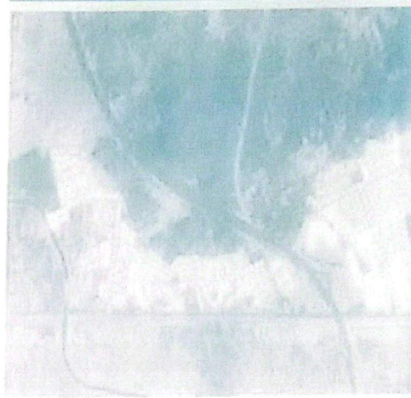
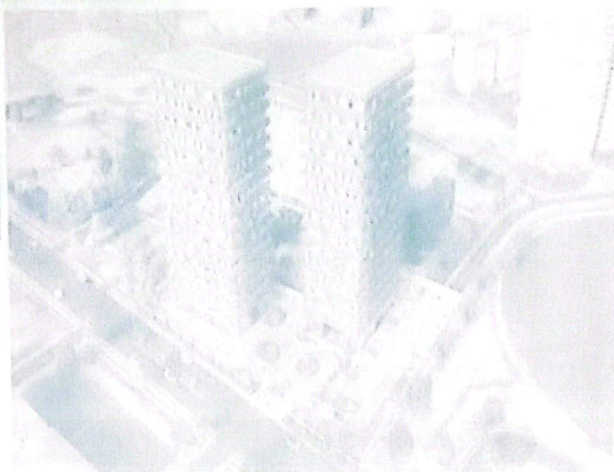
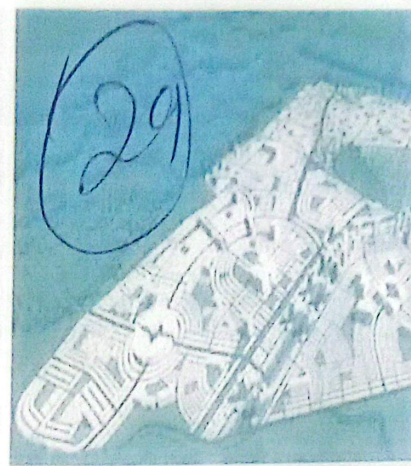
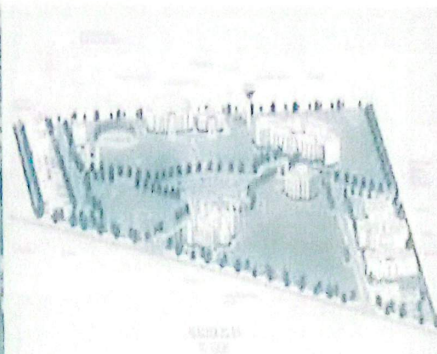




Rehabilitation and Improvement of Water Supply System in MC Bahawalnagar, Punjab

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA) REPORT

September-2022



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Quality Control Sheet



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EXECUTIVE SUMMARY

This Environmental and Social Impact Assessment (ESIA) has been prepared for Rehabilitation and Improvement of Water Supply System in MC Bahawalnagar, Punjab which is being funded by the World Bank through the Punjab Municipal Development Fund Company and to be implemented by the Municipal Corporation Bahawalnagar and supervised by consultants appointed by PMDFC.

Sub-project Background

In view of growing realization to have a separate agency for municipal development in the province, Government of the Punjab established Punjab Municipal Development Fund Company (PMDFC) with the technical and financial assistance of the World Bank in 1998. PMDFC, registered under the Companies Ordinance 1984 as an independent entity, is a vibrant civil society organization working for the improvement of municipal services in Punjab province. Its role as a technical arm of the Local Government and Community Development (LG & CD) Department over the past few years has been well established. PMDFC resolves to continue striving towards its motto 'Help Build Healthy Cities' with the support of all its stakeholders.

Punjab Cities Program is one the major ongoing projects of PMDFC. The development objective of the Punjab Cities Program for Pakistan is to strengthen the performance of participating urban local governments in urban management and service delivery.

The program focuses on urban management and improvement of municipal services infrastructure for the following sectors:

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

Sub-project overview

The sub-project aims at improvement of infrastructure of municipal services in MC Bahawalnagar. The Sub-project consists of rehabilitation of existing water supply system as well as laying of new water supply system in areas with water shortage and to enhance the water source of MC Bahawalnagar.

It is comprised of rehabilitation and construction of new tube wells, Overhead Tanks / GST, transmission main, distribution network, pumping machinery, electrification & other allied works. The project will require 100 labourers that will be engaged throughout the timeline of the project i.e., one year.

The Sub-project has the following main objectives.

1. To Rehabilitate the existing pumping machinery of Tube wells and Intermediate pumping station.

2. To fulfill the water requirement for water shortage area.
3. Improvement of service delivery level of the municipal services.
4. Increment in water source.
5. Proper controlling of network through valve system.
6. Increase the water storage for community.
7. To deliver potable water to community at door step.
8. Improvement in local and province economy.

Further details are described in section Brief Description of the Sub-Project.

Sub-project Location

The sub-project is located in MC Bahawalnagar, Punjab, Bahawalnagar is a city of southern Punjab, Pakistan. It is located at 29° 59' 34" N, and 73° 15' 13" E and has an altitude of 163 meters. Bahawalnagar is situated 262 km (163 mi) south of Lahore and about 175 km (109 mi) miles east of Bahawalpur. It is 65 km (40 mi) far from District Pakpattan. River Sutlej passes on the northern side at a distance of about 6 miles. (Location map is provided in Chapter 5: Description of Sub-Project)

Sub-project Proponent

Chief Executive Officer of Municipal Corporation Bahawalnagar is the proponent of project and intends to get Environmental approval for the said sub-project as the proponent by submitting the Environmental & social Impact Assessment Report for the compliance of section 12, PEPA, 1997 (Amended 2012).

Brief Description of the Sub-project

Bahawalnagar city consists of surface and ground water resources. Surface water sources consist of Fordwah Canal and Sadqia Canal. Fordwah canal is flowing at the Western periphery of the city and Sadqia Canal flowing at the Eastern periphery of the city. The canal is unlined and recharging the ground water in narrow belts on both sides with fresh water. The city has some fresh ground water in the vicinity of canals but the majority of the city's subsoil water is brackish and unfit for drinking. Therefore, a large number of tube wells have been installed on the bank of both canals to extract fresh subsoil water. Water from these tube wells is either pumped into storage tanks or supplied directly to consumers.

Existing water supply system in Bahawalnagar City is a combination of the following assets:

1. Tube wells
2. Transmission Mains
3. Overhead Tanks / GSTs
4. Piped Distribution Network

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Transmission main is damaged at some points which cause hindrance in the delivery of water. Some existing tube wells are also non-functional.

If water supply system is not improved at this stage, then this infrastructure will be further damaged / degraded giving financial loss to the public as well as private sectors and the growth potential of the city will be adversely affected.

The sub project comprises of tube wells, Overhead Tanks / GSTs, transmission main, distribution network, pumping machinery, electrification & other allied works.

Detail of these water supply components are given in the table below:

Table 0-1. Scope of work

Improvement and Rehabilitation of Water Supply System		
Sr. No.	Name of Water supply component	Quantity
1.	New Distribution Network (length 1.5 km)	5,000 Rft
2.	Rehabilitation of old and installation of new Transmission Main	28,000 Rft
3.	Under Ground Water Tank (100,000 Gallon)	02 Nos.
4.	Under Ground Water Tank (50,000 Gallon)	01 Nos.
5.	New Tube wells	20 Nos.
6.	House Connection	8,000 Nos.
7.	Rehabilitation of existing non-functional tube wells	13 Nos.
8.	Installation of Valves on Existing Transmission Main	70 Nos.

Need of ESIA

As per Environmental and Social Management Framework (ESMF) of Punjab Cities Program (PCP), the sub-projects under the scope of Water Supply distribution network which involve ESIA for repair and maintenance of existing network and the ones where installation of new water supply network fall in category E1 and may require as per scope of work and environmental impacts and categorization given in Schedule I and II of PEPA Review of IEE/EIA Regulations, 2022.

This sub-project involves installation of 20 new tube wells along with the rehabilitation of 13 existing tube wells on Fordwah Canal and Sadajia Canal (20 new tube wells for construction / installation and 08 old tube wells for

rehabilitation on Fordwah Canal and 05 old tube wells for rehabilitation on Sadda Canal). Sub-project also involves construction of 03 overhead tanks / GSTs (02 in Madina Town and 01 in Satuj Park), installation of 6.4 km length of transmission mains and 1.5 km length of transmission lines to be rehabilitated, installation 1.5 km of new distribution lines along with other allied work related to the improvement of overall water supply system of MC Bahawalnagar as described in table 0-1.

The sub-project corridor is in direct vicinity of surface water bodies i.e., Fordwah canal and Sadda canal that may have minor mitigatable environmental impacts during construction works like dust generation etc. As per ESMP, Water Supply Sub-Projects that include new construction works has to be categorized as E-1. Due to which, the sub-project falls in the E-1 category.

As there is no resettlement required in the sub-project as the sub-project is being established on government owned land and no private land will be acquired, so the sub-project should fall in S-3 category as per ESMP.

According to the Review of IEE and EIA Regulations, 2022, the sub-project falls under Schedule II (List of sub-projects requiring an EIA), Category F (Water Supply, Sewerage System and Treatment), sub clause [Water supply schemes and treatment plants (excluding the Reverse Osmosis, Ultra filtration and such like) with total cost more than Rs. 50 million] as the capital cost of the sub-project is about 855.80 million PKR.

After the review of the legal framework and the scope of sub-project it has been decided to conduct ESIA of the sub-project.

Major Impacts & their Mitigation Measures

In order to identify all the activities associated with the sub-project during construction & operation phase with potential to cause significant environmental & social impacts and harm a thorough review has been conducted. Sub-project will not have significant negative impacts on the nearby community but may pose minor mitigatable impacts on environment in terms of dust, noise etc. And, the sub-project will have positive impacts on the local population and country as a whole.

Table 0-2, Summary of Major Impacts during Construction & Operation Phase

Pollutant	Constructional Phase	Operational phase
Ambient air quality	The impact on air quality is expected as a result of construction works, specifically excavation of the trenches which will generate dust with motorized equipment also	Resources utilization i.e., fuel and energy for the operation of pumps and tube wells

Pollutant	Constructional Phase	Operational phase
	generating gases. Smoke from vehicles. Generator and other fuel consuming machinery and Construction material	
Noise and vibration	- During the implementation of the sub-project a large amount of equipment and construction machinery will be utilized for construction. - The equipment would include excavators, concrete mixer, trucks, Generator and other machinery and vehicles. The operation and movement of such equipment will increase the noise and vibration in the Sub-project Area and Neighborhood residential may be disturbed by the noisy activities.	Noise and vibration emission and associated impacts during repair and maintenance is expected to be low and will emanate from motorized equipment. This impact is expected to be low in nature and short term, experienced only in cases where motorized equipment is used. Resources utilization i.e. utilization of pumps and machinery also cause noise and vibration.
Odor	Nil	Nil
Flora and fauna	Impact on Flora A few trees and vegetation (like small grass) are present near the sites for proposed installation of tube wells. However, it will be made sure that no tree is cut during the construction work by changing the positions of tube wells on the canal bank by few feet as no tree will be cut. No trees / vegetation will be affected during the construction of transmission lines. Disturbance to Fauna: No impacts.	No significant impact on flora and fauna during operation phase.
Solid Waste	Solid waste will be generated due to construction activities and domestic sources.	Solid wastes will mainly emanate from the operation activities related to maintenance operations and will include among others:

Pollutant	Constructional Phase	Operational phase
	Also due to sludge from septic tank	- Excavated soil - Cement storage bags and other packets from materials used during repair and maintenance. - Spillage of oil and grease from machines used in excavation, repair and maintenance and transportation activities may also encompass solid wastes
Soil Contamination	- Soil Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the Sub-project Site and in its nearby surroundings. Spillage from the generator or from moving vehicle will cause contamination of soil at construction sites - Solid wastes generation Hazardous materials	Soil can be contaminated due to leaching of oil, fuel, from vehicles or machinery any stored oil. Storage & handling of hazardous chemicals.
Surface and Ground water contamination.	- Sewage and sanitary waste water generated from the construction site may contaminate groundwater, if not disposed of properly. 20 new tube wells are being constructed and 08 old tube wells are being rehabilitated on the embankment of Fordwah canal and 05 old tube wells are being rehabilitated on the embankment of Saqdia canal therefore, proximity to surface water bodies may lead to contamination of	Nil.

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Pollutant	Constructional Phase	Operational phase
	surface water bodies during construction activities.	
Health and safety issues	Construction activities including excavations, backfilling involve inherent occupation health risks related to operation of equipment and machineries. In the absence of sufficient management of Health and Safety (H&S) issues, the workforce may suffer injury or death. Accidents may also occur.	Health and safety issues will be arising if flue gases or noise exceed the permissible limits of PEQS, and improper practice of work during storage, handling and transportation of fuel.
Socioeconomic	- Disturbance to neighbors by constructional activities - People earning associated for their sites will be temporarily disturbed	Employment opportunities will be enhanced as staff will be hired for operation of newly installed tube wells.
Gender & privacy issues	- Sub-project activities may cause hindrance to mobility especially for women in terms of privacy or harassment, during construction stage. - Privacy of the community may be disturbed. - Harassment issues	Privacy of the community may be disturbed.
Land acquisition	No private land will be acquired for the project. Sub-project site is government land. Tube wells will be constructed on land / RoW of irrigation department while supply lines pass through the land of Highway and Railway that are be consulted before initiation of construction works and NOCs / Consent Letters will be obtained by MC.	Nil
Mobility Issues & Traffic management	The roads maybe temporarily blocked at the active construction zone that may create	The roads maybe temporarily blocked at the active construction zone

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Pollutant	Constructional Phase	Operational phase
	- problems of traffic for nearby community - Blockage due to construction waste • Blockage due to machinery and vehicles	during repair/ maintenance in operation phase that may create problems of traffic for nearby community
Loss of livelihood	• The project is of short duration (12 months) and will not have significant impact on the livelihood of the community.	Nil
Community health and safety	• The community health and safety must be ensured during construction phase especially the hazard of falls during excavation of trenches. Accidents & disputes can also arise.	The community health and safety must be ensured during repair/ maintenance in operation phase especially the hazard of falls during excavation of trenches.
Resettlement issues	• There are no resettlement issues during this project	Nil
Child protection	• Child labor might get involved in the construction activity	Child labor might get involved in the construction activity during repair and maintenance

Recommendation for Mitigation Measures

Table 0-3, Summary of recommendations during Construction & Operation Phase

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
Ambient Air Quality	• Tuning off vehicles should be made mandatory to reduce the emissions of NOx, SOx, CO and PM₁₀ when they are not in use. • Equipment and vehicles powered with diesel should be well maintained and tuned to minimize particulate emissions. • Haul-trucks carrying, earth, sand, aggregate and other materials should be kept covered during transportation of materials and during storage at site, with tarpaulin. • The fugitive dust emission will not be a problem because the roads are paved but for the precautionary measure sprinkling of water-by-water trucks will be done. • As well as the temporary boundary wall made of wood will be constructed that will act as barrier for air emissions going towards residential area.	• It is not expected that significant impact will occur on local residents or that emissions will exceed regulatory permissible ground-level concentrations. All air emission impacts will be of temporary nature, location specific and reversible. The impact on air quality is considered to be insignificant if appropriate mitigation measures are implemented such as dust suppression techniques, regular maintenance and monitoring of vehicles, use of high-quality fuel, etc. • Further, the sub-project will be implemented through the significant use of manual labor and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery.
Noise and vibration	• During the construction phase of the sub-project, it is expected that elevated levels of noise will be produced in the construction area. Pipeline construction would progress along the route and, as a result, all noise impacts would be	• The repair and maintenance works will mainly be carried out during the daylight working hours with no night working expected unless it is an emergency e.g., pipe burst or blockage. Mitigation measures will prescribe

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	temporary. Contractor will ensure the use of well-tuned vehicles • Contractor will ensure the use of well-tuned machinery and skilled labor • Attenuation boxes can be installed • Silencer can be fitted to reduce and suppress the noise • Constructional activities should be planned or scheduled • Restricting access to noisy area • Shutting down the noisy equipment when not needed • Providing personal protective measures to labors working • Regular monitoring to determine compliance will be done by the Supervision Consultant and corrective/mitigation measures applied where necessary.	daylight working hours in the most affected zones.
Odor	Nil	Nil
Impacts on flora and fauna	• In this sub-project, low impact is expected on vegetation (like small grass or shrubs but not trees) since the pipeline routes are devoid of significant unique floral and faunal life, as per design. No tree will be cut. • The clearing of sub-project sites through excavations for the	Maintenance and monitoring of plantation around the sub-project corridor.

