of the Punjab through Punjab Rural Municipal Services Company (PRMSC) which has been established under Section 42 of Companies Act 2017. Through various studies, it has been proven that poor condition of WASH not only affects the health of masses, but it also adversely affects the economic growth of the region. Recently, a number of mega initiatives have been launched by the Government, and international organizations in the urban areas of all provinces of Pakistan for the improvement of water and sanitation but the rural areas still remain neglected. Rural settlements of Punjab, which hold 73 % the province's population living in 23,000 revenue villages, are in dire need for investments to improve WASH.

Outcomes of Pre-Feasibility Studies (PFS) and sector assessments, have identified requirements for improving climate resilience and planned economic growth of 2,000 villages which will be the part of the project. Due to the gravity of the situation, the Government of the Punjab, has endorsed selection of these 2,000 revenue villages, having 2009 large and 85 small habitations for the water supply, sanitation and solid waste management interventions. Poverty, water contamination, stunting and sanitation condition of the areas have been taken as basic parameters for selection of project sites / tehsils. Over 6.0 million rural residents shall be served under the said component including Multi-village water supply scheme & 100% solid waste through recycling, composting and management of residual waste. The interventions shall be implemented in phased manner

Government of Punjab, with the assistance of World Bank, will finance complete detailed engineering designs through Engineering, Design & Supervision Consultancy Services (EDCS) under the pilot phase of the project in revenue villages of following Tehsils of Geographical based Cluster named as "South - II" of selected districts given hereunder. The services will assist in; (i) design documentation, including Sub-scheme/Project Document (PC-I), Bill of Quantities, for water supply and sanitation services to achieve economies of scale and desired results, and (ii) resident supervision of infrastructure development:

Sr. #	Districts	Names/Number	
		Tehsils	No. of Revenue Villages
South - II			
1	Lodhran	Karor Pacca	11
2	Multan	Shuja Abad	12
3	Muzaffargarh	Alipur	10
TOTAL =	3	3	33

All the relevant details alongwith coordinates are given in Annex – I.

2. Objective of the Assignment

The ToRs of the subject assignment have been framed to carry out following functions:

- (i) Identification of sites for the respective work and conducting feasibility studies for the water supply, sanitation and solid waste management interventions ensuring 100% solid waste through recycling, composting and management of residual waste,
- (ii) Preparation of detailed Environment and Social Safeguard Documents i.e., Environmental and Social Management Plans (ESMPs), Initial Environmental Examination (IEE) / Environmental Impact Assessment (EIA), Resettlement Action Plan (RAP) / Abbreviated Resettlement Action Plan (ARAP) under the World Bank guidelines and Punjab Environmental Protection Department,
- (iii) Detail Designs, preparation of Bill of Quantities, Sub-Scheme Documents (PC-Is), Bidding Documents and Construction Supervision of the entire sub- projects via detailed Topographic Surveys, authentication of technically suitable and hydraulically viable water supply and sewerage systems (100% solid waste through recycling, composting and management of residual waste), socio-economic and engineering surveys, and
- (iv) Specialized services during Construction phase as Resident Supervision.

3. Scope of Consultancy Services

The consultant shall perform, but not limited to, the following tasks in close coordination with Project Implementation & Management Unit (PIMU) which is also Head Office of the Company (PRMSC-HO):

3.1: PLANNING, FEASIBILITY STUDY AND DETAILED ENGINEERING DESIGN, DRAWINGS, SPECIFICATIONS AND BILL OF QUANTITIES:

The Consultant's inputs shall include but not limited to the following tasks, to be carried out for each revenue village:

