PUNJAB AAB-E-PAK AUTHORITY

GOVERNMENT OF PUNJAB

Environmental Impact Assessment (EIA) Report

"PROVISION OF SAFE DRINKING WATER IN DISTRICT FAISALABAD BY UTILIZING 66 EXISTING BOREHOLES OF PUNJAB SAAF PANI COMPANY (NORTH ZONE)"

Tehsil Chak Jhumra



Study Conducted by:

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GUIDLINES FOR PREPARATION AND REVIEW OF ENVIRONMENTAL REPORTS

CHECKLIST

Clause No.	Requirements for Preparation and Review of Environmental Reports	Page No. 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	8
	2. Name of the proponent	8
	3. Name of the organization preparing the report	8
	4. A brief outline of the proposal	8-9
	5. The major impacts	11-13
	6. Recommendations for mitigation measures	13
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2.3 (B)	**Introduction** should include:	
	1. Purpose of the report	25-26
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2.3 (C)	**Description of project should include:**	
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	2. Training schedule	133
	3. Summary of impacts and their mitigation measures	Table 0-2
	4. Equipment maintenance details	133-134
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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 din Chapter 7 of Impact Assessment
3.2 Table 2	Methodologies for impact identifications (one/more)	
	1. Checklist	
	2. Matrices	

Clause No.	Requirements for Preparation and Review of Environmental Reports	Page No. of IEE/EIA Report
	3. Networks	
	4. Overlays	
	5. GIS and computer expert system	
3.3 and 3.6	Impact analysis and prediction (one/more)	
	1. Meetings	
	2. Workshops	
	3. Consultations/ case studies	
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	2. Improved monitoring and management practices	92
	3. Compensation in money terms	92,136
	4. Replacement, relocation and rehabilitation	92,137
4.3	Prepare an environmental management plan	Table 8-1
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	✓

Clause No.	Requirements for Preparation and Review of Environmental Reports	Page No. of IEE/EIA Report
	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
BDL	Below detection level
CC	Construction Contractor
CO	Carbon Monoxide
dB	Decibel
DCR	District Census Report
DG	Director General
Dia	Diameter
DLR	Directorate of Land Reclamation
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMMP	Environmental management and Monitoring Plan
Ft	Feet
Fig	Figure
GOP	Government of Pakistan
HSE	Health & Safety Engineer
HUD	Housing Urban Development
IEE	Initial Environmental Examination
Km	kilometer
LGO	Local Government Ordinance
LAA	Land Acquisition Act
LCC	Lower Chenab Canal
LLR	Low Level Reservoir
MA	Markaz-e-aab
MSDS	Material Safety Data Sheet
NEQS	National Environmental Quality Standards
NCS	National Conservation Strategy
NSL	Natural Surface Level
NEAP	National Environmental Action Plan
NOx	Oxides of Nitrogen
NOC	No Objection Certificate
OHR	Over Head Reservoir
PAPA	Punjab Aab-e-Paak Authority
PEPC	Pakistan Environmental Protection Council
PEPO	Pakistan Environmental Protection Ordinance
PEQS	Punjab Environmental Quality Standards
PEPA	Punjab Environment Protection Act
PID	Punjab Irrigation Department
PHED	Public Health Engineering Department
PM	Particulate matter
PPEs	Personal Protective Equipment
PPSGDP	Punjab Private Sector Groundwater Development Project
PSDWQ	Pakistan Standard Drinking Water Quality
RE	Resident Engineer

RCC	Reinforced Cement Concrete
RO	Reverse osmosis
SDGs	Sustainable development goals
SMART	Specific, Measurable, Achievable, Realistic, and Timely.
SOx	Oxides of Sulphur
UF	Ultra Filtration
UV	Ultra Violet
WAPDA	Water and Power Development Authority
WB	World Bank
WHO	World Health Organization
WL	Water level
WTP	Water Treatment Plant

Glossary

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.

Executive Summary

Consultant:	JERS Consultancy (PVT) LTD.
Location of the project	Tehsil Chak Jhumra, District Faisalabad
Proponent:	Punjab Aab-e-Pak Authority, Government of Punjab
Title of the Project:	Provision of Safe Drinking Water in Tehsil Chak Jhumra of District Faisalabad by Utilizing Existing 66 boreholes of Punjab Saaf Paani Company (North Zone)

1. Introduction

The executive summary presents an overview of the main findings of Environmental Impact Assessment (EIA) of the project of **"**Provision of Safe Drinking Water in Tehsil Chak Jhumra of District Faisalabad by Utilizing Existing 66 boreholes of Punjab Saaf Paani Company (North Zone)**"**.

Punjab is the biggest province of Pakistan with a population of almost 100 million and is facing the issues of ground water depletion and deterioration of water quality. About half of the population is getting bacteriological contaminated water. The quality of drinking water is further aggravated due to presence of arsenic and other chemical contaminants in some of the districts of Punjab. Housing Urban Development (HUD) and Public Health Engineering Department PHED is the provincial administrative department of the government of Punjab which is responsible for the provision of drinking water to the communities in the rural and urban areas of the province. Therefore, Punjab Aab-e-Pak Authority is committed to cooperate with HUD and PHED to improve public access to safe drinking water and ensure the sustainable operation and maintenance of water supply services, for each household of Punjab Province. The Employer intends to develop safe drinking water supply schemes to the under-served areas (rural and peri-urban population), using localized and customized solutions, with regard to sources and supply options and sustainable operation and maintenance models.

Therefore, the aim of the proposed project is to help the government eradicate water-borne diseases by providing safe drinking water and improve the health of all the people of Faisalabad District.

The initial estimated capital cost for the project is approximately PKR 944 million. This includes the cost of machinery, fabrication and civil works (for a periods of 20 years). Where environmental budget is approximately 2% of the total cost of the project.

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 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 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 Aab-e-Paak authority 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 the distribution of safe drinking water is Cluster based pipe distribution system. The key components of this project alternative are to extract water from the existing wells, treat the water at source by using appropriate treatment technology i.e. Chlorination and then after chlorination it is stored to Overhead Reservoir (OHR) which is to be located at center of the cluster. Finally distribute the water through a proposed network of pipelines to the standalone points of water known as Markaz-e-Aab.

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

The national guidelines and legislations relating to the environment considered for the project include, National Conservation Strategy (1992), National Environment Policy (2005), Pakistan Labor Policy (2010), Punjab Environmental Protection Act (PEPA 1997), amended PEPA, (2000), National Environmental Quality Standards (NEQS), Land Acquisition Act (1894), Cutting of Trees (Prohibition) Act (1975), Punjab Wildlife Act (1974), Punjab Plantation and Maintenance of Trees Act (1974), Antiquities Act (1975), Hazardous Substances Rules, 2003 etc.

Current national environmental policy as well as administrative and legal framework of PEPA, 2000 has been reviewed comprehensively which provides an overview of the national policies, laws, guidelines and regulations related to the EIA study of the proposed project. Environment related documents have been reviewed including submission of environmental assessment study report to obtain environmental approval was made mandatory by the Pakistan Environmental Protection Ordinance (PEPO), 1983 and the Pakistan Environmental Protection Act (1997). Section 12(1) of the PEPA (1997) stipulates that no project involving construction or any change in the physical environment can be undertaken unless an IEE or an EIA is conducted, and approval (NOC) is received from the relevant provincial environmental agency.

This EIA report has been prepared with due consideration of PEPA, 1997, Punjab Environmental Protection (Amendments) Act, 2012 and all other legal requirements of Pakistan and Punjab Government Including LAA, 1894.

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. However, these are briefly enumerated below to have a quick assessment of the situation.

Table 0-2 Impacts and Mitigation Summary

CONSTRUCTION PHASE			
POTENTIAL NEGATIVE IMPACTS	**DURATION AND SIGNIFICANCE OF IMPACT**	**RECOMMENDED MITIGATION MEASURES**	**PARAMETERS FOR MONITORING**
Dust, soil erosion, wastewater disposal problems	Moderate and Short term	On exposed construction surfaces during dry/windy periods fugitive dust generation will be suppressed by spraying water	Air Quality
Removal of trees, shrubs, ground vegetation creating ecosystem and habitat disturbance, loss of biodiversity	Moderate and Long Term	Cutting of Trees shall be avoided to the maximum extent and landscaping shall be done	Landscaping by Environmental Management Committee
Solid Waste Generation (Construction Debris)	High and Short Term	All excavated material (soil) shall be reused for backfilling. Dedicated waste segregation units shall be provided.	Solid Waste Management

		Recyclable items will be provided to recycling contractors	
Vehicular Traffic and Noise	High and Short Term	Vehicles and other noisy equipment should be in good conditions. Noisy construction activities will be carried out only during normal working hours.	Noise Level
Health and Safety of Workers	Low and Long Term	All occupational health and safety requirements for work force will be adhered to.	HSE guidelines/standards

OPERATIONAL PHASE			
Potential Negative Impacts	**Duration and Severity of Impacts**	**Recommended Mitigation Measures**	**Parameters for Monitoring**
Hazards due to chlorination	Moderate and short term	Maintaining the optimum dose. Handling the sodium hypochlorite by following the guidelines of Material Safety Data Sheet.	HSE/WHO guidelines
Delivery of unsafe water due to operation and maintenance issues	Major and long term	The distribution system shall be operated and maintained on regular basis to ensure provision of safe water.	Water Quality Reports
Excessive Consumption of Electricity	Major and Long Term	Installation of Solar Panels as an additional source of electric energy at each Pumping Station to run the pumps.	Electricity Bills-electric power consumed
Noise and Vibration from running	Minor and Short Term	Provision of buffer zone in the form of raised walls	Noise Levels

machinery		and plantation and oiling of parts of machinery causing noise and vibration.	
Environment and Landscape	Proponent	Creation of Landscape by tree planting, species introducing or landscaping appropriate to localconditions will be done.	Environment and Landscape

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. 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 0-3 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 PAPA	24 hours
Noise Level	-	• Nearby Receptors	Once-off	Construction Contractor and PAPA	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 PAPA	-
Operational Phase					
Air Quality	CO, NO_x, SO_x, PM_{10}	• Inside the Treatment Plant	Quarterly	PAPA	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, Copper, Magnesium, Phenol, Zinc, DO	• Sample from Markaz-e-aab	Annually	PAPA	-
Noise Level	-	• Nearby Markaz-e-aab	Quarterly	PAPA	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 saline groundwater. However, fresh groundwater is available close to major canals. Water quality of already established six bores was studied. It has been concluded from the prior 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 near the canals can be used for the drinking purpose after its disinfection.

As the project is provision of clean drinking water 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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Chapter 1
Introduction

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

Access to safe drinking water is the basic human right. Pakistan Vision 2025 and UN Sustainable Development Goals (SDG's) 2030 impose obligations on Pakistan towards achieving its water and sanitation goals. Drinking water is also placed on priority No. 1 in the approved National Water Policy 2018.

Pakistan has been blessed by nature with enough surface and groundwater resources yet it is one of the most water-deficient countries in the world. Industrialization, urbanization, and rapid population growth have placed huge stress on water resources. Due to technological developments, drinking water may contain various impurities, which are of physical, biological, and chemical in nature. The most dangerous impurity is of biological nature, which causes human health problems or cause death. Various impurities in the form of nutrient and microorganisms are transported from one place to another. Water pollution occurs when microorganisms and toxic chemicals from domestic waste and industries either come in contact with water bodies or run off or leach into ground water or freshwater resources. The contamination of animal and human fecal indicates presence of coli form bacteria. The growth and dispersion of bacteria is at peak in rainy season due to drainage in water bodies, that is, rivers, lakes, and streams. Poor treatment facilities cause spread of waterborne diseases. In Pakistan, drinking water sanitation system and drainage lines run in parallel, which causes leakages and intermixing result in deterioration of water quality. In most of the cities of Pakistan, the elementary source of provision is ground water supply, which contains various pathogens including many viral, bacterial, and protozoan agents causing 2.5 million deaths from endemic diarrheal disease each year.

In Punjab, 7% of all the rural population depends on dug wells and rivers for water supply. It seems that Punjab has best water supply system among all the provinces. This ratio is 24% in Sindh and people are utilizing water from unprotected sources. The rural communities of Khyber Pakhtunkhwa (KP) and Baluchistan using water from surface and dug well are about 46% and 72%, respectively, as shown in Figure below:

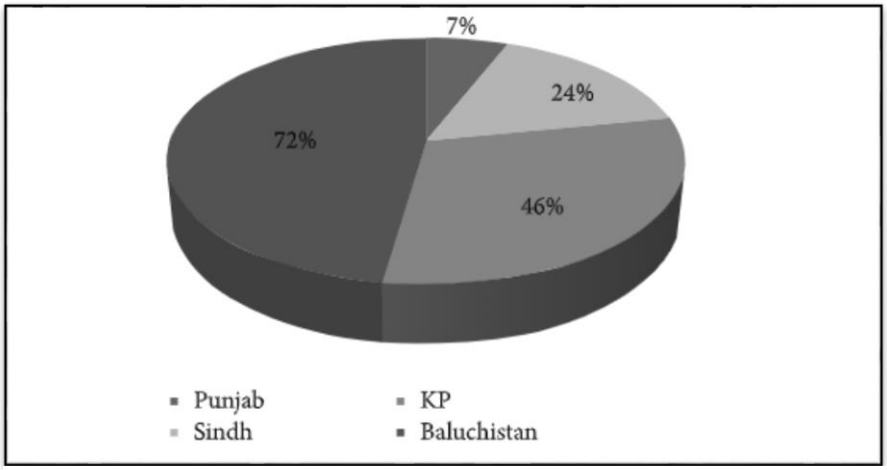


Figure 1-1: Dependence of Water Supply in the Provinces of Pakistan

Drinking water should be free from color, turbidity, odor, and microbes. It should be esthetically pleasant. Due to increasing population of Faisalabad, contaminated water is the most alarming problem. In 1999, Faisalabad required about 64.7 million gallons of drinking water supply daily to fulfill needs. But unfortunately 3 million gallons of this water came from domestic pumps that come out from subsoil water and tube well. According to Pakistan National Conservation Strategy, less rain, drought, and nondevelopment of other water resources reduce water availability and increase water scarcity. When water comes from surface water resources, it is necessary to make it safe for drinking purposes. Chlorination is the popular method for disinfection of drinking water at treatment plant and in sanitation system. It is the universal method to make drinking water safe and to reduce epidemic diseases.

Faisalabad is known as polluted industrial city due to the inadequate treatment facilities. The physicochemical analysis of drinking water was carried out to evaluate drinking water quality of Faisalabad city. The turbidity, hardness, pH, and TDS were found within safe limits of WHO guidelines. The microbial analysis showed that all samples were contaminated with total coliforms and *E. Coli*. Water quality and quantity crisis has remained an issue for a long time in Faisalabad Division. Therefore, the Government of the Punjab aims to develop sustainable drinking water supply solutions in the underserved areas of Tehsil Chak Jhumra (rural, peri-urban areas of the province) with contaminated or brackish water through Punjab Aab-e-Pak Authority.

1.2 Purpose of Report

This report is an environmental impact assessment study of Provision of safe drinking water project in Chak Jhumra Tehsil of District Faisalabad using the existing boreholes of Punjab Saaf

Paani Project (north zone). 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

- **Proponent:**

  Name: Punjab Aab-e-Pak Authority

  Contact: 042-35786893

  support@aab-e-pak

  Address: 4th Floor, EFU House, Jail 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	Engr. Hafsa Ghani	Senior Environmental Engineer	Masters in Environmental Engineering	Conducted literature review for the baseline study Performed feasibility study of the project and Analysis of Alternatives
2	Engr. Shamseela Falak Boas	Environmental Engineer	BS Environmental Engineering	Responsible for writing EIA Report, Conducted Impact Assessment and recommended Mitigation Measures
3	Abdul Hadi Atif	Sociologist	Conducted site visits and collected data from the project area. Participated in the process of public consultations and traffic study.	
4	Sajid Hussain	Sociologist		

1.4 Brief Description of Nature, Size and Location of Project

The aforesaid project is the Provision of Provision of Safe Drinking Water in Tehsil Chak Jhumra of District Faisalabad by Utilizing Existing 66 boreholes of Punjab Saaf Paani Company (North Zone). The area covered by the project is 120343.4 Acre and the number of settlements in this area are 398. The project aims to serve a current population of around 3 lakh in the tehsil Chak Jhumra and will to continue to serve for next 20 years till 2042 when population of the tehsil would be around 4 lakh as per population projection for the year. The total number of Markaz-e-aab to be constructed are 70 in number. The location map of the project area, its villages and proposed clusters are given below:

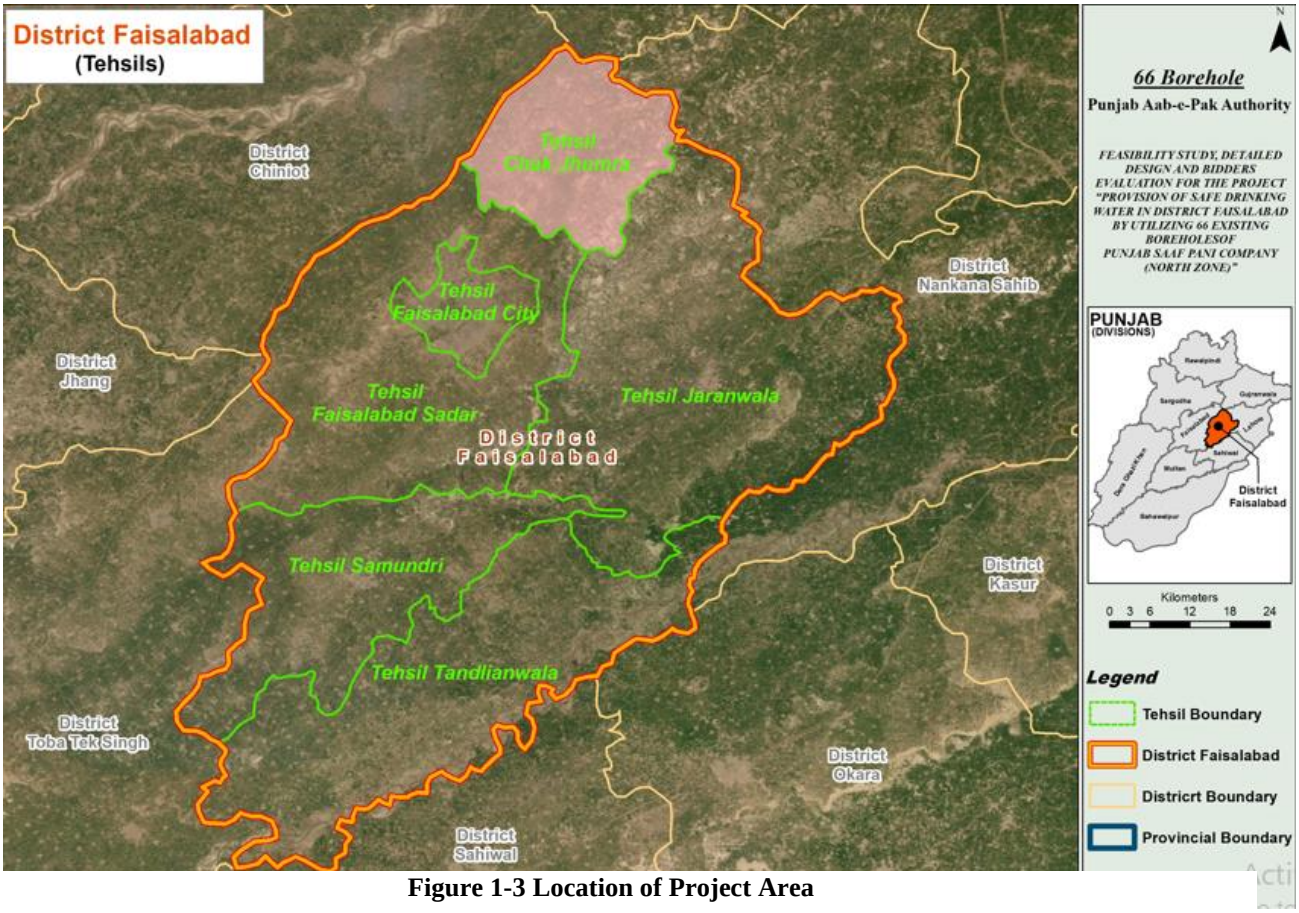


Figure 1-3 Location of Project Area

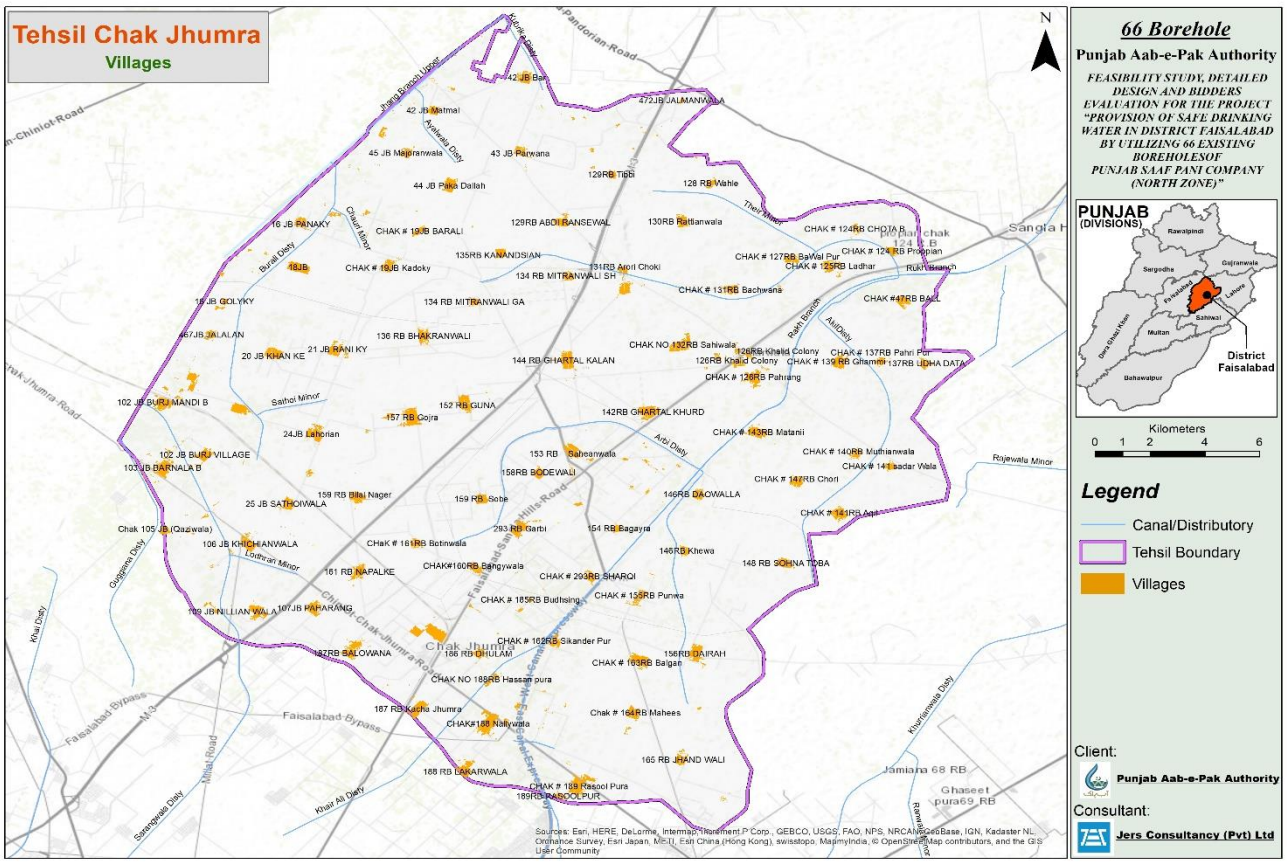


Figure 1-2: Villages in Chak Jhumra (Project Area)

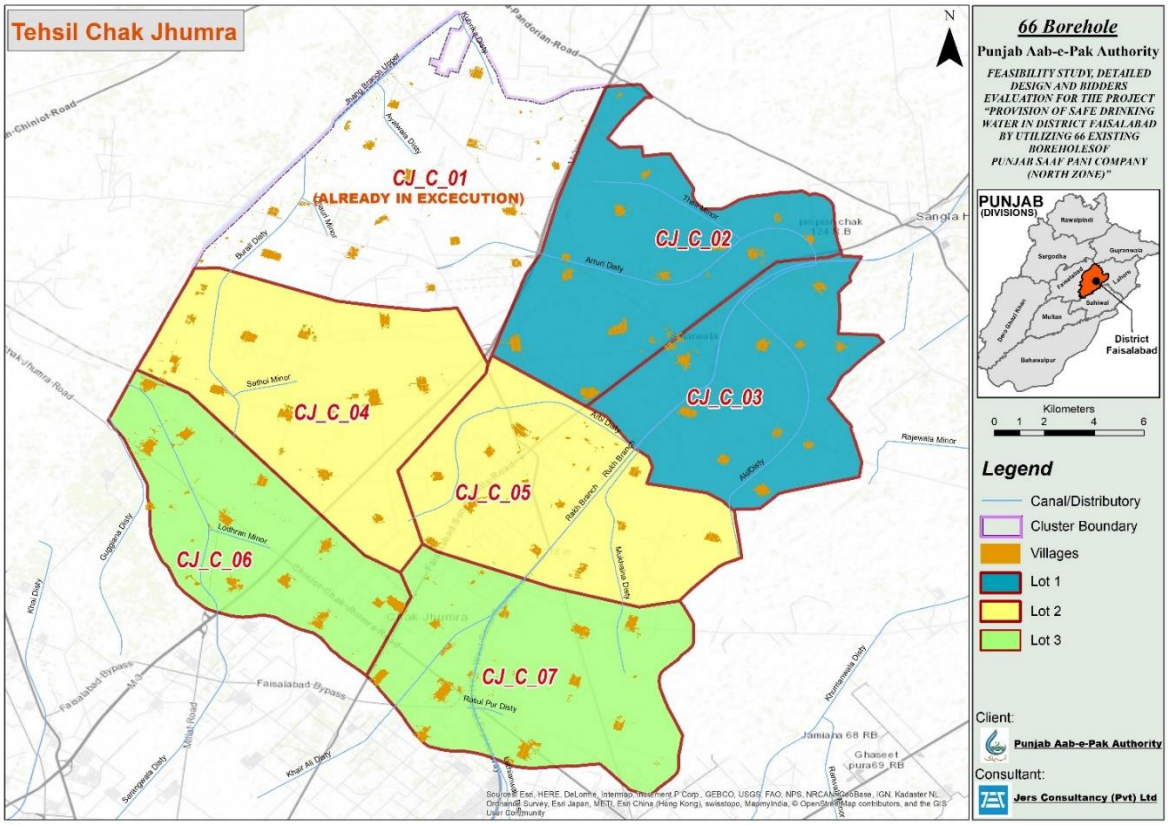


Figure 1-4: Clusters in Project Area

1.5 Scope of the project

- Determine pre-project environment conditions to assess post-project conditions if they have changed for better or worse;
- Document all the environmental impacts likely to occur due to the implementation of the proposed sub-project;
- Provide maximum information to the proponent and other stakeholders about the existing environmental conditions and the implications of the proposed sub-project;
- Allow planners to alleviate potential impacts of the proposed sub-project on different environmental conditions such as physical environment, biological environment and socio-economic environment;
- Aid decision makers to take informed decisions.
- Identification of necessary mitigation measures to minimize the negative impacts; and
- Preparation of Environmental Management Plan.
- Carry out Public Consultation and socio-economic survey of the project area by site visits.

Chapter 2

Policy, Legislation, Legal & Administrative Framework

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).

According to environmental laws of the country development projects have to undergo the process of Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) in order to predict and mitigate the impacts of the development at an early stage. Based on nature, size, cost and associated impacts, the project under consideration has been categorized for EIA study according to the regulation 3 of Statutory Notification issued on June 13, 2000 (S.R.O.339 (1) /2001).

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, 2000".

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

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

2.3.1 National Conservation Strategy, 1992

On March 1, 1992, the Cabinet of Pakistan approved the National Conservation Strategy. It describes the stark reality of the country's deteriorating resource base and its implications for what is still largely a natural resource-based economy. It sets forth the beginnings of a plan to integrate environmental concerns into virtually every aspect of Pakistani economic life. The strategy has three overriding objectives: conservation of natural resources, sustainable development, and improved efficiency in the use and management of resources.

2.3.2 PEPO, 1983 and PEPA 1997 (Amended 2012)

In 1983, the Government of Pakistan issued an Environmental Protection Ordinance (EPO), which was replaced by the Pakistan Environmental Protection Act (PEPA) 1997, through an Act of Parliament. Now the PEPA 1997 has been replaced by Punjab Environmental Protection Act 1997 (Amended 2012) on 18th April, 2012.

Under Sec. 8 of Environment Protection Ordinance (EPO) 1983, it was necessary to carry out EIA/IEE for all development projects, but there were no IEE /IEE regulations under that ordinance.

Under section 12 of the Punjab Environmental Protection Act, 1997 (Amended 2012) it is mandatory to take an Environmental Approval Environmental Protection Agency for commencement of any construction of project.

2.3.3 National Environmental Policy 2005

Government of Pakistan (GOP) has notified National Environmental Policy 2005, for different projects/aspects in which guidelines/priorities have been given to undertake/commence the projects having significant environmental impacts.

2.3.4 Review of IEE and IEE Regulations, 2000

The GOP has issued Review of Initial Environmental Examination and Environmental Impact Assessment Regulations 2000, to review the Initial Environmental Examination (IEE) / Environmental Impact Assessment (EIA) Reports.

2.3.5 Guidelines for the Preparation and Review of Environmental Reports, 1997

The GOP has also framed guidelines for the preparation and review of IEE/EIA of projects in various developmental sectors.