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	pipelines (reservoir) will not affect flora and fauna and all the minor impacts caused by construction work on flora (like small grass / shrubs) are of temporary and reversible in nature and can be mitigated by appropriate good working practices that will be prescribed in ESIA/ESIA.	
Solid Waste	- A site waste management plan should be made the responsibility of the construction contractor to provide for the designation of appropriate waste storage area on the site and a schedule for the timely collection and removal of construction debris to an approved dump site. - The organic waste produced during site clearing should be mechanically mulched and composted at the site and used for landscaping. - Arrangements should be made for regular garbage collection and removal of sewage from the construction site. - A barrier between surface water bodies and the active construction zone should be made to make sure that no construction	- The occurrence of these wastes is expected to be minimal because of the expected use of manual equipment and labor which would reduce wastes associated with oil spills, repair and maintenance. - The soil excavated during maintenance will be used as backfill and thereby reducing the generation of waste material and related waste pollution concern. - There will be limited hazardous wastes generated from this sub-project including the cement bags, grease and oil. Site for hazardous waste should be constructed using concrete so infiltration of material in soil cannot take place. - All wastes will be disposed in an approved waste disposal site. The operator will develop a Waste Management Plan (WMP).

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	debris is disposed-off intentionally or unintentionally in the canals.	to guide the disposal of all types of wastes emanating from the sub-project
Soil erosion / Soil Contamination	• Soil contamination can be curtailed by reducing the oil spill at sub-project construction areas by well maintaining the construction vehicles as well as generators. • The Contractor is required to impart proper training to his workforce in the handling and proper disposal of solid waste. • Proper drainage facility will be provided to avoid the water accumulation, which will minimize the soil contamination. • Ground shall be leveled to avoid slopes. • Proper solid waste management plan should be developed by the Contractor and implemented to avoid the litter and any other waste problems.	• Soil contamination can be curtailed by reducing the oil spill at sub-project construction areas by well maintaining and use of well-tuned vehicles as well as machinery & generators. • The Contractor is required to impart proper training to his workforce in the handling and proper disposal of solid waste. • Proper drainage facility will be provided to avoid the water accumulation, which will minimize the soil contamination. • Ground shall be leveled to avoid slopes. • Proper solid waste management plan should be developed by the Contractor and implemented to avoid the litter and any other waste problems.
Surface and ground water	• Sewage from construction camp will be disposed of using septic tank • Avoid accidental spills of oils and lubricants through good practice. Prepare and implement Emergency Response Procedures in case of any spill hazard. • Construction site effluent drainage should be established in areas with adequate natural drainage channels in	• The water supply will be closed down during construction phase ensure that no polluted water gets into water supply.

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Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	order to facilitate flow of the effluents. Efforts will be made to make sure that the surface water quality is not disturbed in any way during the construction activities and contingency plans will be made to ensure that.	
Health and safety issues	Occupational health and safety impacts during construction phase is considered to be of moderate in significance. The construction activities will use a mix of hand-held tools and mechanized equipment and machinery in digging the trenches. Experienced and trained and skilled labor or personnel will be engaged in operating equipment. Health safety procedure is also prepared and will be implemented. Training of workers in the construction safety procedures, environmental awareness, and equipping all construction workers with safety boots, helmets, gloves, ear plugs, and protective masks, and monitoring their proper and sustained usage.	- Occupational health and safety impacts during operation/maintenance and repair is considered to be of moderate in significance due to the expected use of non-mechanized equipment and machinery. The construction activities will use hand held tools in digging the trenches with very limited use of excavators. Experienced and trained personnel will be engaged in operating equipment. - First aid box should be present on sites - Construction safety SOPs should be followed. - Road lights should be maintained on construction sites at night - Labors should be provided with PPEs to avoid accidents. - Labors should be trained for healthy team work - Conflicts should be settled according with law - Labors should be trained for healthy team work - Sign boards should be displayed at sites

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
Socioeconomic	• People will be informed in advance when work is about to start at the site. • Job opportunity was provided to local people of the area	• Community wellbeing should be considered and neighbor's privacy should not be disturbed. • Local people should be preferred for the employment. • Working should be scheduled and informed to the concerned public.
Gender issue	• Workers would be trained to address privacy issues and ethically behaved. • Labours would be strictly asked to cater the privacy issues. • staff capacity-building	• Workers would be trained to address privacy issues and ethically behaved. • Labours would be strictly asked to cater the privacy issues. • Staff capacity-building
Land acquisition	Sub-project land is government owned. 20 new tube wells will be installed on Fordwah Canal (in RoW of Irrigation Department, Fordwah Canal Division). Transmission main will be installed in RoW of Highway Department and Railway Department. So, all these relevant stakeholders have been consulted during the survey. Applications will be submitted for relevant NOCs / consent letters by MC that will be submitted to EPA upon issuance.	Nil
Traffic management	• Provision of alternative routes • Water sprinkling at sub-project site at consecutive intervals • Indicators / signboards regarding alternate routes should be provided at proper distance to avoid accidents	• Provision of alternative routes • Indicators/signboards regarding alternate routes should be provided at proper distance to avoid accidents • Vehicles should be parked at designated points

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	- Inform and coordinate the local residents regarding construction time schedule and also to display the details at sub-project site for their convenience (Public consultation has been carried out. Performa is attached as Annex H). - Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and inconvenience to the local residents. - In case of any complaint, focal person of GRC may contact (details will be highlighted at sub-project site).	- Machinery after use should be allocated to designated places. - Storage of construction material should store at proper places that should not affect mobility. - Inform and coordinate the local residents regarding construction time schedule and also to display the details at sub-project site for their convenience.
Loss of livelihood	As there will be no significant impact hence no mitigation measure is required	Nil
Community health and safety	Contractor will ensure the provision of medicines, first aid kits, emergency vehicles, etc. at the work place. Compliance with the safety precautions for construction workers as per International Labor Organization (ILO) Convention No. 62 will be ensured by the Contractor. The active construction zone must be cordoned off to avoid injuries due to accidents.	The active construction zone must be cordoned off to avoid injuries due to accidents.
Resettlement issues	As no resettlement is required hence there will be no need for mitigation	Nil

Pollutants	Recommendations during Construction phase	Recommendations during maintenance / Operation phase
	measures	
Child protection	Child labor must be prohibited on sub-project site	Child labor must be prohibited on sub-project site

Proposed Environmental Monitoring

To oversee the environmental performance of the sub-project through its lifecycle enforcing the PEQS an Environmental Monitoring Program should be formulated which ensures effective surveillance of the environmental parameters at various stages of the sub-project development and compliances with PEQS and legal obligations. Monitoring for following Environmental Parameters is recommended:

Ambient Air

Regular monitoring for ambient air should be conducted during construction & operational activities of the sub-project and report should be submitted to EPA Punjab.

Noise

Regular monitoring for noise level should be maintained periodically during construction & operational phases of the sub-project and report should be submitted to EPA Punjab.

Water Quality

Regular monitoring of water quality should be conducted during construction & operational phases of the sub-project and report should be submitted to EPA Punjab.

S.1.1.1 Schedules of Proposed Monitoring

Table 0-4, Proposed monitoring schedule

Sr. No.	Parameters	Monitoring Schedules
1	Ambient Air Monitoring (NO _x , CO _x , SO _x , VOCs, PM ₁₀)	Quarterly
2	Noise Level	Weekly
3	Water quality	Quarterly

Note: Environmental Monitoring data log book should be maintained by the sub-project proponent.

ESMMP Implementation and monitoring arrangements of ESIA

S.1.1.2 MC Bahawalnagar

Overall responsibility for Environmental Management and Monitoring will rest with MC Bahawalnagar. ESM Wing of PMDFC will provide support to ESFPs ifc

¹ Environment and Social Focal Persons

Executive Summary

managing environmental and social aspects of the sub-project and implementation of the present ESMMP. The specific responsibilities of the institutions involved in the ESMMP implementation are described below:

1.1.3 PMDFC ESM Wing

MC Bahawalnagar will be responsible for implementation of ESMMP with the technical assistance of ESM Wing PMDFC throughout the sub-project period. ESM Wing would also support communities' participation, consultations and other social activities from the Sub-project identification to completion stage. PMDFC ESM-Wing will formulate a comprehensive report to be submitted to World Bank regarding the progress of implementation of ESMMP.

1.1.4 The Contractor

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

1.1.5 Supervision Consultant

The Environment Specialist of the consultant will be responsible for the on-field supervision and monitoring of the implementation of ESMMP being done by the contractor. The Environment Specialist of the consultant will report the progress to PMDFC ESM-Wing.

1.1.6 ESIA Implementation and monitoring budget

The costs for the implementation of construction stage activities given in this ESIA/ESIA will be included within the civil works contract for this sub-project with total cost of sub-project is 855.80 million PKR. The total cost of ESIA/ESIA implementation is **2.496 Million PKR**. Detail is given in Table 8-4.

1.1.7 Grievance Redress Mechanism

A site-based Grievance Redress Mechanism (GRM) for the sub-project will be operational during the implementation of this ESIA/ESIA. Grievance Redress will be processed as per the World Bank OP 4.12 which requires an appropriate and accessible grievance redress mechanism for affected persons, including displaced persons and host communities.

A multi-tier GRM has been proposed in the ESMF. At project site, Chief Officer MC Bahawalnagar will act as the Grievance Redress Officer (GRO) of the grievance. Grievance Redress Committee at Regional level will also be notified under umbrella of Punjab Cities Program (PCP). Deputy Program Officer (Environmental & Social Management) (DPO-ESM). DPO-ESM will support ESFPs in steering the GRC functions both at city and regional level.

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The GRM will be accessible to diverse members of the communities, including women, senior citizens, and people with disabilities, laborers/workers, and other vulnerable groups. Culturally appropriate communication mechanisms will be used at all Sub-project sites both to spread awareness regarding the GRM process as well as complaints management. ESMF GRM will be integrated with the PCP's overall program GRM hotline to be developed by the Consultants under the scope of PCP.

A Grievance Redress Committee (GRC-PMDFC/LG&CDD) will be responsible to oversee the overall functions of the GRM at a strategic level including monthly reviews. It will be headed by the Secretary LG&CDD.

If the complainant is not satisfied, the complaint will have the option to seek redress through the court of law. **(This mechanism developed for GRM is tentative and will be finalized after hiring of consultant for GRM).**

SECTION - 1: INTRODUCTION

This Environmental and Social Impact Assessment (ESIA) has been prepared for Rehabilitation and Improvement of Water Supply System in MC Bahawalnagar, Punjab which is being funded in by the World Bank through the Punjab Municipal Development Fund Project and to be implemented by the Municipal Corporation Bahawalnagar and supervised by consultants appointed by PMDFC. This report has been prepared to meet compliance with environmental regulations and requirements under Punjab Environmental Protection Act (PEPA) (Amended 2012) and the World Bank's Safeguard policies applicable to the sub-project.

1.1 PURPOSE OF THE REPORT

Environmental and Social impact Assessment (ESIA) report is being submitted to the Environmental Protection Agency (EPA), Government of the Punjab, Lahore for the compliance of Section 12 of Punjab Environment Protection Act-1997 (Amended 2012) for obtaining No Objection Certificate (NOC) before starting the construction activity at the sub-project site. The other relevant regulations and guidelines considered while preparing this ESIA report include:

- Policy and procedures for filing, review and approval of environmental assessments.
- Guidelines for the preparation and review of environmental reports.
- Guidelines for public participation writer
- Guidelines for sensitive and critical areas.
- Detailed sectorial guidelines

Various aspects like environmental, social, physical and other aspects of the sub-project both during construction and its regular occupancy are highlighted in this ESIA report. Measures necessary to be adopted to mitigate any environmental impacts on any part of the environment around are also described. All the important information is also provided as described under the format used to help decision makers (EPA Punjab), before issuing the desired Environmental Approval.

1.2 PROJECT BACKGROUND

In view of growing realization to have a separate agency for municipal development in the province, Government of the Punjab established Punjab Municipal Development Fund Company (PMDFC) with the technical and financial assistance of the World Bank in 1998. PMDFC, registered under the Companies Ordinance 1984 as an independent entity, is a vibrant civil society organization working for the improvement of municipal services in Punjab province. Its role as a technical arm of the Local Government and Community Development (LG & CD) Department over the past few years has been well

established. PMDFC resolves to continue striving towards its motto "Help Build Healthy Cities" with the support of all its stakeholders.

Punjab Cities Program is one the major ongoing projects of PMDFC. The development objective of the Punjab Cities Program for Pakistan is to strengthen the performance of participating urban local governments in urban management and service delivery.

The program focuses on urban management and improvement of municipal services infrastructure for the following sectors:

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

SUB-PROJECT OVERVIEW

In the modern era, the access to clean water for everyone is becoming rare day by day, especially in district headquarter city, the supply of water free from any harmful impurity is one of the most basic needs. To cope up with this problem water filtration system according to the existing nature of water is designed and water supply system is proposed accordingly. For ease of public, drinking water supply network is designed to provide better water in colonies and wards and in various drinking stations within the city area.

The major reason of unsatisfactory service delivery is the lack of proper maintenance of the municipal infrastructure in all sectors causing consumer dissatisfaction at one end and degradation of the infrastructure on the other end apart from very low revenue recovery as the consumers are reluctant to pay because of deteriorated service delivery.

Bahawalnagar city consists of surface and ground water resources. Surface water sources consist of Fordwah Canal and Saddia Canal. Fordwah canal is flowing at the Western periphery of the city and Saddia Canal flowing at the Eastern periphery of the city. The canal is unlined and recharging the ground water in narrow belts on both sides with fresh water. The city has some fresh ground water in the vicinity of canals but the majority of the city's subsoil water is brackish and unfit for drinking. Therefore, a large number of tube wells have been installed on the bank of both canals to extract fresh subsoil water. Water from these tube wells is either pumped into storage tanks or supplied directly to consumers.

The sub-project aims at improvement of infrastructure of municipal services such as lying of water supply system in water shortage area and to enhance the water source of MC Bahawalnagar.

The subproject comprises of tube wells, Overhead Tanks / GST, transmission

WATER DISTRIBUTION NETWORK, EXISTING INFRASTRUCTURE, VULNERABILITY & OTHER RELATED WORKS

1.4 OBJECTIVE OF ESIA

The main objective of this ESIA study is the identification of the existing and potential impacts of the proposed sub-project on environment and socio-economic aspects. The impact identification process focuses on identifying and documenting socio-economic and cultural aspects of the environment. Based on the level and nature of these considerations the ESIA then delineates proper mitigation measures. As a planning tool, the ESIA aims to ensure that environmental, socio-economic and cultural issues throughout the entire sub-project lifecycle are anticipated and considered by the sub-project proponent. It also serves as a framework for establishing sub-project controls to reduce or prevent adverse environmental or socio-economic impacts.

The specific objectives of this ESIA are:

- To assess the existing environmental and socioeconomic conditions of the Sub-project Area;
- To identify potential impacts of the proposed sub-project on the physical, ecological and social aspects of the Sub-project Area, to predict and evaluate these impacts and determine their significance;
- To propose appropriate generic mitigation measures that should be incorporated in the design of the Sub-project to avoid or minimize if not eliminate the potentially adverse impacts;
- To assess the compliance status of the proposed activities with respect to the national and provincial environmental legislation and W&S OfS;
- To provide institutional, monitoring, reporting and documentation measures for environmental safeguards compliance;
- To aid decision makers to take informed decisions.

1.5 IDENTIFICATION OF THE SUB-PROJECT

20 new tube wells will be installed while 13 existing tube wells will be rehabilitated, similarly 6.4 km length of transmission lines will be installed and 1.52 km length of transmission lines will be rehabilitated and 03 Overhead tanks / GSTs will be constructed as part of this sub-project. Hence this sub-project falls in E-1 category. However, sub-project has no impact on house hold or any social apprehensions. Therefore, sub-project categorized as S-3.

According to the IEE and EIA Regulations, 2022, the sub-project is falls under Schedule II (List of sub-projects requiring an EIA), Category F (Water supply, Sewerage System and treatment), sub clause [Water supply schemes and treatment plants (excluding the Reverse Osmosis, Ultra filtration and such like) with total cost more than Rs. 50 million].

1.6 THE PROPONENT

Chief Executive Officer of Municipal Corporation Bahawalnagar, is

responsible to get Environmental approval for the said sub-project as the proponent by submitting the Environmental Impact Assessment Report for the compliance of section 12, PEPA, 1997 (Amended 2012).

1.7

THE CONSULTANT

ASIAN Consulting Engineers Private Limited (AsCE) JV with Rehman Habib Consultants (Pvt.) Ltd. is providing their services to conduct environmental assessment for the sub-project. ASIAN Consulting Engineers Private Limited is an independent consulting company working in the field of environment. Asian provides consulting services and sustainable solutions for infrastructure projects, industrial projects and social development projects.

The contact details for the company are given as under:-

Asian Consulting Engineers Private Limited

Tel: +92 42 35450914-5 | Fax: +92 42 35450916 | Mobile: +92 321 4260133

E-mail: arsan.hanif@asiancon.com, aleem.butt@asiancon.com

Address: C-3, Jhelum Block, Green Fields-II, Lahore, Pakistan.

1.8

BRIEF DESCRIPTION OF SUB-PROJECT

1.8.1

Nature & Size of Sub-project

Existing water supply system in Bahawalnagar City is a combination of the following assets:

1. Tube wells
2. Transmission Mains
3. Overhead Tanks / GSTs
4. Piped Distribution Network

Transmission main is damaged at some points which cause hindrance in the delivery of water. Some existing tube wells are also non-functional.