(i) PLANNING

- (a) Identify key stakeholders and ensure that they are aware about the planning initiative and are willing to engage with it,
- (b) Collect and validate available secondary information, including reports, existing maps and plans etc. and information on planned activities,
- (c) Prepare a detailed GIS base map based on satellite imagery (0.6 m resolution) which will be acquired from an authentic source and shall be used to develop an updated land cover base map of the city and its surrounding areas. Prepare an updated GIS map of the villages based on field surveys, which includes all major features, such as, existing built-up area, infill sites, brown fields, agricultural land, forests, water bodies and open land available for future development for the study area/ planning boundary. Administrative boundaries should also be added to this base map,
- (d) Prepare overlays showing existing municipality services (water supply, drainage,

sewerage, electricity, gas lines, telephone lines, water courses, canals etc.),

- (e) Engage with local stakeholders, to (a) collect local knowledge through focus groups discussions, and (b) collect information on their concerns and priorities,
- (f) Prepare situational analysis report, with the findings about existing conditions, current growth trends, any planned work to be undertaken, ongoing works, and an estimate of future growth trend/visions,
- (g) Assess options for meeting priority needs and forecasting the implementation of the masterplans and develop preliminary proposal/strategy for the schemes, which meet the requirements and facilitate implementation of the plan,
- (h) Present the Plan and possible options for meeting priority needs to local stakeholders and modify it accordingly in response to their suggestions and concerns,
- (i) Finalize the plans and list of priority sub projects,
- (j) Liaise with PIMU (PRMSC-HO) and relevant stakeholders to ensure that the plan and priority list of sub projects are formally approved and agreed upon,
- (k) Presentation of Final Report.

(ii) FEASIBILITY STUDY

- (a) Assess the sub projects relevancy showing their relationship with existing infrastructure under integrated rural development concept,
- (b) Identification and assessment of alternative technical and operational options with comparative cost effectiveness,
- (c) Collect and evaluate all new data needed to produce a robust study and will make no assumptions drawn from the Previous Report or Study,
- (d) Produce an appropriate tentative cost estimate of each sub project, based on typical sections and details using appropriate unit rates,
- (e) Assess the relevance and feasibility of each sub project ensuring that:
 - It fulfills a clear need of the village,
 - It is compatible with existing infrastructure (for instance those levels are such that proposed drains and sewers can be discharged to existing facilities or can receive flows from their proposed drainage areas and that existing drains have sufficient capacity to carry any additional flow resulting from proposed schemes, likewise existing drains are utilized for storm water),
 - The O&M of the proposed technology is manageable by the Village Councils and services related to long term maintenance are available in the local market,
 - Carry out financial viability analysis and relevant indicators, including a financial model and value for money analysis,
- (f) Based on the assessment, produce a brief feasibility report for each sub project and present this for clearance (a clustering exercise for similar sub-projects is recommended in the report),

- (g) Possibilities of a Public-Private-Partnership (PPP) set-up for operation and maintenance,
- (h) Priority should be given to multi-village schemes with skimming wells near canals, where possible. This will require source selection point, alignment of network, groundwater analysis and surface water quality for a detail designing,
- (i) Problem analysis / problems to be addressed. Present organizational and financial situation of the service providers comprised by the project and other project financially involved parties; non-autonomous (departmental)/ semi-autonomous/ autonomous; organizational set-up; tariff system and rates; income and cost recovery

(iii) DEMOGRAPHIC AND SOCIO-ECONOMIC DATA

- (a) Based on survey, prepare local level statistical information and reconcile it with government records, where possible. Disaggregated data on most vulnerable groups will be preferred) on; (a) Population, (b) Income, (c) Occupation, (d) Poverty, (e) Economic growth and growth potentials,
- (b) Prepare and forecast (20-25 years) demand for the services (extension of service area; increase of population and per capita income; industrial, commercial and institutional development, affordability index),
- (c) Collect & assess Socio-economic situation of main project beneficiaries.

(iv) DETAILED ENGINEERING DESIGN

- (a) Review, conduct and ensure that all the available surveys data are correct (amend if required) and meet the best international practices,
- (b) Undertake field surveys (geotechnical [(field investigations along with in- situ & lab testing) to arrive at the geotechnical parameters required for the design], engineering, site investigations, topographic etc.) and studies to establish firm basis for design,
- (c) Undertake environmental and social safeguard studies (including but not limited to EIA, IEE, land acquisition and resettlement plans, health and safety management plan, gender action plan for the proposed investments,
- (d) Conduct energy requirement analysis for the overall project and the best suitable solutions must be recommended (inclusive of solarization), which will be used for cost calculation of O&M,
- (e) Description and assessment of the project's adherence to legal agreements of Project, including the Guiding Principles for sustainable Infrastructure and suitability for sustainable Infrastructure Finance funding,
- (f) Description and assessment of the project's adherence to the government policies and laws,
- (g) Description and assessment of sustainability aspects of the project as per:
 - UN Sustainable Development Goals,
 - IFC Performance Standards on Environmental and Social Sustainability (IFC PS),