2.3.6 National Environmental Quality Standards (NEQS)

According to Punjab Environmental Protection Act, 1997 (Amended 2012), National Environmental Quality Standards (NEQS) were established for municipal and industrial effluents and air emissions.

2.3.7 Guidelines for Sensitive and Critical Areas

GOP has issued Guidelines for Sensitive and Critical Areas in October, 1997. The objective of the guideline is to provide guidance to project proponents and other stakeholders in the environmental assessment process, so that the projects are planned and sited in way that protects the values of sensitive and critical areas.

2.3.8 Policy and procedures for the Filing, Review and Approval of Environmental Assessments, November-1997

Environmental Assessment is the Primary means of managing the approval of new development proposals in Pakistan. Environmental Assessment allows for the systematic examination of proposals, clear procedures which provide for the interests of relevant Government Departments and other stakeholders to carefully consider.

2.3.9 Guidelines for Public Consultation, Pakistan Environmental Protection Agency October, 1997

This guideline is part of a package of regulations and guidelines which include:

- Punjab Environmental Protection Act, 1997 (Amended 2012)
- Policy and Procedures for filing, review and approval of environmental assessments
- Guidelines for the preparation and review of Environmental Reports
- Guidelines for sensitive and critical areas
- National Environmental Quality Standards (NEQS)
- Detailed sectorial guidelines

2.3.10 Punjab Wildlife Protection Act, 1974

This law was enacted to protect the province's wildlife resources directly and other natural resources indirectly. It classifies wildlife by degree of protection, i.e., animals that may be hunted on a permit or special license, and species that are protected and cannot be hunted under any circumstances. The Act specifies restrictions on hunting and trade in animals, trophies, or meat. The Act also defines various categories of wildlife protected areas, i.e., National Parks,

Wildlife Sanctuaries, and Game Reserve. The project activities will have to be carried out in accordance with this Act. In particular, no activities will be carried out inside any protected areas defined under the Act**.**

2.3.11 Forest Act, 1927

This act was framed in 1927. The Forest Act, 1927 is still the basic charter for the forest departments in Pakistan. This law empowers provincial governments to manage forest areas.

2.3.12 Punjab Local Government Ordinance, 2001

Schedules 4 and 8 of this Ordinance pertain to environmental pollution. Under the Ordinance, the local councils are authorized to restrict projects causing pollution to air, water or land. They may also initiate schemes for improving the environment.

2.3.13 Provincial Sustainable Development Fund (Utilization) Rules, 2003

These Rules prescribe procedure for filing, appraisal and sanction of project proposals for utilization of financial assistance from the Fund. As action is to be taken by the Provincial EPAs/ government departments, no immediate amendment is required.

2.3.14 Pakistan Penal Code, 1860

This defines the penalties for violations concerning pollution of air, water bodies and land. Sections 268 to 291 are about offences affecting public health. The offences relating to public health safety and environment are as under;

Sec 268: Public Nuisance

Sec 269: Negligent act likely to spread infection of disease dangerous to life:

Sec 270: Malignant act likely to spread infection of disease dangerous to life:

Sec 278: Making atmosphere noxious to health:

Sec 284: Negligent conduct with respect to poisonous substance:

Sec. 290: Punishment for public nuisance in cases not otherwise provided for:

Sec. 291: Continuance of nuisance after injunction to discontinue

2.3.15 Punjab Land Use Rules 2009

In January 2009 the Punjab Government notified **"**Punjab Land Use Rules 2009" for the clarification of Lahore Master Plan. In these rules permissible land use according to area type is defined.

2.3.16 Antiquities Act 1975

The law relates to protection of Antiquities, monuments, National &International heritage. The compliance of this Act is mandatory for the Installation of Generators. Under section 22 of the Act no development plan or scheme or new construction can be done within distance of 200ft from the boundary of the monuments/ National Heritage. There is no historical Site or monuments in the proximity of the project.

2.3.17 Guidelines for Critical and Sensitive Area

These guidelines have been prepared under section 12 of Punjab Environmental **Protection Act 1997 (Amended 2012)** for protection and safety of critical and sensitive areas.

2.3.18 Punjab Irrigation and Drainage Authority Act, 1997

This Act aims to implement the strategy of the Government of Punjab for streamlining the Irrigation and Drainage System; to replace the existing administrative setup and procedures with more responsive, efficient and transparent arrangements; to achieve economical and effective operation and maintenance of the irrigation, drainage and flood control system in the Province; and to make the irrigation and drainage network sustainable on a long-term basis and introduce participation of beneficiaries in the operation and management.

2.3.19 Canal and Drainage Act, 1873

This act contains provisions for the prevention of pollution of natural or man-made water bodies. It prohibits the discharge of any solid or liquid or combination of both from any source into any river, canal or drain including natural channels (Sec 59A (4)). The exceptions are discharges that do not harm the natural environment of the receiving water body and/or corrupt or foul the water channel so as to render it unfit for the purpose for which it is ordinarily used (Sec 70 (8)). Any person who fails to comply with the provisions shall be incurred with the penalty provided under the act. According to a provision of this act (Sec 59-A (3)), the applicant shall obtain a certificate of no adverse impact from Canal Officer before discharging treated wastewater in to irrigation channel.

2.3.20 SMART Rules, 2001

SMART Rules or Self-Monitoring and Reporting by Industry Rules, 2001 are applicable to all industries releasing effluents and gaseous emissions into water bodies and the atmosphere. According to the type of industries as mentioned in scheduled in category A, B and C of the rules, the unit has to carry out environmental monitoring of effluents and gaseous emissions on a monthly, quarterly or biannual basis as the case may be.

2.3.21 Land Acquisition and Resettlement Act, 1894

This law regulates the acquisition of land for public purposes and provides compensation in the form of cash, an alternative land allocation, or through other equitable arrangements (Sec 31).

Chapter 3
Project Description

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** (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, 2000".

Chak Jhumra is one of the tehsils of Faisalabad District, where Punjab Aab-e-Paak Authority intends to supply clean drinking water. Scope of the project includes:

- Installation of Cluster Based Water Supply Schemes in the tehsil, for which tubewells will supply seepage water from canal.
- 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 each low level reservoir (LLR) located at the Aab-e-pak markaz centers.

3.2 Objectives of Project

The main objective of the project is to provide clean drinking water facility based on minimum requirement set by World Health Organization, ensuring provision of potable water to rural households in Chak Jhumra by utilizing existing 66 boreholes of Punjab Saaf Paani Company (North Zone).

Punjab Aab-e-Pak Authority intends to develop projects of safe drinking water supply to the deserved i.e. rural, semi-urban and peri-urban population, using localized and customized solutions, with regard to sources and supply options and sustainable O&M models with community engagement and participation. The option would be determined by the quality of existing water sources, availability of infrastructure, population density and level of community participation. The areas which are worst affected in terms of contamination level and non-availability of water supply system will be served at the earlier stages of the project.

3.3 Location and Site Layout of Project

The proposed project involves 6 clusters and 70 standalone units serving the 82 villages of the tehsil. The table below shows the co-ordinates of the standalone units or Location of Markaz-e-aab.

Table 3-1: Location of Markaz-e-Aab

Sr #	Standalone Unit	Latitude	Longitude
1	472JB JALMANWALA	31.7605	73.2673
2	128 RB Wahle	31.7316	73.2767
3	130RB Rattianwala	31.7209	73.2668
4	131RB Arori Choki	31.701488	73.250023
5	131RB Bachwana	31.6953	73.281014
6	127RB BaWal Pur	31.74903	73.302495
7	125RB Ladhar	31.7045	73.31386
8	124RB CHOTA B	31.715576	73.32683
9	124 RB Proppian	31.710255	73.335875
10	133 RB KAMAL PUR	31.697	73.2506
11	132RB Sahiwala	31.6754	73.26564
12	132RB MUHAMMAD KHAN IZAFIABADI	31.67	73.28
13	144 RB GHARTAL KALAN	31.67328	73.23135
14	142RB GHARTAL KHURD	31.65266	73.25645
15	CHAK #47RB BALL	31.6889	73.3406
16	137RB UDHA DATA	31.67	73.35
17	137RB Pahri Pur	31.67	73.33
18	139 RB Ghammi	31.6724	73.3206
19	126RB Pahrang	31.665245	73.290319
20	126RB Khalidcolony	31.6668818	73.2915693
21	143RB Matanii	31.64734	73.28938
22	141RB Aqil	31.6164	73.3182
23	147RB Chori	31.6281	73.3042
24	140RB Muthianwala	31.6378	73.3247
25	141 sadar Wala	31.6334	73.3366
26	16 JB GOLYKY	31.6915	73.1161
27	467JB JALALAN	31.6809	73.1142
28	23 JB Sodherean	31.6645	73.107
29	20 JB KHAN KE	31.6721	73.1325
30	23 JB na Bhatian	31.656921	73.12032
31	21 JB RANI KY	31.6757	73.1542
32	24JB Lahorian	31.649	73.1478
33	25 JB Rehmat Abad	31.6317	73.1446
34	136 RB BHAKRANWALI	31.6776	73.1833
35	157RB Gojra ASGHARTOWN	31.6523	73.1709
36	152 RB GUNA	31.6581	73.1982
37	157 RB Gojra	31.6503	73.1812
38	159 RB Bilal Nager	31.6262	73.1625
39	161RB Botinwala	31.609095	73.181598
40	153 RB Saheanwala	31.6421	73.2297
41	158RB BODEWALI	31.633	73.2216
42	159 RB Sobe	31.6236	73.2036
34	136 RB BHAKRANWALI	31.6776	73.1833

35	157RB Gojra ASGHARTOWN	31.6523	73.1709
36	152 RB GUNA	31.6581	73.1982
37	157 RB Gojra	31.6503	73.1812
38	159 RB Bilal Nager	31.6262	73.1625
39	161RB Botinwala	31.609095	73.181598
40	153 RB Saheanwala	31.6421	73.2297
41	158RB BODEWALI	31.633	73.2216
42	159 RB Sobe	31.6236	73.2036
43	145RB CHATHYANWALA	31.6378	73.251
44	CHAK # 153RB DASKA	31.6226	73.235
45	293 RB Garbi	31.6124	73.2148
46	146RB DAOWALLA	31.6266	73.2741
47	154 RB Bagayra	31.6121	73.2451
48	146RB Khewa	31.6043	73.2677
49	148 RB SOHNA TOBA	31.6007	73.3022
50	293RB SHARQI	31.595	73.2379
51	155RB Punwa	31.5893	73.2537
52	160RB Bangywala	31.599	73.1989
653	102 JB BURJ MANDI B	31.6548	73.0985
54	103 JB BARNALA B	31.6362	73.0994
55	103 JB BARNALA	31.6329	73.0953
56	102 JB BURJ VILLAGE	31.6362	73.1111
57	110RB BabayWala	31.61815	73.11224
58	105 JB Ghaziwala	31.6124	73.0985
59	25 JB SATHOIWALA	31.6235	73.14
60	106 JB KHICHIANWALA	31.6072	73.1259
61	110 JB MAJHE WALA	31.5852	73.1165
62	109 JB NILLIAN WALA	31.5849	73.1455
63	161 RB NAPALKE	31.5986	73.163
64	107JB PAHARANG	31.5849	73.1455
65	187RB BALOWANA	31.57223	73.158305
66	186RB DOGRAN-1	31.579054	73.183894
67	186RB Dogran-2	31.5784	73.1884
68	185RB Budhsing	31.59	73.22
69	186 RB DHULAM	31.572	73.2024
70	162RB Sikander Pur	31.57539	73.22758
71	163RB Balgan	31.56535	73.25301
72	156RB DAIRAH	31.56975	73.27354
73	164RB Mahees	31.5504	73.2522
74	165 RB JHAND WALI	31.5356	73.27
75	189RB Tibba Rasoolpur	31.52711	73.2348
76	189RB RasulPur	31.5195	73.2288
77	188 RB LAKARWALA	31.5295	73.1967
78	188 Nallywala	31.543	73.2036
79	188RB	31.5472	73.2068
80	188RB Jinnahabadi	31.5538	73.215
81	188RB Hassan pura	31.56039	73.2051
82	187 RB Kacha Jhumra	31.5505	73.1823

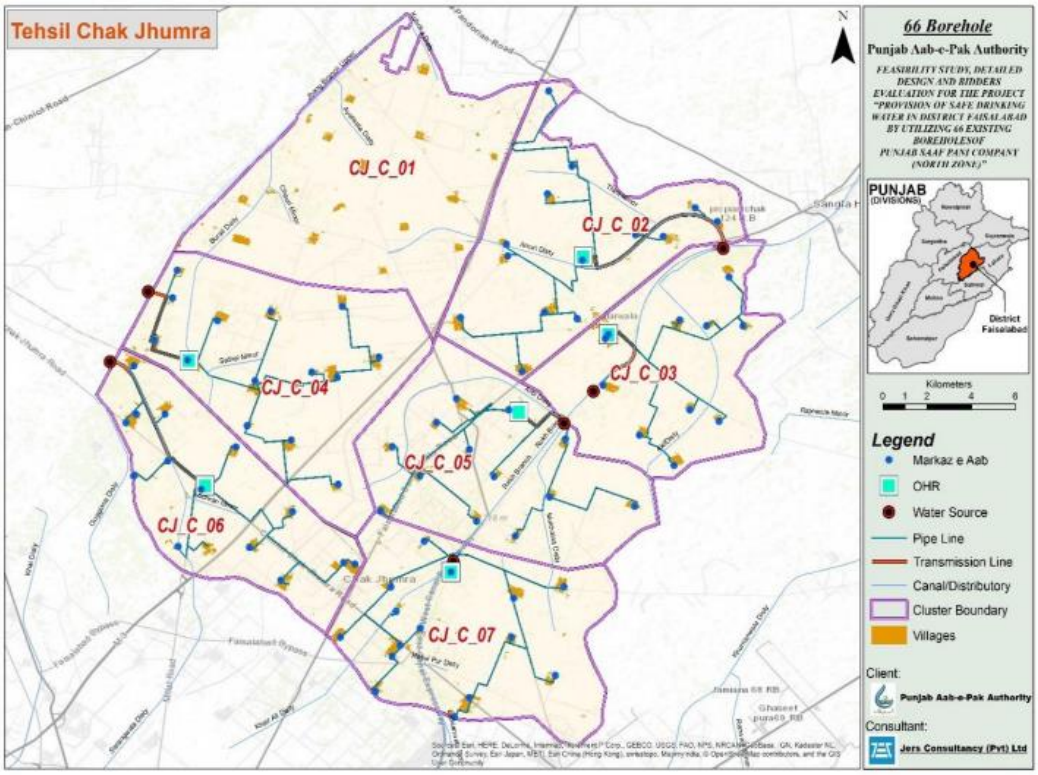


Figure 3-1 Complete Layout for Water Supply System in Chak Jhumra

3.4 Land Use on Site

The proposed locations for Markaz-e-aab are all in rural areas. Some standalone units shall be constructed near mosques, government schools or dispensaries as the land is owned by government and for some units private land is donated by volunteers for Markaz-e-aab. Most of the sites are vacant, unpaved or being used as resting place for domestic animals. Following pictures show the land use at various sites within different villages in Tehsil Chak Jhumra.

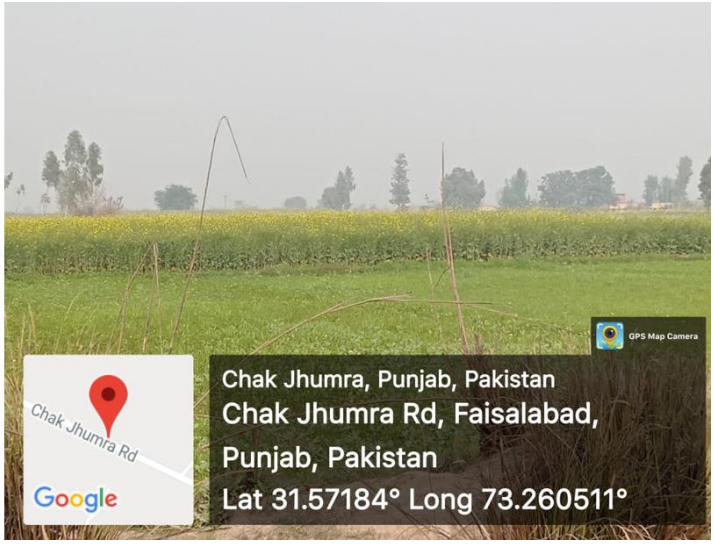






Figure 3-2 Land Use Within the Project Area

3.5 Road Access

The proposed Sites for Markaz-e-Aab have been selected by keeping in view their accessibility via suitable road networks for the transportation of construction material and equipment as well as ease in access for public to obtain clean drinking water. All sites are accessible via 20-30 ft. wide sub-main roads which are further connected to 50-60 ft. wide main roads.

3.6 Vegetative Features of Site

The proposed project covers the rural areas of Faisalabad including Tehsil Chak Jhumra which is an agricultural area. The proposed sites for water source, overhead reservoir and Markaz-e-aab are also surrounded by vast agricultural lands. The boundaries of few sites are surrounded by Keekar or Safaida 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.



Figure 3-3 Vegetative Features of Project Area

3.7 Cost Breakdown of the Project

The project is divided into 6 clusters or 3 lots for calculating the estimated cost for construction activities. The table below gives the estimated costs for all 6 clusters:

Sr #	Cluster	Construction Cost (PKR)
1.	Construction work cost for Cluster 2 & 3	2,82,418,167

2	Construction work cost for Cluster 4 & 5	3,16,971,866
3	Construction work cost for Cluster 6 & 7	324,910,179
	Total construction cost	**924,300,212 or 925 million approx**
4.	Cost for machinery and fabrication	**19 million**
	Overall Initial Capital Cost	**944 million**

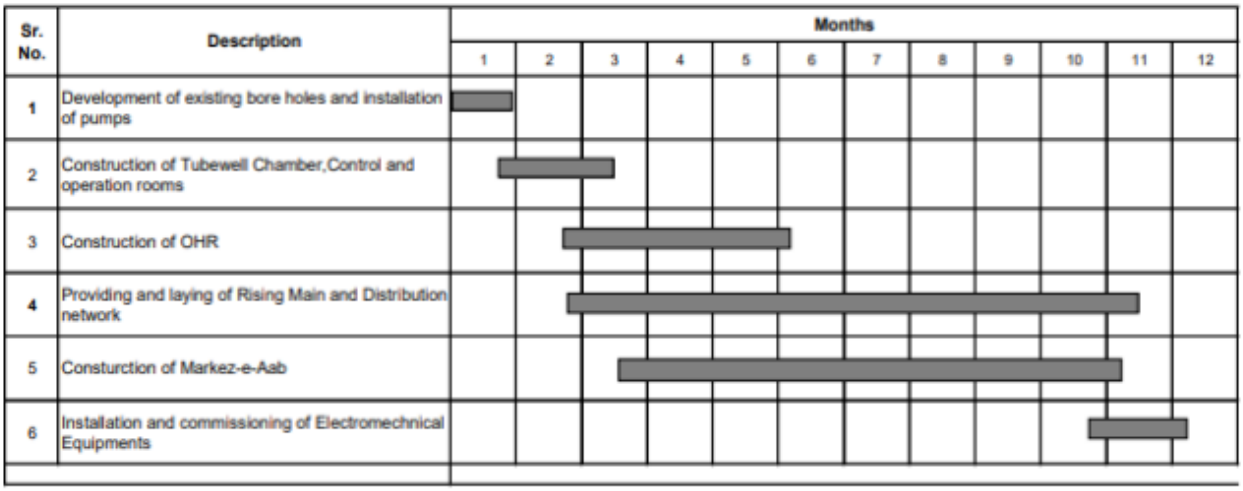
3.8 Schedule of Implementation

Six major activities are involved in the project which will be carried out simultaneously in all six clusters of the tehsil by the construction contractors within a period of one year. Following Gantt Chart depicts the relevant project activities and their schedule of implementation:

PUNJAB AAB-E-PAK AUTHORITY

PROVISION OF SAFE DRINKING WATER IN DISTRICT FAISALABAD BY UTILIZING 66 EXISTING BOREHOLES OF PUNJAB SAAF PANI COMPANY (NORTH ZONE)

PROJECT IMPLEMENTATION PLAN (12 Months)



3.9 Description of Project

The already developed bore located along the Rakh Branch canal will be used as water sources for the proposed system. The six bores for tube wells already established in the project site are capped and none of these are operational at present. The drilling of bore, bores-log and pump testing was conducted in 2018. The ground water (raw water) from the bores is pumped and after pre-treatment will be stored in Over Head Reservoirs (OHR). Disinfected water from the OHR will be distributed to different Markaz-e-Aab (MA) located in the villages of each cluster through piping network. At each MA water will be stored in Low Level. Reservoirs (LLR) equipped with UV lamps.

The major component of the safe drinking water supply network in Lot -1 (Cluster 02 and 03) are:

Tube well	=	2 Nos.,
OHR	=	2 Nos.,
MA	=	18 Nos.
Pipe Network	=	71,798 m

The major component of the safe drinking water supply network in Lot -2 (Cluster 4 and 5) are:

Tube well	=	2 Nos.
OHR	=	2 Nos.
MA	=	27 Nos.
Pipe Network	=	72,296 m

The major component of the safe drinking water supply network in Lot -3 (Cluster 6 and 7) are:

Tube well	=	2 Nos.
OHR	=	2 Nos.
MA	=	25 Nos.
Pipe Network	=	70,451 m

The capacities of MA vary from minimum 500 gallons to a maximum of 3500 gallons depending on the water demand of the area.

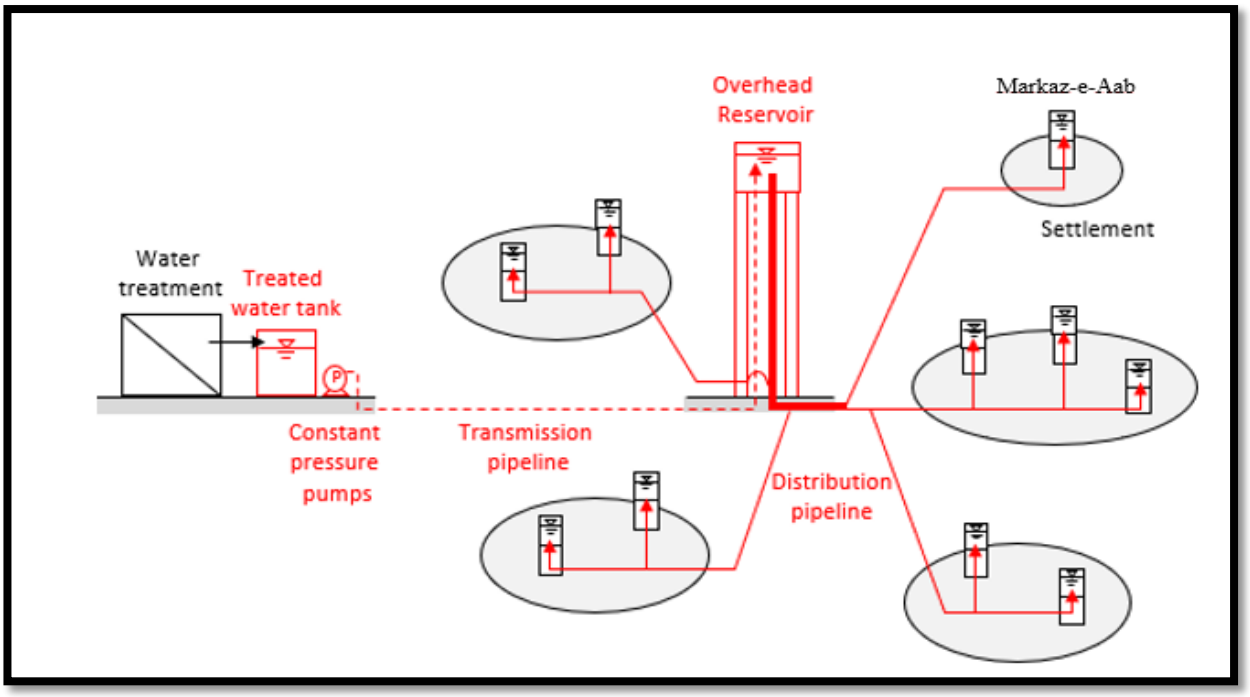


Figure 3-4 Process Diagram- Water Distribution Network

3.10 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 20 years by keeping in view the future population. The minimum anticipated life of the project is 20 years. The individual modules such as damaged pipes, chlorine dozing pumps, UV lamps, taps, tanks, solar panels, lights etc. will be replaced as and when required during this period. No decommissioning procedures or restoration plans have been compiled at this stage, as it is envisaged that the plant will be refurbished rather than decommissioned after the anticipated 20 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.

Therefore, it is concluded that no detailed Rehabilitation or Resettlement Action Plan is required for Tehsil Chak Jhumra. As a result, Grievance Redress Mechanism is not required.

Government owned land is available for location of Labour Camps, 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.

3.11 Government Approvals

Housing Urban Development and Public Health Engineering Department (HUD and PHED) is the provincial administrative department of the government of Punjab which is responsible for the provision of drinking water to the communities in the rural and urban areas of the province. The PHE department has so far completed about 4,216 water supply schemes out of which 2,825 schemes are functional and 1,391 schemes are dysfunctional as per record of the department.

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 Aab-e-Pak Authority (PAPA).

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.

Chapter 4
Review of Project Alternatives

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 Chak Jhumra, District Faisalabad. An analysis of the available alternatives is necessary to established 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

Following types of water supply system design options are considered for evaluation in Aab-e-Pak Authority Project:

Option 1: Cluster based Piped distribution systems;

This system consists of a tube well located at the sweet water zone along the canal. Raw water is first treated to get safe drinking water then pumped to overhead tank, from where treated water will supply to number of Markaz-e-Aab by gravity through a pipe network. . Chlorination Dosing System will be installed in the Pumping chamber to kill the microbial contamination. Dosing system consist of the dosing pump and dosing tank. Liquid sodium hypochlorite solution is proposed to use for chlorination purpose. At each Markez-e-aab again disinfection facility will be provided in form of Ultra-violet lamps.

Option 2: Single Point Standalone systems (drinking water supply for settlements), which usually consist of small-diameter tube wells from which water is drawn using a submersible borehole pump. In this option an individual tube-well and a treatment plant will be established in each village. Relatively inferior quality of ground water will be available i.e. brackish water having heavy metal traces. Keeping this in view, the minimum required treatment of the ground water will consist of the combination of UF and RO plants in each village depending upon the water quality analysis.

Option 3: Transmission of Water by Bowsers to Markaz e Aab from Tube-well

In this option, it is proposed to transmit treated water from tube well to all Markaz e Aab centers in a cluster, by means of a bowser truck. In this way, the distribution network, consisting of lengthy pipe networks and Overhead tank will be avoided.

In the light of detailed analyses and discussions in the feasibility report of the proposed project, Option-1 is recommended for implementation for the subject project.

4.1.1 Advantages of Option 1 (Cluster Based Approach)

- For large water-distribution systems fully detailed models result in a substantial amount of data, making it difficult to manage, monitor and control of water supply system and pressure regime. A possible way to cope with this difficulty is to gain insight to the system behavior by simplifying its operation using the methodology of clustering, dividing the distribution system into sub-areas.
- It is keenly observed during the review of the water quality results which was conducting in 2018 and the water characteristic of the already established tubewell in cluster -1 at Chak Jhumra that there is no need to take any taste and odour control measure. All the physical and Chemical parameter are well within the guideline of the WHO Safe drinking water quality standard. So the option 2 was not feasible in this case. But the biological contamination is observed in the water quality result. The most appropriate treatment process for the selected bore in the Chak Jhumra based on review of the pervious water quality result is the Chlorination.
- Option-2 involves high capital and operational costs for individual treatment plants.
- Option-3 also involves high capital and as well as operation cost, further health risk is also involved through transmission of water by bowser.

4.1.2 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
- Access to Markaz-e-aab
- Environmental Issues
- Social Issues

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

- Voluntary negotiation with the owners for sale of land
- Donation from the land lord owners who would not have any negative impact on their housing and business activities.

Public access to Markaz-e-Aab (MA) is very important. Availability of approach roads for carriage of construction machinery, construction material etc. is pre-requisite. Each alternative site was therefore ranked according to the availability of access routes for construction and public ease to access clean water. It has been taken into consideration that MA should be available within a radius of 1 km. It is also ensure that maximum people can utilize the facility, therefore MA are to be constructed in populated areas.

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 Chak Jhumra 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 alongwith 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 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 Chak Jhumra 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.

Chapter 5

Description of Baseline Environment

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.