If water supply system is not improved at this stage, then this infrastructure will be further damaged / degraded giving financial loss to the public as well as private sectors and the growth potential of the city will be adversely affected.

The following component will be added or rehabilitated for the improvement of the project:

Table 1-1. Scope of work

Improvement and Rehabilitation of Water Supply System		
Sr. No.	Name of Water supply component	Quantity
1.	New Distribution Network (length 1.5 km)	5,000 Rft
2.	Rehabilitation of old and installation of new Transmission Main	28,000 Rft

Improvement and Rehabilitation of Water Supply System		
Sr. No.	Name of Water supply component	Quantity
3.	Under Ground Water Tank (100,000 Gallon)	02 Nos.
4.	Under Ground Water Tank (50,000 Gallon)	01 Nos.
5.	New Tube wells	20 Nos.
6.	House Connection	8,000 Nos.
7.	Rehabilitation of existing non-functional tube wells	13 Nos.
8.	Installation of valves on existing transmission Main	70 Nos.

LOCATION

Sub-project is located in MC Bahawalnagar, Bahawalnagar, Punjab. Bahawalnagar is a city of southern Punjab, Pakistan. It is located at 24° 34' 34" N, and 67° 13' E and has an altitude of 163 meters. Bahawalnagar is situated 262 km / 163 miles south of Lahore and about 173 km (107 mi) miles east of Bahawalpur. It is 65 km (40 miles) from District Pakpattan. River Sutlej passes on the northern side at a distance of 40 miles. Google Map of sub-project is shown below. Further detail is provided in Chapter 5: Description of Sub-Project.

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degree college
hospital
old tubewells
proposed tubewells
transmission lines
tubewells proposed



1.10 APPROACH & METHODOLOGY TO WORK

1.10.1 Approach

The study has been conducted in accordance with Environmental Protection Agency (EPA), Government of Pakistan (GOP) Guidelines, 1997 and the World Bank Safeguards policies (OP4.01, OP4.04, OP4.36, OP4.11 and OP4.12) applicable to this sub-project. The study is based on both primary and secondary data and information. The primary data includes data collected from field i.e.: information about land use; environmental sampling and analyses for air, water and noise; biodiversity & ecological survey; social survey including demographic characteristics, income dependency & quality of life, occupation, agriculture and cropping pattern and social amenities etc. The secondary data includes a review of relevant information from literature. Discussions were held with stakeholders including government officials, community representatives and a wide range of people living in the area. The main purpose of this approach was to obtain an impartial impression of the people's perceptions about the sub-project and its environmental and social impacts.

1.10.2 Methodology

The following methodology was adopted for carrying out the ESIA study of the proposed Sub-project:

a) Orientation

Meetings and discussions were held among the members of the ESIA Consulting Team. This activity is aimed at achieving a common ground of understanding of various issues of the Study.

b) Data Collection Planning

Subsequent to the concept clarification and understanding obtained in the preceding step, a detailed data acquisition plan was developed for the internal use of the ESIA Consulting Team. The plan included; identification of specific data requirements and their sources; determination of time schedules and responsibilities for their collection and indication of the logistics and other supporting needs for the execution of the data acquisition plan. Field surveys were then conducted based on the data collection plan.

c) Detailed Field Survey

Detailed site visits for collection of data were conducted from July August-08 2022, 2 and 8 September, 2022. The data collected from field include:

- Identification of environmental sensitive receptors including air sensitive receivers, noise sensitive receivers and water bodies expected to receive pollutant load;
- Sampling and analysis for air, noise and water;

- Ecological survey;
- Socioeconomic survey including public consultation;
- Stakeholders' consultation;

Meetings with different departments at MC Bahawalnagar were held and following data was collected.

d) Sampling & Analysis of Physical Environmental Parameters

Asian Environmental Services Private Limited, which is EPA certified laboratory, was hired for physical environmental sampling and mobilized on September 2, 2022 for sampling and analysis of air, water and noise quality. Samples were collected from two (02) locations for analysis in the laboratory.

e) Review of Secondary Data

Previous environmental and social soundness assessment for Bahawalnagar and other published and unpublished information was collected in order to gain a complete understanding of existing environmental conditions of the area including:

- **Physical environment:** topography, geology, soils, surface and ground water resources and climate;
- **Biological environment:** habitat types, flora and fauna (particularly rare or endangered species), critical habitats/zones and vegetation communities within the sub-project area;
- **Socio-economic environment:** settlements, socio-economic conditions, infrastructure and land use.
- **Heritage aspects:** sites of cultural, archaeological or historical significance.

f) Corridor of Impact (COI)

COI include the actual Sub-project Right of Way (ROW) as well as the area in the surroundings in which positive and adverse impacts may be foreseen due to the implementation of the proposed Sub-project. The area of influence is the area likely to be affected by the sub-project, including all its ancillary aspects, such as relocation and access roads, borrow and disposal areas and construction camps, as well as unplanned developments induced by the sub-project (e.g., spontaneous settlement, logging, or shifting agriculture along access roads).

g) Stakeholder Consultations

For this ESIA study, stakeholder consultation was carried out through questioners and one on one meeting. The ESIA team met with the government functionaries, affected persons and local communities along the proposed route. The objective of the consultation was to disseminate information on the sub-project and its expected impact, long-term as well as short-term, among primary and secondary stakeholders and to gather information on relevant issues so that the feedback received could be used to address these issues at an early stage.

h) Environmental and Social Impact Assessment

The data collected from the field was analyzed and the impacts of the proposed sub-project on the physical, biological and socio-economic environment prevalent in the sub-project area were identified and characterized with respect to significance and probability of occurrence at the design, construction, operation and decommissioning phases. The impacts were analyzed using various tools such as

- Overlay Mapping
- Screening Checklists
- Impacts matrix

Possible mitigation measures and implementation mechanisms are proposed so that the impacts can be mitigated / controlled and the sub-project implementation remains sustainable.

i) Development of Environmental and Social Management & Monitoring Plan (ESMMP)

An ESMMP for the proposed sub-project activities was prepared. The ESMMP provides a plan for implementing and managing the mitigation and monitoring measures recommended in the ESIA. The ESMMP includes the following:

- Mitigation and monitoring plan.
- Definition of roles and responsibilities of the proponent, contractors and monitoring teams.
- Requirements for communication, documentation and training during the sub-project.
- Restrictions on design, timing and conduct of the sub-project.
- Change Management Plan to cover unforeseen events/environmental conditions during the sub-project.

.11 STRUCTURE OF REPORT

The structure of this report is listed below:

Section 1: Introduction briefly presents the sub-project background, objectives, methodology and need of the ESIA study.

Section 2: Legal and Administrative Framework Lists national as well as provincial laws, regulations and procedures and applicable World Bank Operational Policies (OPs).

Section 3: Scoping will discuss the spatial and temporal boundaries of the sub-project. Important issues raised by the community during the consultative sessions and significant impact that are determined during the initial visits.

Section 4: Sub-project Description provides an overall description of the sub-project including proposed alignment, design considerations and concepts, manpower requirement, waste generation, machinery and material requirements.

Section 5: Sub-project Alternatives enlists possible design alternatives for Rehabilitation and Improvement of Water Supply System in MC Bahawalnagar, and their influence on environment and social situation.

Section 6: Baseline Environmental & Social Conditions gives a description of baseline physical, biological and socio-economic conditions of the sub-project area.

Section 7: Public Consultation and Information Disclosure identifies the main stakeholders and their concerns rose during scoping sessions and deals with the measures to mitigate the social impacts.

Section 8: Potential Environmental and Social Impacts and their Mitigations Measures identifies, predicts and evaluates impacts of the sub-project activities during the construction and operation stages and deals with the measures proposed to mitigate potential environmental impacts of the proposed sub-project.

Section 9: Environmental and Social Management Plan:

This section outlines organizational framework, mitigation and monitoring plans training requirements, defines roles and responsibilities, estimates budgets requirements for satisfactory implementation.

Section 10: Grievance Redress Mechanism: Committees for grievance redressal and process for amicable resolution of any grievance faced by the community

12 ESIA TEAM

A multidisciplinary team conducted the ESIA study. The team consisted of environmentalists, ecologists and sociologists.

The team of experts are given as under:-

Figure 1-2, List of Team Members

Sr. No.	Team Member	Position Held	Qualifications
1.	Aleem Butt	Chief Environmentalist Team Leader- ESIA	M.Phil. Environmental Sciences, Government College University (GCU) Lahore M.Sc. Environmental Sciences, Punjab University (PU), Lahore NEBOSH, Lead Auditor
2.	Noman Ashraf	Environmental Specialist	M.Phil. Environmental Sciences, Government College University (GCU) Lahore PGD, Environmental Law University of the Punjab, Lahore
3.	Faiza Anjum	Environmental Specialist	MS Environmental Sciences University of the Punjab, Lahore
4.	M. Umair Iqbal	Environmentalist	BS Environmental Science

	and economic conditions affecting community life; and (g) the interrelationships between any of the factors specified in sub-clauses 'a' to 'f'. The notable points of the law are: - No proponent of a project shall commence construction or operation unless he has filed an EIA/EE with the Provincial Agency designated by the Provincial EPAs on EIA/EE and has obtained an approval; - Establishment and formation of the Punjab Environmental Protection Council (PEPC); - Prohibition of certain discharges or emissions; - Punjab Environmental Quality Standards (PEQS) for wastewater, air emissions and noise; and - Provincial Government can issue notices and enforce them to protect the environment. In the recent amendment of 2012, legislative powers related to environment and ecology are given to provincial governments from the Federal government. The provinces are required to enact their own legislation for environmental protection. Other amendments include increasing the penalties for violations. For the proposed Project, Environmental Protection Department (EPD)/Environmental Protection Agency (EPA), Government of Punjab (GoP) is the concerned authority. The capability of regulatory institutions for environmental management is ultimately	section 13 of the act prohibits the import of hazardous waste. The provisions of section 16 are also applicable to comply with the discharge or emission of any effluent, waste, air pollutant or noise or disposal of waste or handling of hazardous substance. Under section 17, penalties will apply if anyone fails to comply with the provisions of section 11, 12, 13 and 16.
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		responsible for the success of environmental assessments and their development projects are environmentally sound and sustainable.	
3.	Punjab Environmental Quality Standards (PEQS) 2018	PEQS promulgated recently in 2018. Specified standards under PEQS are for: Drinking Water • Ambient Air; • Noise; • Industrial Gaseous Emissions; • Municipal and Liquid Industrial Effluents; • Motor vehicle exhaust and noise; and • Treatment of Liquid and Bio-Medical Waste	
4.	Pakistan Environmental Protection Agency, (Review of IEE and EIA) Regulations, 2000	These regulations set out: • Key policy and procedural requirements for filing an EIA; • The purpose of environmental assessment; • The goals of sustainable development; • The requirement that environmental assessment be integrated with feasibility studies; • The jurisdiction of the Federal and Provincial EPA's and Planning & Development (P&D) Departments; • The responsibilities of proponents; • Duties of responsible authorities; • Provides schedules of proposals that the project requires either IEE or an EIA; • The environmental screening process of the	The provisions of these regulations are applicable for environmental screening of the project, which implies that an Environmental study is required for the proposed project. The process described in the regulation will be useful for MC Bahawalnagar, Punjab to follow the procedure to file an Environmental study with Punjab-EPA and to understand its review process along with timelines to be followed.

		projects under schedule I, II and III; and The procedure for the environmental approval for filing the case with the concerned EPA for the granting of the NOC.	
E.	Pakistan Penal Code 1860	The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions and disposal of effluents.	The provisions of the Penal Code, 1860 are applicable to the project in terms of penalties for affecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.
F.	The Canal and Drainage Act 1873 and amendment 2016	The Canal and Drainage Act 1873 (CDA) focuses on construction and maintenance of drainage channels and defines powers to prohibit obstruction or order their removal. It also covers issues related to canal navigation. It briefly addresses issues relating to environmental pollution. Section 70(5) of the CDA clearly states that no one is allowed to "corrupt or foul the water of any canal so as to render it less fit for the purposes for which it is ordinarily used." In addition, Section 73 of the CDA gives power to arrest without warrant or to be taken before the magistrate a person who has willfully damaged or obstructed the canal or "rendered it less useful."	This act will be applicable as the project is for improvement of water supply and Fordwah and Saqdia canals are the major canals which are used as a source of water
7.	Punjab Water Act, 2019	This act provides a framework for comprehensive management of all water resources in the Punjab and to regulate their use in the interest of conservation and sustainability	This act will be applicable as the project is for improvement of water supply

8.	Punjab Water Policy, 2012	The Punjab Water Policy 2012 is a strategic policy document at provincial level. The overall objective of Punjab Water Policy is to provide clear policy directions to the Government of Punjab on the water resource management and development of water from all sources of water (surface water, groundwater and rainwater), for all sub-sectors of water use (domestic, stock water, agriculture, industry, commercial and environment) and for all regions (rural, urban, canal commands and outside the canal commands) at the both level through equitable water allocations, management and development.	This act will be applicable on the project for improvement of water supply.
9.	Punjab Municipal Water Act, 2014	The basic aim of the Act is to recognize, regulate and provide present and future municipal water supply and sanitation services and to establish rights of access to basic water supply and basic sanitation and to ensure conservation of water resources in the province. This Act is in draft stage.	This Act will affect if there is modernization of water supply during construction activities.
10.	Motor Vehicle Rules 1969	It defines powers and responsibilities of Motor Vehicle Examiners (MVEs). The establishment of MVE inspection system is one of the regulatory measures that can be taken to tackle the ambient air quality problems associated with the vehicular emissions during operation phase.	This act is applicable to the gaseous emission that will be released from project vehicles.
11.	Pakistan Labour Policy, 2010	The main objective of the Labour Policy, 2010 is the social and economic well-being of the labour of Pakistan. The Labour Policy, 2010 has following 4 parts: • Legal Framework:	This act is applicable to protect the rights of labor involved in the sub project implementation.

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		• Advocacy: rights of workers and employers; • Skill development and employment; and • Manpower export	
12.	The Bonded Labour System (Abolition) ACT 1992	According to this act, forced labour is any type of work or kind of service in which someone engages involuntarily and under implied coercion a manifest threat of a party or oppression measures. The bonded labour can exist in following forms under different situations: • Bonded labour in exchange of advance/an amount of money given before services are rendered, received by a person or his family. • Bonded labour as a consequence of some social or customary obligations. • Bonded labour in exchange of an economic benefit/consideration received by a person or his family, • Bonded labour of a guarantor in exchange for debtor who was unable to pay off his debt. Bonded labour is prevalent in agriculture sector, brick kilns, domestic work and begging.	This act is applicable to protect the rights of labor involved in the sub project implementation.
13.	Punjab Forest Act (Amended), 2010	The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests. There is no protected forest	This act provide guidelines to protect the trees present the sub-project corridor

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		situated in and around the Project area.	
14.	Employment of Child Act 1991	Article 11(3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any construction, or any other hazardous employment. In accordance with this Article, the Employment of Child Act 1991 prohibits child labour (a child is under 14 years old).	The relevance of this act to the project will be to prohibit child employment for construction of the proposed sub-project.
15.	The Land Acquisition Act, 1894	The Land Acquisition Act, 1894, is a "law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be paid on account of such acquisition". The exercise of the power of acquisition has been limited to public purposes. The principles laid down for the determination of compensation, as clarified by judicial pronouncements made from time to time, reflect the anxiety of the law-giver to compensate those who have been deprived of property, adequately. The land needed for the construction of development projects will be acquired under normal conditions based on prevailing market prices or negotiated prices between client and the owners of land. Section 17(4) of the LAA will not be used in the absence of an emergency. Instead, the land will be purchased under willing-seller willing-buyer deal at agreed upon market rates and the seller will have the option not to sell the land, in case an acceptable deal for both the parties is not reached.	This act will not trigger as no land acquisition required.

16.	The Punjab Land Acquisition Rules, 1983,	It describes the land acquisition procedure for public purposes or for a company.	This act will not trigger as no land acquisition is required.
17.	Provincial Wildlife Act, 1974	The Punjab Wildlife Act (1974) is developed for the regulation of activities relating to protection, conservation and management of wildlife in Punjab.	This act will not trigger as no trees will be cut and no habitat loss will not occur.
18.	Pakistan Antiquities Act 1975 and Punjab Antiquities Amendment Act 2012	The Punjab Antiquities Amendment Act, 2012 is adopted from the Pakistan Antiquities Act of 1975 with a few minor changes. The Antiquities Act, 1975 (amended in 1990) states the following: • "Ancient" is any object that is at least 75 years old; • All accidental discoveries of artefacts must be reported to the Federal Department of Archaeology; • The Government is the owner of all buried antiquities discovered on any site, whether protected or otherwise; • All new construction within a distance of 200 feet from protected antiquities is forbidden; • No changes or repairs can be made to a protected monument, even if it is owned privately, without approval of the responsible authorities; and The cultural heritage laws of Pakistan are uniformly applicable to all categories of sites regardless of their state of preservation and classification as monuments of national or world heritage.	The law will be applicable to the project mainly due to its two provisions: • According to the law, any construction activity within 61 meter or 200 ft. of protected antiquities, are prohibited. The provisions of this act would also be applicable, if any accidental archaeological discoveries may occur during the excavation works for the construction of the proposed project.