- UN Guiding Principles on Business and Human Rights (UNGP),
 - IFC/World Bank EHS General Guidelines and sector relevant guidelines,
 - FIDIC Project Sustainability Management,
 - ISO Life-cycle Costing,
- (h) In addition, it will include a high-level gap assessment between national requirements and international requirements (IFC PS and UNGP),
- (i) Undertake technical due diligence and geotechnical assessment, for the proposed priority sub-projects,
- (j) Prepare and finalize the detailed engineering designs of priority sub-projects, technical specifications, detailed cost estimates (including costs for addressing environmental concerns based on ESMP), climate resilience measures, as per international best practices. The detailed engineering designs of the priority sub-projects should be prepared using integrated rural planning approach keeping the future needs in mind and new technologies,
- (k) The design should include both piped options for the larger settlements and non-piped options for smaller settlements, for both water and sewage solutions,
- (l) Identify the infrastructure (if any) to be replaced/ removed in relation to any priority sub-projects and prepare its detailed implementation/relocation plan(s),
- (m) Assist Client in appropriate packaging/ repackaging of activities,
- (n) Assist in preparing the subproject(s) PC-1 or other PIMU (PRMSC-HO) required documents/requirements for administrative/ management approvals for starting of the procurement process. The Consultant will be responsible for the costing of the detail engineering design of priority sub-projects to be finalized by the PIMU / Punjab Rural Municipal Services Company (PRMSC) and LG&CD

(v) PROCUREMENT OF WORKS

- (a) Prepare draft bidding documents for the individual packages to be identified in the procurement plan as per World Bank Procurement Regulations using appropriate procurement documents. Bidding documents shall include detailed design/construction/working drawings, technical specifications, BOQs, EMP, HSMP, GAP or any other documents required as per legal agreements and associated documents,
- (b) Provide necessary support to the Client in all aspects of the procurement process for civil works contracts in accordance with the World Bank Procurement Regulations. The support shall include but not limited to the following:
- Assist in the pre-bid meetings (as per requirement) and site visits of interested bidders (if applicable), preparation of responses for bidders;
 - Assist the Client in preparing and finalization of contracts submission for review by concerned agencies including the Client and the World Bank, contract negotiation and awarding,
 - Prepare a Process Action Plan (PAP), detailing steps to be taken to deliver the

full project.

3.2. CONTRACT ADMINISTRATION & CONSTRUCTION SUPERVISION AS RESIDENT ENGINEER

The Consultant while supervising the construction works, shall also make all necessary arrangements for quality control and implementation of the civil works sub-schemes/project(s), as Resident Engineer. The task of the Consultant shall include, but not be limited to, the following:

- (i) Supervision of civil works and contracts shall be carried out based on the World Bank standards and guidelines. The consultant on behalf of the Client will administer both the goods and the civil works' contracts, make engineering decisions, be responsible for quality and quantity assurance, provide general guidance and furnish timely responses to the suppliers and contractors and ensure that all clauses of the contract agreements between the suppliers/contractors and PIMU (PRMSC-HO) are implemented,
- (ii) Assure submission(s) of contractual documents and advise PIMU (PRMSC-HO) on the adequacy of the Contractor's insurance policies, performance guarantees and advance payment guarantees,
- (iii) Give notice to contractor to commence the works,
- (iv) Provide advance payment advice to PIMU (PRMSC-HO) concerning schedule of handing over of project sites, and any anticipated delays due to various reasons,
- (v) Liaise with PIMU/PRMSC-HO, PRMSC-TO, District office, Village Councils and other concerned parties/consultants, as required, to ensure that the sub-scheme/project sites are made available to the Contractors on time and that any issues related to land acquisition and utilities relocations are resolved in minimum time,
- (vi) Assess the competence of the contractors' inputs in material, labor selection, construction methods, and safety measures,
- (vii) Monitor the progress of sub-schemes/projects against the contractual construction schedules/workplans. Warrant that the Contractor submits regular updated workplans that take into account the time passed and work completed. A realistic timetable for completing the works within the specified contract period must also be furnished periodically. Initiate action if the Contract is clearly going to time overrun,
- (viii) Assure the receipt of the materials and maintain permanent records of all warranties required under terms and conditions of the Contract Agreement,
- (ix) Without relieving the Contractors of their obligations under the Contract, check and approve the contractors' Working Drawings, Method Reports and Temporary Works proposals,
- (x) Carry out any subsequent design changes, and expeditiously issue supplementary/revised drawings, site instructions, variation orders and day work orders to avoid delay to the works and to ensure that the works are executed in accordance with Contract/on time,
- (xi) Ensure that the Contractors shall have all necessary data including the right- of-way