A site visit was conducted to survey the field area for collection of relevant data. Interviews were conducted with the general public and stakeholders of the project area in order to seek the public opinion on the implementation of the proposed project. Various Governmental and Non-Governmental Organizations (NGOs) were also visited for the collection of relevant data and their views on the proposed project were recorded for incorporation into the EIA report. The environmental impacts of any activity or process will be assessed on the basis of deviation from baseline or normal situation. The following components form part of the baseline:

- Physical Environment
- Ecological Environment
- Socio-economic Environment

5.1 Physical Environment

Faisalabad District

Faisalabad District is one of the four districts (Faisalabad, Chiniot, Jhang, and Toba Tek Singh) of Faisalabad division. The total area of the district is 5856 square kilometers. Its Coordinates are 31.4181° N, and 73.0776° E. According to the 2017 census of Pakistan the population of the subject district reported as 7,874,790 persons, out of which 47.76% of population were lived in the urban areas while 52.23% of population were rural. The Faisalabad District is subdivided into six (06) tehsils namely Chak Jhumra, Jaranwala, Tandlianwala, Sammundri, Faisalabad City and Faisalabad Sadar as shown in Figure below:

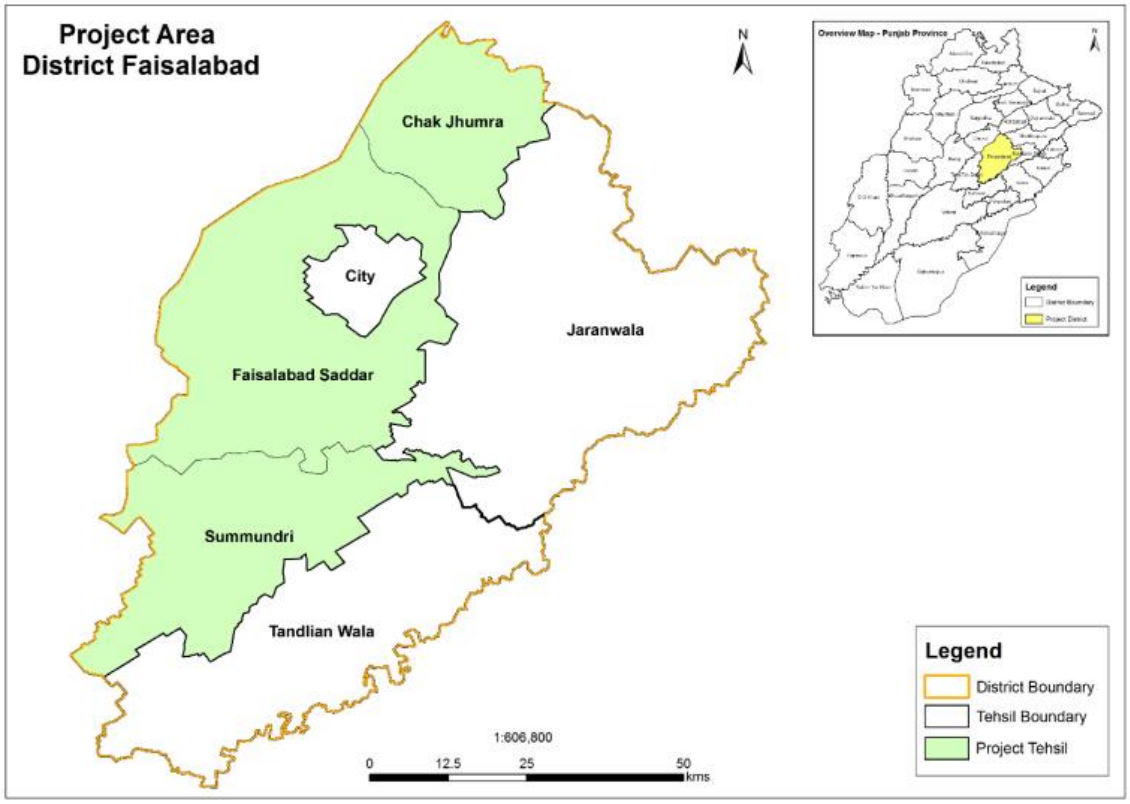


Figure 5-1 Map of the Faisalabad District

The natural surface elevation of the district is 184 meters above the sea level. Faisalabad is bounded by Hafizabad and Sheikhupura towards north and northeast, by Sheikhupura, Okara and Sahiwal towards east and southeast, and by Jhang and Toba Tek Singh towards west and southwest. River Chenab flows about 30 km in the northwest while River Ravi meanders about 40 km off the city in the southeast. (source: https://faisalabad.punjab.gov.pk/geography).

Chak Jhumra Tehsil is an administrative subdivision (tehsil) of Faisalabad District. Headquarters of the tehsil is Chak Jhumra City. Gross area of the Tehsil is 120,343.4 acres. Coordinates of the Tehsil Headquarters are 31^{o}-34'-10" N and 73^{o}-10'-56" E. The Tehsil Headquarter is connected with rest of the country by road and rail. Faisalabad Airport is the nearest airport. The distance of Chak Jhumra City from Faisalabad is 21 kilometers.

Population of Chak Jhumra Tehsil as per population census of 1998 and 2017 was 253,806 and 332,966 respectively. Population growth rate estimated from the above two populations is 1.44 per annum.The overall climate of the tehsil is similar to that for the district. Agricultural lands of the tehsil are irrigated by Lower Chenab Canal (LCC).

5.1.1 Climate

The climate of Faisalabad features a hot desert climate. The climate of the district can see

extremes, with a summer maximum record temperature of 48 °C was observed on May 26, 2010 and a winter temperature of −1 °C.

The summer season starts in mid-April and continues until late October. May and June are the hottest months, while July, August and the first half of September can be oppressively humid, except for the days when it rains. June is the hottest month in Faisalabad, when conditions are dry and dust storms are common. The coldest month is January, which is also a dry month with significant foggy days. The fog is particularly dense at night and in early morning hours. The winter season starts in November and continues until early February. Spring begins after mid-February and lasts usually until late March, when temperatures begin to rise and conditions become drier and sunnier. The average annual rainfall is only about 375 millimeters (14.8 in), which is highly seasonal since approximately half of the yearly rainfall takes place in July and August during the monsoon season. The mean maximum and minimum temperature in summer are 39 °C and 27 °C, respectively. In winter it peaks at around 21 °C and 6 °C, respectively.

5.1.2 Soils

The soils of the project area are typical of the soils of the Punjab. The soils of the Punjab are composed of alluvial material which was carried from the Himalayan ranges by tributaries of the vast Indus River system. Frequent changes in the rate of flow of the streams, recurrent floods, and ponding of the sediment- laden waters have created a varied and mixed soil pattern throughout the area.

The soils of the Punjab are of recent origin and nearly everywhere a zonal. Generally, the soils cannot be classified by genetic characteristics, and therefore they have been grouped into five basic series according to subsoil texture.

In many respects the soils show a high degree of similarity throughout the area. They are reddish-brown to grayish-brown, mostly moderately coarse and medium-textured soils, containing high percentages of fine to very fine sand and silt. The clay part consists largely of non-swelling minerals, which may account for the generally favorable permeability characteristics of the soils. Most soils in the Punjab are moderately to highly permeable; only a small percentage displays low coefficient of permeability. The lime content of the soils is high, which is normal for areas of low rainfall.

5.1.3 Physiography

Punjab has been divided into four physiographic units and three subdivisions as follows:

i) Kirana Hills

ii) Pabbi Hills

iii) Piedmont area's

iv) Alluvial plain:

- Active flood plains
- Abandoned flood plains
- Bar uplands

Faisalabad district is only covered by alluvial plain. The dominant physiographic unit is the alluvial plain of the Punjab, a part of the Indo-Gangetic Plain. The alluvium consists of sand and silt and minor amounts of gravel and clay, deposited by the Indus River and its present and ancestral tributaries. In accordance with their mode of deposition by large constantly shifting rivers, the alluvial deposits are heterogeneous, and individual strata have limited horizontal and vertical continuity. The three physiographic subdivisions of the alluvial plain are based on the present relationship of the surface features to the rivers.

5.1.3.1 Active flood plains

This subdivision includes the meander belt and present flood plain of the principal rivers of the area. During low-water stage, the rivers flow in braided or meandering channels, as much as 5 miles wide. Meander scars, sandbars, natural levees, and backwater swamps are conspicuous features of the active flood plains.

5.1.3.2 Abandoned flood plains

These areas, paralleling the rivers in a belt as much as 20 miles wide, are a few feet higher than the active flood plains. They represent flood plains that have been abandoned in comparatively recent times by the major rivers. However, the low-lying parts of the abandoned flood plains are subject to inundation by exceptionally high floods, which at places may extend to the bar uplands. Within the abandoned flood plains are areas of higher ground rising to elevations approaching those of the bar uplands. These features surrounded by channel scars are isolated remnants of the bar, or in some places they may represent depositional features of the streams. The abandoned flood plains are of hydrologic significance in that they provided the site of recharge by the rivers in the recent past.

5.1.3.3 Bar uplands

Large areas of relatively older alluvium are found in the central parts of the four doabs. Because of their elevation above the bordering flood plains, generally beyond the reach of flood waters of the five rivers, these areas, termed "bar uplands," are the most significant physiographic features of the alluvial plain. They coincide to a large extent with zones of highly mineralized ground water within the doabs. Typically, the bar uplands rise abruptly from the abandoned flood plains and are bordered by steep scarps, 5-25 feet high.

5.1.3.4 Topography and Drainage

The natural surface elevation of the Project area ranges from 188 to 197 m. District Faisalabad is drained by River Ravi in Southern direction.

5.1.4 Geology and Hydrogeology

Faisalabad District is a part of Rechna Doab. Geology and Hydrogeology of the Rechna Doab is similar to that of Punjab Plains.

In Punjab Plains, Quaternary alluvium has been deposited on semi-consolidated Tertiary rocks or on a basement of metamorphic and igneous rocks of Precambrian age. The distribution of Tertiary rocks in the project area is unknown, except in the Pabbi Hills area, in northeastern Chaj Doab, where rocks of the Siwalik system are exposed. In the area of the buried bedrock ridge, in Chaj, Rechna, and Bari Doabs, exploratory drilling has revealed that the Precambrianbasement rocks are overlain directly by Quaternary alluvium. The northeast and southwest of the bedrock ridge, test holes drilled to a maximum depth of about 1,500 feet bottomed in alluvium. Hence, no information is available concerning the total thickness of the alluvia l deposits, the southward extension of Tertiary or older sedimentary rocks from the Salt Range and the Pabbi Hills, and the depth to the basement complex in most of the area.

The alluvium of the Punjab Plains, derived from the mountain ranges to the north, has been deposited by the present and ancestral tributaries of the Indus River. The alluvial complex of Pleistocene and Recent age represents the latest phase of sedimentation in an environment that had its beginnings in mid-Tertiary time: the deposition of predominantly fluviatile sediments in a subsiding trough a foredeep adjacent to the rising Himalayan ranges. The alluvial complex consists principally of fine to medium sand, silt, and clay. Beds of gravel or very coarse sand are uncommon. Pebbles of siltstone or mudstone, however, may be found embedded in silty or clayey sand in many places. Also associated with fine-grained strata are concretionary zones or nodules

of kankar, a calcium carbonate deposit of secondary origin. The study of drill cuttings and electric logs has shown the absence of thick horizons of pure clay within the alluvium. Except for local clay lenses, a few feet thick, the finer parts of the alluvium consist generally of sandy, gravelly, or silty clay. Although there are local concentrations of fine - grained sediments of considerable thickness, individual strata are generally lenticular and have little horizontal or vertical continuity. The random distribution of coarse and fine-grained sediment within the alluvial complex is entirely consonant with its mode of deposition by large constantly shifting streams.

To estimate hydrologic parameters of the Rechna Doab aquifer, 49 test wells were drilled by WAPDA, during nineteen sixties, to carry out aquifer tests. Summary of the aquifer test results are presented here as Table 5-1, Average permeability of the aquifer material is 0.0038 ft/sec, while average specific yield is 0.13.

Table 5-1 Summary of Test Results for Rechna Doab

Area	Intensity	Number of Tests	Lateral Permeability (ft/sec)	Specific Yield (percent)	Specific Drawdown (ft/cusec)
Rechna Doab	Maximum	49	0.0101	0.3300	**15.00**
	Minimum	49	0.0009	0.0100	**3.94**
	Average	**49**	**0.0038**	**0.1315**	**6.75**

Very high and also relatively low values of permeability can be observed at scattered locations throughout the area. This simply reflects the fact that sections of predominantly coarse sand as well as sections of predominantly fine silt can be located in all parts of the Punjab. The lateral-permeability figures refer to the screened intervals of the test wells, the specific-yield figures obtained in the tests actually apply to the material at water-table depth in the vicinity of the test well. The aquifer is in effect unconfined, the anisotropy of the sediments frequently causes well-drawdown records to resemble those normally observed in artesian aquifers. This is especially true in wells where the top of the screen is located at a considerable depth below the water table. Despite these effects, however, the evidence is indisputable that the aquifer is unconfined, and that well discharge on any scale results in drainage from the water table. The aquifer test results of Chak Jhumra tehsil are given in Table 5-2.

Table 5-2 Aquifer results of Chak JhumraTehsil

Location of	Pr	Sy	Ls	D	Q	DD	Sp.Cap	Sp.DD

Test No.	Test Well	(m/sec)		(m)	(m)	(m^3/hr)	(m)	(m^3/m)	(m/(100m^3/hr))
7	Jhang Branch	2.74E-04		42.7	74.1	127	4.3	29.86	**3.35**
21	Jhumra	1.19E-03	0.08	42.7	71.3	255	3.3	78.33	**1.28**
49	**R.D 19800 Aruridisty**	9.14E-04	0.06	42.7	91.4	306	7.0	43.61	**2.29**

5.1.5 Ground water

Depth To Water Table

Depth to water table in Faisalabad district, observed by Land Reclamation Directorate, Irrigation Department Punjab for (2013-2015) varies from 4 to 57 feet below ground surface. Average depth to water table for various tehsils is given in Table below:

Table 5-3 Water Table Depth in Different Tehsils of Faisalabad District

Name of Tehsil	Depth to Water Table (ft)	
	From	To
Chak Jhumra	4	**15**
Samundri	4	**37**
Faisalabad Saddar	**4**	**57**

Source: Directorate of Land Reclamation (DLR), Irrigation Department, Government of Punjab.

Time-Rate Changes in Groundwater Level And Quality

Punjab Irrigation Department (PID) implemented a project in collaboration with the World Bank, titled "Punjab Private Sector Groundwater Development Project (PPSGDP), 1997-2001 involving detailed studies on groundwater management and regulation. This led to the establishment of "Groundwater Monitoring Cell" in Directorate of Land Reclamation (DLR) in IPD for systematic groundwater monitoring in the province. Starting from the modest network adopted from SMO (WAPDA) the existing DLR network has gradually expanded and is being planned to extend it to Potwar Plateau to cover the non-irrigated areas also which are more prone to disaster during any drought period.

Since 2003, groundwater monitoring is being carried out by the Groundwater Cell (DLR), for the collection of necessary data to determine the time-rate changes in groundwater levels and quality in response to the variations in the groundwater recharge-discharge components. The main objective of the groundwater monitoring is to develop a sound database for the management of groundwater resources for optimal development, usufruct exploitation without any adverse effect on the groundwater regime and environment.

Ground water levels are reported as depth to water table below the ground surface (in feet for the convenience of understanding by the farming community). Water quality parameters reported are:

- Electrical conductivity (EC) of groundwater indicating groundwater salinity in terms ofS/m.
- Sodium adsorption ratio (SAR); and
- Residual sodium carbonate (RSC).

These parameters define the quality of groundwater mainly from agricultural use point of view. Data on the other parameters tested during the detailed chemical analysis (cations and anions) are also available with DLR and may be compiled in due course of time. Field data on groundwater levels and quality are compiled and analyzed for mapping various zones indicating Depth to water table conditions and the suitability of groundwater for irrigated agriculture.

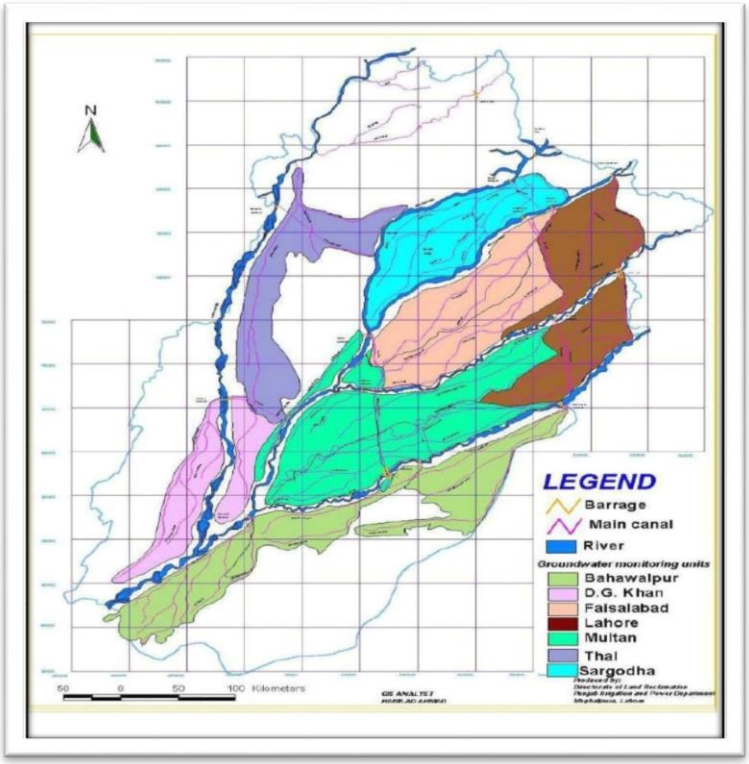


Figure 5-2 Map Showing Irrigation Zones of Punjab

Water Level and Quality Data for Faisalabad District

Faisalabad Irrigation Zone encompasses areas commanded by LCC (E) and LCC (W) canal systems in Sheikhupura, Hafizabad, Gujranwala, Nankana, Faisalabad and Jhang districts. There are 430 water level monitoring points. However, the data are available for 319 points, as some of the piezometers were abandoned and/or had to be replaced in course of time since 2003.

The Project Area is a part of Faisalabad District. There are 135 WL monitoring points in the district, out of which data for the year 2008 are available for 112 points. Based on the analysis of selective /representative monitoring points the water table trend in Chak Jhumra is shown in Figure below:

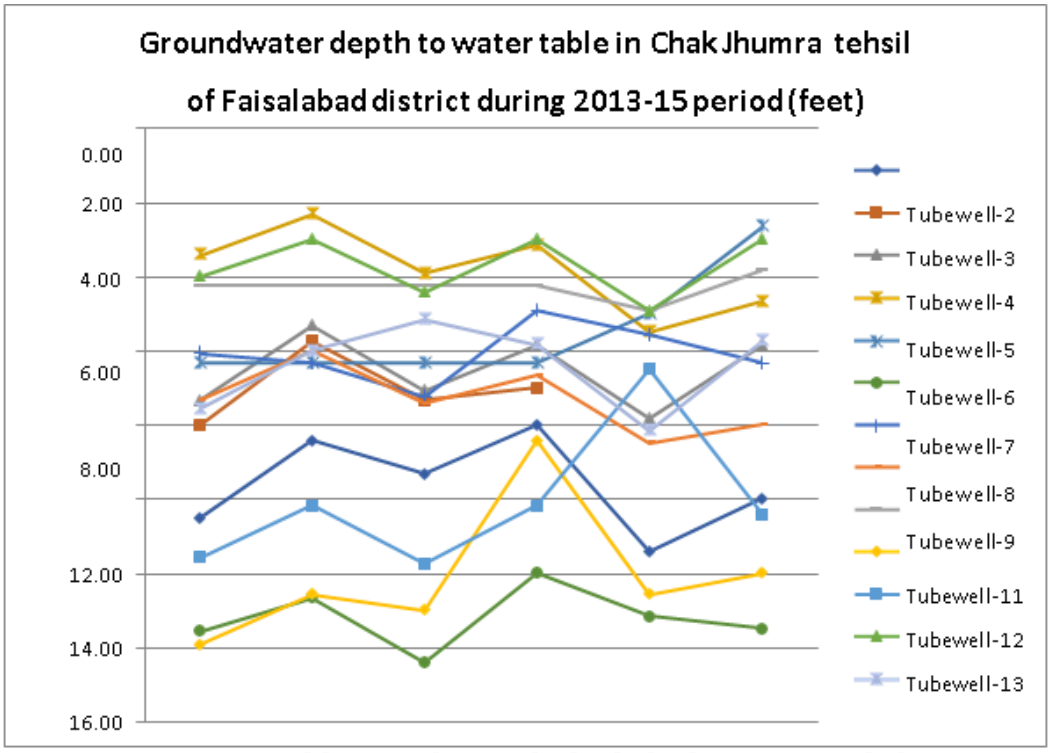


Figure 5-3 Water Table Trends in Tehsil Chak Jhumra (Feet below GLS)

Perusal of above figure indicates that the:

- Depth to groundwater level ranges from less than 04 to 14 feet.
- Water levels have shown mixed trends, generally lowering and rise in some cases
- The mean water table stage shows that there is no major change in depth to water tablein Chak Jhumra.

5.1.6 Groundwater Quality Trends in Faisalabad District

Data collected through field checks and water sampling on selected private Tube wells in each zone are analyzed in DLR laboratory for determining the suitability of groundwater for mainly agricultural use in line with the guidelines by FAO considering the values of EC, SAR and RSC. However, at this stage, time-rate changes in EC values have only been used to study the groundwater quality trends in each zone.

There are 231 groundwater quality monitoring points in Faisalabad district, out of which continuous data for the year 2008 are also available for 231 points. Based on the analysis of selective/representative monitoring points the groundwater quality trends in the district are shown in Figure 5-4. Perusal of the figure indicates that the:

Groundwater is fresh to brackish in the area, depending upon the location of individualTube well. EC Values range from 0.50 dS/m to 6.2 dS/m.

General trend of the groundwater quality at the selected points is more or less flat,indicating minor changes;

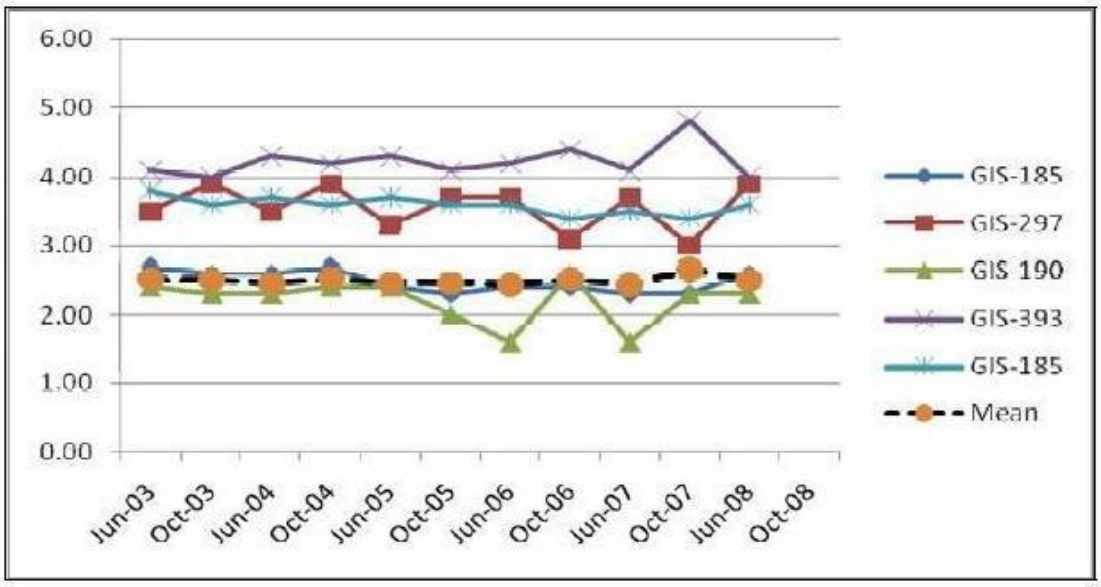


Figure 5-4 **Water Quality Trends in Faisalabad District (EC-dS/m)**

5.1.7 Number of Tube Wells in Faisalabad District

As per inventory of 2011-12, within Faisalabad district there were 31,984 private irrigations as well as government water supply Tube wells. Distribution of these Tube wells is given below:

Table 5-4 Number of Tube wells in Faisalabad District

Total			Diesel Engine Operated			Electric Operated		
Total	**Private**	**Govt.**	**Total**	**Private**	**Govt.**	**Total**	**Private**	**Govt.**

31,984	**31,967**	**17**	**28,005**	**28,005**	**0**	**3,979**	**3,962**	**17**

5.1.8 Surface Water

Primary sources of surface water for Faisalabad District is the River Chenab. Extensive canal system, off taking from Khanki Barrage, irrigates agricultural lands of the district. Name of the main canal irrigating the area is Lower Chenab Canal. A small part of the district is also irrigated by Upper Chenab Canal off taking from Marala Barrage.

5.2 Ecological Environment

Ecological Environment involves:

- Flora
- Fauna
- Endangered species

5.2.1 Flora

There are no natural forest trees, grassland or ecological important place. But the natural vegetation has been replaced by the industries. So, this sector consists generally of industrial land. Some of the older stands of trees, especially fruit trees, still survive the onslaught of urbanization on this previously natural and agricultural area. There is wild growth of Mesquite bushes in the areas near the project area.

Floral species can be divided into following groups:

- Fruiting Plants
- Non-Fruiting Plants
- Crops

Amongst trees, the most important are Kikar (Acacia Arabica), Shisham or Tahli (Delbergiasissoo), Beri (Zizyphus jujube), Toot (Morus alba), Sharin (Albizzia lebbek), Dherek (Melia azeharach), Phulai (Acacia modesta), Pipal (Ficus religiosa) and Bohr (Ficus bengalansis) are planted for shade. The growth in Rakhs is composed mainly of three kind of trees, Jand (Prosopis spicigera), Karir (Capparis aphylla), and Wan (Salvadora oleoides). Occasionally Rero (Acacia ieucophhloea) and Farash (Tamarix articulata) are also found. Pilchhi (Tamarix dioica) is found on moist sandy soil along the river and is used for wicker work & basket making etc.

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

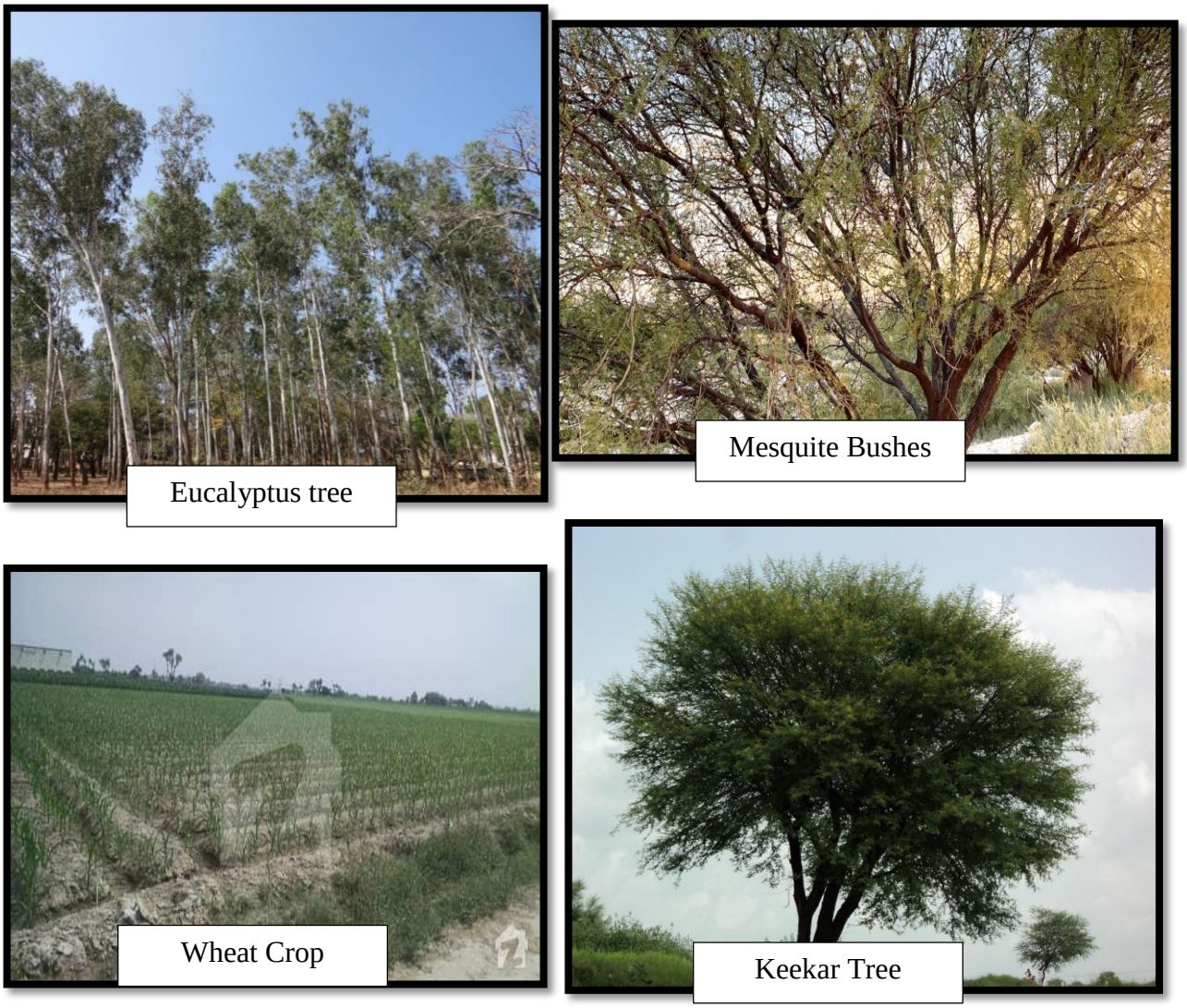


Figure 5-5 Flora of Project Area

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. Common species of birds found in the propsed project area are sparrows, crows, pigeon, dove, tiliar (starling), parrot, quail, pintail and humming bird etc. River Chenab is source of freshwater fishes. Some commercial fisheries operate in the project area.



Hoopoe Bird



House Crow



Little Egret



Jackal



Snake



Tiliar (Starling)

Figure 5-6: Fauna of the Project Area

5.2.3 Endangered species

There are no floral or faunal species inhibiting in the project area that are included in RED Data Book of IUCN, birds population is reported to be reduced during last decades because of pesticide sprays on crops.

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. 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 access 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 and water treatment plants (WTP), Over Head Reservoir (OHR) and Markaz-e-Abb (MA).