19.	The Punjab Special Premises (Preservation) Ordinance, 1985	It is expedient to preserve certain premises of historical, cultural and architectural value in the Punjab and to control and regulate alterations therein and demolition and re-erection thereof and for matters ancillary thereto;	The provisions of this act would also be applicable, if any accidental archaeological discoveries may occur during the excavation works for the construction of proposed sub-Project.
20.	Katchi Abadis Act, 1967	The Katchi Abadis Act covers the urban squatter's rehabilitation rights by providing plots in public resettlement areas or cash assistance.	This act is not triggered as there is no resettlement required in this project
21.	Land Revenue Act, 1967	Determination of disputes under section 44 of LR Act 1967 sub-section (2) if in any such dispute, the Revenue Officer is unable to satisfy himself as to which of the parties thereto is in possession of any property to which the dispute relates, he shall (a) if he be not below the rank of Assistant Collector of the first grade, ascertain, after an inquiry in which an opportunity shall be given to all the parties, to the dispute of being heard and adducing evidence in support of their claims, who is the person best entitled to the property, and shall by written order direct that the person be put in possession thereof, and that entry in accordance with that order be made in the record or register; and (b) if he be below the rank of Assistant Collector of the first grade, report the matter to the Assistant Collector of the first grade, who shall thereupon proceed in the manner provided in clause (a). (3) A direction under sub-section (3) shall be subject to any decree or order	This act will not trigger as no land acquisition is required.

		which may be subsequently passed by any Court of competent jurisdiction.	
22.	Punjab Alienation of Land Act, 1900	Under section 13, sub-section 11 of Punjab Alienation of Land Act 1900: Any member of an agricultural tribe may make a lease or farm of his land for any term not exceeding twenty years, and any lease or farm made by a member of an agricultural tribe for a longer term than twenty years shall if the lessee or farmer is not a member of the same tribe or of a tribe in the same group, be deemed to be a lease or farm for the term permitted by this section. Under section 13, sub-section 12. (1) During the currency of a mortgage made under section 6 in form (a) or form (b) or of a lease or farm under this Act, the owner shall be at liberty to make a further temporary alienation of the same land for such term as together with the term of the current mortgage, lease or farm will make up a term not exceeding the full term of twenty years.	This act will not be triggered as will be no loss of agriculture land during sub project implementation
23.	Colonization of Government Lands Act, 1912	This Act shall, unless the Provincial Government, otherwise directs, apply to land to which the provisions of the Government Tenants (Punjab) Act 1893, have been applied and to any other land to which the Provincial Government may by notification in the Official Gazette apply it and which at the time of the notification was the property of the Provincial Government, Provided that unless the Provincial Government by general or special order otherwise directs nothing in	This act will be triggered as the Tube wells and transmission lines are at the government lands.

		Sections 20, 21, 22 and 23, or in the proviso to section 14, of this Act shall, apply to tenancies specified in Schedule I of this Act, or to any class of tenancies created hereafter which the Provincial Government may declare to be scheduled tenancies under this section.	
24.	Punjab Restriction of Employment of Children Ordinance, 2016	According to the sub-section 11(a) of this Act, an occupier who employs or permits a child (person under the age of 15 years) to work in an establishment shall be liable to punishment with imprisonment for a term which may extend to six months, but which shall not be less than seven days, and a mandatory fine between 10,000 and 50,000 rupees.	The relevance of this act to the project will be to prohibit child employment for construction of the proposed sub-project.

2.2 COMPARISON OF INTERNATIONAL AND LOCAL ENVIRONMENTAL LEGISLATIONS

In order to select the most stringent standards applicable, a mix of local (PEQS) and international (IFC) regulations have been adopted. The IFC Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Environmental, Noise Management has noise level guidelines for daytime and night time, which are applicable. It shall be ensured that all necessary noise mitigation measures are implemented to minimize the noise levels in the sub-project area.

The Table 2.5 presents IFC workplace noise standards that are applicable to the construction workers. It should also be noted that IFC EHS guidelines advise that where existing ambient noise levels already exceed thresholds, the Sub-project should not result in an increase of more than 3 dB(A) over existing ambient noise at the nearest receptor location off-site.

Table 2-2, IFC Work Environment Noise limits

Sr. No.	Type of Work, workplace	IFC General EHS Guidelines
1	Heavy industry (no demand for oral communication)	85 Equivalent level Leq,8h
2	Light industry (decreasing demand for oral communication)	50-65 Equivalent level Leq,8h

A comparison of applicable local and international guidelines for ambient air quality has been provided in Table 2-3 below. In the case of most pollutants, the PEQS standards for ambient air quality are more stringent in comparison to USEPA and WHO/IFC standards. The applicable and most stringent parameters for each respective pollutant are highlighted in green.

Table 2-3. Comparison of International and local Air Quality Standards*

Sl. No.	Pollutants	USEPA Avg. Time	Standard	WHO/IFC Avg. Time	Standard	PEQS Avg. Time	Standard
1	SO ₂	3 hrs 1 hr	0.5 ppm 75 ppb			Annual Mean 24 hrs	80 ug/m ³ 120 ug/m ³
2	CO	8 hrs 1 hr	9 ppm (11 mg/m ³) 35 ppm (43 mg/m ³)			8 hrs 1 hr	5 mg/m ³ 10 mg/m ³
3	NO ₂	Annual Mean 1 hr	100 ug/m ³ (55 ppb) 100 ppb	24 Hour Annual Mean	25 ug/m ³ 10 ug/m ³	Annual Mean 24 hrs	40 ug/m ³ 80 ug/m ³
4	O ₃	8 hrs	0.07 ppm (148 ug/m ³)	8 hrs daily maximum 8 hr mean peak season	100 ug/m ³ 60 ug/m ³	1 hr	150 ug/m ³
5	TSP	-	-	-	-	Annual Mean 24 hrs	360 ug/m ³ 500 ug/m ³
6	PM ₁₀	24 hrs	150 ug/m ³	Annual Mean 24 hr	15 ug/m ³ 45 ug/m ³	Annual Mean 24 hrs	120 ug/m ³ 150 ug/m ³
7	PM _{2.5}	Annual Mean 24 hrs	15 ug/m ³ 35 ug/m ³	Annual Mean 24 hr	3 ug/m ³ 15 ug/m ³	Annual Average 24 hrs 1 hr	15 ug/m ³ 35 ug/m ³ 15 ug/m ³

* The standards highlighted in green for each respective pollutant are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed sub-project.

* In instances where the air shed is significantly degraded and the pollutant levels are already exceeding the ambient pollutant concentrations provided in the table above, it shall be ensured that the sub-project activities cause as

small an increase in pollution levels as feasible, and amounts to a fraction of the applicable short term and annual average air quality guidelines or standards as established in the sub-project specific environmental assessment. Similar to the standards for air quality, the comparison of noise standards provided in Table 2-4 clearly shows that PEQS standards for noise are more stringent in comparison to the IFC standards. The only exception is the daytime noise level standard for industrial areas where the IFC standard is more stringent i.e., 70 dB(A) in comparison to PEQS i.e., 75 dB(A) and so for this particular parameter, the IFC standard will be used. Apart from this one exception, the PEQS standards have been used for the proposed Sub-project. Further, the IFC EHS guidelines advise that where existing ambient noise levels already exceed thresholds, the sub-project should not result in an increase of more than 3 dB over existing ambient noise at the nearest receptor location off-site.

Table 2-4, Comparison of International and Local Noise Standards

Sr. No.	Category of Area/Zone	Limit in dB(A) Leq		WHO/IFC	
		PEQS Day Time 06:00 - 22:00	Night Time 22:00- 06:00	Day Time 07:00 - 22:00	Night Time 22:00-07:00
1	Residential area (A)	55	45	55	45
2	Commercial area (B)	65	55	70	70
3	Industrial area (C)	75	65	70	70
4	Silence zone (D)	50	45	55	45

* The standards highlighted in green for each respective Area/Zone are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed sub-project.

* In instances where baseline noise levels are already exceeding the standards above, it will need to be ensured that the sub-project activities do not cause an increment of more than 3 dB(A) from the baseline noise levels.

Table 2-5 presents the vibration levels below which there is no risk of damage to buildings. These limits apply to vibration frequencies below 15Hz where the most conservative limits are required and are presented for both transient and continuous vibrations. For protected or potentially vulnerable buildings, the recommended construction vibration limit is reduced by half.

Table 2-5, Maximum Permissible Construction Phase Vibration Levels

Building Type	Vibration Limit - PPV for Transient Vibrations Frequencies <15Hz	Vibration Limit - PPV for Continuous Vibrations Frequencies <15Hz
Structurally sound and not protected structures	12.5 mm/s	6.25 mm/s
Protected and/or vulnerable structures	6 mm/s	3 mm/s

Source: British Standard 7365-2: Evaluation and Measurement for Vibration in Buildings. A Guide to Damage Levels Arising from Ground borne Vibration. 1993

The comparison of water quality standards provided in Table 2-6 and Table 2-7 clearly shows the PEQS standards for surface and drinking water quality as compare to WHO and FAO standards.

Table 2-6. Comparison of National and International Drinking Water Standards

Sr. No	Parameter	Units	PEQS	WHO Standards
1	Temperature (During Sample Collection)	OC	NS	NS
2	Color	Pt-Co	≤15TCU	<15TCU
3	pH	pH unit	6.5-8.5	6.5-8.5
4	Turbidity	NTU	<5	<5
5	Total Hardness	mg/L	<500.00	NS
6	Total Dissolved Solid (TDS)	mg/L	<1000.00	<1000.00
7	Total Suspended Solid (TSS)	mg/L	NS	NS
8	Ammonia	mg/L	NS	NS
9	Fluoride F-	mg/L	<1.50	1.50
10	Sulfate (SO4-2)	mg/L	NS	NS
11	Chloride (Cl-)	mg/L	<250.00	250
12	Nitrate (NO3-)	mg/L	<50.00	50.00
13	Odor	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable
14	Taste	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable
15	Sodium	mg/L	NS	NS
16	Iodine	ppm	NS	NS
17	Arsenic (As)	mg/L	< 0.05	NS
18	Iron (Fe 3+)	mg/L	NS	NS
19	Zinc (Zn 2+)	mg/L	5.0	3.0
20	Conductivity	µS/cm	NS	NS
21	Bicarbonate	mg/L	NS	3
22	Nitrite	mg/L	NS	NS
23	Magnesium	mg/L	NS	NS
24	Calcium as Ca	mg/L	NS	NS

Sr. No.	Parameter	Units	PEQS	WHO Standards
25	Phosphate	mg/L	NS	NS
26	Potassium	mg/L	NS	NS
27	Boron	mg/L	<0.3	0.3
28	SAR Iodine (I)	mg/L	NS	NS
29	Aluminum	mg/L	<0.2	0.2
30	Antimony	mg/L	<0.02	0.02
31	Cadmium	mg/L	0.01	<0.01
32	Mercury	mg/L	<0.02	0.001
33	Nickel	mg/L	<0.02	0.02
34	Selenium	mg/L	0.01	0.01
35	Barium	mg/L	0.7	0.7
36	Total Chromium	mg/L	<0.05	0.05
37	Copper	mg/L	2	2
38	Lead	mg/L	<0.05	<0.05
39	Cyanide (CN)	mg/L	<0.05	0.07
	Manganese	mg/L	<0.5	0.5
40	Total Coliforms	cfu/100ml	0/100 ml	0/100 ml
41	Fecal Coliforms (E.Coli)	cfu/ml	0/100 ml	0/100 ml

NS = Not Specified

* The standards highlighted in green for each respective pollutant are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed sub-project. Other are same in both case.

Table 2-7. Comparison of National and International Surface Water Standards

Sr. No.	Parameter	Units	PEQS (Regional)	WHO Class V (Agriculture)	FAO Standards
1	Temperature	OC	--	--	--
2	pH	pH unit	6-9	<5.3	6.0-8.5
3	COD	mg/L	150	<30	--
4	(BOD5)	mg/L	80	--	--
5	Solids, Total dissolved (TDS)	mg/L	3500	--	0-2000
6	Solids, Total suspended (TSS)	mg/L	200	--	--
7	Chloride	mg/L	1000	--	0-1065
8	Fluoride (F-)	mg/L	10	--	--
9	Oil & grease	mg/L	10	--	--
10	Phenols, Total (Phenolic Compounds)	mg/L	0.10	--	--
11	Cyanide (CN-)	mg/L	01.00	--	--
12	Anionic Detergents as MBAS	mg/L	20.00	--	--

Sr. No.	Parameter	Units	PEQS (Regional)	WHO Class V (Agriculture)	FAO Standards
13	Sulfate (SO ₄ -2)	mg/L	100	---	0-960
14	Sulfide (S)	mg/L	01.00	---	---
15	Ammonia NH ₃	mg/L	40.00	---	---
16	Cadmium (Cd)	mg/L	0.10	≥0.0039 mg/L	---
17	Chromium (Cr) as Hexavalent Trivalent	mg/L	1.00	≥0.016 mg/L	---
18	Copper (Cu)	mg/L	1.00	≥0.018 mg/L	---
19	Lead	mg/L	0.50	≥0.082 mg/L	---
20	Nickel	mg/L	1.00	≥1.4 mg/L	---
21	Zinc	mg/L	5.00	≥0.12 mg/L	---
22	Iron	mg/L	8.00	---	---
23	Manganese	mg/L	1.50	---	---
24	Selenium	mg/L	0.50	---	---
25	Silver	mg/L	1.00	---	---
26	Arsenic	mg/L	1.00	≥0.36 mg/L	---
27	Barium	mg/L	1.50	---	---
28	Magnesium	mg/L	---	---	0-61
29	Nitrate	mg/L	---	---	0-10
30	Sodium	mg/L	---	---	0-920
31	Boron	mg/L	6.00	---	0-2
32	Mercury	mg/L	0.01	≥0.0024 mg/L	---
33	Chlorine	mg/L	01.00	---	---
34	Total Toxic Metals	mg/L	02.00	---	---
35	Turbidity	NTU	NS	---	---
36	Oxygen, Dissolved	mg/L	NS	---	---
37	Pesticides	µg/L	NS	---	---
38	Nutrients as Potassium	mg/L	---	---	0-2
39	Nutrients as Nitrogen	mg/L	---	---	---
40	Nutrients as Phosphorous	mg/L	---	---	---
41	Total Coliform	MPN/100ml	---	---	---
42	Fecal Coliform	MPN/100ml	---	---	---

NS = Not Specified

* The standards highlighted in green for each respective pollutant are the most stringent based on a comparison between local and international regulation and thus shall be applicable for the proposed sub-project. Other are same in both case.

FEQS standards for ambient air quality, noise, water and wastewater were adopted as more parameters are covered in FEQS as compare to WHO and FAO guidelines that provide are clearer picture of baseline environmental conditions of the sub-project area. Moreover, EC itself guides that local standard i.e., FEQS should take precedence over any other international regulations.

2.3 INTERNATIONAL LAWS/TREATIES

2.3.1 The World Bank Operational Policies

The World Bank (WB) has approved a series of Operational Policies which define the conduct of WB operations. A summary of the status of those Operational Policies which relate to environmental and social impacts are provided in the following sections.

Table 2-8. Assessment of Applicable World Bank Operational Policies

Safeguard Policies	Triggered?	Explanation
Environmental Assessment OP/4.11	Yes	This sub-project has been categorized as 'Category A'. The sub-project activities under Component 3 may potentially cause negative environmental and social impacts. The sub-project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented.
Physical/Cultural Resource OP/4.11	No	The sub-project does not lie in or near any cultural and heritage resource therefore OP 4.11 will not be triggered.
Involuntary Resettlement OP/4.12	No	OP 4.12 is not triggered as the sub-project does not require any land acquisition, therefore there be no involuntary resettlement, livelihood impacts, or restrictions on access. Consequently, there is no need of a Resettlement Action Plan. If this situation changes, the PMDFC will take immediate steps to prepare a RAP.

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2.3.2 World Bank Environmental, Health and Social Guidelines

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

- Environmental, Health, and Safety (EHS) Guidelines prepared by International Finance Corporation and World Bank in 2007
- Pollution Prevention and Abatement Handbook 1998, Towards Cleaner Production
- Environmental Assessment Sourcebook, Volume 1: Policies, Procedures, and Cross Sectoral Issues
- Social Analysis Sourcebook
- WB Committee on disability-inclusive development
- WB guidelines on labour influx
- WB Group Gender Strategy

Additional related EHSG can be found in Annexure H.