limits, centerline, and grade etc.,

- (xii) Check that the lines, levels and layouts of the construction work follows with those specified in the contract document,
- (xiii) Develop and implement a quality monitoring plan to ensure the works comply with the specifications in the contract documents regarding materials used, and technical requirements etc. by preparing QA/QC Manual and will be responsible for Quality Assurance i.e. project components are tested according to the specifications as per the Contract; also make a report for imported items for efficiency and quality including testing on manufacturing site test bed and check duty & import documents of each item being imported for the project,
- (xiv) Inspect quarries, borrow pits, and crushing plants,
- (xv) Conduct material tests and approve the sources of materials, as per standards,
- (xvi) Continuously inspect the soils and materials, construction operations and the works with regard to workmanship and compliance with the specifications. Approve or disapprove and certify the works that conform to the specifications and maintain permanent records of the results of all the tests,
- (xvii) Give notice (s) to the Contractors of any defects and deficiencies, and issue instructions/directions for the removal and replacement of the improper works, as per the contract. If required, order suspension of the work(s) under intimation to the PIMU and/or recommend to PIMU/ PRMSC and sought other recourse available under the Contract,
- (xviii) Monitor and appraise progress of the works, and maintain a day-by-day project log which shall record all activities/progress pertaining to the administration of the contract, liaise with MIS to update real time data, requests taken and orders given to the Contractors, and any other information which may be at a later date be of assistance in resolving queries which may arise concerning execution of the works,
- (xix) Check the Contractor's periodic statement of the estimated value of work-completed and certify that these statements clearly and accurately describe the value of work executed on the value of the quantities of the items in the Bill of Quantities,
- (xx) Verify and endorse the interim payment certificates to PIMU/ PRMSC for payment to the Contractors based on inspected Work Items, having regard to any contractual provisions for advance payment, variation of price, escalation, Comparative statement according to the acceptance letter and exchange rate fluctuation etc. Certify and endorse the completion of the activities/works or parts thereof in order to process final payments to the Contractors,
- (xxi) Assist in clarification of Contract Documents, explain and/or reconcile any ambiguities and or discrepancies that may occur in the Contract Documents, and assist PIMU (PRMSC-HO/TO) along with all relevant documentation needed for settling disputes/claims (if any) with the Contractors, and suggest recommendations to PIMU (PRMSC-HO) for resolving the Contractors' escalation claims, contract time extensions (if needed), variation orders, subletting of work, additional cost, rate and price fixing etc.,
- (xxii) Advise PIMU (PRMSC-HO)/PRMSC-TOs on the need for effective and efficient

liaison with the local authorities, police, landowners, utility owners, the public and others affected by the works in progress in order to minimize or avoid unnecessary delays or disputes,