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 transact 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

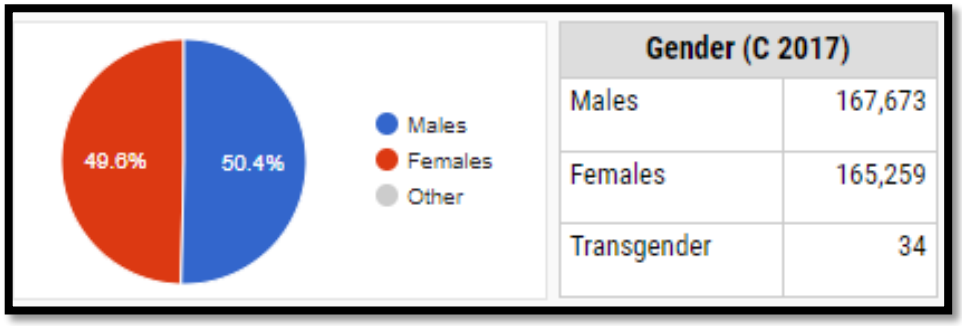
The town is traditionally known for its cotton trade. Historically, Tehsil Chak Jhumra was famous for its cotton trade and was considered as the hub of it. Before the partition of the subcontinent, there were three cotton mills in the town. Even today, this town is well-known for its textile manufacturing industry.

The town has a runway belonging to the army, but it is rarely used. Chak Jhumra is a railway junction so many people travel through its railway station. The town is connected by road to Salarwala, Shah kot, Chiniot and Faisalabad. In Chak Jhumra, a sizable population uses power looms to earn their live lihood. Public transportation available to this town is in a state of decay. Train is a major mode of transportation which may not be punctual, causing time delays.

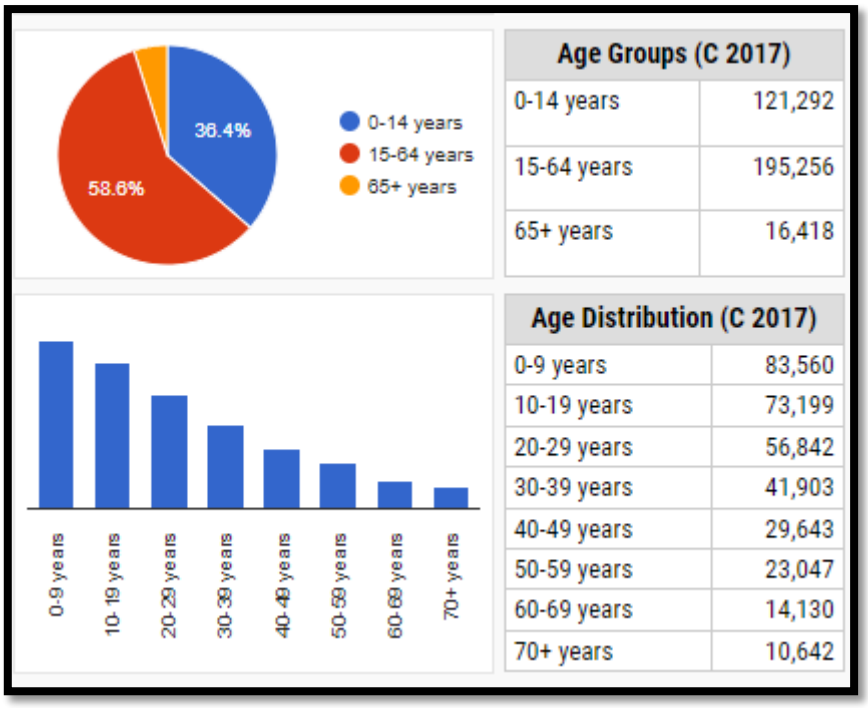
- **Population**

According to the 2017 census, the population of Tehsil Chak Jhumra is 332,461 and its population density is 635.4/km².

- **Gender and Age Disribution**



Gender (C 2017)	
Males	167,673
Females	165,259
Transgender	34

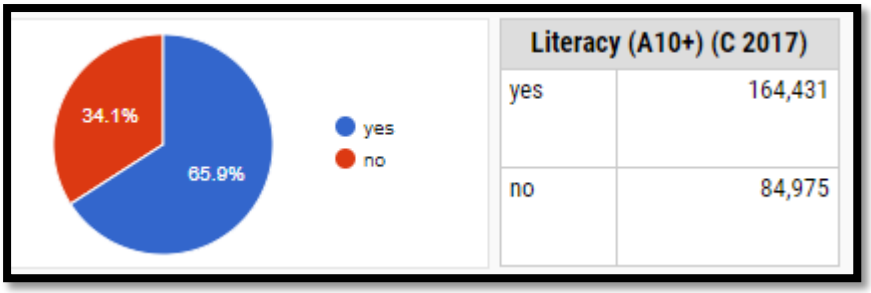


Age Groups (C 2017)	
0-14 years	121,292
15-64 years	195,256
65+ years	16,418

Age Distribution (C 2017)	
0-9 years	83,560
10-19 years	73,199
20-29 years	56,842
30-39 years	41,903
40-49 years	29,643
50-59 years	23,047
60-69 years	14,130
70+ years	10,642

- **Education**

According to Census of 2017, 65.9% of the people were literate in Tehsil Chak Jhumra.



Literacy (A10+) (C 2017)	
yes	164,431
no	84,975

Different educational institutions are located in this Tehsil including:

COLLEGES

Following colleges are located in the tehsil:

- Al-Suffah Girls Higher Secondary School
- Sandal college
- Higher secondary College
- Degree College Chak Jhumra
- Al Falah college
- Degree College for Woman

- Wisdom Public School and College

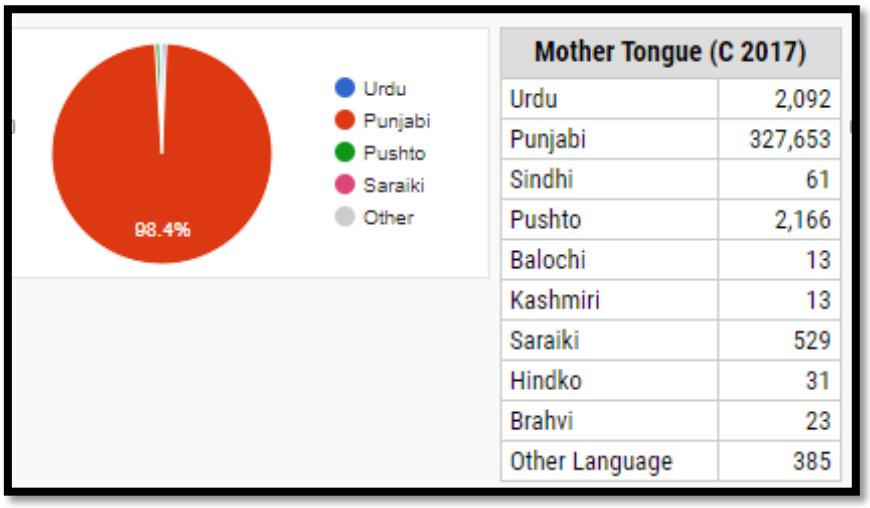
SCHOOLS

Government Higher Secondary School for Boys and one for Girls in Jhumra. Government Degree College for Boys and Girls in Chak Jhumra. Government Technical Training Center (Male) Gover nment Technical Training Center (Female). In Private Sector Global School & College is well reputed institutes in Jhumra

- **Basic Health Units**

➢ Tehsil Headquarter (THQ) Chak Jhumra
➢ 131002_BHU CHAK NO. 19/JB
➢ 131003_BHU CHAK NO. 20/JB
➢ 131009_BHU CHAK NO. 44/JB
➢ 131010_BHU CHAK NO. 47/RB
➢ 131025_BHU CHAK NO.102/JB
➢ 131029_BHU CHAK NO.126/RB
➢ 131031_BHU CHAK NO.133/RB
➢ 131032_BHU CHAK NO.134/RB

- **Languages**



Mother Tongue (C 2017)	
Urdu	2,092
Punjabi	327,653
Sindhi	61
Pushto	2,166
Balochi	13
Kashmiri	13
Saraiki	529
Hindko	31
Brahvi	23
Other Language	385

- **Castes**

Kainth, Bajwa, Warriach,Waince, Cheema, Chattha, Sahi, Malik, Rajput, Rajpoot Janjua, Mughal, Shiekh, Gujar, Jats, Alawi, Ansari, wahla, Syed, Bar, Arain, Mian, Willoun, Cheeand, Shamsi and Mirasi are the major castes in Chak Jhumra City.

- **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 and Sui-gas was present in the area. People use groundwater obtained via hand-pumps for drinking purposes without any treatment.

- **Landmarks (Archeological and Cultural Sites)**

There is a well known mosque and tomb of hazrat Qaim Ali Shah. There is a Sikh Gurudwara (shrine) dedicated to Shaheed Bhai Dalip Singh. There is also a small market called Chak Jhumra main bazaar. It has Punjabi cultural and historical values for their products food and other stuff.Chak Jhumra is also linked with Motorway M3 through "Sahianwala" Interchange. Chak Jhumra is situated amid of two industrial estates namely "Khurrian wala Industrial Area" and "Faisalabad Industrial Zone, Sahianwala".

No official heritage sites or historic, religious or archeologically important sites are located in the subproject works areas. There are no major historic or archaeological feature of note but there a few places of worship i.e. mosques within about 100-250m of some of the proposed Markaz-e-aab..

5.4 Environmental Baseline Monitoring

To assess the baseline conditions of the project area, following environmental components were monitored:

- Ambient air quality monitoring,
- Noise monitoring and
- Water sampling and analysis

Water Sources in Chak Jhumra: The Drinking water is being used from two basic sources:

- Surface waters, such as canals / rivers
- Groundwater.

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.

The following five sources of raw water have been considered for the proposed water supply schemes of the project area:

- Shallow groundwater underlying the selected village, having TDS less than 800 mg/l
- Deep groundwater underlying shallow saline groundwater, having TDS less than 800 mg/l
- Saline groundwater, having TDS more than 800 mg/l, underlying the village of water distribution
- Canal water flowing within the project area
- Shallow groundwater close to major canals of the project area, having TDS less than 800 mg/l

Based on the pervious result of the ERS given in the prior feasibility study, water quality data and considering the sustainability of the water supply system, the recommended water source for this Project is to tap fresh ground water from shallow layer close to major irrigation canals. Moreover, the selected option is being used by PHED and other private housing scheme since more than decades and this option is more reliable, workable and sustainable for long run.

5.4.1 Water Quality Report

The bores for tube wells already established in the project site are capped and none of these are operational at present. In order to bring these well bores in function, it is pertinent to carry out some physical works at the bores i.e. installation of submersible pumps and testing and commissioning of tube wells etc. Therefore, the water sample collection from these existing bores is not possible as the establishment of tube well is not included in consultant's scope of work. This issue was raised with the client (PAPA) in the weekly meetings with consultant that was held on Monday 17 Jan,2022 and Monday 24 Jan,2022 duly chaired by Director General, PAPA.

It was decided by the client that pervious water quality analysis results that were conducted in 2018 can be used to select the degree of treatment and treatment technologies in the present project.

It was also concluded in the weekly meetings that contractor will be bound to carry out water quality sampling and analyses after the establishment, testing and commissioning of tube wells in the project area.

It is further recommended by the consultant that contractor will be bound to submit the water quality results and get approval of proposed treatment technology and degree of treatment from client and consultant before execution of treatment plant works at site. In case of any change of scope of work for treatment works, the additional cost or reduction of cost will be dealt with at the execution stage

separately. The Water samples were collected from the selected sites and analyzed by National Institute for Biotechnology and Genetics Engineering (NIBGE) laboratory. The testing of various quality parameters was carried out as described in Table below:

Table 5-5 Selected Water Quality Parameters for testing of source points

Sr. No.	Chemical / Physical/ Biological Tests	WHO guidelines	Units
Microbial Aspects			
1	Total Coliform	Nil	--
	Fecal Coliform	Nil	--
2	E. Coli	Nil	--
Physical Aspects			
3	pH	6.5 - 8.5	--
4	Odor	Non	--
5	Color	≤15	**TCU**
6	Taste	Non	--
7	Turbidity	<5	**NTU**
8	TDS	<1,000	**mg/l**
9	Total hardness as CaCO3	-	**mg/l**
10	Temperature	-	**°C**
11	Dissolved Oxygen	-	**mg/l**
12	Hydrogen Sulfide	-	**mg/l**
Chemical Aspects			
13	Aluminum (Al)	-	**mg/l**
14	Antimony (Sb)	0.02	**mg/l**
15	Arsenic (As)	0.01	**mg/l**
16	Barium (Ba)	0.7	**mg/l**
17	Boron (B)	2.4	**mg/l**
18	Cadmium (Cd)	0.003	**mg/l**
19	Chloride (Cl)	-	**mg/l**
20	Chromium (Cr)	0.05	**mg/l**
21	Copper (Cu)	2	**mg/l**
22	Cyanide (CN)	-	**mg/l**
23	Fluoride (F)	1.5	**mg/l**

Sr. No.	Chemical / Physical/ Biological Tests	WHO guidelines	Units
24	Lead (Pb)	0.01	**mg/l**
25	Manganese (Mn)	-	**mg/l**
26	Mercury (Hg)	0.006	**mg/l**
27	Nickel (Ni)	0.07	**mg/l**
28	Nitrate (NO3)	50	**mg/l**
29	Nitrite (NO2)	3	**mg/l**
30	Selenium (Se)	0.04	**mg/l**
31	Residual chlorine	5	**mg/l**
32	Zinc (Zn)	-	**mg/l**
33	Calcium (Ca)	-	**mg/l**
34	Magnesium (Mg)	-	**mg/l**
35	Sulfate	-	**mg/l**
36	Iron	-	**mg/l**
37	Sodium	-	**mg/l**
38	Alkalinity	-	**mg/l**
39	Potassium (K)	-	**mg/l**
40	Ammonia	-	**mg/l**
41	Asbestos	-	**mg/l**
42	Thallium	-	**mg/l**
43	Beryllium	-	**mg/l**
44	Bromate	0.01	**mg/l**
45	Molybdenum	-	**mg/l**
46	Conductivity	-	**µS/cm**
47	Carbonate	-	**mg/l**
48	Bicarbonate	-	**mg/l**
Organics			
49	COD	-	**mg/l**
50	TOC	-	**mg/l**

The above testing parameters were proposed by previous consultants and agreed by PSPC after thorough deliberation in the technical committee meeting.

NIBGE confirmed the testing of 40 parameters out of 50 parameters depending on the facilities they have. The remaining 10 parameters which were not tested by them are as follows:

Sr.No.	Chemical / Physical/ Biological Tests	Units
1	Ammonia	**mg/l**
2	Asbestos	**mg/l**
3	Antimony	**mg/l**
4	Beryllium	**mg/l**
5	Bromate	**mg/l**
6	Hydrogen Sulfide	**mg/l**
7	Molybdenum	**mg/l**
8	Selenium	**mg/l**
9	Thallium	**mg/l**
10	**Taste**	**-**

Water quality data from the previous feasibility study is given in the following Table.

Table 5-6 Source, Location and Quality of water at Chak Jhumra

ChakNo	Latitude	Longitude	S-1 TDS	S-1 BHD	S-1 Temp	S-2 TDS	S-2 BHD	S-2 Temp	S-3 TDS	S-3 BHD	S-3 Temp
187 RB Kacha Jhumra	31.550637	73.182250	1090	50ft	25.7c°	1660	50ft	26.4c°	1520	50ft	**23.7c°**
189 Rasool Pura	31.527270	73.235010	920	50ft	N/A	1520	N/A	N/A	1660	N/A	**24c°**
187RB BALOWANA	31.570640	73.160450	2510	4050ft	25.5c°	1600	40-50ft	26c°	2510	40-50ft	**25.5c°**
107JB PAHARANG	31.585180	73.145810	1740	40ft	N/A	1010	50ft	N/A	1800	40ft	**N/A**
161 RB NAPALKE	31.598720	73.163180	1170	30ft	23.2c°	270	N/A	N/A	1740	40ft	**22.8c°**
155RB Punwa	31.588090	73.255130	310	60ft	N/A	2000	50ft	N/A	1550	N/A	**N/A**
163RB Balgan	31.567490	73.249890	950	30ft	N/A	1730	60ft	N/A	410	N/A	**N/A**
164RB Mahees	31.548910	73.249610	890	N/A	N/A	1290	60	N/A	2530	40ft	**N/A**
162RB Sikander Pur	31.572430	73.226040	290	50ft	26.1c°	190	60ft	N/A	460	50ft	**N/A**
106 JB KHICHIANWALA	31.608360	73.127490	930	40-50ft	23.6c°	1020	45-50ft	27.2c°	1040	40-50ft	**25.4c°**
25 JB SATHOIWALA	31.623950	73.140010	1180	40ft	24c°	1470	N/A	24.2c°	1110	N/A	**23.1c°**
110 JB MAJHE WALA	31.580960	73.119560	270	60ft	24.5c°	200	100ft	25.25c°	N/A	N/A	**N/A**
110 JBSIKHAN WALA	31.587140	73.111490	1210	50ft	25.3c°	820	45ft	22.6c°	1100	50ft	**24.3c°**
109 JB NILLIAN WALA	31.585110	73.128910	750	40ft	N/A	760	50ft	N/A	520	40ft	**N/A**
188 Nallywala	31.543060	73.203110	560	50ft	N/A	410	45ft	N/A	330	110ft	**N/A**
147RB Chori	31.628690	73.304360	2180	40ft	27c°	2130	40ft	28c°	2090	50ft	**28c°**
141RB Aqil	31.616490	73.318320	890	45ft	N/A	590	40ft	N/A	590	60ft	**27c°**
Sadar Wala	31.633440	73.336000	2110	60ft	N/A	2230	300ft	N/A	1870	50ft	**N/A**

ChakNo	Latitude	Longitude	S-1 TDS	S-1 BHD	S-1 Temp	S-2 TDS	S-2 BHD	S-2 Temp	S-3 TDS	S-3 BHD	S-3 Temp
188 RB LAKARWALA	31.529350	73.196590	350	50-60ft	25.7c°	420	40-50ft	22.2c°	490	40 to 50ft	**23.9c°**
188RB Hassan pura	31.560460	73.204870	870	50ft	N/A	690	48ft	N/A	850	40ft	**N/A**
140RB Muthianwala	31.638940	73.325750	1510	40ft	28c°	2210	40ft	N/A	2190	50ft	**N/A**
186 RB DHULAM	31.569830	73.202930	550	N/A	N/A	1630	70ft	N/A	2380	N/A	**N/A**
47RB BALL	31.689300	73.340510	840	50ft	25.2c°	880	40ft	24.2c°	810	120ft	**25.5c°**
137RB Pahari Pur	31.670350	73.331910	1130	45ft	27.2c°	1280	50ft	25.6c°	2110	50ft	**25.3c°**
186 RB DOGRAN	31.578430	73.188180	320	60ft	N/A	750	50ft	N/A	2080	50ft	**N/A**
186 RB JINAHABADI	31.577900	73.182690	2260	40ft	N/A	2140	50ft	N/A	2110	40ft	**N/A**
139 RB Ghammi	31.670870	73.319330	800	35ft	26.6c°	1360	40ft	25.8c°	750	N/A	**24.50c°**
103 JB BARNALA	31.633170	73.095410	780	50-60ft	18.3c°	950	40ft	22.9c°	450	60ft	**16.9c°**
103 JB BARNALA B	31.635360	73.098630	660	60ft	22.7c°	1030	50ft	20.5c°	950	40ft	**22.9c°**
132RB Sahiwala	31.675430	73.265990	1910	40ft	26c°	900	60ft	24.2c°	2110	60ft	**24.5c°**
102 JB BURJ VILLAGE	31.635440	73.110400	900	150ft	22.8c°	850	60ft	22.9c°	820	60ft	**19.5c°**
102 JB BURJ MANDI B	31.654500	73.098820	500	50ft	24.9c°	440	60ft	20.3c°	930	60ft	**24.5c°**
126 SALARWAL	31.666870	73.291520	540	60ft	22c°	810	50ft	22.9c°	790	40ft	**22.5c°**
143RB Matanii	31.647110	73.290100	510	50ft	25c°	440	50ft	22.4c°	570	N/A	**N/A**
126RB Pahrang	31.664310	73.291570	830	40ft	22c°	810	50ft	22.9c°	790	40ft	**22.5c°**
144 RB GHARTAL KALAN	31.668680	73.231780	1010	60ft	N/A	820	60ft	25c°	1250	60ft	**24.5c°**
134 RB MITRANWALI Garbi	31.692280	73.199580	1220	40ft	23c°	110	N/A	25c°	440	30ft	**23.2c°**
134 RB MITRANWALI SHArqi	31.701870	73.230570	990	35ft	24.8c°	940	35ft	24.2c°	980	40ft	**22.4c°**

ChakNo	Latitude	Longitude	S-1 TDS	S-1 BHD	S-1 Temp	S-2 TDS	S-2 BHD	S-2 Temp	S-3 TDS	S-3 BHD	S-3 Temp
133 RB KAMALPUR	31.696310	73.249330	1290	40ft	22.3c°	380	40ft	24.5c°	1580	45ft	**27c°**
127RB BaWal Pur	31.705710	73.302760	240	40ft	28.1c°	250	45ft	23.7c°	390	45ft	**27.7c°**
131RB Bachwana	31.696570	73.281180	1510	50ft	27c°	100	55ft	25.7c°	1180	55ft	**24.5c°**
125RB Ladhar	31.704290	73.314090	210	70ft	26.8c°	1020	55ft	26.5c°	1880	50ft	**26.2c°**
23 JB Sodherean	31.665570	73.107480	860	35ft	26.9c°	840	35.4ft	24.4c°	460	45ft	**25.3c°**
25 JB Rehmat Abad	31.631690	73.144760	2050	30ft	26.3c°	1720	45ft	27.3c°	1330	30ft	**27.5c°**
124 RB Proppian	31.708480	73.337080	770	60ft	24.5c°	870	50ft	26.8c°	1460	70ft	**26.4c°**
124RB CHOTA Bahwalpur	31.716940	73.324940	560	40ft	27.2c°	300	40ft	27.3c°	480	45ft	**23.5c°**
293RB SHARQI	31.594750	73.238380	230	45ft	25.4c°	860	45ft	23.7c°	310	50ft	**24.5c°**
152 RB GUNA	31.654170	73.196820	1430	N/A	24.9c°	2050	50 to 60 ft	23.3c°	2070	35ft	**N/A**
293 RB Garbi	31.613150	73.216130	1930	40ft	26.4c°	1930	40ft	26.1c°	1600	40ft	**27.8c°**
157 RB Gojra	31.649820	73.181260	480	30ft	26.2c°	790	40ft	26.3c°	1380	N/A	**24.8c°**
128 RB Wahle	31.731420	73.276600	650	50ft	27.5c°	1510	50ft	26.7c°	860	50ft	**25.5c°**
23 JB na Bhatian	31.656800	73.120870	260	40ft	24.3c°	430	40ft	24.2c°	910	55ft	**27.3c°**
159 RB Bilal Nager	31.625620	73.161740	1370	40ft	26c°	1720	40ft	26.3c°	1420	50ft	**26.3c°**
153 RB Saheanwala	31.638130	73.234820	1860	40ft	27.8c°	1790	40ft	26.9c°	550	40ft	**26.6c°**
136 RB BHAKRAyWALI	31.678400	73.183210	1220	45ft	27c°	1030	50ft	28c°	1180	50ft	**25.8c°**
145RB Tabbran Dachak	31.629590	73.260890	810	40ft	25.6c°	600	30ft	26.8c°	460	30ft	**31c°**
21 JB RANI KY	31.673430	73.153220	1080	35ft	29.1c°	1090	30ft	27.9c°	1300	40ft	**27.5c°**
20 JB KHAN KE	31.673990	73.133000	830	40ft	28c°	1270	40ft	27.5c°	570	40ft	**28.5c°**
154 RB Bagayra	31.612310	73.244960	890	40ft	28.5c°	600	50ft	27.6c°	510	60ft	**26.7c°**
16 JB GOLYKY	31.691410	73.117420	1830	80ft	26.5c°	1590	70ft	25.4c°	1290	70ft	**27c°**
159 RB Sobe Chak	31.623180	73.202400	720	30ft	27.2c°	590	40ft	25.7c°	560	40ft	**26.5c°**

ChakNo	Latitude	Longitude	S-1 TDS	S-1 BHD	S-1 Temp	S-2 TDS	S-2 BHD	S-2 Temp	S-3 TDS	S-3 BHD	S-3 Temp
160RB Bangywala	31.599110	73.199020	900	55ft	27c°	1010	55ft	27.5c°	2090	40ft	**23.9c°**
42 JB Bar	31.768330	73.217220	1060	45ft	27.8c°	700	40ft	25.9c°	1350	70ft	**27.5c°**
45 JB Theiam	31.748890	73.170520	320	50ft	25.8c°	330	45ft	26.2c°	740	50ft	**26c°**
45 JB Majoranwala	31.744200	73.177790	540	50ft	24.3c°	550	45ft	26.2c°	1180	40ft	**25.9c°**
185RB Budhsing	31.588010	73.217310	350	40ft	27.6c°	400	N/A	26.8c°	530	40ft	**30.5c°**
42 JB Matmal	31.756520	73.185620	570	40ft	26c°	450	45ft	23.2c°	480	45ft	**25.9c°**
43 JB Parwana	31.743640	73.214780	750	40ft	26.1c°	610	50ft	24.1c°	890	45ft	**22.6c°**
161RB Botinwala	31.608840	73.181810	1320	N/A	26.5c°	590	40ft	26.1c°	440	60ft	**c°**
153RB DASKA	31.621650	73.232530	1620	40ft	28c°	1720	40ft	27.5c°	1840	40ft	**26.7c°**
44 JB Paka Dallah			750	50ft	25.9c°	700	40ft	23.3c°	470	45ft	**23.1c°**
17 JB BALMABAD	31.721840	73.155240	400	50ft	26.7c°	930	45ft	31.8c°	580	50ft	**26.4c°**
16 JB PANAKY	31.719640	73.143180	680	60ft	26.7c°	850	50ft	26.9c°	640	45ft	**26.5c°**
17 JB Lodhiky	31.721880	73.165180	570	55-60ft	26.7c°	370	50ft	24.9c°	530	60ft	**27.2c°**
165 RB JHANDWALI	31.535540	73.270090	430	45ft	24c°	760	50ft	25c°	1340	40ft	**24.5c°**
148 RB SOHNATOBA	31.601930	73.303320	1000	45ft	27.5c°	2130	40ft	25.1c°	2380	40ft	**21.5c°**
19JB Kadoky	31.705420	73.171680	590	60ft	27c°	530	50ft	24.1c°	600	50ft	**24.1c°**
19JB BARALI	31.714940	73.180010	1050	N/A	26.9c°	890	N/A	26c°	870	40ft	**27c°**
156RB DAIRAH	31.569820	73.273480	2450	40ft	27.3c°	860	35ft	27.2c°	1550	30ft	**28.2c°**
145RB CHATHYANWALA	31.636390	73.255330	1050	40ft	28.5c°	870	60ft	25.8c°	520		
157RB Gojra ASGHARTOWN	31.652450	73.172470	1270	40-45ft	23.5c°	1190	40 to 45ft	23.6c°	1070	45 to 50 ft	**23.5c°**
131RB Arori Choki	31.702480	73.248390	1260	40ft	29.8c°	980	40ft	28.8c°	830	40ft	**26.4c°**
132RB SALARWAL	31.678910	73.268690	1090	40ft	25c°	1450	40ft	25.2c°	2110	60ft	**24.5c°**
188RB	31.546620	73.207450	850	40ft	N/A	N/A	50ft	c°	480	50ft	

ChakNo	Latitude	Longitude	S-1 TDS	S-1 BHD	S-1 Temp	S-2 TDS	S-2 BHD	S-2 Temp	S-3 TDS	S-3 BHD	S-3 Temp
110JB Sheikhwala	31.566560	73.120700	410	50ft	N/A	570	50ft	25.1c°	370	50ft	**25.3c°**
189RB RASOOLPUR			380	55ft	24c°	540	60ft	24c°	690		**26c°**
135RB KANANDSIAN	31.709810	73.208280	800	40ft	22c°	1320	50ft	26.1c°	930	40ft	**28c°**
146RB DAOWALLA	31.624960	73.271890	430	40ft	27c°	470	40ft	27c°	470	60ft	**N/A**
146RB Khewa	31.605620	73.268650	820	40ft	N/A	470	70ft	c°	980	N/A	**N/A**
129RB Tibbi	31.734230	73.245300	820	25ft	22.7c°	840	50ft	24.5c°	1100	25ft	**25.5c°**
129RB ABDI RANSEWAL	31.719690	73.228390	920	40ft	28c°	940	40ft	25.5c°	1110	40ft	**23.5c°**
129RB Asian Wala	31.737570	73.239020	830	60ft	27.5c°	870	40ft	29c°	1100	40ft	**25.6c°**
142RB GHARTAL KHURD	31.652850	73.256870	1780	40ft	25c°	2080	50ft	25.1c°	1550	40ft	**25.5c°**
472JB JALMANWALA	31.759950	73.267040	1300	100ft	28c°	1050	50ft	27.5c°	930	50ft	**26.2c°**
158RB BODEWALI	31.632410	73.221160	1630	35ft	27.2c°	1220	60ft	27.2c°	1670	50ft	**27.2c°**
24JB Lahorian	31.645980	73.148060	1450	32ft	26.9c°	1660	N/A	28.1c°	1240	N/A	**28c°**
130RB Rattianwala	31.718920	73.268260	1200	40ft	27.7c°	810	40ft	27.9c°	810	30ft	**24.3c°**

5.4.2 Air Quality

IQAir, a Swiss air quality technology company, uploads the air quality of major cities of the world on daily basis using Air Quality Index (AQI). Air Quality Index, is a system for translating confusing pollutant concentration measurements, into one easy-to-understand scale to clearly represent the health risk posed by ambient air pollution.