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

Core Principles	Applicability
Core Principle 1 Environmental and social management procedures and processes are designed to: a) avoid, minimize, or mitigate against adverse impacts; b) promote environmental and social sustainability in program design; and c) promote informed decision making relating to a program's environmental and social effects.	ESIA prepared under the light of this Principle in order to mitigate negative impacts envisaged in this Sub-project. ESMP implementation and monitoring arrangements of ESIA will help in achieving environmental and social sustainability.
Core Principle 2 Environmental and social management procedures and processes are designed to avoid, minimize, and mitigate against adverse effects on natural habitats and physical cultural resources resulting from the program.	Table 8-3 prepared to mitigate all minor impacts anticipated during the course of the Sub-project.
Core Principle 3 Program procedures ensure adequate measures to protect public and worker safety against the potential risks associated with (a) construction and/or operations of facilities or other operational practices developed or	All the mitigation measures have been incorporated in the Table 8-3 to address risks associated with workers and community health and safety. Contractor will ensure compliance with these attributes.

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promoted under the Program and (b) exposure to toxic chemicals, hazardous wastes, and otherwise dangerous materials	
Core Principle 4 Land acquisition and loss of access to natural resources are managed in a way that avoids or minimizes displacement, and affected people are assisted in improving, or at least restoring, their livelihoods and living standards	This core principle doesn't trigger in this Sub-project as no land acquisition is required during the rehabilitation of existing water supply and construction of new tube wells and transmission lines.
Core Principle 5 Due consideration is given to cultural appropriateness of, and equitable access to, program benefits, giving special attention to rights and interests of indigenous peoples and to the needs or concerns of vulnerable groups.	No indigenous/Vulnerable groups exist along with ROW of the Sub-project.
Core Principle 6 Avoid exacerbating social conflict, especially in fragile states, post-conflict areas, or areas subject to territorial disputes.	This principle doesn't trigger in this Sub-project.

2.3.4 World Bank Environmental Code of Practices

The World Bank Environmental Code of Practices (ECoPs) address less significant environmental impacts and all general construction related impacts of the proposed sub-project implementation. The ECoPs provide guidelines for best operating practices and environmental management guidelines to be followed by the contractors for sustainable management of all environmental issues during execution of sub-project. The list of ECoPs is provided below.

ECP 1: Waste Management

ECP 2: Fuels and Hazardous Substances Management

ECP 3: Water Resources Management

ECP 4: Drainage Management

ECP 5: Soil Quality Management

ECP 6: Erosion and Sediment Control

ECP 7: Borrow Areas Development and Operation

ECP 8: Air Quality Management

ECP 9: Noise and Vibration Management

SECTION - 3: SCREENING AND SCOPING OF SUB-PROJECT

SCREENING OF THE SUB-PROJECT

As per the Environmental and Social Framework (ESMF) of the project, the sub-projects are categorised in E1, E2 and E3 category and S1, S2 and S3 category based on the magnitude and severity of the environmental and social impacts of the sub-project.

As per ESMF, water supply and transmission sub-projects are categorized as E-2 for repair and maintenance of existing network and an ESIA must be prepared against it or E-1 for new sub-projects as per scope of work and environmental and social impacts and IEE/ESIA will be prepared, such sub-project will be further categorized as per Schedule I and II of PEPA Review of IEE/EIA Regulations 2022.

20 new tube wells will be installed while 13 existing tube wells will be rehabilitated, similarly 6.4 km length of transmission lines will be installed and 1.52 km length of transmission lines will be rehabilitated and 03 overhead tanks / GSTs will be constructed as part of this sub-project. Hence this sub-project falls in E1 category as per ESMF as the sub-project involves new construction works. However, sub-project has no impact on household or any social apprehensions. Although 20 new tube wells will be installed on the bank of Fordwah Canal / RoW of Irrigation Department (Fordwah Canal Division) and transmission main will be installed in the RoW of Highway and Railway Department, but NOCs / Consent Letters will be acquired by MC before the execution of the sub-project. No resettlement is expected and no private land will be acquired, therefore, sub-project has been categorized as S-3.

According to the EIA and EIA Regulations, 2022, the sub-project falls under Schedule II (List of sub-projects requiring an EIA), Category F (Water Supply, Sewerage System and Treatment), sub clause [Water supply schemes and treatment plants (excluding the Reverse Osmosis, Ultra filtration and such like) with total cost more than Rs. 50 million].

3.2

SPATIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT

Spatial Boundaries	Temporal Boundaries
REGIONAL: Impact could extend to the region surrounding the proposed Sub-project	YEAR ROUND: Significant throughout the year
LOCAL: Impact limited to the local area in close proximity to the proposed Sub-project	SEASONAL: Significant on a seasonal basis, depending on nature of valued environmental component (VEC)

The spatial and temporal boundaries of the sub-project can be observed through figure 3.1

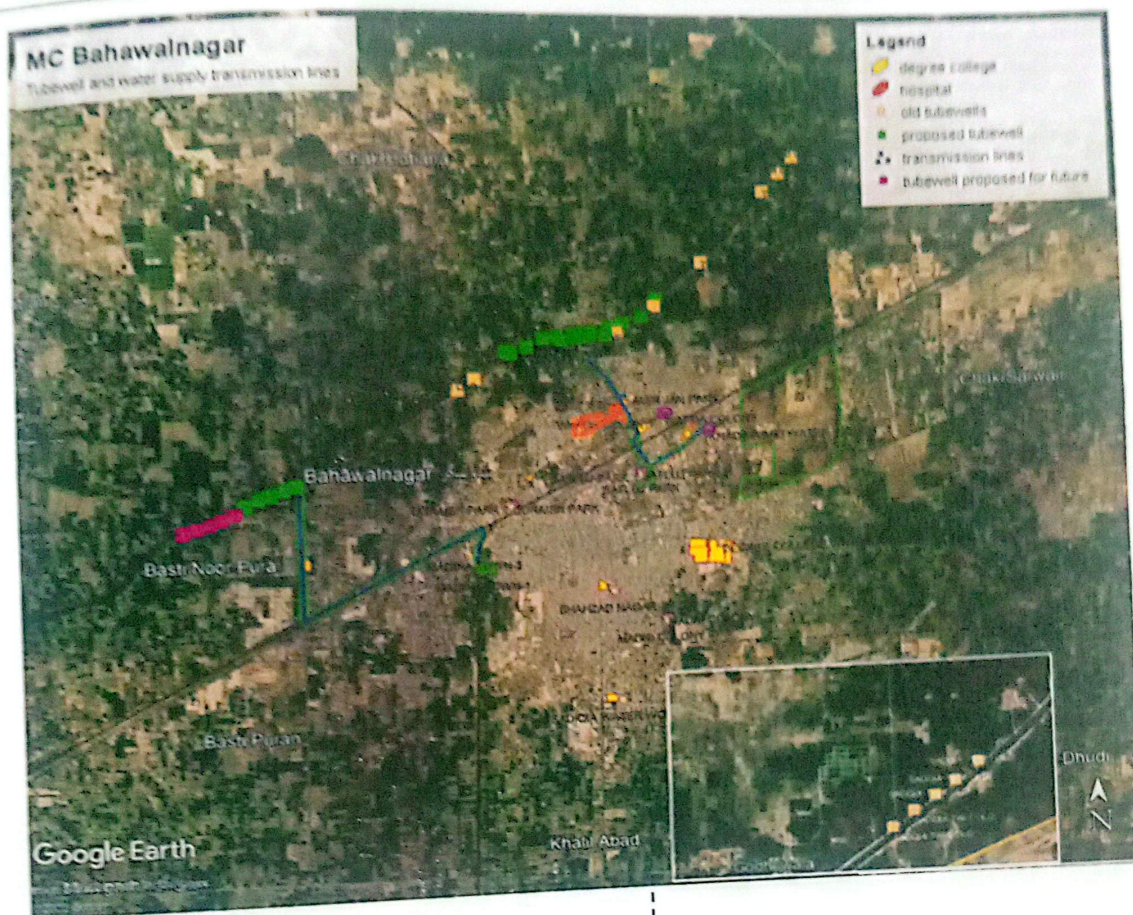


Figure 3-1: Google Map of Sub-Project

3.4.1 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

During the survey, respondents were inquired about their views regarding the proposed sub-project. Almost all respondents showed their concerns about the Proposed Sub-project. Some of the respondents had positive thinking and they were in favour of the sub-project. But few respondents showed their concerns regarding construction phase dust and noise issues. They expressed vividly that such sub-projects should be completed in time. During the survey, respondents were inquired about their views regarding the perceived impacts of the sub-project during construction phase. Almost all respondents express their positive and negative views. The views are:

- There will be noise and dust pollution
- There will be health and safety issues

3.4.2 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

- Soil Contamination and Erosion
- Ground water contamination
- Air quality deterioration
- Noise
- Waste material
- Labor HSE issues

SECTION - 4: ANALYSIS OF ALTERNATIVES

This Chapter deals with the analytical overview of different alternatives that have been considered. The analysis has been carried out critically so as to justify the need for the Sub-project and to select the most feasible alternative. Besides the economic viability, environmental sustainability and social soundness of the sub-project has also been considered while analyzing different alternatives.

THE NO PROJECT ALTERNATIVE

A no project alternative entails no changes in the existing status of the site. Adopting no project Alternative will save the World Bank Money, the efforts, time and resources that can be utilized on another project else-where in the province. Any short-term negative impacts that are envisaged during the execution of the sub-project.

This project is for the betterment of the water supply systems of MC Bahawalnagar. The people will be deprived of clean water supply and will have to resort to alternative water sources. That will incur them with extra charges. The pressure on the alternative water sources will increase and the significant water source from the canal will be wasted.

LOCATION ALTERNATIVES

1. Option 1

A route for the construction of transmission lines was previously selected which was passing through the residential colony named as Madina Town. The route of transmission line was passing along Bahawalnagar-Chishtian Road and then through the street of Madina Town. The ramps of a number of houses were to be demolished for the execution of the project and resettlement with the residents was required. This alternative is shown in the figure 4-1 below;

2. Option 2

The second alternative for transmission lines was passing from the west of Madina Town and along the railway line. In this alternative no private property is disturbed and no resettlement with the residents is required. This alternative is shown in the figure 4-1 below;

3. Selected Option

Option 2 was selected as no private property was disturbed in this route and no resettlement was required.

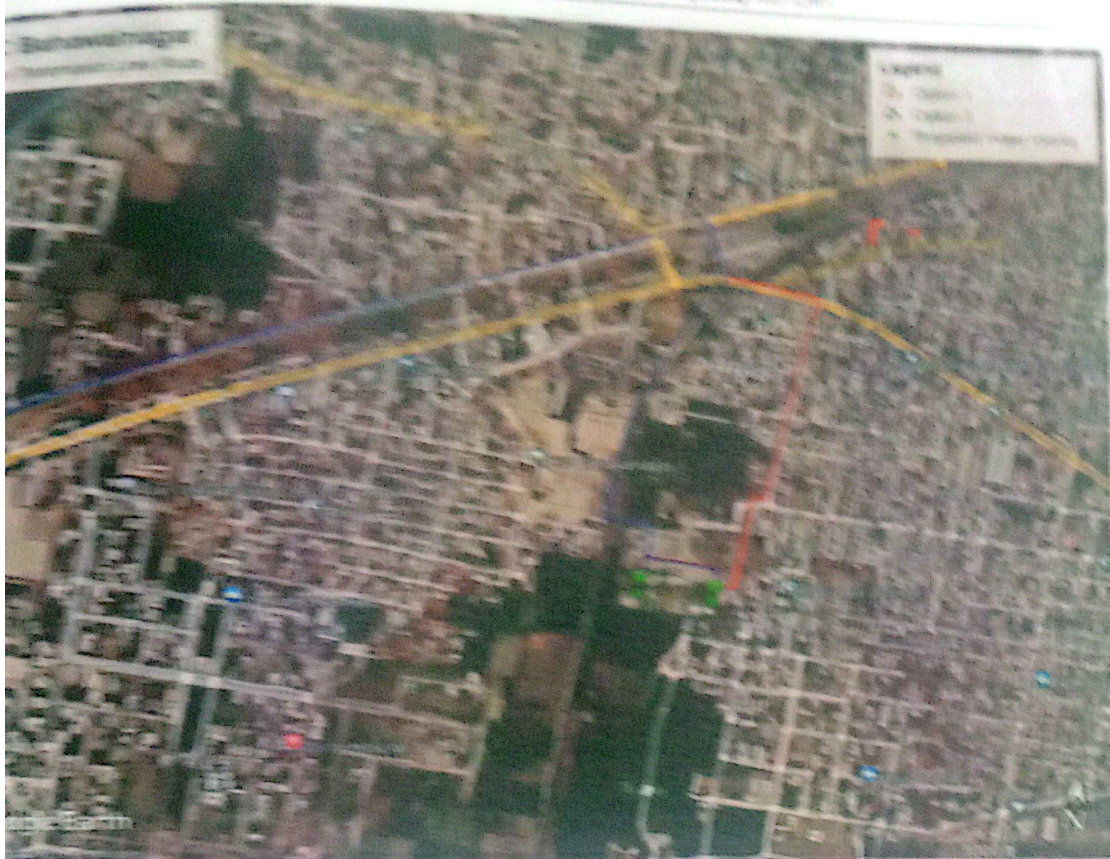


Figure 4-1: Location Alternatives

DESIGN / TECHNOLOGY ALTERNATIVES

The development will be constructed using modern, locally and internationally accepted technology and materials to achieve public health, safety, security and environmental aesthetic requirements.

Trenchless technology offers a cost-effective alternative for rehabilitating buried water supply infrastructure. There is an estimated 20% reduction in direct and indirect costs when appropriate trenchless methods specific to prevalent site conditions are used in place of open trenching. There will be no excavation for trenches so there will be less pollution due to dust and particulate emission.

However, due to limitations such as labor capacity and training in incorporating the trenchless system. The traditional trench water supply system will be implemented for the sub-project.

ENVIRONMENTAL ALTERNATIVES

The environmental conditions of the sub-project were overall in compliance with the PEQS standards as per the baseline environmental reports attached with this report. The construction works during this sub-project will lead to

momentary dust/particulate and gaseous pollution, that will eventually subside.

Overall, this sub-project will lead to the improvement of environmental quality of sub-project site.

4.5

ECONOMIC ALTERNATIVES

Raw material for construction will be purchase from nearby area from local vendor, so that the transportation cost of material might be saved. Efforts will be made to save any unnecessary expenses to be taken out of the World Bank and public funds.

SECTION - 5: DESCRIPTION OF SUB-PROJECT

This chapter presents all aspects of the sub-project. It describes the nature of the sub-project, its location, designs and site layout/plan. It presents the activities that will be involved during all stages of sub-project; how product will form, detail of process and machinery as well as details on supportive resources i.e., man power and utility requirements.

5.1 AREA DESCRIPTION

Following sub-project has been designed to improve the existing infrastructure of the water supply with the provision of better living standards and the environment for urban populations in and around its sub-project locations.

"Rehabilitation and Improvement of Water Supply System in MC Bahawalnagar, Punjab"

This sub-project consists of rehabilitation of 13 existing tube wells on Fordwah canal and sadqia canal (08 on Fordwah Canal and 05 on Sadqia Canal), construction of 03 overhead tanks / GSTs (02 in Madina Town and 01 in Satluj Park) and transmission lines, and construction of 20 new tube wells at present and recommendation for construction of further new tube wells on Fordwah Canal in future.

5.2 OBJECTIVE OF SUB-PROJECT

The sub-project has the following main objectives.

1. To Rehabilitate the existing pumping machinery of Tube wells and Intermediate pumping station.
2. To fulfill the water requirement for water shortage area.
3. Improvement of service delivery level of the municipal services.
4. Increment in water source.
5. Proper controlling of network through valve system.
6. Increase the water storage for community.
7. To deliver potable water to community at door step.
8. Improvement in local and province economy.

5.3 LOCATION & SITE LAYOUT OF SUB-PROJECT

This site has been selected on the recommendation of MC Bahawalnagar. 13 existing tube wells will be improved on Fordwah Canal & Sadqia Canal (08 on Fordwah Canal and 05 on Sadqia Canal) and 20 new tube wells will be constructed on Fordwah Canal, and 03 overhead tanks / GSTs will be constructed (02 in Madina Town; coordinates: 29°59'31.46"N, 73°14'23.39"E & 29°59'31.54"N, 73°14'26.77"E and 01 in Satluj Park; coordinates: 30° 0'8.64"N, 73°15'35.52"E). Sub-project site is on the bank of Fordwah canal in Bahawalnagar near Basti Burhan Kot / Bahawalnagar bypass road and near Arif Wala-Sahiwal Road. and on Sadqia Canal near basti Godhuwala. (Location and coordinates are given in below maps and table).

The sub-project is located in MC Bahawalnagar, Bahawalnagar, Punjab. Bahawalnagar is a city of southern Punjab, Pakistan. It is located at 29° 59' 34" N, and 73° 15' 13" E and has an altitude of 163 meters. Bahawalnagar is situated 262 km (163 mi) south of Lahore and about 175 km (109 mi) miles east of Bahawalpur. It is 65 km (40 mi) far from District Pakpattan. River Sutlej passes on the northern side at a distance of about 6 miles.