- (xxiii) In close coordination with PIMU (PRMSC-HO)/PRMSC-TOs and the local authorities, prepare a traffic management plan where the sub-projects are in the densely populated areas of the city,
- (xxiv) Jointly inspect with PIMU (PRMSC-HO)/ PRMSC-TOs /Village Councils the completed civil works, and assist in formal taking over process, completion certificates and review and approve "as built" drawings and plans (as the case may be) and provide report(s) affirming that the contracts have been completed in a satisfactory manner and develop a checklist for re-works or incomplete works. In addition, review the final commissioning tests being conducted upon completion of each construction package, such as, network, pumping stations, approve acceptance of performance in accordance with the targets set in the tender documents/workplan, approve the content of the O&M manuals and advise the PIMU (PRMSC-HO), PRMSC-TOs and Village Councils on delivery of certificate of performance,
- (xxv) Inspect the completed work periodically during the defect liability period within the term covering the Consultant's Agreement, prepare lists of deficiencies/incomplete works (if any) in consultation with PIMU (PRMSC_HO), and carry out supervision of the rectification works, and issue the Defects Liability certificates after the rectification of notified defects by the Contractors,
- (xxvi) Establish a comprehensive monitoring system that entails maintaining site records including site correspondence, inspection records, test data, site diaries, records of meetings, financial records, progress records etc,
- (xxvii) Support the PIMU (PRMSC-HO) and consultants to implement the safeguard related policies, prior to starting work and as work progresses, which may include the environment management plans, IEEs, resettlement plan, public consultation, verification of the resettlement compensation payment, and preparation of all safeguard monitoring reports (bi-weekly/monthly),
- (xxviii) Make available record to the auditor appointed by AG office of Pakistan and draft replies and clarifications along all supporting documents against any observation raised by auditor, to facilitate the Client,
- (xxix) Assist PIMU (PRMSC-HO)/PRMSC-TOs in preparing monthly and quarterly progress and monitoring reports for submission to various authorities, including the World Bank,
- (xxx) Coordinate with contractors and local authorities on obtaining clearances during construction and commissioning of works,
- (xxxi) Provide any other technical services requested by PIMU (PRMSC-HO)/PRMSC-TOs and other Consultants under the project, as mutually agreed, and
- (xxxii) Shall be responsible to make visit arrangements by any Government/Donor delegation or authority/management and shall prepare presentation arrangement when required.

3.3 Linkage with MIS:

PRMSC is also endeavouring to develop and deploy a Management Information System (MIS). The System will ensure adequate monitoring of project activities including flow and utilization of funds, tracking water and sanitation service delivery performance and progress towards project outcomes, transparency in decision making, and accessibility of complaints and grievance system to project beneficiaries. The MIS system will be designed to receive data from multiple sources including PRMSC Tehsil Office field staff, customers, community-level Ambassadors of Change (AoC), and others that receive permission from the Government of Punjab. Parts of the MIS will be publicly accessible, to aide transparency and accountability, while some sections that include personal data or sensitive financial information will have restricted access.

MIS System shall also employed for contract management support through tracking of physical and financial progress of infrastructure development. This will include data on; progress milestones related to design, procurement, physical and financial progress including finalization of detailed design, initiation and completion of bidding process, contract award, procurement of equipment, groundbreaking, construction progress, handover to PRMSC, etc. All data on construction will be geo-tagged and will include time-stamped images. The System shall also be used for service delivery monitoring, including all billing data and complaints logged from households/villages.

The Engineering, Design and Construction Supervision Consultant shall be extending their technical support in all the phases of MIS System development, deployed, maintenance and reporting through it, to PRMSC.

4. Staffing:

The quality of staff, expertise and their numbers, shall be the key factors in evaluation of the consultant's proposal. The firm may propose inputs required to complete the assignment within the contractual time. The Consultancy firm must be specialized and have capacity to carry out Design, Construction Supervision, Contract Management and Environment & Social Management Services of the proposed works. However, an indicative staff requirements with expertise, is given hereunder:

Sr. #	Description of Personnel	Qualification
Key Staff		
1	Team Leader / Senior Design Engineer (Water & Sewerage)	Master's Degree or above in Civil Engineering or relevant discipline. Minimum 25 years of overall professional experience in project planning, designing and project management. Working experience in World Bank/Foreign Funded Projects will be an added advantage. Registered with relevant professional bodies.
2	Deputy Team Leader/ Resident Engineer	Bachelor's Degree or above in Civil Engineering or relevant discipline. Minimum 20 years of overall professional experience in project execution, construction supervision and project management of water supply and sewerage projects. Working experience in World Bank/Foreign Funded Projects will be an added advantage. Registered with relevant professional bodies.
3	Design Engineer	Bachelor's Degree or above in Civil Engineering or relevant discipline. Minimum 15 years of professional experience in project designing, planning and project management pertaining to Water