In the month of Jan 2021, the AQI of Faisalabad District ranged 152 – 308 with a monthly average of 219.36. The average value of PM2.5 in Janauary 2021 is similar to the last year value (223 ug/m^3).This shows that the air quality of Faisalabad is very unhealthy for the residents in winter season.

While the AQI in May 2022 is having an average of 160 ug/m^3 which is also unhealthy. Same is the case with PM10; the concentration of PM10 is higher than PM2.5.

Table 5-7 Ambient Air Quality Standards of Punjab EPA, USEPA, WHO and World Bank

Standards		Parameters					
		SO_2	NOx	CO	O_3	$PM_{2.5}$	PM_{10}
PEQS	Standard	120 µg/m^3	120 µg/m^3	5 mg/m^3	130 µg/m^3	35 µg/m^3	150 µg/m^3
	Average Time	24 hrs	24 hrs	8 hrs	1 hr	24 hrs	24 hrs
NEQS	Standard	120	120 µg/m3	5 mg/m3	130	35 µg/m3	150
	Average Time	24 hrs	24 hrs	8 hrs	-	24 hrs	24 hrs
USEPA	Standard	365 µg/m3	100 µg/m3	10 mg/m3	235 µg/m3	35 µg/m3	150 µg/m3
	Average Time	24 hrs	annual mean	8 hrs	1 hr	24 hrs	24 hrs
WHO	Standard	20 µg/m3	190 - 320 µg/m3	10 mg/m3	100 µg/m3	25 µg/m3	50 µg/m3
	Average Time	24 hrs	1 hr	8 hrs	8 hrs	24 hrs	24 hrs

The main causes of pollution in Faisalabad include sources such as emissions from vehicles, with numerous cars, motorbikes and heavy-duty vehicles such as trucks, lorries and buses inhabiting the roads. Many of these run on lower quality fuels, or fossil fuels such as diesel, and often aren't subject to the same stringent rules that other countries might have in place, leading to huge numbers of ancient and outdated vehicles still being in use, putting out vast amounts of smoke and fumes far beyond the level of what a newer vehicle running on cleaner fuel would do.

Other sources are of course the many factories and textile mills around the city, along with brick kilns that number in the thousands, many of which also run on unclean fuel sources and are not subject to any universal regulations.

Other industrial areas that further contribute to pollution levels are ones such as chemical plants, foundries and smelting plants, sugar mills and poultry feed production units. Other causes of pollution

include the burning of wood and other materials in homes, dust from roadside areas as well as transborder smoke, which can be blown in from other areas and accumulate within the city, being unable to disperse and causing the heavily elevated numbers as seen on record.

Due to the increase in burning during the colder months, as well as the cold weather causing thermal inversion to further entrench the pollution within the city and make it even harder to disperse, the PM2.5 count rises to these excessive numbers. September through to November saw a significant decline in air quality, culminating in December with a reading of 217.3 µg/m³, and with its absolute highest reading in January with 220.4 µg/m³, which coincidentally is also the coldest month of the year in Pakistan.

5.4.3 Noise Quality

There is no continuous major source of noise in the project area. Intermittent sources include farm tractors, farm equipment, road and operational activities of some industries. Considering the intermittent nature of these noise sources, it can be concluded that the noise pollution in the area is low. Noise generated by the plant operations will be recorded periodically.

Chapter 6

Public and Stakeholder Consultation

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 performas 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). In the case of aforesaid project, the citizens of Faisalabad division will get opportunities of being employed. So, in the early development stages and during the operational phase the people will be benefited. 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.
- Government Departments such as; Field Office Environment (Faisalabad) divisions, Public Health and Engineering Department (PHED), Local Government Bodies had been consulted and considered as indirect stakeholders.
- 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. A series of scoping sessions and informal focus group discussions were carried out with local communities and local government representatives. The meetings were held at various locations. On the basis of the project location a survey plan was developed in order to gather details of the current socio-economic norms and activities. The survey plan was developed under the supervision of Environmental Expert.

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

Sr. No.	Location	Respondent's Name	CNIC/Contact	Main Concerns	Expectations
1	Chak# 132 R/B	Sohail Akbar	33100-5722727-5	• Priority for employment should be given to residing communities;	• Employment opportunities will be generated for local communities.
2	Chak#125 RB, Chaudhary Bricks	Siftul Nawaz	3310160640505	• Community water resources should not be over-exploited;	• Drinking water provision shall be ensured without comprising the quantity or quality.
3	Chak#142, Ghartal Khurd	M. Akram	3310130651991	• Construction activity should be carried out during day hours. • Noisy activities should be confined.	• Improvement of sanitary conditions of the area

4	Chak#143 RB Matani	Shahbaz Ahmad	0346-4876266	• Construction activities must not hinder the movement of residents or their domestic animals for farming	• Upgradation of drinking water facilities
5	Chak#126 RB	M. Afzal Bajwa	3310008919825	• Noise levels should be controlled so as not to disturb the local residents during their daily activities.	• Construction works shall be carried out during day time.
6	Chak#147 RB	Zubair Ishaq	3310106979745	• No Objection or concerns	• Project is beneficial for the locals in terms of health and hygiene
7	Chak#141 RB, Aqil, Chak Jhumra	Azwar Ali	3310194033245	• Ease of access to the clean drinking water facility must be kept in mind while designing	• Public Health will be improved overall as a result of the proposed project
8	Chak#139 RB Ghammi	Abu Ubaida	331063561961	• Mentioned the dysfunctional water supply systems in their respective villages	• Individual saving arising from reduced price and time spent fetching water.
9	Chak#128 RB, Wahla	Naveed Anjum	0300-4248909	• There should not be any Damage / loss of public infrastructure / utilities, property, structure, livelihood etc.	• Ensure that privacy of local women is respected and any violator is strictly disciplined
10	Chak#130 RB, Rattan Wala	Nasir Mehmood	331018512335	• They have to travel long distances in order to fetch drinking water which is not necessary reliable,	• They see the project as an improvement in their daily lives.

6.7 Pictorial Assessment

Pictorial view of Public Consultation held in various Villages of Tehsil Chak Jhumra is presented in **Annexure II** .

6.8 Consultant's Conclusions

People in the Tehsil presently have no adequate quality & quantity of water and the few existing pipe network in some villages of the tehsil is not reliable for safe drinking water. Majority population of Tehsil is effected by this problem. 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 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 Chak Jhumra. 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.

Chapter 7

Potential Environmental Impacts and Mitigation Measures

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 Faisalabad Division, Tehsil Chak Jhumra. 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 Chak Jhumra 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 environmental 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 constructed in Chak Jhumra Tehsil of 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 Markaz-e-aab are proposed to be built are owned by the government and a few of them are 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, 2-3 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 Chak Jhumra, 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 to the residents of the mentioned districts. 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	LA	LA	LA	O	O	O	LA	LA	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)	LA	LA	LA	MA	LA	LA	LA	O	O	LA	MA	LA	LA	LB	LA	O	O	LA	O	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/concretework 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								
	Environmental Components / Project Activities	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
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	LA	O	LA	O	O	LA	LA	O	O	O	LA	O	O	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.

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 Markaz-e-aab 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 Markaz-e-aab, 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 Markaz-e-aab 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 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 (Markaz-e-aab) to the residents of the area.

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 be established 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 paved road structure. 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 m^2 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 500 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.

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, lying 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

In project area, no significant changes are envisaged in traditional lifestyle and occupation of local people residing in the nearby communities. The local people are rather benefited due to the provision of job opportunities. No impact is envisaged due to influx of workers as local will be preferred and hired for working. Social issues may arise which will cause minor negative impact on the social lifestyle of people. Moreover, health and safety related issues may arise during the construction activities. These impacts are in-significant can be further reduced significantly by adopting best management practices.

Nature of Impact

The nature of proposed impact will be direct, low, short-term and hence insignificant.

Mitigation Measures

Following mitigation measures will be adopted to reduce the socio – economic impact on the community:

- Good relations with local communities will be promoted by encouraging contractor to provide opportunities for skilled and un-skilled employment to the locals as well as on job training.
- In case of not hiring the locals, contractor will restrict his permanent staff to mix with the locals to avoid any social problems.
- The contractor should prefer hiring local labor from adjacent communities.
- The contractor will keep the copy of National Identity Card (CNIC) of his employees and will warn the workers not to involve in any anti-social activities otherwise they may face dire consequences.
- At the time of hiring the contractor must ensure that workers should be good repute.
- First aid kits having all the necessary first aid stuff will be available at site.
- Routine medical checkups of all the field staff including unskilled labor needs to be conducted by qualified physician and surgeon.
- Trainings of workers should be carried out for operating various constructional machinery, safety procedures should be adopted, environment awareness should be carried out, equip all workers with safety boots, helmets, and protective masks and monitoring for their proper and sustained usage will be carried out. In case of accidents, contractor will provide free medical treatment to the community.
- The contractor will be responsible for sensitivity towards the local customs and traditions.

7.5 Impacts and Mitigation Measures during Operational Phase

1) Impact of Water Intake

Water source for Markaz-e-aab will be seepage water of canal in Tehsil Chak Jhumra. 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 (SOx, NOx 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 tress/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) Socio Economic Impacts

It is envisaged that the adverse impacts associated with the development of abovementioned project includes; local community will be disturbed due to increase in the traffic load (i.e., vehicles approaching towards site on daily basis), wastewater management, soil pollution, etc. The intensity of the aforesaid project will be quite low. The commencement of the aforesaid project will have a beneficial impact on the surrounding community such as; increase in employment opportunity, increase in the wages of the local area employees, increase in revenue generation, provision of social

welfare funds of the employees, provision of potable drinking water and appreciation in the land value of the area.

Nature of Impact

The aforesaid impact is considered to be positive and will have a direct, medium impact.

Mitigation Measures

No mitigation measures will be required.

9) 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 PAPA.

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 by TMA.

10) 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.

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 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.

Chapter 8

Environmental Management and Monitoring Plan

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 Institutional Responsibilities

Following functionaries will be involved in the implementation of EMMP:

8.2.1 Primary Responsibilities

The primary responsibility for implementing EMP during construction and operational phase of the project lies with the client: Punjab Aab-e-Pak Authority.

8.2.2 Operational Management and Control

Conducting the operational activities in environmentally sound manner will be the responsibility of the concerned Manager; for which he will be trained.

8.2.3 Supervision and Monitoring

Senior Supervisor will be responsible for all environmental issues and for the implementation of EMP.

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 Punjab Aab-e-Pak Authority & 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.

8.3 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:

KEY:

- CC = Construction Contractor
- EPA = Environmental Protection Agency
- PAPA = Punjab Aab-e-Pak Authority

HSE = Health & Safety Engineer
RE = Resident Engineer
CBO= Community Based Organizations

Table 8-1 EMMP for Construction and Operational Phase

Sr #	Environmental Component and Activity	Mitigation Measures	Monitoring Indicators	Data Collection or Reporting Frequencies	Responsible Authority	Mitigation Cost
CONSTRUCTION PHASE						
1	Clarification of property Rights	Govt.-owned land will be preferably utilized for the construction of Markaz-e-aab. Verification of the indemnification and compensation of the affected persons and owners of land expropriated. (if applicable). During mobilization of the contractor, PAPA authority	Land ownership documents/details	Once before construction	PAPA, CBO`s, CC	No additional cost required

		officials, CBO`s of PHED, Contractors and Consultants will meet with the owners of the private lands and the lands will be purchased for the proposed sub-projects.				
2	Construction of a temporary site offices/camps and lay down area may have a limited impact on the topography	Limit earthworks to the minimum required for the proposed facilities such as site office. Use purpose built Containers to serve as camp or site office	Earthwork quantities optimization	Prior to commencing earthworks	Construction Manager	The cost of these measures will be included in other items of work. No additional payment will be made.
3	Laying of Water Pipelines	The lying of water supply 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.	Visual inspection	Daily checks	PAPA, RE, CC	The cost of these measures will be included in other items of work. No additional payment will be made.

4	Effluent from construction workers' temporary amenities leaching into groundwater, carrying nutrients and micro-organisms	Provision of temporary amenities for workers. Effluent should be treated via septic tank or suitably disposed off-site	Efficiency of provided amenities	Prior to commencing construction	CC, HSE	Included in the cost of works
5	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	Location and quantities of cut and fill volumes	Before and During construction	CC, RE	Included in the cost of works
6	Water for wash down of vehicles and machinery on site may contaminate groundwater	Provision of uncontaminated water for dust suppression and wash down of vehicles and machinery	Water quality for dust suppression	Bi - Weekly	CC, RE, HSE	No additional cost needed

7	Spills or leaks of fuels, lubricants or chemicals from machinery and vehicles 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	Correctness of procedures and plans	Prior to commencing construction	CC, HSE	Included in the cost of works
8	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 reach a waterway; Diversion of overland flow around work areas / construction sites	Visual inspections	Daily checks of the location of the stockpiles	CC, RE	No additional cost needed

9	Traffic congestions	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). 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	Number of vehicles required to transport workers	Daily/weekly	CC, Site engineer, HSE	Included in the cost of works
			Efficiency of signs location	Prior to commencing construction		
			Number of local suppliers involved compared to non-local construction materials	Prior to and during construction		
			Traffic Level of Service	Prior to and during construction		

10	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); Wire fence meshing, dust screens or wooden hoardings should be installed to delineate the construction area and therefore decrease impacts; The access points for construction vehicles should be a minimum of 100m from school or mosque access	Noise levels monitoring	during construction	CC, site supervisor	Included in the cost of works
11	Dust emissions generated from earthworks due to loading and unloading	Minimizing the height and slope of stockpiles to ensure erosion of unconsolidated	Visual Inspections or PM_{10}, $PM_{2.5}$ monitoring	Prior to commencing construction	CC, RE	The cost of these measures will be included in other items of work.

	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 water supply network	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. Use of water sprays to decrease dust generation		Prior to commencing construction Daily/Weekly Daily		No additional payment will be made.
12	Workers' safety on-site	-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	Visual Inspection	Daily	HSE expert, CC	Contingency charges are made part of cost estimate for the project and cost of PPEs shall be included in it.

		- Presence of notices posted at the sight of workers showing the names and phone numbers of officials and describing the early warning system				
13	Deterioration of landscape (trees and plants) that exists at the proposed new site location	Plant trees and shrubs around facility	Trees layout, number and height	At the end of construction	PAPA	Included in Environmental Budget of project
OPERATIONAL PHASE						
14	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	Visual Inspection, Electricity Bills	During operation	PAPA, EPA	Included in O&M cost of the project works. No additional cost needed.
15	Water drawdown rate	Control water extraction to match as close as groundwater recharge rate	Amount of water being extracted	Bi-weekly	PAPA	No additional cost needed

16	Improper chlorination dosage may alter water quality	Regular monitoring of water content and of chlorination performance	Water quality tests Total coli forms not detectable in any 100 ml sample	Monthly or Quarterly basis	Health Officer, EPA	Included in O&M cost of the project works. No additional cost needed.
17	Potential hazard from the use of chlorine	Regular monitoring of chlorination performance and appropriate disposal of wastes	Water quality tests and visual inspections	Quarterly and daily respectively	PAPA, Operation manager	Included in O&M cost of the project works. No additional cost needed.
18	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	Noise level monitoring	During operation Quarterly basis	PAPA, Operation manager, EPA	Included in O&M cost of the project works. No additional cost needed.
19	Occupational Health and Safety Issues	The issues related to operation of machinery and equipment will be controlled by efficient management, staff training,	ISO 45001, OHSAS 18001	Daily during operation	PAPA HSE.	Included in O&M cost of the project works. No

		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 employees including masks, gloves etc.				additional cost needed.
20	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.	-	-	PAPA, and Local Municipal Corporation	-

8.4 Environmental Monitoring

Environmental monitoring can be categorized into two types:

- Compliance Monitoring
- Effects Monitoring

The environmental monitoring will be conducted according to SMART rules and EPA regulation.

8.4.1 Compliance Monitoring

Compliance monitoring will be carried out to ensure compliance with the requirements of the EIA and EMMP. The project staff and contractors will carry out the inspections on a routine basis. This will also include the routine monitoring at the project site as specified in EMMP.

8.4.2 Effects Monitoring

To monitor actual impacts of the project on selected sensitive receptors so that impacts not anticipated in the EIA report or impacts which exceed the levels anticipated in the EIA report can be identified and appropriate mitigation measures can be adopted in time. This objective will be achieved through effects monitoring.

Considering the environmental conditions of the project area and the assessment of potential impacts of the project made in the EIA report, the following monitoring program will be undertaken:

- **Ambient air quality:** ambient air monitoring should be carried out to validate the results of air monitoring. The monitoring will be carried out at key locations covering both environmental receptors and worker's occupational exposures.
- **Noise:** measurement of noise levels within the project site and the surroundings will be carried out on regular basis to ensure that the noise levels are within the standards stated in the EIA report.
- **Groundwater:** as a good environmental practice, groundwater will be monitored regularly to observe any unlikely change in groundwater properties.

8.4.3 Objectives of Environmental Monitoring

The main objectives of the pre-construction and construction phase monitoring plans will be to:

- Monitor the actual impacts of the works on the project site physical, biological and socio – economic receptors. This will indicate the adequacy of the EIA assessment.
- Recommend mitigation measures for any unexpected impact or where the impact level exceeds the anticipated impacts.

- Ensure compliance with legal obligations including safety on construction site.
- To monitor the rehabilitation of the borrow areas and the restoration of construction campsites as described in the EMP.

The main objectives of monitoring during operational phase activities are as follows:

- Appraise the adequacy of the EIA with respect to the project`s predicted long term impacts of operation of the filtration plants on physical, biological and socio-economic environment.
- Evaluate the effectiveness of the mitigation measures proposed in the EMP and recommend improvements, when necessary; and
- Compile periodic environmental monitoring reports on the basis of recommendations provided in the EMP.

8.4.4 Reporting Structures and Outcomes

Progress reporting will be the overall responsibility of the Project Director who will provide inputs to the Supervision Consultants for submission of Progress Report to PAPA. The Supervision Consultants will be responsible for submitting a monthly or quarterly report for the Project to PAPA.

Table 8-2 Environmental Monitoring Plan at the Construction and Operational Phases of the Project

Components	Parameters	Location	Frequency	Responsibility	Duration
Ambient Air Quality	CO, NOx, SOx, PM_{10}	Labor camp sites Batching Plant sites	Monthly	CC & independent testing authority	24 Hours
Noise Level	-	Construction Site Camp Site	Monthly at both sites throughout the construction period and When required.	CC & independent testing authority	Reading taken at 15 Sec. Intervals over 15 min, every hour and then averaged
Ground Water Quality	For Parameters given in PEQS	At Markaz-e-aab Sites and water source	Monthly	CC & independent testing authority	Composite or Grab Samples
Visual Check for Vegetation Loss	Type and number of tree species uprooted	Construction Site Camp Site	At the beginning of construction activities	-	-
Air Quality	CO, NOx, SOx, PM_{10}	Markaz-e-aab sites	Quarterly	PAPA	24 Hours
Ground Water Quality	As mentioned in PEQS	Markaz-e-aab sites	Quarterly	PAPA	Composite or Grab Sample
Noise Level	-	Markaz-e-aab sites	Quarterly	PAPA	Reading taken at 15 Sec. Intervals over 15 min, every hour and then averaged

8.5 Environmental Training

An environmental training and technical assistance program will be carried out to build the capacity to effectively implement this EMP, as well as to facilitate the improved environmental management of future projects by increasing the environmental and social awareness of PAPA staff in general. PAPA with the collaboration of monitoring consultants will arrange the environmental trainings sessions for their staff. The objectives of this session will be to help establish appropriate systems, and to train PAPA staff responsible for managing environment, operations and planning, who can then impart training at a broader level within and outside the PAPA. The details of this training program is presented in table below:

Table 8-3: Training Program / Technical Assistance Services

Consultants	Contents	Trainees	Duration
Monitoring consultants/ organizations specializing in environmental management and monitoring	Short seminars and courses on: Environmental laws and regulations daily monitoring and supervision	Two seminars for PAPA Project staff	2 Weeks
Monitoring consultants/ organizations specializing in social management and monitoring	Short seminars and courses on Social awareness	Two seminars for Project staff dealing in Social matters	2 Weeks
Monitoring consultants/ organizations specializing in Occupational, health and safety issue	Short lectures relating to Occupational Health and Safety	Two seminars for contractor's staff	2 Weeks

8.6 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 8-4: Equipment Maintenance Details

Task	Weekly	Monthly	Semi - Annually	Annually
Testing and Inspection		✓		

Check for Leakage		✓		
Recharging				✓
Pipelines		✓		
Machinery			✓	
Solar panels			✓	

8.7 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. An environmental budget of **1.5-2 million PKR** will include the cost for plantation and landscaping, PPEs, air, noise and water quality testing, hiring of HSE engineers and Environmentalists and various other miscellaneous costs.

8.8 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.

8.8.1 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.

8.8.2 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.

8.9 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 Chak Jhumra. As a result, Grievance Redress Mechanism is not required.

8.10 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, the documented evidence for which is attached as **Annexure-III**. Therefore, no monetary compensation needed to be made to anyone for the proposed project.

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 only 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 Chak Jhumra of Faisalabad.

Monitoring and proper employment of the Environmental Management Plan are necessary for the sucessful 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 150 to 200 local people during construction phase and direct employment of approximately 100 to 125 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 town 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 in Faisalabad division of Pakistan.
- This project is directly beneficial for the Residents of Chak Jhumra, as potable drinking 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.
- Availability of water at the designated times at Markaz-e-aab will reduce the unnecessary loss of drinking water in the area.

- 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.

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

Annexure I

Response of Public Consultation and Socio-economic Survey

Punjab Aab-e-Pak Authority

Questionnaire for Field Staff Regarding PROVISION OF SAFE DRINKING WATER IN DISTRICT FAISALABAD BY UTILIZING 66 EXISTING BOREHOLES OF PUNJAB SAAF PANI COMPANY (NORTH ZONE)

Village:	Chak No 124 RB Proposed	Teh:	Chak Jhumra	Distt:	Faisalabad

Sr.No.	Query			Response			
1	Reference Tubewell (Bore): CJ/C2/B1						
	Co-ordinates of Markaz E Aab 31.710255°, 73.335875°			3-0-27		3-Marla	✓
	Available Area Yes				sq.ft		marla
	Owned by Govt						
	(i) Government (Specify) Forest Meadows						
	(ii) Private (Specify)						
	Name: Ayaz Mehmood (Fiaz)	Cell no: 0300 7981797 ~~03007457797~~	CNIC No. 33101-2687053	Stamp Paper Status			
	Site/Material Accessibility						
	Availability of Electricity Yes						
	Nearest Drainage Point Yes						
	Any underground/overhead obstacle No						
	Availability of any other source of safe drinking water No						
	Site Condition (Depression/Elevated)			Levelled			
2	Distribution Network						
	No. of hindrances/crossings No						

	Nature of Hindrance	Co-ordinates	Length	NOC Required
(i)				
(ii)				
(iii)				
(iv)				
(v)				

Attachments

i. Any Map or Drawing Collected-- Yes/No

ii. Rough sketch w.r.t Village specimen sketch enclosed

Notes/Comments/Additional Information

Data collected by:

Name: Sajid Hussain

Date of Data Collection: 27/01/2022

Signature:

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Punjab Aab-e-Pak Authority

Questionnaire for Field Staff Regarding PROVISION OF SAFE DRINKING WATER IN DISTRICT FAISALABAD BY UTILIZING 66 EXISTING BOREHOLES OF PUNJAB SAAF PANI COMPANY (NORTH ZONE)

Village: Chak No 131 RB (Bachelana) | Teh: Khas Jhumra | Distt: Faisalabad

Sr.No.	Query			Response
1	Reference Tubewell (Bore): CJ/BL/B1			
	Co-ordinates of Markaz E Aab 31.695386, 73.281014			10 Marla
	Available Area			sq.ft / marla
	Owned by Government			
	(i) Government (Specify)			
	(ii) Private (Specify)			
	Name: Sheraz Muhammad	Cell no. 0345-6468131	CNIC No. 33101-6684260-3	Stamp Paper Status
	Site/Material Accessibility			Yes
	Availability of Electricity			Yes
	Nearest Drainage Point			No
	Any underground/overhead obstacle			No
	Availability of any other source of safe drinking water			No
	Site Condition (Depression/Elevated)			2 ft deep from road.
2	Distribution Network			
	No. of hindrances/crossings No			
	Nature of Hindrance	Co-ordinates	Length	NOC Required
(i)	No			
(ii)	No			
(iii)	No			
(iv)				
(v)				

Attachments

i. Any Map or Drawing Collected-- Yes/No

ii. Rough sketch w.r.t Village specimen sketch enclosed

Notes/Comments/Additional Information

Data collected by:

Name: Sajid Hussain

Date of Data Collection: 27/01/2022

Signature:

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent Abid Hussain
2. Gender : Male ✓ Female
3. Age 52
4. Education Matric
5. Address Chak No 131 RB (Bodwana) Tehsil Chak Jhumra District Faisalabad
6. Marital Status Yes Married
7. Contact / CNIC No. 3301-8711089-5

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   Yes ✓ **No**

9. How you were informed about this project?

   _____

10. In your Opinion. Do you think this project should be implemented?

    Yes ✓ **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    Yes ✓ **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    Yes ✓ **No**

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

    Yes ✓ **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	No	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent Muhammad Mushtaq
2. Gender : Male ✓ Female
3. Age 52
4. Education Undg Matric (Pachwana)
5. Address Chak NO 131 RB Tehsil Chak Jhumra District Faisalabad
6. Marital Status Married
7. Contact / CNIC No. 0345-7886650 33101-6147835-9

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   Yes ✓ **No**

9. How you were informed about this project?

10. In your Opinion. Do you think this project should be implemented?

    Yes ✓ **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    Yes ✓ **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    Yes **No** ✓

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

    Yes ✓ **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Punjab Aab-e-Pak Authority

Questionnaire for Field Staff Regarding PROVISION OF SAFE DRINKING WATER IN DISTRICT FAISALABAD BY UTILIZING 66 EXISTING BOREHOLES OF PUNJAB SAAF PANI COMPANY (NORTH ZONE)

Village: Chak No 131 R.B Asrori Wali | Teh: | Distt:

Sr.No.	Query	Response
1	Reference Tubewell (Bore): CJ|C2|B1	
	Co-ordinates of Markaz E Aab 31.701488 73.250023	3 Marla
	Available Area Yes	sq.ft / marla
	Owned by	
	(i) Government (Specify)	
	(ii) Private (Specify)	
	Name: Shafqat Ali / Cell no. 0301-2297023 / CNIC No. 3310-6772673-9	Stamp Paper Status
	Site/Material Accessibility	Yes
	Availability of Electricity	Yes
	Nearest Drainage Point	Yes
	Any underground/overhead obstacle	No
	Availability of any other source of safe drinking water	NO
	Site Condition (Depression/Elevated)	3 ft deep from Road
2	Distribution Network	
	No. of hindrances/crossings NO	

	Nature of Hindrance	Co-ordinates	Length	NOC Required
(i)				
(ii)				
(iii)				
(iv)				
(v)				

Attachments

i. Any Map or Drawing Collected-- Yes/No

ii. Rough sketch w.r.t Village specimen sketch enclosed

Notes/Comments/Additional Information

Land was transferred to Govt. Claimed by Numberdar & Villagers

Data collected by:

Name: Sajid Hussain

Date of Data Collection: 27/01/2022

Signature:

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Environmental Impact Assessment (EIA)
Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"
Punjab Aab-e-Pak Authority
Questionnaire for Socio-Economic Survey
Januaury 2022
Personal Information

1. Name of Respondent Shehraz Mustafa
2. Gender : Male ✓ Female
3. Age 23
4. Education Matric
5. Address Chak No 131 RB Arroy Wala Tehsil Chak Jhumra, Distoid FSD
6. Marital Status Not Married
7. Contact / CNIC No. 33100-2202477-5 0346-4081131

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   ✓ **Yes** **No**

9. How you were informed about this project?

10. In your Opinion. Do you think this project should be implemented?

    ✓ **Yes** **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    ✓ **Yes** **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    Yes ✓ **No**

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

    ✓ **Yes** **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets	✓	

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	✗

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent Engr. Fayyad Hussain Dogar
2. Gender : Male Female
3. Age 45
4. Education B.Sc Civil Engineering
5. Address Chak No 131 RB Arbab Wala Tehsil Chak Jhumra District Fsd.
6. Marital Status Married
7. Contact / CNIC No. 33101-8065101-9 0300-7144131

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   Yes **No**

9. How you were informed about this project?

10. In your Opinion. Do you think this project should be implemented?

    Yes **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    Yes **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    Yes **No**

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

    Yes **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets	✓	

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Punjab Aab-e-Pak Authority

Questionnaire for Field Staff Regarding PROVISION OF SAFE DRINKING WATER IN DISTRICT FAISALABAD BY UTILIZING 66 EXISTING BOREHOLES OF PUNJAB SAAF PANI COMPANY (NORTH ZONE)

Village: Chak No 127 RB (Behlol pur) Teh: Chak Jhumra Distt: Faisalabad

Sr.No.	Query			Response
1	Reference Tubewell (Bore): CJ/C2 (B)			
	Co-ordinates of Markaz E Aab 31.7d903, 73.302495			3-Marla
	Available Area 3-Marla			sq.ft / marla
	Owned by Government			
	(i) Government (Specify)			Union Council
	(ii) Private (Specify)			
	Name: Asad Tanveer	Cell no. 0341-5833438	CNIC No. 3310-1707585-3	Stamp Paper Status
	Site/Material Accessibility			
	Availability of Electricity			Yes
	Nearest Drainage Point			Yes
	Any underground/overhead obstacle			NO
	Availability of any other source of safe drinking water			NO
	Site Condition (Depression/Elevated)			Levelled.
2	Distribution Network			
	No. of hindrances/crossings NO			
	Nature of Hindrance	Co-ordinates	Length	NOC Required
(i)				
(ii)				
(iii)				
(iv)				
(v)				

Attachments

i. Any Map or Drawing Collected-- Yes/No

ii. Rough sketch w.r.t Village specimen sketch enclosed

Notes/Comments/Additional Information

Data collected by:

Name: Sajid Hussain

Date of Data Collection: 27/01/2022

Signature:

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent Shoaib Ahmed
2. Gender : Male Female
3. Age 48
4. Education Matric
5. Address Chak No 127 RB (Behlol pur) Tehsil Chak Jhumra District Fsd.
6. Marital Status Yes
7. Contact / CNIC No. 3210-3368036-3 (0321-6039300)

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   Yes **No**

9. How you were informed about this project?

10. In your Opinion. Do you think this project should be implemented?

    Yes **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    Yes **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    Yes **No**

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

    Yes **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers	✓	
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent Safdar Ali
2. Gender : Male Female
3. Age 45
4. Education Matric
5. Address Chak No 187 RB Kacha Jhumra Tehsil Chak Jhumra District Fsd.
6. Marital Status Married
7. Contact / CNIC No. 0340 3384263 3361-1828116-7

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

✓ **Yes** **No**

9. How you were informed about this project?

Survey Team

10. In your Opinion. Do you think this project should be implemented?

✓ **Yes** **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

Yes ✓ **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

Yes ✓ **No**

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

✓ **Yes** **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	No	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers		✓
Mosques		✓
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent Nasir Mehmood
2. Gender : Male ✓ Female
3. Age 38
4. Education Un Educated
5. Address Chak No 130 RB Rattian Wala Tehsil Chak Jhumra District FSD.
6. Marital Status Married
7. Contact / CNIC No. 3310/-8512335-1

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

✓ **Yes** **No**

9. How you were informed about this project?

Survey Team

10. In your Opinion. Do you think this project should be implemented?

✓ **Yes** **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

✓ **Yes** **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

✓ **Yes** **No**

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

✓ **Yes** **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions		✓
Healthcare Centers		✓
Mosques		✓
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent Rizwan Ali
2. Gender : Male ✓ Female
3. Age 24
4. Education Middle
5. Address Chak No 472 JB Jagmanwala Tehsil Chak Jhumra, District FSD
6. Marital Status Not married
7. Contact / CNIC No. 0345-6621620)

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   Yes **No** ✓

9. How you were informed about this project?

   Not Informed.