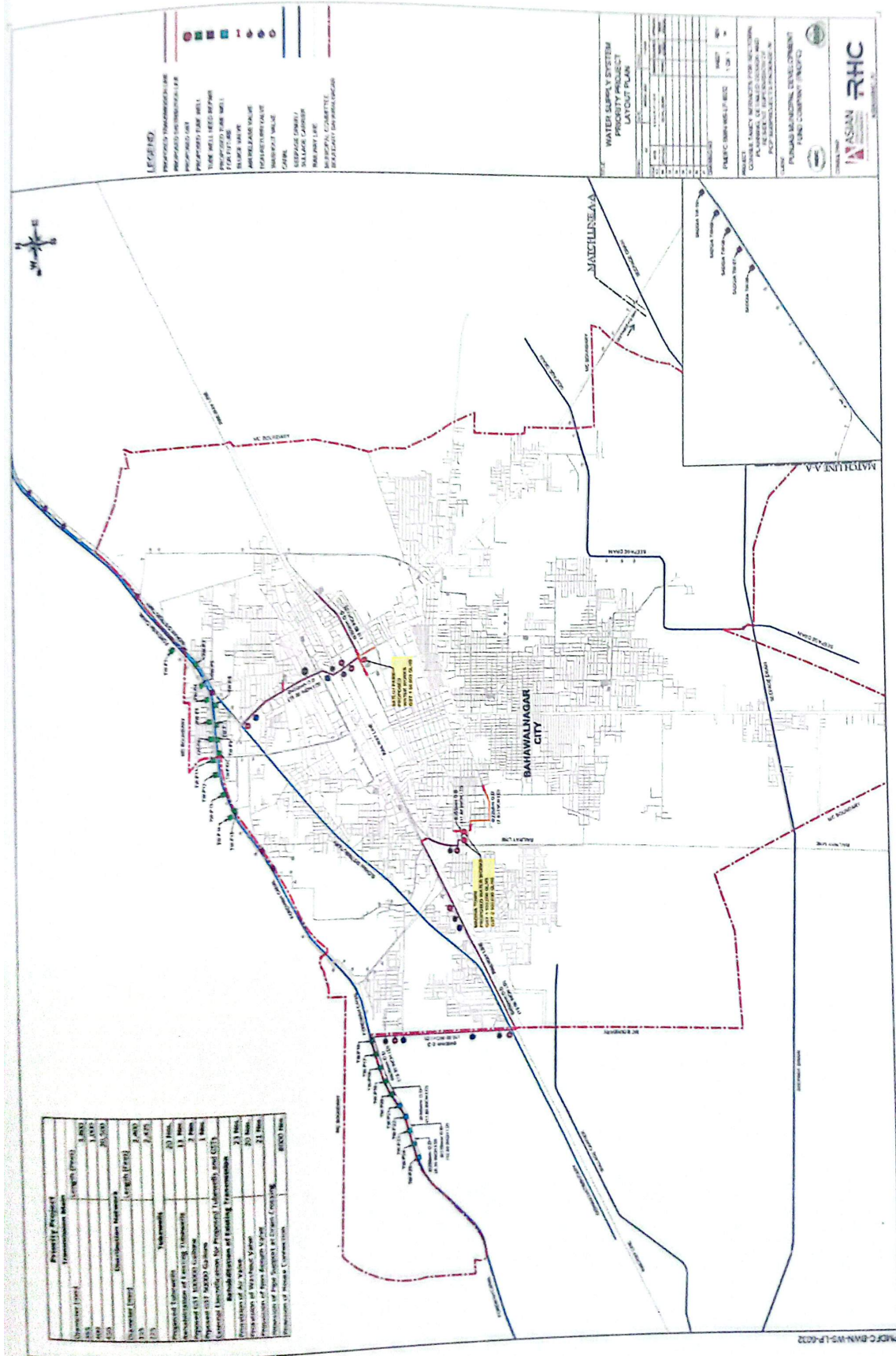


Figure 5-2, Site Layout

5.4 LAND USE & VEGETATION FEATURES ON SITE

A few trees and vegetation (like small grass / shrubs) are present near the site (at the bank of Fordwah canal) for proposed installation of new tube wells, but no tree will be cut. No trees will be affected during the construction of transmission lines as well.

Table 5-1. New tube wells details

Sr. No.	Name	GPS Coordinates	Acquisition Status		Area	Existing Land-use
1.	TW-P1	30°1'16.67"N, 73°15'40.97"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
2.	TW-P2	30°1'9.01"N, 73°15'34.46"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
3.	TW-P3	30°1'6.41"N, 73°15'26.72"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
4.	TW-P4	30°1'4.39"N, 73°15'21.09"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
5.	TW-P5	30°1'2.10"N, 73°15'18.78"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
6.	TW-P6	30°1'3.47"N, 73°15'12.39"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
7.	TW-P7	30°1'1.33"N, 73°15'11.23"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
8.	TW-P8	30°1'2.84"N, 73°15'5.67"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
9.	TW-P9	30°1'1.00"N, 73°15'5.50"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
10.	TW-P10	30°1'0.37"N, 73°15'0.26"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
11.	TW-P11	30°1'1.93"N, 73°14'57.51"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land
12.	TW-P12	30°1'1.15"N, 73°14'51.95"E	Irrigation (Fordwah Division)	Department Canal	16ft x 20ft	Open Land

Sr. No.	Name	GPS Coordinates	Acquisition Status	Area	Existing Land-use
13.	TW-P13	30°0'57.75"N, 73°14'44.81"E	Irrigation (Fordwah Division) Department Canal	16ft x 20ft	Open Land
14.	TW-P14	30°0'55.94"N, 73°14'35.81"E	Irrigation (Fordwah Division) Department Canal	16ft x 20ft	Open Land
15.	TW-P15	30°0'55.15"N, 73°14'37.62"E	Irrigation (Fordwah Division) Department Canal	16ft x 20ft	Open Land
16.	TW-P16	30°0'4.70"N, 73°13'6.40"E	Irrigation (Fordwah Division) Department Canal	16ft x 20ft	Open Land
17.	TW-P17	30°0'3.17"N, 73°13'1.00"E	Irrigation (Fordwah Division) Department Canal	16ft x 20ft	Open Land
18.	TW-P18	30°0'1.50"N, 73°12'55.65"E	Irrigation (Fordwah Division) Department Canal	16ft x 20ft	Open Land
19.	TW-P19	29°59'59.87"N, 73°12'50.28"E	Irrigation (Fordwah Division) Department Canal	16ft x 20ft	Open Land
20.	TW-P20	29°59'57.59"N, 73°12'45.22"E	Irrigation (Fordwah Division) Department Canal	16ft x 20ft	Open Land

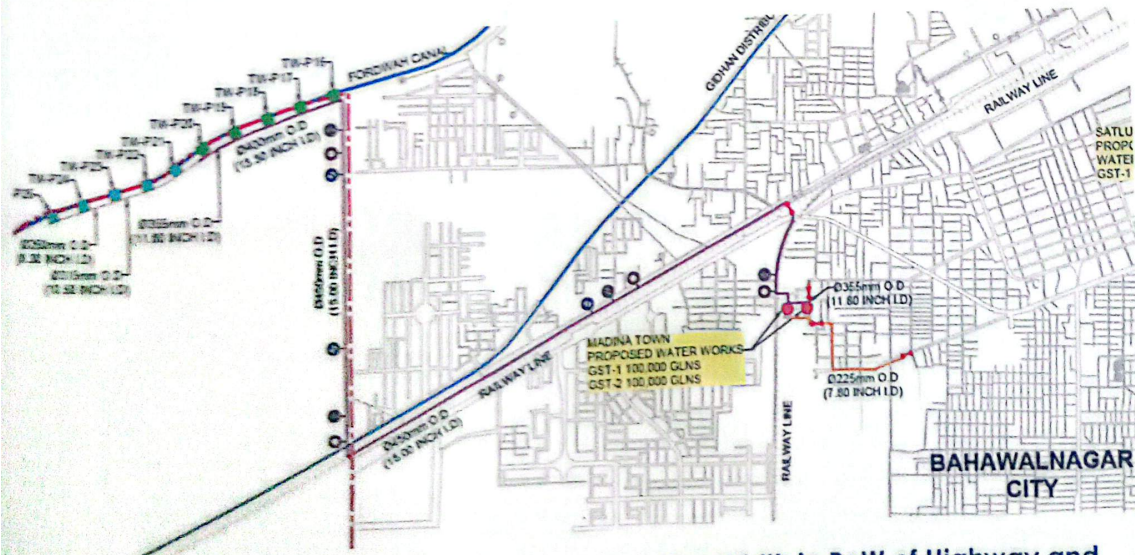


Figure 5-3, Proposed Water Supply Transmission Line Width in RoW of Highway and Railway

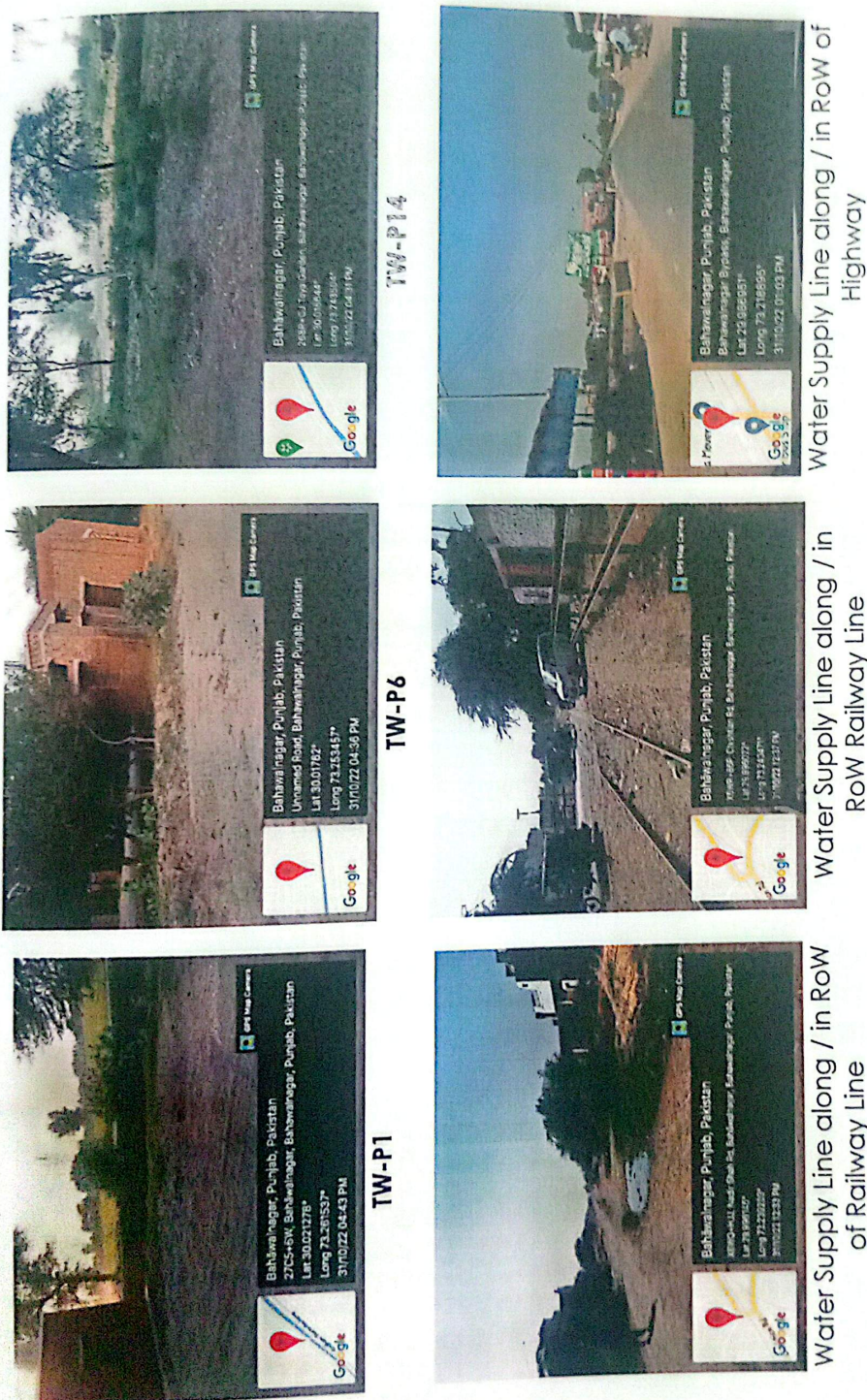


Figure 5-4, Representative location pictures of proposed tube wells and transmission lines

ROAD ACCESS

The main roads near the site of sub-project are Bypass-Bahawalpur Road, Minchhabad-Bahawalnagar Road, Arifwala-Bahawalnagar, Bahawalnagar Road, and Head Jalaniwala road.

COST & MAGNITUDE OF THE SUB-PROJECT

Total cost of sub-project is 655.80 million PKR. The sub-project will improve the water supply of almost whole of the MC Bahawalnagar, Bahawalnagar.

LABOUR REQUIREMENT

At the peak of construction activities, up to 100 laborers are likely to be employed for the works of sub-project out of which 05 would be skilled employees and 95 would be construction workers. It is anticipated that approximately 75% of the workforce will be from the sub-project area while some 25% of labour (skilled) would be hired from outside the sub-project area.

During operation phase, 65 employees would be required which would include, supervisor W.S.S, Foreman W. S. S, oil man, electrician, plumber, tube well operators and chowkidars

SCHEDULE OF IMPLEMENTATION

Detailed feasibility studies and designing of the sub-project have been completed. Necessary legal, administrative and financial formalities have been also completed. The sub-project is expected to be completed within 12 months from the date of environmental approval. Subsequently the construction, operational and maintenance aspects of the sub-project will be undertaken by the proponent.

SCOPE OF WORK

If water supply system is not improved at this stage, then this infrastructure will be further damaged / degraded giving financial loss to the public as well as private sectors and the growth potential of the city will be adversely affected

Table 5-2, Scope of work

Improvement and Rehabilitation of Water Supply System		
Sr. No.	Name of Water supply component	Quantity
1.	New Distribution Network (length 1.5 km)	5,000 Rft
2.	Rehabilitation of old and installation of new Transmission Main	28,000 Rft
3.	Under Ground water Tank (100,000 Gallon)	02 Nos.
4.	Under Ground water Tank (50,000 Gallon)	01 Nos.

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Improvement and Rehabilitation of Water Supply System		
Sr. No.	Name of Water supply component	Quantity
	Gallon)	
5.	New Tube wells	20 Nos.
6.	House Connection	8,000 Nos.
7.	Rehabilitation of existing non - functional tube wells	13 Nos.
8.	Installation of Valves on Existing Transmission Main	70 Nos.

Table 5-3, Designed capacity and output of the proposed sub-project

Component	Existing	After Sub-project
Transmission Main	60 km	67 km
Ground Storage Tanks	08 Nos.	11 Nos.
Tube wells	31 Functional + 16 Temporarily Non-Functional (Total 47 Nos.)	64 Nos.

5.10 SUB-PROJECT DESCRIPTION

Bahawalnagar city consists of surface and ground water resources. Surface water sources consist of Fordwah Canal and Sadqia Canal. Fordwah canal is flowing at the Western periphery of the city and Sadqia Canal flowing at the Eastern periphery of the city. The canal is unlined and recharging the ground water in narrow belts on both sides with fresh water. The city has some fresh ground water in the vicinity of canals but the majority of the city's subsoil water is brackish and unfit for drinking. Therefore, a large number of tube wells have been installed on the bank of both canals to extract fresh subsoil water. Water from these tube wells is either pumped into storage tanks or supplied directly to consumers.

Existing water supply system in Bahawalnagar City is a combination of the following assets;

1. Tube wells
2. Transmission Mains
3. Overhead Tanks / GSTs
4. Piped Distribution Network

Transmission main is damaged at some points which cause hindrance in the delivery of water. Some existing tube wells are also non-functional. If water supply system is not improved at this stage, then this infrastructure will be further damaged / degraded giving financial loss to the public as well as private sectors and the growth potential of the city will be adversely affected.

5.10.1 Supply and demand comparison

Existing supply of water is 12.9 cusecs and demand is 27.2 cusecs. New

proposed Tube wells under this sub-project will enhance the water supply up to 22 cusecs. For full supply, additional tube wells will be installed in future.

5.10.2 Component of Water Supply System

Water supply system can be characterized by following main components:

- Water Source
- Distribution System

The water source determines the treatment that is necessary to obtain clean, safe potable water that does not endanger public health. The two main sources that are used in water supply schemes are groundwater and surface water. In general groundwater has a better quality and needs little treatment. In the following sections the various components of water supply systems will be discussed in greater detail.

5.10.3 Water Source

Keeping in view the existing conditions of the sub-project area, the main sources of water supply are:

- Ground water
- Surface water

Surface and groundwater availability in the selected regions will be assessed in general from the available literatures and site inspections accordingly. The quality of the source will determine whether they are suitable for portable water supply or not.

The principal source of drinking water for the majority of the people in Pakistan is groundwater. The population of Bahawalnagar mainly depends upon groundwater. In the specific sub-project areas, sub soil water quality Bahawalnagar is brackish. Currently, seepage water of canals is being used for supply of water in this MC.

5.10.4 Design Criteria for Tube wells

Capacity of the tube well shall be based upon the maximum day water requirements, for the served area, with design operational duration (working hours) of 16 hours per day.