10. In your Opinion. Do you think this project should be implemented?

    ✓ **Yes** **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    ✓ **Yes** **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    ✓ **Yes** **No**

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

    ✓ **Yes** **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions		✓
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)
Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"
Punjab Aab-e-Pak Authority
Questionnaire for Socio-Economic Survey
Januaury 2022
Personal Information

1. Name of Respondent Javed Iqbal
2. Gender : Male ✓ Female
3. Age 40
4. Education Middle
5. Address chak No 133 EB Kamal pur Tehsil Chak Jhumra District Fsd
6. Marital Status Married
7. Contact / CNIC No. 0336-7991094

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   ✓ **Yes** **No**

9. How you were informed about this project?

   Survey Team

10. In your Opinion. Do you think this project should be implemented?

    ✓ **Yes** **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    ✓ **Yes** **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    Yes **No** ✓

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

    ✓ **Yes** **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers	✓	
Mosques		✓
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)
Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"
Punjab Aab-e-Pak Authority
Questionnaire for Socio-Economic Survey
Januaury 2022
Personal Information

1. Name of Respondent Nasir Mehmood
2. Gender : Male ✓ Female
3. Age 38
4. Education Un Educated
5. Address Chak No 130 RB Pattian Wala Tehsil Chak Jhumra, District Fsd.
6. Marital Status Married
7. Contact / CNIC No. 3310-8512335-1

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

✓ **Yes** **No**

9. How you were informed about this project?

Survey Team

10. In your Opinion. Do you think this project should be implemented?

✓ **Yes** **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

✓ **Yes** **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

✓ **Yes** **No**

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

✓ **Yes** **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions		✓
Healthcare Centers		✓
Mosques		✓
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)
Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"
Punjab Aab-e-Pak Authority
Questionnaire for Socio-Economic Survey
Januaury 2022
Personal Information

1. Name of Respondent Naveed Anjum
2. Gender : Male ✓ Female
3. Age 38
4. Education Middle
5. Address Chak No. 128 RB Wahla Tehsil Chak Jhumra District Fsd.
6. Marital Status Married
7. Contact / CNIC No. 33301-7570114-7 0300-4248909

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

✓ **Yes** **No**

9. How you were informed about this project?

Survey Team

10. In your Opinion. Do you think this project should be implemented?

✓ **Yes** **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

✓ **Yes** **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

✓ **Yes** **No**

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

✓ **Yes** **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent Abu Ubaida.
2. Gender : Male ✓ Female
3. Age 40
4. Education Matric
5. Address C#139 RB Ghammi, Chak Jhumra, FSD.
6. Marital Status Married.
7. Contact / CNIC No. 3310635619 61

- **Project Related Information**

8. *Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?*

   Yes **No** ✓

9. How you were informed about this project?

   —

10. In your Opinion. Do you think this project should be implemented?

    Yes ✓ **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    Yes ✓ **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    Yes ✓ **No**

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

    Yes ✓ **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	NO	Value enhancement of project area	Yes
Odor Problems	NO	Health benefits to the residents	Yes
Any Social Issues	NO	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	NO
Provision of Commercial markets	NO
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	NO
No Response	

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent Azwar Ali
2. Gender : Male ✓ Female
3. Age 28
4. Education F.A
5. Address Chak 141 RB Aqil, Chak Jhumra, FSD
6. Marital Status Married.
7. Contact / CNIC No. 3310194033245.

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   Yes ~~No~~

9. How you were informed about this project?

   —

10. In your Opinion. Do you think this project should be implemented?

    ~~Yes~~ **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    ~~Yes~~ **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    ~~Yes~~ **No**

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

    ~~Yes~~ **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	NO	Value enhancement of project area	Yes
Odor Problems	NO	Health benefits to the residents	Yes
Any Social Issues	NO	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions		✓
Healthcare Centers		✓
Mosques		✓
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	NO
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	NO
No Response	

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Environmental Impact Assessment (EIA)
Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"
Punjab Aab-e-Pak Authority
Questionnaire for Socio-Economic Survey
Januaury 2022
Personal Information

1. Name of Respondent Zubair Ishaq.
2. Gender : Male ✓ Female
3. Age 52.
4. Education Matric
5. Address Chak 147 RB Choi, Chak Jhumra, FSD.
6. Marital Status Married.
7. Contact / CNIC No. 3310106979745

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   Yes **No** ✓

9. How you were informed about this project?

   —

10. In your Opinion. Do you think this project should be implemented?

    ✓ **Yes** **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    ✓ **Yes** **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    ✓ **Yes** **No**

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

    ✓ **Yes** **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	No	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions		✓
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	NO
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	NO
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes (not much)
No Response	

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent M. Afzal Bajwa.
2. Gender : Male ✓ Female
3. Age 68.
4. Education BS. MEd. Pahrang
5. Address 126RB Colony, Chak Jhumra, FSD.
6. Marital Status Married.
7. Contact / CNIC No. 3310008919825.

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad, Samundri, Jaranwala and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   ~~Yes~~ ✓ **No**

9. How you were informed about this project?

   Though survey team.

10. In your Opinion. Do you think this project should be implemented?

    ~~Yes~~ ✓ **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    ~~Yes~~ ✓ **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    ~~Yes~~ ✓ **No**

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

    ~~Yes~~ ✓ **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes, a bit	Value enhancement of project area	Yes
Odor Problems	A bit	Health benefits to the residents	Yes
Any Social Issues	NO	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	✓
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)

Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"

Punjab Aab-e-Pak Authority

Questionnaire for Socio-Economic Survey

Januaury 2022

Personal Information

1. Name of Respondent Shahbaz Ahmad.
2. Gender : Male ✓ Female
3. Age 65
4. Education Matric - F.A.
5. Address 143 RB Matanii, Chak Jhumra, FSD.
6. Marital Status Married.
7. Contact / CNIC No. 03464876266.

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   Yes **No** ✓

9. How you were informed about this project?

   Previous survey.

10. In your Opinion. Do you think this project should be implemented?

    Yes ✓ **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    Yes **No** ✓

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    Yes **No** ✓

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

    Yes ✓ **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	No	Value enhancement of project area	Yes
Odor Problems	NO	Health benefits to the residents	Yes
Any Social Issues	NO	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions		✓
Healthcare Centers	✓	
Mosques		✓
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	NO
Provision of Filtration Plants	Not much
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)
Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"
Punjab Aab-e-Pak Authority
Questionnaire for Socio-Economic Survey
Januaury 2022
Personal Information

1. Name of Respondent M. Akram.
2. Gender : Male ✓ Female
3. Age 67
4. Education F.A.
5. Address Chak 142 Ghaital Khud, Chak Jhumra, FSD.
6. Marital Status Married.
7. Contact / CNIC No. 3310-3065199-1.

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

~~Yes~~ ✓ **No**

9. How you were informed about this project?

Suwey team.

10. In your Opinion. Do you think this project should be implemented?

~~Yes~~ ✓ **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

~~Yes~~ ✓ **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

~~Yes~~ ✓ **No**

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

~~Yes~~ ✓ **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	No	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

Scanned with CamScanner

Environmental Impact Assessment (EIA)
Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"
Punjab Aab-e-Pak Authority
Questionnaire for Socio-Economic Survey
Januaury 2022
Personal Information

1. Name of Respondent Siftul Nawaz.
2. Gender : Male✓ Female
3. Age 58.
4. Education B.A.
5. Address 125RB Ladhar, Chaudhey Bricks, CT
6. Marital Status Married.
7. Contact / CNIC No. 3310160640505.

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

✓Yes **No**

9. How you were informed about this project?

Survey team.

10. In your Opinion. Do you think this project should be implemented?

✓Yes **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

✓Yes **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

✓Yes **No**

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

✓Yes **No**

Scanned with CamScanner

14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	NO	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	NO	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)
Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"
Punjab Aab-e-Pak Authority
Questionnaire for Socio-Economic Survey
Januaury 2022
Personal Information

1. Name of Respondent Sohail Akbar.
2. Gender : Male ✓ Female
3. Age 50
4. Education Matric
5. Address Chak#132 RB, Sahiwala, Chak Jhumra, FSD.
6. Marital Status Married.
7. Contact / CNIC No. 3310057227275

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   ✓ Yes **No**

9. How you were informed about this project?

   Survey team.

10. In your Opinion. Do you think this project should be implemented?

    ✓ Yes **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    ✓ Yes **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    ✓ Yes **No**

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

    ✓ Yes **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	NO	Health benefits to the residents	Yes
Any Social Issues	No	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions		✓
Healthcare Centers		✓
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)
Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"
Punjab Aab-e-Pak Authority
Questionnaire for Socio-Economic Survey
Januaury 2022
Personal Information

1. Name of Respondent Sumaz Pervaiz
2. Gender : Male ✓ Female
3. Age 60 Years
4. Education Matric
5. Address Chak No 124 RB Poopbian Tehsil Chak Jhumra District Fsd.
6. Marital Status Married
7. Contact / CNIC No. 33101-8456901-3

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   ✓ **Yes** **No**

9. How you were informed about this project?

   Survey Team

10. In your Opinion. Do you think this project should be implemented?

    ✓ **Yes** **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    ✓ **Yes** **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    Yes ✓ **No**

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

    ✓ **Yes** **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers	✓	
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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Environmental Impact Assessment (EIA)
Feasibility Study, Detailed design and Bidders Evaluation for the Project " Provision of Safe Drinking Water in District Faisalabad by utilizing 66 existing boreholes of Punjab Saaf Pani Company (North Zone)"
Punjab Aab-e-Pak Authority
Questionnaire for Socio-Economic Survey
Januaury 2022
Personal Information

1. Name of Respondent Khalid Farooq
2. Gender : Male ✓ Female
3. Age 60
4. Education Matric
5. Address chak No 124 RB Proplan Teh Chak Jhumra Dist Fsd
6. Marital Status Yes
7. Contact / CNIC No. 0306 4819545 (3310-4405254-5)

- **Project Related Information**

8. Do you know that (Punjab Aab-e-Pak Authority is planning to install treatment plants in Faisalabad Saddar, Samundri, and Chak Jhumra tehsils) to provide safe drinking water to its residents?

   Yes ✓ **No**

9. How you were informed about this project?

   Survey Team

10. In your Opinion. Do you think this project should be implemented?

    Yes ✓ **No**

11. Do you experience any difficulties regarding potable and safe drinking water in your area?

    Yes ✓ **No**

12. Do you experience any pathogenic diseases (diarrhea, typhoid, cholera etc.) due to unsafe drinking water in your area?

    Yes **No** ✓

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

    ✓ **Yes** **No**

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14. In your opinion, what are possible impacts of this project?

Impacts (during construction)	Response	Impacts (After construction)	Response
Land Acquisition		Employment Opportunities	Yes
Air Pollution, Dust and Noise Issue	Yes	Value enhancement of project area	Yes
Odor Problems	Yes	Health benefits to the residents	Yes
Any Social Issues	Yes	Overall improvement of potable water supply in project area.	Yes

15. Facilities nearby the proposed project area?

Facilities	Yes	No
Educational Institutions	✓	
Healthcare Centers	✓	
Mosques	✓	
Historical / Archeological Sites		✓
Commercial Markets		✓

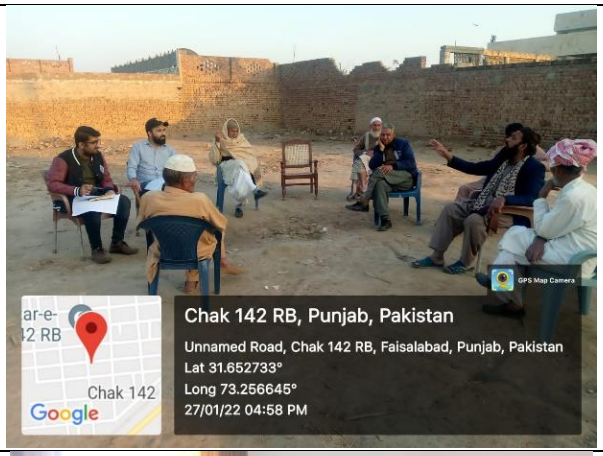
16. In your opinion what are the pressing needs of the subject area?

Pressing Needs	Response
Provision / upgradation of Drinking Water Facility	Yes
Provision / upgradation of roads	Yes
Provision / upgradation of Educational Institutes	Yes
Provision of Commercial markets	Yes
Provision of Filtration Plants	Yes
Provision of Recreational Facilities	Yes
No Response	

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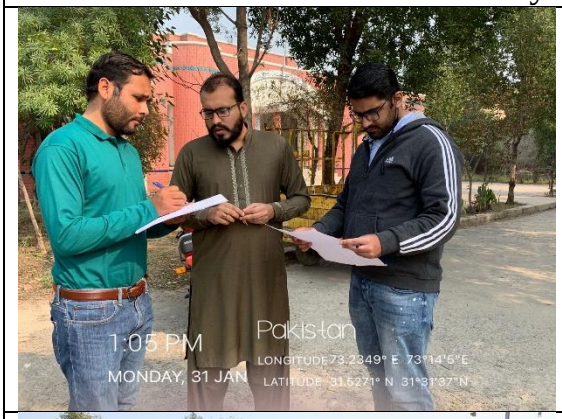
Annexure II

Pictorial View of Public Consultation
at various sites of the Tehsil

Survey Team (Cluster 2)	
	Survey team with residents of village discussing regarding Markaz-e-Aab initiative by Punjab Aab-e-Pak Authority.
	Survey team with Numberdar in discussion regarding location of Markaz-e-Aab.
	Questionnaire form being filled by survey team member regarding point of view of community.
Survey Team (Cluster 3)	
	The residents of village helping to locate the land for Markaz-e-Aab.

	Survey team member explaining the project of Safe water by Punjab Aab-e-Pak Authority.
Survey Team (Cluster 4)	
	The survey team members are in discussion with the owner of land which is proposed for Markaz-e-Aab.
	The Numberdar along with his members are in conversation with survey team members at the Dera.
	The survey team members are at the house of numberdar for land selection of Markaz-e-Aab.

Survey Team (Cluster 5)	
	The Numberdar along with residents of village are in discussion with survey team member regarding the Punjab-Aab-e-Pak project.
	The questionnaire form is being filled by survey team member along with resident of village.
	The numberdar discussing regarding land for Markaz-e-Aab with survey team member.
Survey Team (Cluster 6)	
	The survey team member is in discussion with the owner of land which is proposed for Markaz-e-Aab.

	The survey team members are in discussion with the owner of land which is proposed for Markaz-e-Aab.
Survey Team (Cluster 7)	
	Survey Team members asking for details related land for Markaz-e-Aab.
	Survey member filling up the questionnaire form during the survey.

Annexure III

Land Ownership Transfer Papers for Markaz-e-Aab

E-STAMP

E-Stamp ID : PB-FSD-A7E4EA972713F6D0
Stamp Type : Low Denomination
Amount : Rs 100/-

3864

Description :	AFFIDAVIT - 4
Applicant :	Farhat Zaheer Ullah[00000-0000000-0]
S/O :	Sana Ullah
Address :	Faisalabad
Issue Date :	7-Mar-2022 12:50:10 PM
Delisted On/Validity :	14-Mar-2022
Amount in Words :	One Hundred Rupees Only
Reason :	In favor of Punjab Aab e Pak Authority
Vendor Information :	Muhammad Ashraf | PB-FSD-6 | ETO Office

MUHAMMAD ASHRAF
STAMP VENDOR
LICENCE NO.06
ZILA KATCHERI FAISALABAD.

نوٹ :یہ ٹرانزیکشن تاریخ اجرا سے سات دنوں تک کے لیے قابل استعمال ہے۔

بیان حلفی

عنوان: وقت نامہ زمین برائے فراہمی آب پاک سنٹر آب پاک اتھارٹی حکومت پنجاب

میں مسمی / مسماۃ فرحت ظہیر اللہ ولد / دختر / زوجہ ثنا اللہ قوم شناختی کارڈ نمبر 33101-4380812-5
سکنہ حکیمہ 28 ارب رابطہ تحصیل چک جھمرہ ضلع فیصل آباد

حلفاً گواہی دیتا / دیتی ہوں کہ حکومت پنجاب عوامی فلاح و بہبود کے فراہمی آب پاک مرکز آپ کے لیے منتخب کی جگہ ذاتی ملکیتی ہے اور میں ۔۔۔۔۔۔۔۔ مرلہ جگہ بغیر کسی شرط کے آب پاک اتھارٹی حکومت پنجاب کو فراہمی آب پاک سنٹر کے لے وقف کرتا / کرتی ہوں حلفاً بیان دیتا ہوں کہ میں میرے وارثان آئندہ کبھی بھی اس جگہ پر کسی قسم کا حق ملکیت رقبہ کا دعویٰ نہیں کریں گے اور میں اس بات کا بھی حلف دیتا / دیتی ہوں کہ آب پاک اتھارٹی حکومت پنجاب کے مطالبہ پر میں متذکرہ ۔۔۔۔۔۔۔۔ مرلہ جگہ اس کے نام پر بغیر کسی معاوضہ کے انتقال کروادوں گا / گی۔ متذکرہ جگہ کے مشترق میں گلی ۔۔۔۔ مغرب گورنمنٹ سکول شمال میں خالی پلاٹ جنوب گلی ۔۔۔۔ واقع ہے۔

نام بیان دہندہ: فرحت ظہیر اللہ
ولدیت / زوجیت: عبدالجبار وایلہ ولد ارشد علی
شناختی نمبر:

دستخط / نشان انگوٹھا فرحت ظہیر اللہ
دستخط / نشان انگوٹھا عبدالجبار
دستخط / نشان انگوٹھا

OATH COMMISSIONER
SH. ABDUL WAHID
ADVOCATE
Exp:13-05-2022
Distt. Courts Faisalabad

ATTESTED
SH. ABDUL WAHID
ADVOCATE
OATH COMMISSIONER
DISTT. COURTS FAISALABAD

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E-STAMP

E-Stamp ID : **PB-FSD-A2FAB0CA70EB7A37**
Stamp Type : **Low Denomination**
Amount : **Rs 100/-**

38705

Description :	AFFIDAVIT - 4
Applicant :	Idrees Watto[00000-0000000-0]
S/O :	Muhammad Shafi
Address :	Faisalabad
Issue Date :	7-Mar-2022 12:48:21 PM
Delisted On/Validity :	14-Mar-2022
Amount in Words :	One Hundred Rupees Only
Reason :	In favor of Punjab Aab e Pak Authority
Vendor Information :	Muhammad Ashraf | PB-FSD-6 | ETO Office

MUHAMMAD ASHRAF
STAMP VENDOR
LICENCE NO.06
ZILA KATCHERI FAISALABAD.

نوٹ :یہ ٹرانزیکشن تاریخ اجرا سے سات دنوں تک کے لیے قابل استعمال ہے۔

بیان حلفی

عنوان: وقت نامہ زمین برائے فراہمی آب پاک سنٹر آب پاک اتھارٹی حکومت پنجاب

میں مسمی / مسماۃ سیف اللہ ولد / دختر از وجہ اسد اللہ قوم شناختی کارڈ نمبر 33107-3905206-3
سکنہ حلقہ 161 ربیب تحصیل جڑانوالہ ضلع فیصل آباد

حلفاً گواہی دیتا / دیتی ہوں کہ حکومت پنجاب عوامی فلاح و بہبود کے فراہمی آب پاک مرکز آپ کے لیے منتخب کی جگہ ذاتی ملکیتی ہے اور میں 3 مرلہ جگہ بغیر کسی شرط کے آب پاک اتھارٹی حکومت پنجاب کو فراہمی آب پاک سنٹر کے لے وقف کرتا / کرتی ہوں حلفاً بیان دیتا ہوں کہ میں میرے وارثان آئندہ کبھی بھی اس جگہ پر کسی قسم کا حق ملکیت رقبہ کا دعویٰ نہیں کریں گے اور میں اس بات کا بھی حلف دیتا / دیتی ہوں کہ آب پاک اتھارٹی حکومت پنجاب کے مطالبہ پر میں متذکرہ 3 مرلہ جگہ اس کے نام پر بغیر کسی معاوضہ کے انتقال کروادوں گا / گی۔ متذکرہ جگہ کے مشترق میں گلی مغرب بھیت شمال میں گلی جنوب خالی واقع ہے۔

بیان دہندہ: سیف اللہ ولد اسد اللہ

دستخط / نشان انگوٹھا

غلام رسول ولد حمد خان

دستخط / نشان انگوٹھا

عطاء اللہ ولد اسد اللہ

دستخط / نشان انگوٹھا

OATH COMMISSIONER
SH. ABDUL WAHID
ADVOCATE
Exp: 13-6-2023
Distt. Courts Faisalabad

ATTESTED
SH. ABDUL WAHID
ADVOCATE
OATH COMMISSIONER
DISTT. COURTS FAISALABAD

Scanned with CamScanner

E-STAMP

E-Stamp ID : PB-FSD-A114D2846EFB63F5
Stamp Type : Low Denomination
Amount : Rs 100/-

Description : AFFIDAVIT - 4
Applicant : Javed Iqbal[00000-0000000-0]
S/O : Lal Khan
Address : Faisalabad
Issue Date : 7-Mar-2022 12:47:33 PM
Delisted On/Validity : 14-Mar-2022
Amount in Words : One Hundred Rupees Only
Reason : In favor of Punjab Aab e Pak Authority
Vendor Information : Muhammad Ashraf | PB-FSD-6 | ETO Office

3B 764

MUHAMMAD ASHRAF
STAMP VENDOR
LICENCE NO.06
ZILA KATCHEFI FAISALABAD.

نوٹ :یہ ٹرانزیکشن تاریخ اجرا سے سات دنوں تک کے لیے قابل استعمال ہے۔

بیان حلفی

عنوان: وقت نامہ زمین برائے فراہمی آب پاک سنٹر آب پاک اتھارٹی حکومت پنجاب

میں مسمی / مسماۃ ازدر علی ولد/دختر از وجہ محمد علی قوم شناختی کارڈ نمبر 3310/- 9403324-5
سکنہ تحصیل چک جھورہ ضلع فیصل آباد

حلفاً گواہی دیتا/دیتی ہوں کہ حکومت پنجاب عوامی فلاح و بہبود کے فراہمی آب پاک مرکز آپ کے لیے منتخب کی جگہ ذاتی ملکیتی ہے اور میں 03 (تین) مرلہ جگہ بغیر کسی شرط کے آب پاک اتھارٹی حکومت پنجاب کو فراہمی آب پاک سنٹر کے لے وقف کرتا/کرتی ہوں حلفاً بیان دیتا ہوں کہ میں میرے وارثان آئندہ کبھی بھی اس جگہ پر کسی قسم کا حق ملکیت رقبہ کا دعویٰ نہیں کریں گے اور میں اس بات کا بھی حلف دیتا/دیتی ہوں کہ آب پاک اتھارٹی حکومت پنجاب کے مطالبہ پر میں متذکرہ 03 (تین) مرلہ جگہ اس کے نام پر بغیر کسی معاوضہ کے انتقال کروادوں گا/گی۔ متذکرہ جگہ کے مشرق میں گاؤں مغرب گاؤں کھیت شمال میں کھیت گاؤں جنوب گاؤں واقع ہے۔

بیان دہندہ: ازدر علی ولد محمد علی
گواہ: سید ریاض حسین / سمندر خاں
گواہ: محمد عدیل / سجاد علی

دستخط/نشان انگوٹھا
دستخط/نشان انگوٹھا
دستخط/نشان انگوٹھا

OATH COMMISSIONER
SH. ABDUL WAHID
ADVOCATE
Exp: 11-05-2023
Distt. Courts Faisalabad

ATTESTED
SH. ABDUL WAHID
ADVOCATE
OATH COMMISSIONER
DISTT. COURTS FAISALABAD

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E-STAMP

E-Stamp ID : PB-FSD-B355F5DF4BF527FA
Stamp Type : Low Denomination
Amount : Rs 100/-

Description : AFFIDAVIT - 4
Applicant : Badar Munir[00000-0000000-0]
S/O : Akbar Ali
Address : Faisalabad
Issue Date : 7-Mar-2022 12:58:20 PM
Delisted On/Validity : 14-Mar-2022
Amount in Words : One Hundred Rupees Only
Reason : In favor of Punjab Aab e Pak Authority
Vendor Information : Muhammad Ashraf | PB-FSD-6 | ETO Office

38708

MUHAMMAD ASHRAF
STAMP VENDOR
LICENCE NO.06
ZILA KATCHERI FAISALABAD.