• Design Factors

In order to design the well, the following major factors shall be considered:

- Design, construction details, water quality of the existing tube wells;
- Depth to water table under existing and future conditions;
- Groundwater quality;
- Aquifer parameters.

• Tube Well Design

Information required before design can be completed includes:

• Aquifer location

- Depth to water bearing strata
- Thickness of strata (aquifer thickness)

• Aquifer nature:

- Consolidated or unconsolidated material
- Hard or friable rock,
- Confined or unconfined,
- Leaky or with delayed yield, etc.
- **Aquifer parameters**
 - Hydraulic conductivity,
 - Transmissivity,
 - Storativity,
 - Grain size,
- **Tube Well Screen**

Lower well casing and screen is used,
- **Screen Length and Location**

The optimum length of well screen for a specific well is based on aquifer thickness, available drawdown, stratification within the aquifer, and if the aquifer is unconfined or confined.
- **Pump Housing Casing**

Length of the pump housing casing in a tube well design is selected keeping in view present static water level, specific drawdown, seasonal fluctuations of water level and pumping water levels under the present and future conditions. The diameter of the pump housing casing is required to accommodate the pump and ensure enough clearance for installation and efficient operation of the pump.
- **Diameter of Borehole**

The diameter of upper well casing required is that needed to accommodate the pump, with some margin for clearance around the unit. Manufacturers of pump will recommend a "minimum" casing. The diameter must be Large enough for the pump to be a comfortable fit, making allowances for non - verticality of the Borehole.
- **Bail Plug**

Tube well will be sealed at the bottom. Bot tom piece of the screen will include a 10 ft section of blank casing sealed at the bottom to be used as sand trap.
- **Gravel Pack**

The gravel pack adjoining the screen consists of larger sized particles than the surrounding formation, and hence larger voids are formed at and close to the screen allowing water entry nearly free from head loss. Necessary conditions for a gravel pack are:

 - Sand-free operation after development,
 - Highest permeability with stability (low resistance),
 - Low entrance velocities,

- Efficient service life, i.e., resistant to chemical attack.

• **PUMPING FACILITIES**

Pumps are devices used to transfer water (or other liquids) from point A to point B with pressure to overcome the resistance along its path.

5.10.5 **WATER DISTRIBUTION**

Transmission and distribution systems vary in size and complexity but they all have the same basic purpose, which is to deliver water from the source(s) to the customer. Water can be transported from the source to the treatment plant, if any, and the distribution system, and eventually reach consumers the following method:

• **Through Pumping with Storage**

In this method tube wells/ pumps supply water to the network along with the reservoirs which act as balancing reservoir. When the system is running on average demand the OHRs are also being filled by pumps, but whenever the peak is attained the OHRs starts augmenting the pumps in maintaining the terminal heads, hence acting as balancing reservoirs. This is the most common, efficient and reliable system.

5.10.6 **Water Transmission System**

The transmission system's function is to transport water from source to the reservoir, if any, and to the distribution point. Water conduits for the transmission system may be canals, aqueducts or tunnels, free-flow pipelines, or pressure pipelines. The transmission of water will either be under gravity or pumping. Pressure pipeline is generally the type of water conduit used for water supply transmission systems.

5.10.7 **Water Reservoirs**

Reservoirs may be classified according to their function, their relative position with respect to the earth's surface, manner of operation, and the type of material of construction. Different types of water reservoir are discussed in the succeeding sections.

- Overhead Water Reservoir
- Groundwater Storage Reservoir

5.10.8 **Operation of Reservoirs**

Reservoirs may be operated on the following basis:

• **FLOATING -ON-THE-LINE RESERVOIR**

Water is pumped both into the reservoir and to the consumers; water goes up the tanks when the water demand is low or if there is a residual water supply. During peak demand, water goes to the customers directly from the source and from the tank.

• **FILL-AND-DRAW RESERVOIR**

Water flows or is pumped directly into the reservoir and from the reservoir, water supply is distributed to the consumers through gravity flow. The tank is usually installed near the water source to minimize head losses due to friction

losses. In the fill- and-draw system, however, water is conveyed to the storage tank at high pumping capacity at shorter time duration, and always against the maximum head.

5.10.9 WATER DISTRIBUTION SYSTEM

- **Types of Water Distribution System**

The purpose of a distribution network is to distribute the potable water from the storage reservoir over the area to be provided, and deliver it to the individual consumer in such a way that at any tap point and at any time sufficient water of good quality can be withdrawn. There are two types of water distribution system;

- Branched System
- Looped System

Keeping in view, technical and financial viability of aforementioned systems and previous matter planning experiences, loop system will be adopted being most efficient and dependable system.

- **Looped System**

A distribution network is looped when there are only few or no pipe dead ends, such that water can move through the system freely.

The advantages of a looped system are;

- The lower water velocities in the main reduce head losses, resulting in greater capacity.
- Main breaks can be isolated, minimizing severe interruptions to consumers.
- Usually, better chlorine residual content is achieved.

The disadvantage is generally more costs because of the need for more pipes to create the loops.

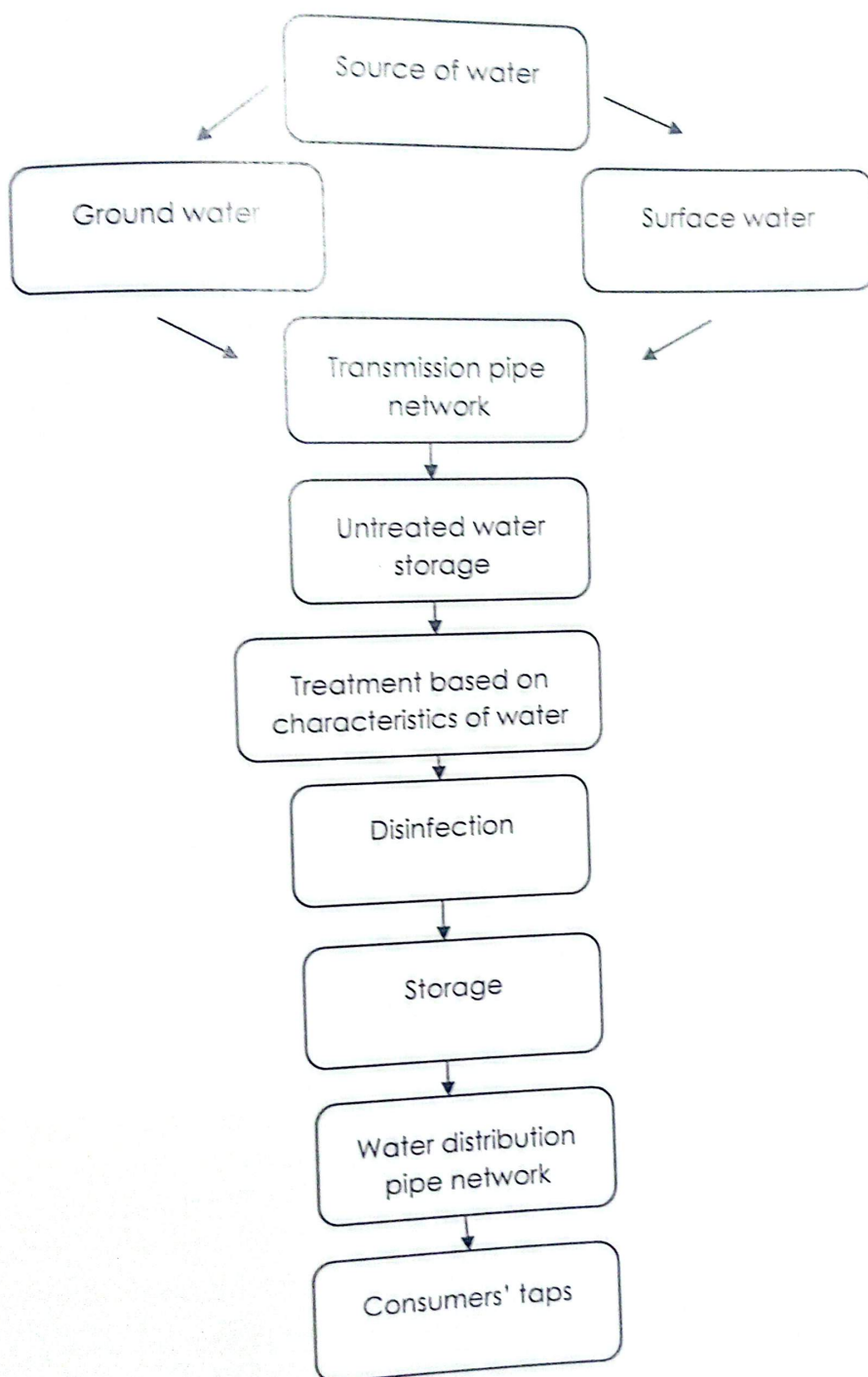


Figure 5-5, Process flow diagram

5.11 WATER CONSUMPTION & WASTEWATER DISPOSAL

Ground water will be the main source of water during construction phase. In constructional phase, 7,200 gallon/day water will be used. During operation 4,752gallon/day water will be used for domestic purpose. Wastewater will be produced from tube wells is domestic wastewater.

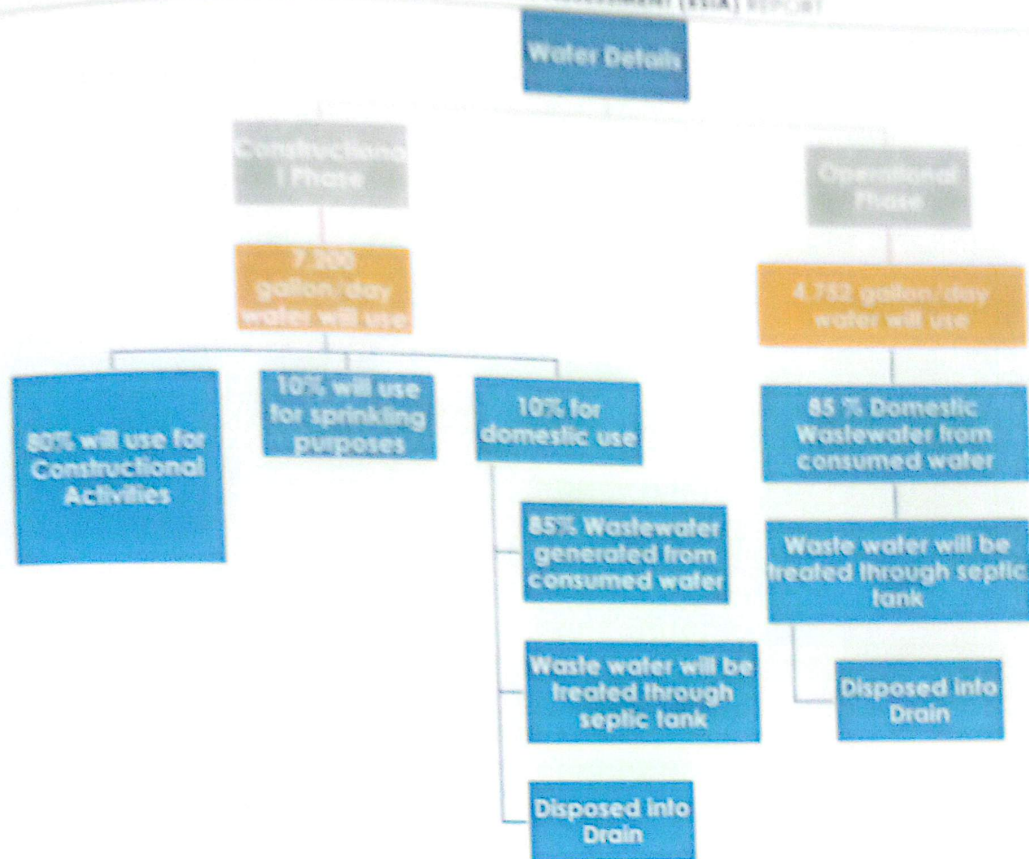


Figure 5-6, Water Balance

5.12 SOLID WASTE

The amount of solid waste produced during construction phase will be 45kg/day. In constructional phase all waste materials such as landscape and land clearing debris, gravel and aggregate products, concrete, masonry scrap and rubble (brick, concrete masonry, stone), and plastics and paper from cement bags will be recycled during the construction activities as road filling and maintenance purposes. Solid waste generated during construction phase will be placed in separate bins. During operation phase, the amount of solid waste will be 29.7 kg/day. Only domestic waste will be produced that will be handed over to contractor.

5.12.1 Waste Management and Disposal

The main types of waste expected to be generated and requiring disposal include:

- a) Fuel, oils, and chemicals:
- b) Sewage:
- c) Campsite waste:
- d) Medical waste:
- e) Demolition waste:
- f) Packing waste; and.

Table 5-4. Waste Management Collection and Disposal Techniques

Activity	Best practices
Generation of construction material	- Implement resource conservation, and encourage staff (through training) to reduce waste, reuse waste and recycle waste wherever possible - Prohibit staff from fouling the site
Disposal of recyclable waste	Sell recyclable waste to local vendors
Disposal of construction material	- Do not burn materials which may lead to the release of toxic or hazardous substances - Do use burn on site when surrounding vegetation is dry and combustible
Disposal of hazardous	Handover to specialized and certified disposal contractor
Generation of construction waste	Reduce construction waste by reusing waste as a fill material (prior to testing to confirm)

5.13 SOURCES OF CONSTRUCTION MATERIAL

Construction material will be acquired from the nearest possible/local sources through approved vendor/contractors of the government.

5.14 USE OF MACHINERY AND EQUIPMENT

Table 5-5. Required machinery / equipment

Sr. No.	Machinery / Equipment	Sr. No.	Machinery / Equipment
1.	Bore hole drilling machine	2.	Excavator
3.	Trucks	4.	Total Station and ancillaries
5.	Pipe jacking equipment	6.	Rock breaker
7.	Back Hoe Excavator	8.	Water bowser
9.	Jack hammer	10.	Pipeline pressure testing equipment
11.	Compressor	12.	Butt fusion equipment
13.	Generator	14.	Water pumps

5.15 STORAGE OF MATERIALS

50,000/- is annually paid to the owner of the land to whom land is rented out as per defined local government rates. As, this sub-project is of short duration, henceforth, land will be rented out with due mutual discussion between owner of the land and the contractor.

5.16 CONSTRUCTION / LABOUR CAMPSITE

Location of the construction camps should be at areas which are acceptable from environmental, cultural or social point of view. Location of

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construction camps should be away from communities in order to avoid social conflict with the surrounding communities. Contractor will submit to the relevant MC for approval of a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps. Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective. The Contractor's staff quarters and labour camps shall be provided with all necessary services for drainage, lighting, roads, paths, parking places, fencing, sanitation, cook-houses, fire prevention and firefighting equipment. All labour camps, workshops and storage areas shall be built on hard compacted ground with sufficient bunding and spill kits so as to prevent the loss or infiltration of leaked or spilt fluids into surrounding soils, ground water or water courses. Traffic signage shall be maintained in the camps. The Contractor shall establish a drainage network, including end discharge, to drain storm water away from camps and settlements. *(Labour Management Plan is given in Table 01 of EHS SOPs for Labour / workers prepared for PCP's sub-projects, attached as Annexure N).*

5.16.1 Proposed Campsite Locations

Two locations have been proposed for contractor's campsite. Both the locations are near sub-project site. Location 01 is near Bahawalnagar Bypass Road, at a distance of almost 1,000 meters from sub-project site and it is almost 250 meters away from housing communities / any sensitive receptor. Location 02 is near Nadir Shah Road, at a distance of almost 1,000 meters from sub-project site and it is almost 240 meters away from housing communities / any sensitive receptor. Google map with coordinates showing both proposed locations is shown below in figure 5-7.



Figure 5-7, Proposed Campsite Locations

17 RESTORATION AND REHABILITATION PLANS

All possible precautions will be taken to prevent an untoward incident in terms of life and property losses. On completion of the sub-project, solid waste will be removed from the site in order to maintain aesthetics of the area. All measures will be undertaken for ensuring occupational safety, security and clean environment during the working hours. Plantation and landscaping will also be done by the proponent after the completion of sub-project.

5.17.1 Details of Restoration and Rehabilitation at the End of the Sub-project Life

There will be no matter of rehabilitation as the site is already owned by the sub-project proponent. At the end of the life of the sub-project, it will be duly dismantled with special precautions to avoid/ minimize pollution and at the same time taking all safety precautions to protect human life and property around the building.

The materials capable of recycling/reuse will be either sold in the market or to be reused for other suitable purposes.

5.18 GOVERNMENT & LOCAL APPROVALS:

The proponent will apply for all relevant approvals from government departments and submit all the NOCs to EPA as received.

SECTION - 6: DESCRIPTION OF ENVIRONMENTAL & SOCIAL BASELINE

This section describes sub-project area and its surroundings to establish baseline, which are expected to be affected by the sub-project. The baseline description includes physical, ecological and socioeconomic aspects of the sub-project area.

A site visit was conducted to collect primary data on physical, ecological and socioeconomic aspects. Environmental surveys, interviews with general public and various governmental and non-governmental organizations were carried out to collect the baseline data. Furthermore, sensitive receptors of potential sub-project impacts were identified. Secondary data was collected from available literature and District Census Report (DCR) etc.