نوٹ :یہ ٹرانزیکشن تاریخ اجرا سے سات دنوں تک کے لیے قابل استعمال ہے۔

بیان حلفی

عنوان: وقت نامہ زمین برائے فراہمی آب پاک سنٹر آب پاک اتھارٹی حکومت پنجاب

میں مسمی / مسماۃ بدر منیر احمد ولد / دختر از وجہ اکبر علی قوم شناختی کارڈ نمبر 33101-2903769-7
سکنہ حکیم کے رقبہ سکول دارالتحصیل چک حمزہ ضلع فیصل آباد

حلفاً گواہی دیتا / دیتی ہوں کہ حکومت پنجاب عوامی فلاح و بہبود کے فراہمی آب پاک مرکز آپ کے لیے منتخب کی جگہ ذاتی ملکیتی ہے اور میں 3 مرلہ جگہ بغیر کسی شرط کے آب پاک اتھارٹی حکومت پنجاب کو فراہمی آب پاک سنٹر کے لے وقف کرتا / کرتی ہوں حلفاً بیان دیتا ہوں کہ میں میرے وارثان آئندہ کبھی بھی اس جگہ پر کسی قسم کا حق ملکیت رقبہ کا دعویٰ نہیں کریں گے اور میں اس بات کا بھی حلف دیتا / دیتی ہوں کہ آب پاک اتھارٹی حکومت پنجاب کے مطالبہ پر میں متذکرہ 3 مرلہ جگہ اس کے نام پر بغیر کسی معاوضہ کے انتقال کروادوں گا / گی۔ متذکرہ جگہ کے مشترق میں سکول مغرب سکول شمال میں گاؤں جنوب گاؤں واقع ہے۔

نام بیان دہندہ: بدر منیر احمد
دستخط / نشان انگوٹھا

نام گواہ: خادم حسین
دستخط / نشان انگوٹھا

گواہ: محمد عثمان غفار
دستخط / نشان انگوٹھا

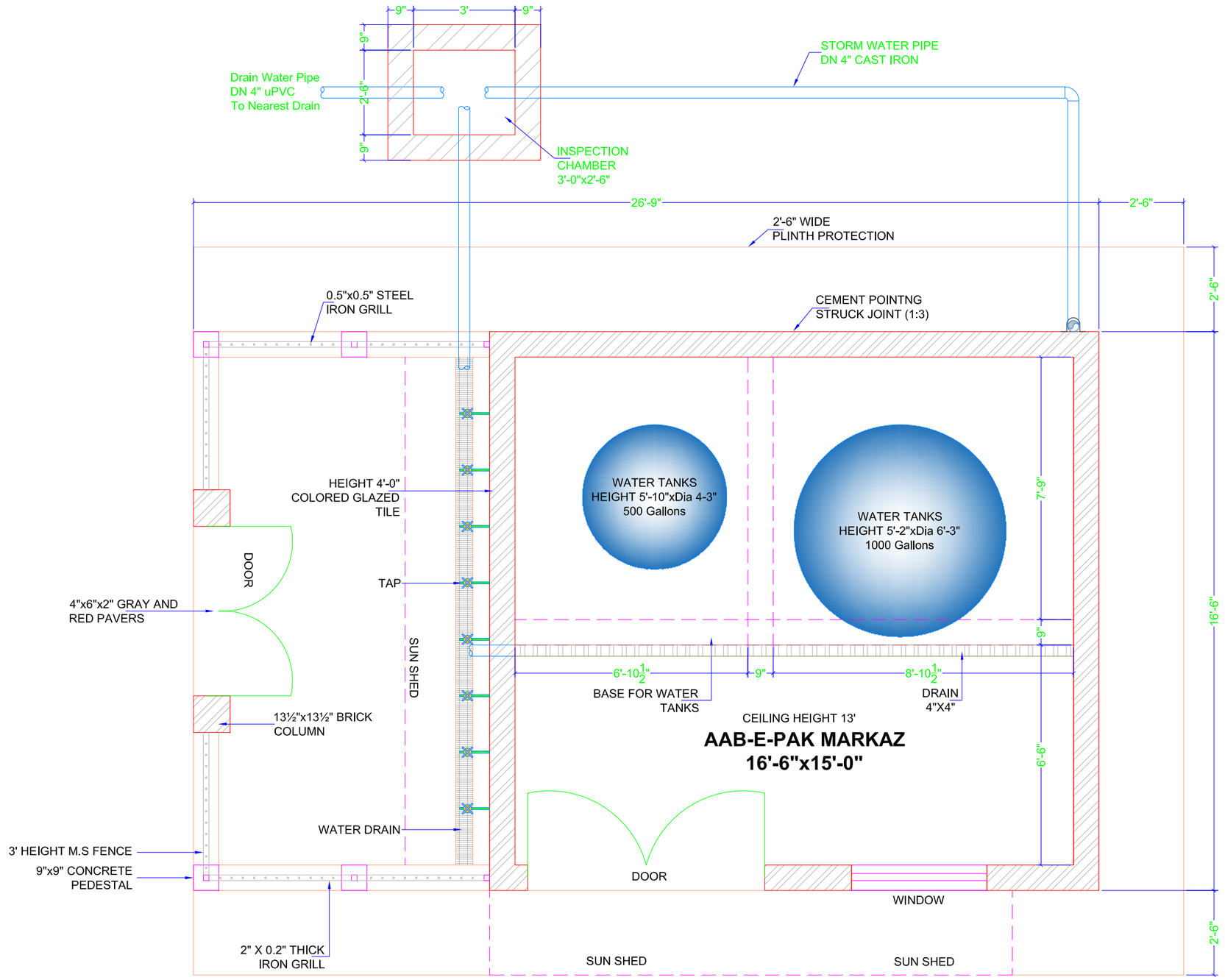
OATH COMMISSIONER
SH. ABDUL WAHID
ADVOCATE
Exp: 13-06-2023
District Courts Faisalabad

ATTESTED
SH. ABDUL WAHID
ADVOCATE
OATH COMMISSIONER
DISTT. COURTS FAISALABAD

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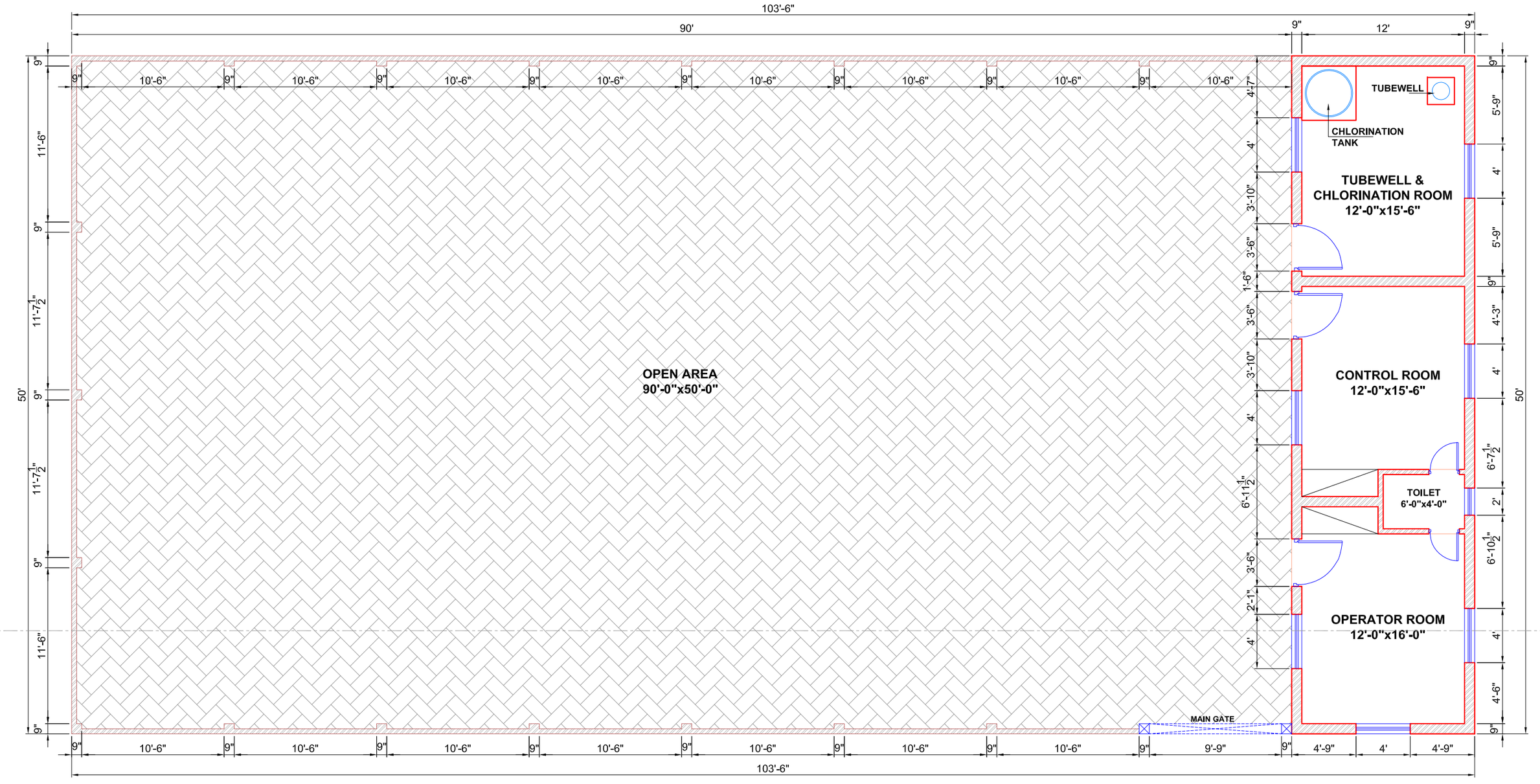
Annexure IV

Layout Plans of Project



AAB-E-PAK CENTER
(1500 Gallons)
AREA = 2.31 Marla

CLIENT: **PUNJAB AAB-E-PAK AUTHORITY**	CONSULTANTS: **JERS CONSULTANCY (PVT) LTD** (Formerly Jers Engineering Consultants) 24-Civic Center, Quaid-e-Azam Town, Township, Lahore (Pakistan) Tel: +92 42 35113123, +92 42 35113124 Fax: +92 42 35113125 E-mail: Info@jers.com.pk, mail@jers.com.pk Web: http://www.jers.com.pk	PROJECT: PROVISION OF CLEAN DRINKING WATER BY AAB-E-PAK AUTHORITY (PHASE-1) NORTH ZONE	DRAWING TITLE: **LAYOUT OF AAB-E-PAK MARKAZ (WORKING PLAN)**	DRAWN BY: Asif CHECKED BY: Zunair DATE: February, 2022	DRAWING NO: **AR-02** SCALE: 1"=4'-0" SHEET: 1 OF 6 JOB NO.: 465



WATER TREATMENT

REV.	DATE	DESCRIPTION

CLIENT:
PUNJAB
AAB-E-PAK AUTHORITY

CONSULTANTS:
JERS CONSULTANCY (PVT) LTD
24-Clvic Center, Quald-e-Azam Town, Townshlp, Lahore (Pakistan)
Tel: +92 42 35113123, +92 42 35113124
Fax: +92 42 35113125
E-mail: Info@jers.com.pk, mail@jers.com.pk
Web: http://www.jers.com.pk

PROJECT:
PROVISION OF CLEAN DRINKING WATER BY AAB-E-PAK AUTHORITY (PHASE-1) NORTH ZONE

DRAWING TITLE:
LAYOUT PLAN OF BORE, CHLORINATION & SOLAR AREA

DRAWN BY: Asif
CHECKED BY: Zunair
DATE: February, 2022

DRAWING NO: DWG-01
SCALE: -
SHEET: 1 OF 1
JOB NO: J-465

Annexure V

Google Earth Maps

Annexure VI

Water Testing Results and Well Logs

1. **Tehsil Chak Jhumra, district Faislabad**

NATIONAL INSTITUTE FOR BIOTECHNOLOGY & GENETIC ENGINEERING
(NIBGE) P O Box # 577, Jhang Road, Faisalabad, Pakistan.
Tel: (0092-41) 9201316-20 (5 lines); Fax: (0092-41) 9201322; URL: www.nibge.org

Soil & Environmental Biotechnology Division

EPA registered, ISO 9001:2008 certified

Ref.No NIBGE PIBS SEBD/PSP 2018/02 **Dated**: January 9, 2018
Sample Code: 17
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/01 Chak No. 45 JB) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 05-12-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	8.52	6.5-8.5	Iron(mg/l)	< 0.005	0.3
DO (mg/l)	4.1	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	0.4	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	216	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	138	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.3	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	15	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	34	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	15	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	50	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	284	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	3.9	NG	Magnesium(mg/l)	04	30
Temperature (°C)	21	NG	*E.coli* (cfu/100ml)	Nil	(0cfu/100ml)
Ca- Hardness (mg/l)	86	NG	*Coliform*(cfu/100ml)	480	(0cfu/100ml)
Bi- carbonates (mg/l)	222	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	104	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant® NOVA 60 Instrument.
Microbial analyses were done according to **Merck Microbiology Manual 12th Edition.**

1. This analytical test report is based solely on the particular sample(s) collected by the party and should not be reproduced in part.
2. The report is valid for 90 days from the date of issue.
3. Sampling has not been performed by the NIBGE and NIBGE does not accept the responsibility that the sample(s) supplied is/are truly representative sample(s) of bulk of stock entire production.
4. While NIBGE agrees to take reasonable precaution to ensure validity of its test results, it assumes no liability for the accuracy thereof beyond the amount of the fee charged for the analytical test.
5. The party shall assume full responsibility for the ethical use of results in the analysis/test report and the laboratory shall be held free from any and all claims which may result from the use of such data by the party of others.
6. After completion of report the sample will be preserved for one month unless agreed otherwise.
7. The contents of the report cannot be, in any manner, used for the publicity of the product or any advertisement.

Analyzed by
Dr. M. Afzal, P.S
Soil & Env. Biotech. Div.

Reported by
Dr. M. Sajjad Mirza, DCS
Head, Soil & Env. Biotech. Div.

NATIONAL INSTITUTE FOR BIOTECHNOLOGY & GENETIC ENGINEERING
(NIBGE) P O Box # 577, Jhang Road, Faisalabad, Pakistan.
Tel: (0092-41) 9201316-20 (5 lines); Fax: (0092-41) 9201322; URL: www.nibge.org

Soil & Environmental Biotechnology Division

EPA registered, ISO 9001:2008 certified

Ref.No. NIBGE PIBS/SEBD PSP/ 2018/02 **Dated:** January 9, 2018
Sample Code: 22
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/06 Chak No. 102 J.B) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 05-12-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	7.4	6.5-8.5	Iron(mg/l)	< 0.005	0.3
DO (mg/l)	5.0	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us cm)	188	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	120	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.2	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	08	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	24	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	21	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	50	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	240	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	Nil	NG	Magnesium(mg/l)	13	30
Temperature (°C)	21	NG	*E.coli* (cfu/100ml)	Nil	(0cfu/100ml)
Ca- Hardness (mg/l)	60	NG	*Coliform*(cfu/100ml)	28	(0cfu/100ml)
Bi- carbonates (mg/l)	207	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	112	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit.
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant ®NOVA 60 Instrument.
Microbial analyses were done according to **Merck Microbiology Manual 12th Edition.**

1. This analytical test report is based solely on the particular sample(s) collected by the party and should not be reproduced in part.
2. The report is valid for 90 days from the date of issue.
3. Sampling has not been performed by the NIBGE and NIBGE does not accept the responsibility that the sample(s) supplied is/are truly representative sample(s) of bulk of stock/entire production.
4. While NIBGE agrees to take reasonable precaution to ensure validity of its test results, it assumes no liability for the accuracy thereof beyond the amount of the fee charged for the analytical/test.
5. The party shall assume full responsibility for the ethical use of results on the analysis/test report and the laboratory shall be held free from any and all claims which may result from the use of such data by the party of others.
6. After completion of report the sample will be preserved for one month unless agreed otherwise.
7. The contents of the report cannot be, in any manner, used for the publicity of the product or any advertisement.

Analyzed by
Dr. M. Afzal, P.S
Soil & Env. Biotech. Div.

Reported by
Dr. M. Sajjad Mirza, DCS
Head, Soil & Env. Biotech. Div.

NATIONAL INSTITUTE FOR BIOTECHNOLOGY & GENETIC ENGINEERING
(NIBGE) P O Box # 577, Jhang Road, Faisalabad, Pakistan.
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Soil & Environmental Biotechnology Division

EPA registered, ISO 9001:2008 certified

Ref.No.NIBGE/PIBS SEBD/PSP/2018/02 **Dated:** January 9, 2018
Sample Code: 15
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/04 Chak No. 467 J.B) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 02-12-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	8.23	6.5-8.5	Iron(mg/l)	< 0.005	0.3
DO (mg/l)	4.2	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	206	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	131	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.4	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	14	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	22	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	14	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	40	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	280	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	Nil	NG	Magnesium(mg/l)	11	30
Temperature (°C)	20	NG	*E.coli* (cfu/100ml)	Nil	(0cfu/100ml)
Ca- Hardness (mg/l)	56	NG	*Coliform*(cfu/100ml)	Nil	(0cfu/100ml)
Bi- Carbonates (mg/l)	209	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	104	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU**: Formizin Attenuation Unit
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA) American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005. Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant ®NOVA 60 Instrument.
Microbial analyses were done according to **Merck Microbiology Manual 12th Edition.**

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Analyzed by
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Reported by
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Ref.No.NIBGE/PIBS/SEBD/PSP//2018/02 **Dated:** January 9, 2018
Sample Code: 14
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/07 Chak No. 162) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 19-11-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	7.70	6.5-8.5	Iron(mg/l)	0.24	0.3
DO (mg/l)	4.7	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	260	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	166	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.6	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	10	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	41	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	37	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	60	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	160	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	Nil	NG	Magnesium(mg/l)	8.0	30
Temperature (°C)	20	NG	*E.coli* (cfu/100ml)	220	(0cfu/100ml)
Ca- Hardness (mg/l)	102	NG	*Coliform*(cfu/100ml)	20	(0cfu/100ml)
Bi- Carbonates (mg/l)	209	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	134	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant ®NOVA 60 Instrument.
Microbial analyses were done according to **Merck Microbiology Manual 12th Edition.**

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Ref.No.NIBGE/PIBS/SEBD/PSP/2018/02 **Dated:** January 9, 2018
Sample Code: 13
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/02 Chak No. 124/47 R.B) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 29-11-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	7.63	6.5-8.5	Iron(mg/l)	< 0.005	0.3
DO (mg/l)	5.1	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	697	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	446	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.6	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	28	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	29	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	37	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	80	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	200	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	3.9	NG	Magnesium(mg/l)	20	30
Temperature (°C)	20	NG	*E.coli* (cfu/100ml)	Nil	(0cfu/100ml)
Ca- Hardness (mg/l)	72	NG	*Coliform*(cfu/100ml)	142	(0cfu/100ml)
Bi- Carbonates (mg/l)	434	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	156	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA) American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant® NOVA 60 Instrument.
Microbial analyses were done according to **Merck Microbiology Manual 12th Edition.**

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Ref.No. NIBGE PIBS/SEBD PSP/ 2018/02 **Dated:** January 9, 2018
Sample Code: 12
Invoice No: 2638

196 Rs

Analysis Report of Drinking Water (CJ C/05 Chak No. 448) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 26-11-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	7.98	6.5-8.5	Iron(mg/l)	< 0.005	0.3
DO (mg/l)	5.0	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	362	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	231	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.5	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	23	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	28	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	05	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	60	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	210	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	7.8	NG	Magnesium(mg/l)	18	30
Temperature (°C)	20	NG	*E.coli* (cfu/100ml)	Nil	(0cfu/100ml)
Ca- Hardness (mg/l)	70	NG	*Coliform*(cfu/100ml)	26	(0cfu/100ml)
Bi- Carbonates (mg/l)	287	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	146	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit
Anulyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant ®NOVA 60 Instrument.
Microbial analyses were done according to **Merck Microbiology Manual 12th Edition.**

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Ref.No. NIBGE/PIBS/SEBD/PSP//2018/02 **Dated:** January 9, 2018
Sample Code: 11
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/03 Chak No. 143 R.B) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 26-11-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	7.01	6.5-8.5	Iron(mg/l)	0.16	0.3
DO (mg/l)	4.9	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	381	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	243	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.7	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	27	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	39	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	10	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	60	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	190	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	3.9	NG	Magnesium(mg/l)	14	30
Temperature (°C)	20	NG	*E.coli* (cfu/100ml)	20	(0cfu/100ml)
Ca- Hardness (mg/l)	98	NG	*Coliform*(cfu/100ml)	80	(0cfu/100ml)
Bi- Carbonates (mg/l)	280	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	158	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA); American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
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Ref.No NIBGE PIBS SEBD/PSP/ 2018/02 **Dated**: January 9, 2018
Sample Code: 17
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/01 Chak No. 45 JB) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 05-12-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	8.52	6.5-8.5	Iron(mg/l)	< 0.005	0.3
DO (mg/l)	4.1	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	0.4	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	216	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	138	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.3	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	15	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	34	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	15	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	2.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	50	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	284	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	3.9	NG	Magnesium(mg/l)	04	30
Temperature (°C)	21	NG	*E.coli* (cfu/100ml)	Nil	(0cfu/100ml)
Ca- Hardness (mg/l)	86	NG	*Coliform*(cfu/100ml)	480	(0cfu/100ml)
Bi- carbonates (mg/l)	222	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	104	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
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Ref.No. NIBGE PIBS/SEBD PSP/ 2018/02 **Dated:** January 9, 2018
Sample Code: 22
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/06 Chak No. 102 J.B) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 05-12-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	7.4	6.5-8.5	Iron(mg/l)	< 0.005	0.3
DO (mg/l)	5.0	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us cm)	188	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	120	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.2	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	08	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	24	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	21	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	50	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	240	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	Nil	NG	Magnesium(mg/l)	13	30
Temperature (°C)	21	NG	*E.coli* (cfu/100ml)	Nil	(0cfu/100ml)
Ca- Hardness (mg/l)	60	NG	*Coliform*(cfu/100ml)	28	(0cfu/100ml)
Bi- carbonates (mg/l)	207	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	112	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit.
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant ®NOVA 60 Instrument.
Microbial analyses were done according to **Merck Microbiology Manual 12th Edition.**

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Analyzed by
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Reported by
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EPA registered, ISO 9001:2008 certified

Ref.No.NIBGE/PIBS SEBD/PSP/2018/02 **Dated:** January 9, 2018
Sample Code: 15
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/04 Chak No. 467 J.B) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 02-12-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	8.23	6.5-8.5	Iron(mg/l)	< 0.005	0.3
DO (mg/l)	4.2	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	206	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	131	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.4	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	14	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	22	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	14	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	40	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	280	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	Nil	NG	Magnesium(mg/l)	11	30
Temperature (°C)	20	NG	*E.coli* (cfu/100ml)	Nil	(0cfu/100ml)
Ca- Hardness (mg/l)	56	NG	*Coliform*(cfu/100ml)	Nil	(0cfu/100ml)
Bi- Carbonates (mg/l)	209	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	104	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU**: Formizin Attenuation Unit
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA) American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005. Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant ®NOVA 60 Instrument.
Microbial analyses were done according to **Merck Microbiology Manual 12th Edition.**

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Ref.No.NIBGE/PIBS/SEBD/PSP//2018/02 **Dated:** January 9, 2018
Sample Code: 14
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/07 Chak No. 162) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 19-11-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	7.70	6.5-8.5	Iron(mg/l)	0.24	0.3
DO (mg/l)	4.7	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	260	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	166	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.6	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	10	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	41	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	37	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	60	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	160	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	Nil	NG	Magnesium(mg/l)	8.0	30
Temperature (°C)	20	NG	*E.coli* (cfu/100ml)	220	(0cfu/100ml)
Ca- Hardness (mg/l)	102	NG	*Coliform*(cfu/100ml)	20	(0cfu/100ml)
Bi- Carbonates (mg/l)	209	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	134	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant ®NOVA 60 Instrument.
Microbial analyses were done according to **Merck Microbiology Manual 12th Edition.**

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Ref.No.NIBGE/PIBS/SEBD/PSP/2018/02 **Dated:** January 9, 2018
Sample Code: 13
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/02 Chak No. 124/47 R.B) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 29-11-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	7.63	6.5-8.5	Iron(mg/l)	< 0.005	0.3
DO (mg/l)	5.1	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	697	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	446	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.6	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	28	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	29	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	37	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	80	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	200	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	3.9	NG	Magnesium(mg/l)	20	30
Temperature (°C)	20	NG	*E.coli* (cfu/100ml)	Nil	(0cfu/100ml)
Ca- Hardness (mg/l)	72	NG	*Coliform*(cfu/100ml)	142	(0cfu/100ml)
Bi- Carbonates (mg/l)	434	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	156	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA) American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant® NOVA 60 Instrument.
Microbial analyses were done according to **Merck Microbiology Manual 12th Edition.**

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Ref.No. NIBGE PIBS/SEBD PSP/ 2018/02 **Dated:** January 9, 2018
Sample Code: 12
Invoice No: 2638

196 Rs

Analysis Report of Drinking Water (CJ C/05 Chak No. 448) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 26-11-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	7.98	6.5-8.5	Iron(mg/l)	< 0.005	0.3
DO (mg/l)	5.0	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	362	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	231	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.5	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	23	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	28	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	05	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	60	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	210	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	7.8	NG	Magnesium(mg/l)	18	30
Temperature (°C)	20	NG	*E.coli* (cfu/100ml)	Nil	(0cfu/100ml)
Ca- Hardness (mg/l)	70	NG	*Coliform*(cfu/100ml)	26	(0cfu/100ml)
Bi- Carbonates (mg/l)	287	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	146	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit
Anulyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant ®NOVA 60 Instrument.
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Ref.No. NIBGE/PIBS/SEBD/PSP//2018/02 **Dated:** January 9, 2018
Sample Code: 11
Invoice No: 2638

Analysis Report of Drinking Water (CJ C/03 Chak No. 143 R.B) from Punjab Saaf Pani Company, Lahore.
Sample was collected and provided by the client on 26-11-2017.

Parameters	Values	WHO standards for drinking water	Parameters	Values	WHO standards for drinking water
pH	7.01	6.5-8.5	Iron(mg/l)	0.16	0.3
DO (mg/l)	4.9	NG	Zinc (mg/l)	< 0.05	0.05
Color (m^{-1})	< 0.5	NG	Lead (mg/l)	< 0.01	0.01
EC (us/cm)	381	NG	Boron (mg/l)	< 0.05	0.3
TDS (mg/l)	243	1000	Nickel (mg/l)	< 0.02	0.02
TOC (mg/l)	Nil	NG	Copper (mg/l)	< 0.02	0.02
COD (mg/l)	Nil	NG	Barium (mg/l)	Nil	0.7
Nitrite (mg/l)	< 0.007	3	Arsenic (mg/l)	< 0.005	0.01
Nitrate (mg/l)	0.7	50	Cyanide (mg/l)	< 0.002	0.05
Sodium (mg/l)	27	200	Mercury (mg/l)	< 0.001	0.001
Calcium (mg/l)	39	90	Fluoride (mg/l)	< 0.10	1.5
Sulphate (mg/l)	10	250	Cadmium (mg/l)	< 0.002	0.01
Chlorine (mg/l)	Nil	NG	Aluminum(mg/l)	< 0.10	0.2
Turbidity (FAU)	< 1.0	NG	Chromium (mg/l)	< 0.01	0.01
Chlorides (mg/l)	60	250	Carbonates(mg/l)	Nil	NG
Alkalinity (mg/l)	190	NG	Manganese (mg/l)	< 0.010	0.5
Potassium (mg/l)	3.9	NG	Magnesium(mg/l)	14	30
Temperature (°C)	20	NG	*E.coli* (cfu/100ml)	20	(0cfu/100ml)
Ca- Hardness (mg/l)	98	NG	*Coliform*(cfu/100ml)	80	(0cfu/100ml)
Bi- Carbonates (mg/l)	280	NG	*Fecal coliform*	Nil	NG
Total Hardness (mg/l)	158	NG	----------	----------	----------

TDS: Total Dissolved Solids, **NG:** Not Given, **FAU:** Formizin Attenuation Unit
Analyses were done according to **Standard Methods for the Examination of Water & Wastewater** American Public Health Association (APHA); American Water Works Association (AWWA) and Water Environment Federation (WEF), 21st Edition 2005.
Heavy metals were analyzed according to Standard Methods of Merck Kits by using Spectroquant ®NOVA 60 Instrument.
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Reported by

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Head, Soil & Env. Biotech. Div.

Borehole Log of Water Source CJ-02

Project Name :	**KHADIM-E-PUNJAB SAAF PANI PROJECT FAISALABAD**				
Client :	PUNJAB SAAF PANI COMPANY				
Consultants :	JAT-EEC				
Contractor :	PHED				
Tube Well Number :	**TW CJ-02**		Nearest Village :	Chak No. 124/47 RB	
Tehsil :	**Chak Jhumra**		Location(Coordinates) :	N 31.69991 E 73.33833	
Borehole Dia :	##### mm	20 inch	Casing ID :	300.0 mm	12.00 inch
Drilling Depth :	50.29 m	165 feet	Casing Depth :	41.15 m	135.00 feet
Drilling Started :	26/10/2017		MS Stick up	1.52 m	5.00 feet
Drilling Completed:	26/10/2017		Method of Drilling :	Reverse Circulation	
Static Water Level :	m		Pumping Quantity :		m3/hr
Pump Installation Depth :	m		Checked by :	Abdur Rehman (Senior Hydrogeologist)	

Scale	Depth (feet)	Thickness of Layer (feet)	Geological: Lithology	Geological: Color	Geological: Geological Description	Casing Program: Pipe Length(feet)	Casing Program: Type	Casing Program: Depth(feet)	Well Detail
	15.00	15.00		Light Brown	C (Clay)				
25	25.00	10.00		Light Gray	fS (fine Sand)				
50	50.00	25.00		Light Gray	fmS (fine to medium Sand)				
	55.00	5.00		Light Gray	mS (medium Sand)				
	60.00	5.00		Light Brown	C (Clay)				
	70.00	10.00		Light Gray	fS (fine Sand)				
75	75.00	5.00		Light Gray	fmS (fine to medium Sand)				
	85.00	10.00		Light Gray	fS (fine Sand)	85.00	MS Pipe	85.00	
	90.00	5.00		Light Gray	fmSwK (fine to medium Sand with Kanker)				
	95.00	5.00		Light Gray	fS (fine Sand)				
100	120.00	25.00		Light Gray	mS (medium Sand)				
125	125.00	5.00		Light Gray	fmS (fine to medium Sand)	40.00	Screen FG Pipe	125.00	
	145.00	20.00		Light Gray	mS (medium Sand)	10.00	Bail Plug	135.00	
150	160.00	15.00		Light Gray	mSwK (medium Sand with Kanker)				
	165.00	5.00		Light Brown	C (Clay)				
175									
200									

Borehole Log of Water Source CJ-03

Project Name :	**KHADIM-E-PUNJAB SAAF PANI PROJECT FAISALABAD**				
Client :	PUNJAB SAAF PANI COMPANY				
Consultants :	JAT-EEC				
Contractor :	PHED				
Tube Well Number :	**TW CJ-03**	Nearest Village :	Chak No. 143RB (Ghammi)		
Tehsil :	**Chak Jhumra**	Location(Coordinates) :	N 31.645 E 73.2855		
Borehole Dia :	##### mm 20 inch	Casing ID :	300.0 mm	12.00	inch
Drilling Depth :	44.19 m 145 feet	Casing Depth :	36.57 m	120.00	feet
Drilling Started :	30/10/2017	MS Stick up	3.05 m	10.00	feet
Drilling Completed:	30/10/2017	Method of Drilling :	Reverse Circulation		
Static Water Level :	m	Pumping Quantity :		m3/hr	
Pump Installation Depth :	m	Checked by :	Abdur Rehman (Senior Hydrogeologist)		

Scale	Depth (feet)	Thickness of Layer (feet)	Geological: Lithology	Geological: Color	Geological: Geological Description
	10.00	10.00		Light Brown	C (Clay)
25	25.00	15.00		Light Gray	fS (fine Sand)
50					
75					
	95.00	70.00		Light Gray	fmS (fine to medium Sand)
100	105.00	10.00		Light Gray	fS (fine Sand)
	125.00	20.00		Light Gray	mS (medium Sand)
125	135.00	10.00		Light Gray	K (Kanker)
	140.00	5.00		Light Gray	fS (fine Sand)
	145.00	5.00		Light Brown	C (Clay)
150					
175					
200					

Casing Program: Pipe Length(feet)	Type	Depth(feet)	Well Detail
72.00	MS Pipe	72.00	
40.00	Screen FG Pipe	112.0	
8.00	Bail Plug	120.0	

Borehole Log of Water Source CJ-04

Project Name :	**KHADIM-E-PUNJAB SAAF PANI PROJECT FAISALABAD**				
Client :	PUNJAB SAAF PANI COMPANY				
Consultants :	JAT-EEC				
Contractor :	PHED				
Tube Well Number :	**TW CJ-04**	Nearest Village :	Chak No. 467 JB		
Tehsil :	**Chak Jhumra**	Location(Coordinates) :	N 31.6833 E 73.1043		
Borehole Dia :	##### mm 20 inch	Casing ID :	300.0 mm	12.00	inch
Drilling Depth :	35.05 m 115 feet	Casing Depth :	35.05 m	115.00	feet
Drilling Started :	03/11/2017	MS Stick up	1.52 m	5.00	feet
Drilling Completed:	03/11/2017	Method of Drilling :	Reverse Circulation		
Static Water Level :	m	Pumping Quantity :		m3/hr	
Pump Installation Depth :	m	Checked by :	Abdur Rehman (Senior Hydrogeologist)		

Scale	Depth (feet)	Thickness of Layer (feet)	Geological: Lithology	Geological: Color	Geological: Geological Description	Casing Program: Pipe Length(feet)	Casing Program: Type	Casing Program: Depth(feet)	Well Detail
	5.00	5.00		Light Brown	C (Clay)				
25	25.00	20.00		Light Gray	fS (fine Sand)				
	40.00	15.00		Light Gray	fmS (fine to medium Sand)				
50	50.00	10.00		Light Brown	C (Clay)				
	60.00	10.00		Light Gray	fmS (fine to medium Sand)				
	65.00	5.00		Light Brown	C (Clay)	65.00	MS Pipe	65.00	
75	85.00	20.00		Light Gray	mS (medium Sand)				
100	105.00	20.00		Light Gray	mSwK (medium Sand with Kanker)	40.00	Screen FG Pipe	105.00	
	110.00	5.00		Light Brown	C (Clay)				
	115.00	5.00		Light Gray	mS (medium Sand)	10.00		115.00	
125									
150									
175									
200									

Borehole Log of Water Source CJ-05

Project Name :	**KHADIM-E-PUNJAB SAAF PANI PROJECT FAISALABAD**				
Client :	PUNJAB SAAF PANI COMPANY				
Consultants :	JAT-EEC				
Contractor :	PHED				
Tube Well Number :	**TW CJ-05**	Nearest Village :	Chak No. 146 (Matiyani)		
Tehsil :	**Chak Jhumra**	Location(Coordinates) :	N 31.6326 E 73.2736		
Borehole Dia :	##### mm 20 inch	Casing ID :	300.0 mm	12.00	inch
Drilling Depth :	42.67 m 140 feet	Casing Depth :	41.15 m	135.00	feet
Drilling Started :	24/10/2017	MS Stick up	1.52 m	5.00	feet
Drilling Completed :	24/10/2018	Method of Drilling :	Reverse Circulation		
Static Water Level :	m	Pumping Quantity :		m3/hr	
Pump Installation Depth :	m	Checked by :	Abdur Rehman (Senior Hydrogeologist)		

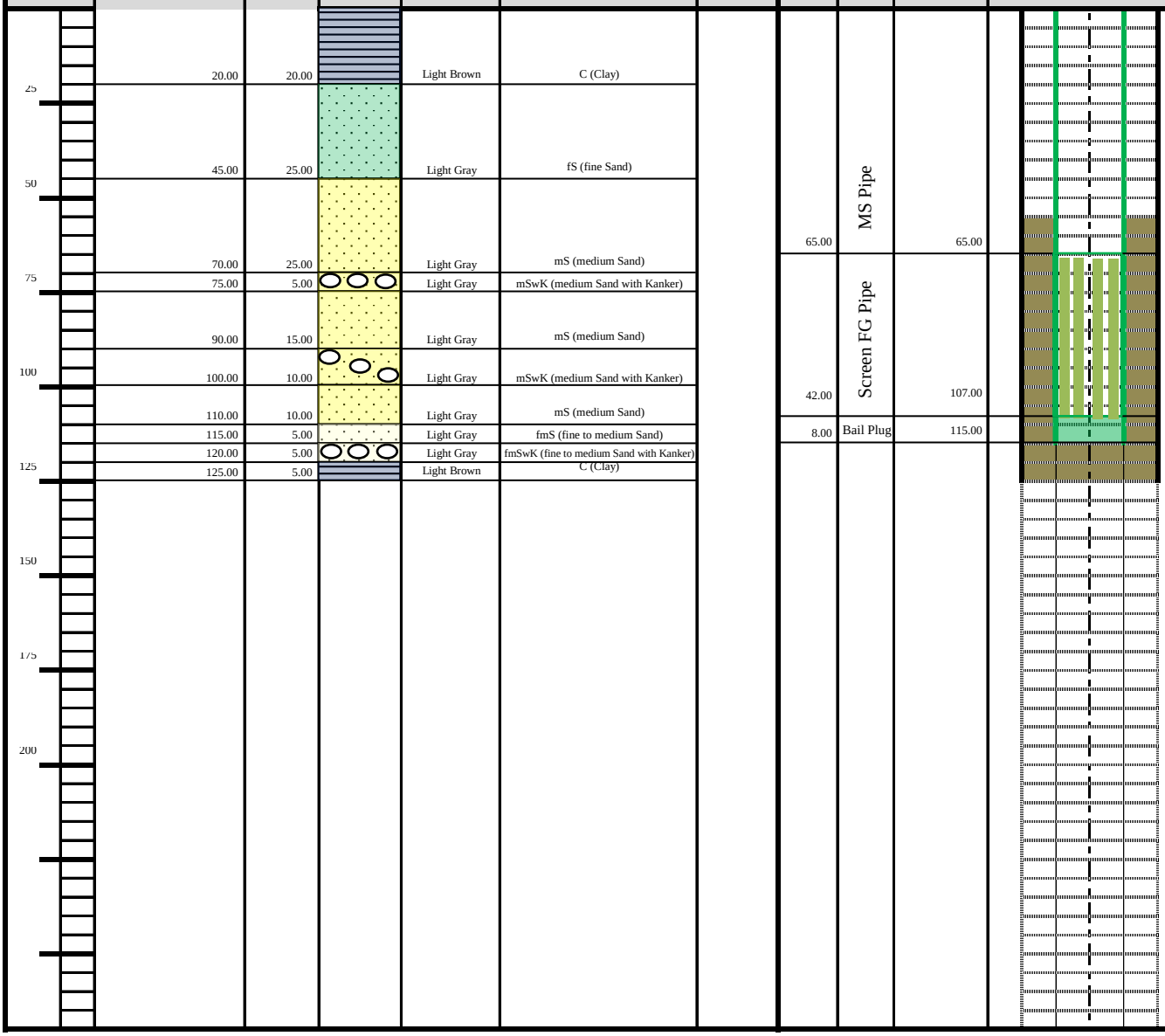
Scale	Depth (feet)	Thickness of Layer (feet)	Geological: Lithology	Geological: Color	Geological: Geological Description	Casing Program: Pipe Length(feet)	Casing Program: Type	Casing Program: Depth(feet)	Well Detail
	20.00	20.00		Light Brown	C (Clay)				
25	25.00	5.00		Light Gray	fS (fine Sand)				
							MS Pipe		
50	65.00	40.00		Light Gray	fmS (fine to medium Sand)				
	75.00	10.00		Light Gray	fmSwK (fine to medium Sand with Kanker)				
75	80.00	5.00		Light Gray	mSwK (medium Sand with Kanker)				
						85.00		85.00	
	95.00	15.00		Light Gray	mS (medium Sand)				
100	110.00	15.00		Light Gray	mSwK (medium Sand with Kanker)				
	115.00	5.00		Light Gray	mS (medium Sand)				
	120.00	5.00		Light Gray	K (Kanker)				
125	130.00	10.00		Light Gray	mSwK (medium Sand with Kanker)		Screen FG Pipe		
						40.00		125.00	
	140.00	10.00		Light Brown	CwK (Clay with Kanker)	10.00	Bail Plug	135.00	
150									
175									
200									

Borehole Log of Water Source CJ-06

Project Name :	**KHADIM-E-PUNJAB SAAF PANI PROJECT FAISALABAD**				
Client :	PUNJAB SAAF PANI COMPANY				
Consultants :	JAT-EEC				
Contractor :	PHED				
Tube Well Number :	**TW CJ-06**		Nearest Village :	Chak No. 102JB	
Tehsil :	**Chak Jhumra**		Location(Coordinates) :	N 31.6563 E 73.0888	
Borehole Dia :	##### mm	20 inch	Casing ID :	300.0 mm	12.00 inch
Drilling Depth :	38.10 m	125 feet	Casing Depth :	35.05 m	115.00 feet
Drilling Started :	30/10/2017		MS Stick up	3.05 m	10.00 feet
Drilling Completed:	30/10/2017		Method of Drilling :	Reverse Circulation	
Static Water Level :	m		Pumping Quantity :		m3/hr
Pump Installation Depth :	m		Checked by :	Abdul Rehman (Senior Hydrogeologist)	

Scale	Depth (feet)	Thickness of Layer (feet)	Geological: Lithology	Geological: Color	Geological: Geological Description
	20.00	20.00		Light Brown	C (Clay)
	45.00	25.00		Light Gray	fS (fine Sand)
	70.00	25.00		Light Gray	mS (medium Sand)
	75.00	5.00		Light Gray	mSwK (medium Sand with Kanker)
	90.00	15.00		Light Gray	mS (medium Sand)
	100.00	10.00		Light Gray	mSwK (medium Sand with Kanker)
	110.00	10.00		Light Gray	mS (medium Sand)
	115.00	5.00		Light Gray	fmS (fine to medium Sand)
	120.00	5.00		Light Gray	fmSwK (fine to medium Sand with Kanker)
	125.00	5.00		Light Brown	C (Clay)

Casing Program: Pipe Length(feet)	Type	Depth(feet)	Well Detail
65.00	MS Pipe	65.00	
42.00	Screen FG Pipe	107.00	
8.00	Bail Plug	115.00	



Borehole Log of water source CJ-07

Project Name :	**KHADIM-E-PUNJAB SAAF PANI PROJECT FAISALABAD**					
Client :	PUNJAB SAAF PANI COMPANY					
Consultants :	JAT-EEC					
Contractor :	PHED					
Tube Well Number :	**TW CJ-07**		Nearest Village :	Chak No. 162 (Sikandar pur)		
Tehsil :	**Chak Jhumra**		Location(Coordinates) :	N 31.5795 E 73.2285		
Borehole Dia :	##### mm	20 inch	Casing ID :	#### mn	12 inch	12.00 inch
Drilling Depth :	36.27 m	119 feet	Casing Depth :	#### m		110.00 feet
Drilling Started :	23/10/2017		MS Stick up	1.52 m		5.00 feet
Drilling Completed:	23/10/2017		Method of Drilling :	Reverse Circulation		
Static Water Level :	m		Pumping Quantity :			m3/hr
Pump Installation Depth :	m		Checked by :	Abdul Rehman (Senior Hydrogeologist)		

Scale	Depth (feet)	Thickness of Layer (feet)	Geological: Lithology	Geological: Color	Geological: Geological Description	Casing Program: Pipe Length(feet)	Casing Program: Type	Casing Program: Depth(feet)	Well Detail
25	25.00	25.00		Light Gray	fS (fine Sand)				
	30.00	5.00		Light Gray	fmS (fine to medium Sand)				
50	50.00	20.00		Light Gray	fS (fine Sand)				
	60.00	10.00		Light Gray	fmS (fine to medium Sand)	55.00	MS Pipe	55.00	
	70.00	10.00		Light Gray	fS (fine Sand)				
75	75.00	5.00		Light Gray	fmS (fine to medium Sand)				
	80.00	5.00		Light Gray	fS (fine Sand)				
100	100.00	20.00		Light Gray	fmS (fine to medium Sand)	50.00	Screen FG Pipe	105.00	
	115.00	15.00		Light Gray	mS (medium Sand)	5.00	Ball Plug	110.00	
125	119.00	4.00		Light Gray	fS (fine Sand)				
150									
175									
200									

Annexure VII

Material Safety Data Sheet

Section 1: Chemical Product and Company Identification

Company Identification: Engro Polymer & Chemicals Ltd

Engro Polymers & Chemicals Limited.
12th Floor, Ocean Towers, G-3, Khayaban-e-Iqbal, Block 9, Clifton, Karachi.
Emergency Telephone Number:(+92) 21-111-411-411
Product Name: Sodium Hypochlorite, 12-16%
CAS#: Mixture.
RTECS: Not applicable.
TSCA: TSCA 8(b) inventory: Sodium hypochlorite; Water
CI#: Not applicable.
Synonym: Chlorine Bleach, Soda Bleach; Sodium Hypochlorite, Solution, 12-16% Available Chlorine.
Chemical Name: Not applicable.
Chemical Formula: Not applicable

Section 2: Hazard Identification

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
****

EMERGENCY OVERVIEW:

Color: Colorless to yellow
Physical State: Liquid
Appearance: Clear
Odor: Characteristic bleach odor
Signal Word: DANGER
MAJOR HEALTH HAZARDS: CORROSIVE. CAUSES SERIOUS EYE DAMAGE. CAUSES SEVERE SKIN BURNS. CAUSES DAMAGE TO RESPIRATORY SYSTEM WHEN INHALED. TOXIC IF SWALLOWED. MAY CAUSE DAMAGE TO GASTROINTESTINAL TRACT WHEN SWALLOWED.
PHYSICAL HAZARDS: CORROSIVE TO METALS.
AQUATIC TOXICITY: Toxic to fish and aquatic organisms.
PRECAUTIONARY STATEMENTS: Do not breathe mist, vapors, or spray. Do not taste or swallow. Avoid contact with skin, eyes and clothing. Wash thoroughly after handling. Wear protective gloves, protective clothing, eye, and face protection. Do not eat, drink or smoke when using this product. Keep only in original container. Avoid release to the environment. Store in a secure manner. Store in corrosive resistant container with a resistant inner liner.
****

GHS CLASSIFICATION:

GHS: PHYSICAL HAZARDS: Corrosive to Metals
GHS: CONTACT HAZARD - SKIN: Category 1C - Causes severe skin burns and eye damage.
GHS: CONTACT HAZARD - EYE: Category 1 - Causes serious eye damage
GHS: TARGET ORGAN
TOXICITY (SINGLE EXPOSURE):

Category 1 - Causes damage to: Respiratory System
GHS: CARCINOGENICITY: Not classified as a carcinogen per GHS criteria. This product is not classified as a carcinogen by NTP, IARC, or OSHA.
UNKNOWN ACUTE TOXICITY: Listed below.
Unknown Acute Dermal Toxicity:
100% of this product consists of ingredient(s) of unknown acute dermal toxicity.
Unknown Acute Inhalation Toxicity:
100% of this product consists of ingredient(s) of unknown acute inhalation toxicity.

GHS SYMBOL:

Corrosion, **Health hazards**





GHS SIGNAL WORD: DANGER
GHS HAZARD STATEMENTS:
GHS - Physical Hazard Statement(s)
• May be corrosive to metals
GHS - Health Hazard Statement(s)
• Causes severe skin burns and eye damage
• Causes serious eye damage
• Causes damage to organs (Respiratory System)
GHS - Precautionary Statement(s) - Prevention
• Do not breathe mist, vapors, or spray
• Wear protective gloves, protective clothing, eye, and face protection
• Wash thoroughly after handling
• Do not eat, drink or smoke when using this product
• Keep only in original container
GHS - Precautionary Statement(s) - Response
• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
• IF ON SKIN (or hair): Remove/Take off Immediately all contaminated clothing. Rinse SKIN with water/shower
• IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
• IF INHALED: Remove person to fresh air and keep comfortable for breathing
• Immediately call a POISON CENTER or doctor/physician
• Specific treatment (see First Aid information on product label and/or Section 4 of the SDS)
• Wash contaminated clothing before reuse
• IF exposed: Call a POISON CENTER or doctor/physician
• Absorb spillage to prevent material damage
GHS - Precautionary Statement(s) - Storage
• Store in a secure manner
• Store in corrosive resistant container with a resistant inner liner
GHS - Precautionary Statement(s) - Disposal
• Dispose of contents and container in accordance with applicable local, regional, national, and/or international regulations

Hazards Not Otherwise Classified (HNOC)
Contact with acids liberates toxic gas
See Section 11: TOXICOLOGICAL INFORMATION

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, . Hazardous in case of skin contact(corrosive), of eye contact (corrosive). Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.)by IARC [Sodium hypochlorite]. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. [Sodium hypochlorite].Mutagenic for mammalian somatic cells. [Sodium hydroxide]. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 3: Composition and Information on Ingredients

Composition:

Name	CAS #	% by w/v
Sodium hypochlorite	7681-52-9	12-16
Sodium hydroxide	1310-73-2	1-2
Water	7732-18-5	84-88

Toxicological Data on Ingredients: Sodium hypochlorite: ORAL (LD50): Acute: 5800 mg/kg [Mouse]. 8910 mg/kg [Rat].
Sodium hydroxide LD50: Not available. LC50: Not available.
Potential Acute Health Effects:

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: combustible materials, organic materials, metals

Explosion Hazards in Presence of Various Substances:

Slightly explosive in presence of heat. Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Releases chlorine when heated above 35 deg. C. The substance itself is non-combustible and does not burn. However, when heated to decomposition it emits corrosive and/or toxic fumes. May ignite combustibles. The heat of reaction with combustibles or organic materials may cause igniton. It may be a fire risk in contact with organic materials. Contact with metals may evolve flammable hydrogen gas.

Special Remarks on Explosion Hazards:

Anydrous Sodium Hypochlorite is very explosive. Primary amines and calcium hypochlorite or sodium hypochlorite react to form normal chloroamines, which are explosive. Interaction of ethyleneimine with sodium (or other) hypochlorite gives the explosive N-chloro cmpd. Removal of formic acid from industrial waste streams with sodium hypochlorite soln becomes explosive at 55 deg C. Several explosions involving methanol and sodium hypochlorite were attributed to formation of methyl hypochlorite, especially in presence of acid or other esterification catalyst. Use of sodium hypochlorite soln to destroy acidified benzyl cyanide residues caused a violent explosion, thought to have been due to formation of nitrogen trichloride. (Sodiumhypochlorite).

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

Large Spill:

Corrosive liquid. Oxidizing material. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material.

Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers,basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials,organic materials, metals, acids.

Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 20°C (68°F). Air Sensitive Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:

Face shield. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

Sodium hypochlorite TWA: 1 CEIL: 1 (ppm as Cl2) STEL: 1 (ppm as Cl2) from ACGIH (TLV) [United States] Sodium hydroxide STEL: 2 (mg/m3) from ACGIH (TLV) [United States] TWA: 2 CEIL: 2 (mg/m3) from OSHA (PEL) [United States] CEIL: 2 (mg/m3) from NIOSH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Clear Liquid.)
Odor: Characteristic. Chlorine-like (Strong.)
Taste: Not available.
Molecular Weight: 74.5
Color: Green to Yellowish. (Light.)
pH (1% soln/water): pH of 10% solution (100 g/l): 12 [Basic.]
Boiling Point: The lowest known value is 100°C (212°F) (Water).
Melting Point: Freezing pt: -3°C (26.6°F)
Critical Temperature: Not available.
Specific Gravity: 1.18 - 1.215 (Water = 1)
Vapor Pressure: 1.6 kPa (@ 20°C)
Vapor Density: The highest known value is 0.62 (Air = 1) (Water).
Volatility: Not available.
Odor Threshold: Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicity (in Water): Not available.
Dispersion Properties: See solubility in water.
Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.
Instability Temperature: Not available.
Conditions of Instability: Incompatible materials, light, air, heat
Incompatibility with various substances: Slightly reactive to reactive with reducing agents, combustible materials, organic materials, metals, acids.
Corrosivity:
Extremely corrosive in presence of aluminum. Moderately corrosive in presence of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.
Special Remarks on Reactivity:
Decomposed by carbon dioxide from air. Slowly decomposes on contact with air. Unstable in air unless mixed with sodium hydroxide. Incompatible with ammonium acetate, ammonium carbonate, ammonium nitrate, ammonium oxalate, and ammonium phosphate. Decompostion of sodium hypochlorite takes place within a few seconds with these salts. Also incompatible with primary amines, phenyl acetonitrile, ethyleneimine, methanol, acidified benzyl cyanide, formic acid,urea, nitro compounds, methylscellulose, celloluse, aziridine, ether, ammonia. Mixing this product with chemicals (e.g.ammonia, acids, detergents, etc.) or organic matter (e.g. urine, feces, etc.) will release chlorine gas. Chloramine gas may be evolved when ammonia and bleach are mixed. Decomposed by hot water. Sensitive to light. Exposure to light accelerates decompositon.
Special Remarks on Corrosivity:
Sodium Hypochlorite is extremely corrosive to brass, and moderately corrosive to bronze. There is no corrosivity information for copper.
Polymerization: Will not occur.

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Section 11: Toxicological Information

PRODUCT TOXICITY DATA: SODIUM HYPOCHLORITE (EPA)
COMPONENT TOXICITY DATA:
Note: The component toxicity data is populated by the LOLI database and may differ from the product toxicity data given.
Component LD50 Oral: LD50 Dermal: LC50 Inhalation:
Sodium hypochlorite 7681-52-9 (12-16 %)= 8200 mg/kg (Rat) 10000 mg/kg (Rabbit) Not listed
POTENTIAL HEALTH EFFECTS:
Eye contact: Causes serious eye damage. Eye exposures may cause burns to the eye lids, conjunctivitis, corneal edema, and corneal burn.
Skin contact: Skin contact may be irritating and corrosive. Can cause skin burns.
Inhalation: Inhalation may cause coughing, choking, irritation (possibly severe), chemical burns, shortness of breath, and pulmonary edema. Pulmonary edema may develop several hours after a severe acute exposure.
Ingestion: Not a likely route of exposure in occupational settings. If swallowed, may cause irritation, swelling, pain, and perforation of upper and lower gastrointestinal tissues. Permanent scarring may occur.
Chronic Effects: Repeated or prolonged skin contact may result in dermatitis.
SIGNS AND SYMPTOMS OF EXPOSURE:
Listed below.
Inhalation (Breathing): Respiratory System Effects: Inhalation exposure may cause irritation, redness of upper and lower airways, coughing, laryngeospasm and edema, shortness of breath, bronchoconstriction, and possible pulmonary edema. The pulmonary edema may develop several hours after a severe acute exposure.
Skin: Skin Corrosion. Skin exposure to gas or liquid may cause redness, irritation, burning sensation, swelling, blister formation, first, second, or third degree burns.
Eye: Serious Eye Damage. Exposure to eyes may cause irritation and burns to the eye lids, conjunctivitis, corneal edema, and corneal burn. Significant and prolonged contact may cause damage to the internal contents of the eye.
Ingestion (Swallowing): Gastrointestinal System Effects: Exposure by ingestion may cause irritation, swelling, and perforation of upper and lower gastrointestinal tissues. Permanent scarring may occur.
TOXICITY:
Carefully controlled sensitization studies on animal have not resulted in any reproducible positive findings. Standard sensitization patch tests in healthy human volunteers show no potential to induce contact sensitization. In tests using rats and mice, there was no evidence of carcinogenicity.
Interaction with Other Chemicals Which Enhance Toxicity: Mixing with ammonia, acids, detergents, or organic matter will release chlorinated compounds, which are irritating to eyes, lungs, and mucus membranes.
****

GHS HEALTH HAZARDS:

Listed below.
GHS: CONTACT HAZARD - EYE: Category 1 - Causes serious eye damage
GHS: CONTACT HAZARD - SKIN:
Category 1C - Causes severe skin burns and eye damage.
Skin Absorbent / Dermal Route? No.
GHS: CARCINOGENICITY:
Not classified as a carcinogen per GHS criteria. This product is not classified as a carcinogen by NTP, IARC, or OSHA.
SPECIFIC TARGET ORGAN TOXICITY (Single Exposure):
Category 1 - Respiratory system
MUTAGENIC DATA:
Not classified as a mutagen per GHS criteria. Sodium hypochlorite has tested positive in in vitro test systems and negative in in vivo test systems. These results are consistent with other germicides

Section 12: Ecological Information

ECOTOXICITY DATA:

Aquatic Toxicity:
Data provided are for sodium hypochlorite.

Component	Freshwater Fish	Invertebrate Toxicity:	Algae Toxicity:	Other Toxicity:
Sodium hypochlorite 7681-52-9 (12.5-15)	- LC50 clupea harengus 0.033 - 0.097 mg//l/96 hr, flow through bioassay (pH: 8) - LC50 cymatogaster aggregata 0.045 - 0.098 mg/l/96 hr, flow through bioassay (pH: 8) - LC50 gasterosteus aculeatus 0.141 - 0.193 mg/l/96 hr, flow through bioassay (pH: 8) - LC50 oncorhynchus gorbuscha 0.023 - 0.052 mg/l/96 hr, flow through bioassay (pH: 8) - LC50 oncorhynchus kisutch 0.026 - 0.038 mg/l/96 hr, flow through bioassay (pH: 8) - LC50 parophrys vetulus 0.044 - 0.144 mg/l/96 hr, flow through bioassay (pH: 8) - LC50 pimephales promelas 0.22 - 0.62 mg/l/96 hr, flow through bioassay (pH: 7)	- EC50 ceriodaphnia sp. 0.006 mg/l/24 hr - EC50 daphnia magna 0.07 - 0.7 mg/l/24 hr - EC50 daphnia magna 2.1mg/l/96 hr - EC50 gammarus fasciatus 4 mg/l/96 hr - EC50 nitocra spinipes 40 mg/l/96 hr - EC50 palaemonetes pugio 52 mg/l/96 hr	- ErC50 dunaliella sp. 0.6 mg/l/24 hr - ErC50 dunaliella tertiolecta 0.11 mg/l/24 hr -ErC50 skeletonema costatum 0.095 mg/l/24 hr	

FATE AND TRANSPORT:

BIODEGRADATION: This material is inorganic and not subject to biodegradation.

PERSISTENCE: This material is believed not to persist in the environment.

HALF LIFE		
Hazardous Chemicals	**Air**	**Water**
NaOCl	115 days	220 days

Section 13: Disposal Considerations

Waste Disposal:

Do not discharge effluent containing this product into laks, streams, ponds, estuaries, oceans, or public waters unless this product is specifically identified and addressed in an NPDES permit. Do not discharge effluent containing this product without previously notifying the sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA. Reduce with agents such as bisulfites or ferrous salt solutions. Some heat will be produced. Keep on alkaline side and dilute with copious amounts of water. The main end-product is salt water. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material
Identification: : Hypochlorite solution UNNA: 1791 PG: III
Special Provisions for Transport: Not available

Section 15: Other Regulatory Information

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Pakistan Environmental Protection Act, 1997 and rules & regulation made thereunder, including in particular the Hazardous Substance Rules 2014.

Section 16: Other Information



Prepared by : Engro Polymer & Chemicals Ltd

Health Rating: 03 Flammability: 0 Reactivity Rating: 0

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Engro Polymer & Chemical Ltd extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Annexure VIII

Sources of Data

References:

- Punjab Environmental Protection (Amendment) Act 2012 (PEPA)
- Guidelines for the preparation and review of Environmental Reports, October 1997
- Review of IEE/ EIA Regulation, 2000
- Faisalabad Master plan Report 2021, available at https://fda.gov.pk/Report_Draft_Faisalabad_Master_Plan_2021-2041_V2.pdf
- WHO, *Guidelines for Drinking Water Quality*, vol. 2, World Health Organization, Geneva, Switzerland, 1996
- Daud, M. K., et al. "Drinking water quality status and contamination in Pakistan." *BioMed research international* 2017 (2017).
- District Census Report, Faisalabad Division, 2017

Annexure IX

Terms of Reference (TORs)

TOR for ENVIRONMENTAL IMPACT ASSESSMENT (EIA):

Consultant will carryout the following activities:

i. The Consultant will carry out the Environmental impact assessment of the project. In addition to EIA, other required instruments, e.g., Environmental Management Plan (EMP) and Stakeholder Engagement Plan (SEP).

ii. Desk review and information/documentation collection of relevant environmental and social laws, regulations and water environmental quality & discharge standards, including environmental quality report, environmental monitoring data, previous studies for key environmental and social issues; surface and groundwater monitoring data and related information.

iii. Conduct on site environmental monitoring for water, groundwater, air, noise, and any other parameters as needed, in order to get the baseline of the environmental condition.

iv. Conduct the project alternative analysis, especially from sitting of the proposed facilities. If there is any significant environmental and social sensitive issues and negative impacts, recommended alternative for the client and design team to consider.

v. Recommend (a) measures to safeguard the environment before, during, and after implementation of the Project; (b) mitigation measures and the monitoring program, including cost implications and an institutional setup for implementing the program; and (c) responsible agency for environmental monitoring during project implementation. Above mentioned shall be included in EMP.

vi. Develop the EIA and EMP, including monitoring indicators for implementation of the EMP in accordance with the laws laid down by Government of the Punjab and relevant environmental assessment requirements and review procedures. Provide detailed information regarding mitigation measures, institutional arrangement and monitoring, etc., as required, which will be needed during the project implementation

vii. The Consultant will bear all the expenditures related to the approval of EIA report from Environment Protection Department Punjab.