6.1 GENERAL CHARACTERISTICS OF SUB-PROJECT AREA

The sub-project is the rehabilitation of old and installation of new tube wells at Fordwah and Sadqia canal (20 new tube wells on Fordwah Canal, 08 existing tube wells on Fordwah Canal for rehabilitation and 05 existing tube wells on Sadqia Canal for rehabilitation), construction of 03 overhead tanks / GSTs in Madina Town and Satluj Park (02 in Madina Town and 01 in Satluj Park) and transmission lines within MC Bahawalnagar, Tehsil and District Bahawalnagar. The site is located in urban area. The DGS has its main access on Bahawalnagar-Chishtian Road, Bypass Road Bahawalpur and Jalanwala Road.

6.2 PHYSICAL RESOURCES**6.2.1 Geography, Geology, and Soils**

The district may be divided into three parts. These are the riverine area, the canal irrigated plain and the desert area. The riverain area of the district lies close to the Satluj River which flows in the North-West along its border with Okara, Pakpattan, Sahiwal and Vehari districts. The land in this area is irrigated by non-perennial canals. During the summer monsoons, the area is generally in-undated by the river water. The canal irrigated area is a plain which has been brought under cultivation by the canals.

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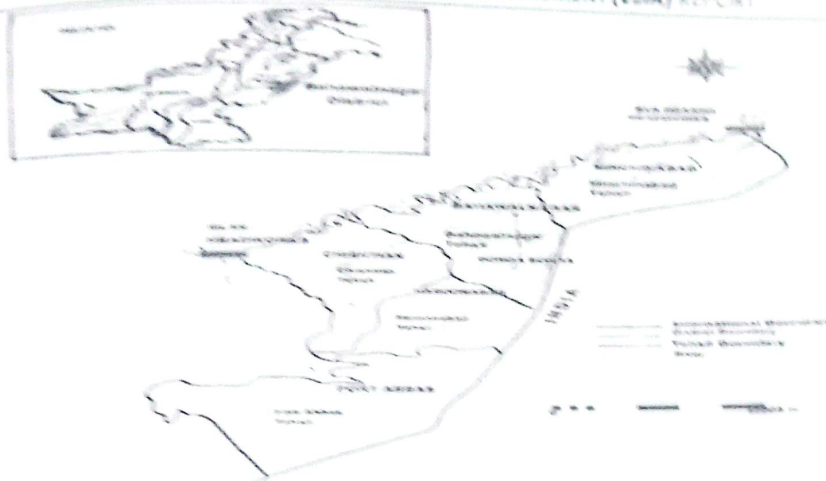


Figure 6-1. Administrative map of Bahawalnagar :

The main canal which is Sadda canal irrigates almost all the tehsils except Chishtian. This canal travels in round with the border of Pakistan and India.

4.2.2 Topography.

Bahawalnagar (Punjab), Pakistan elevation is 159 meters and elevation in feet is 522 ft above sea level.

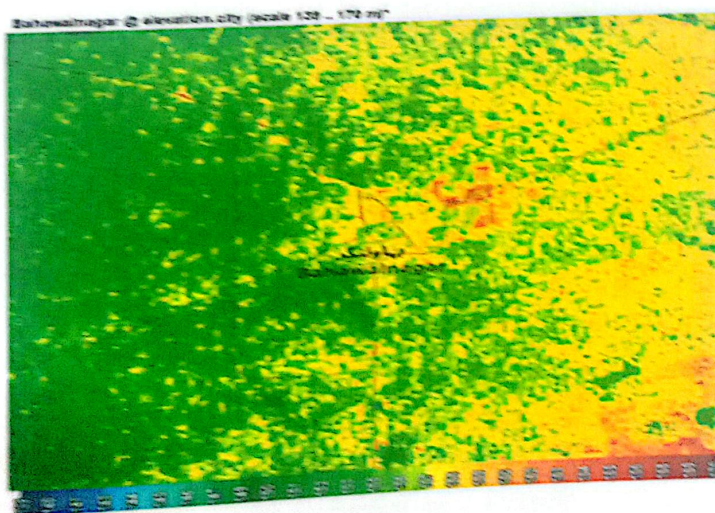


Figure 6-2. Topography of Bahawalnagar³

6.2.3 Climate and temperature

Climate and temperature
Bahawalnagar has a very hot and very dry climate in summer. The maximum temperature in summer reaches up to 51°C . In winter the minimum is 2°C . The summer season starts from April and continues till October. May, June and

² (source: Cheema, M. & Mirza, I. & Hassan, Muhammad & Bandaragoda, D., (2022). Socioeconomic baseline survey for a pilot project on water users organizations in the Hakra 4-R Distributary Command Area, Punjab.)

Area Punjab
1. <https://en-gb.topographic-map.com/map-sh11f3/Bahawalnagar/>

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July are the hottest months. The winter season on the other hand starts from November and continues till March, December and January are the coldest months when the temperature drops to the extent of 20°C or even below. Wind and storms are quite uncommon during the summer.

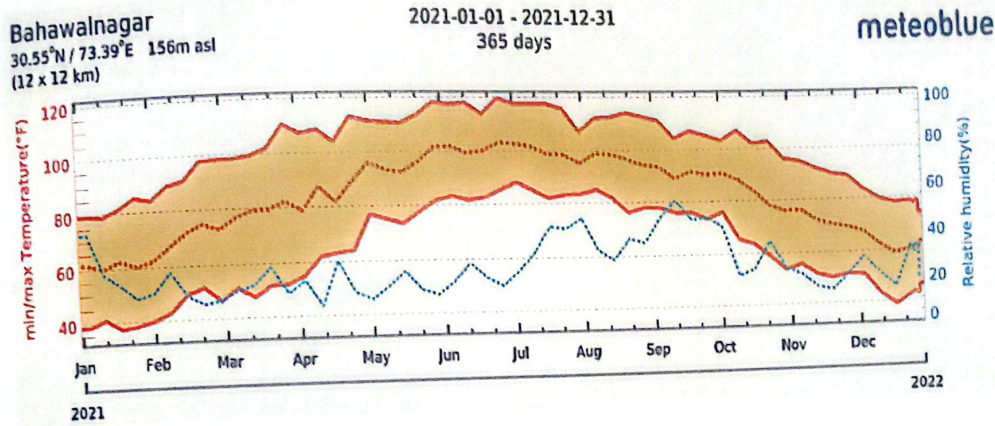


Figure 6-3, Maximum and minimum temperature⁴

6.2.4 Rainfall

The rainy season starts in July and ends in September. Most of the winter rains are received in the months of March and April. The average annual rainfall in the district is just below 99 mm.

The rainy period of the year lasts for 7.3 months, from February 25 to October 2, with a sliding 31-day rainfall of at least 0.5 inches. The month with the most rain in Bahawalnagar is July, with an average rainfall of 1.7 inches.

The rainless period of the year lasts for 4.8 months, from October 2 to February 25. The month with the least rain in Bahawalnagar is November, with an average rainfall of 0.1 inches.

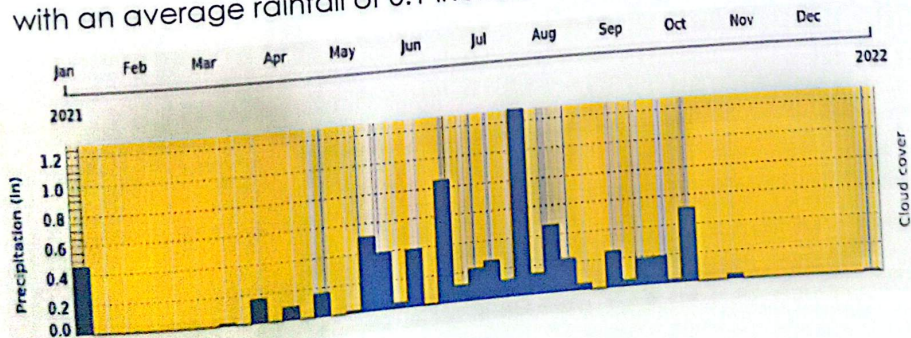


Figure 6-4, Annual Precipitation⁵

6.2.5 Wind Speed and direction

The windier part of the year lasts for 8 months, from April 4 to November 7, with average wind speeds of more than 18 miles per hour. The windiest month of the year in Bahawalnagar is April, with an average

⁴ meteoblue

⁵ meteoblue

hourly wind speed of 30 miles per hour as shown in figure 6-5. The wind blows from WNW and NW direction as shown in figure 6-6.

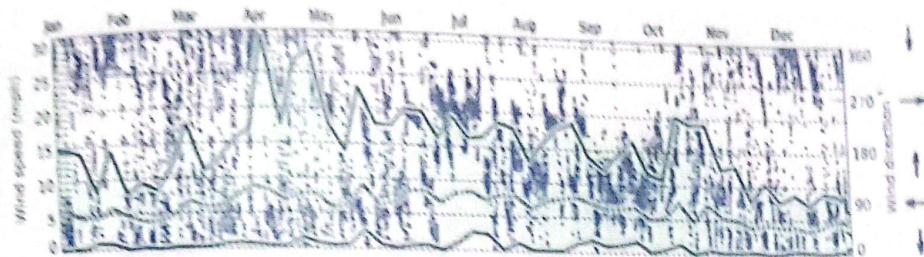


Figure 6-5, Wind Speed⁶

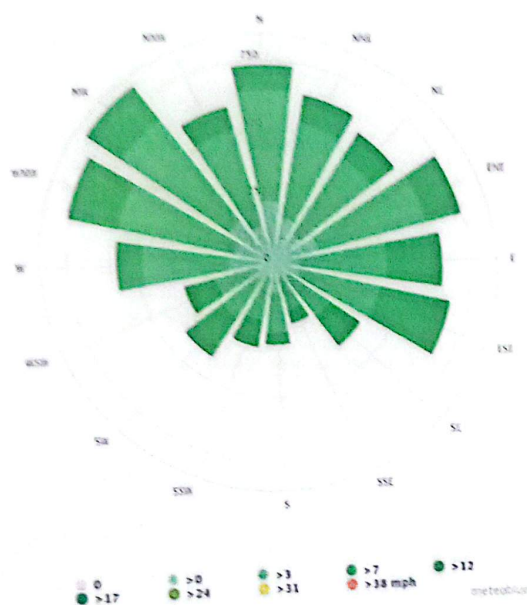


Figure 6-6, Wind Rose⁷

6.2.6 Seismicity

According to Seismic Zoning of Pakistan, the sub-project area lies in Zone 2A and represents minor to moderate damage due to earthquakes.

⁶ Meteoblue

⁷ Meteoblue

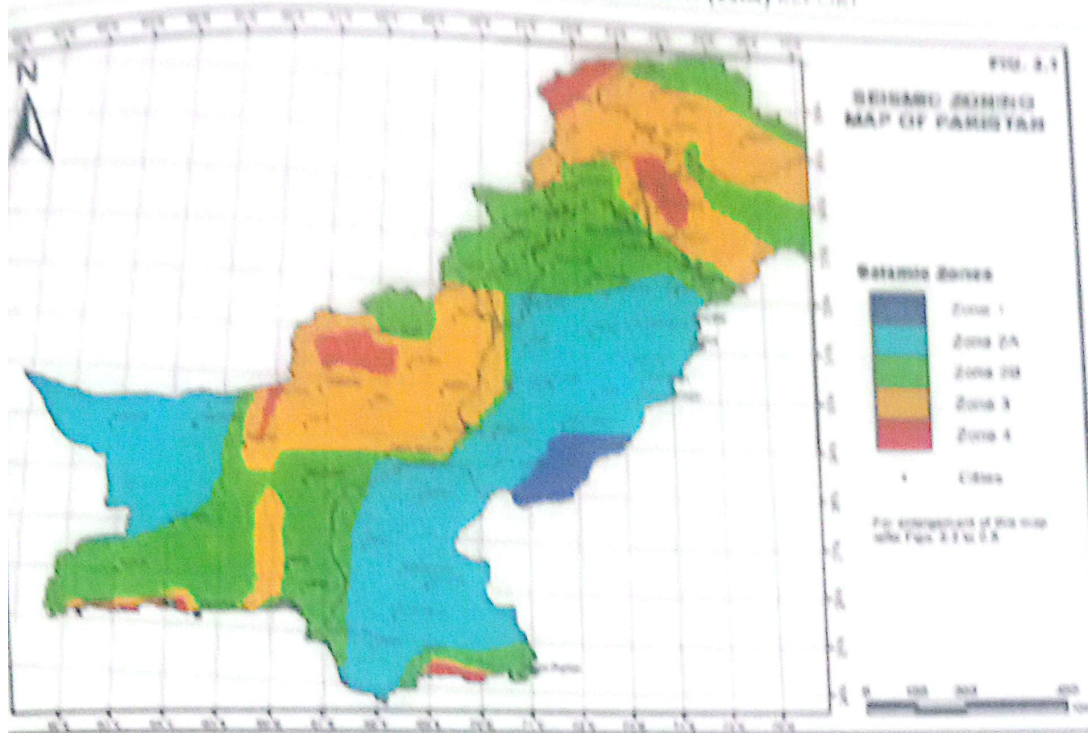


Figure 2-1. Seismic Zones of Pakistan⁸

2.7 Ground water and Water Supply

Around 6.5% of the housing units are using piped water, majority of which has that facility in their own houses. A majority is using hand pump for potable water, 92.4%. Just 0.2% households are using potable water taken out from wells. Irrigation canals, tube wells and wells (Persian wheels) are the main source of irrigation. Canal network consists of Bahawalnagar canal, Rangpur canal and the tail of the Thal canal. All the canals are seasonal ones and supply irrigation water during summer and for a very short period during winter. The agriculture therefore, depends on irrigation through tube wells or the wells. Tube wells are sunk in public as well as private sector. There are 1,746 tube wells installed privately irrigation which however are run also on subsidy given by the agriculture department. In the public sector, SCARP sub-project sponsored by the government is maintaining 1,327 tube wells in different parts of the district. As such there are 18,373 tube wells engaged in irrigation activity.⁹

The current sub-project is for rehabilitation and installation of old and new tube wells and transmission lines at MC Bahawalnagar. To check the quality of the water in the area, ground water was collected Field officers of Asian Environmental Services- an EPA Certified Lab on September 2, 2022 and analyzed. The ground water will be extracted through boring. The detail of

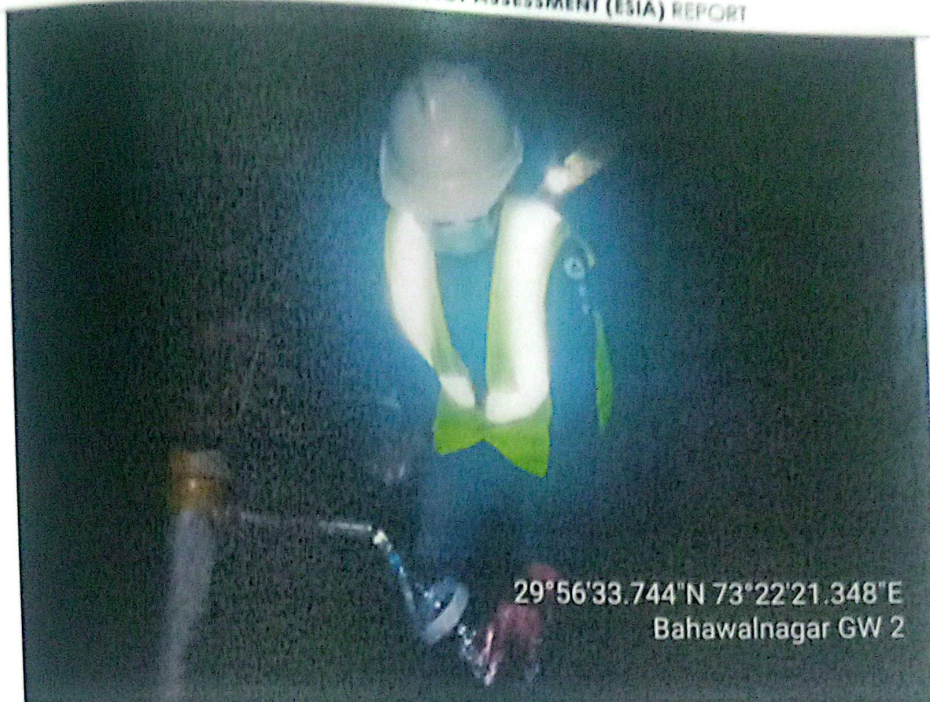
⁸ (Geological Survey of Pakistan)

⁹ EE Report for The Conversion of 66 KV to 132 KV Fort Abbas Grid Station and Faqirwall to Fortabbas 132KV STD Transmission Line (District Bahawalnagar)

The water quality of the sub-project area is given below:

Table 4-1. Ground Water Analysis Results of Burhan Kot, Bahawalnagar (nearby Jwah Canal)

Parameter	Analysis Method	PEQS	Result	Remarks
Color*	SMWW 2120 C	≤ 13 TCU	0	Optimal
Taste*	SMWW 2160 C	Non-Objectable	Non-Objectable	Optimal
Odor*	SMWW 2150 B	Non-Objectable	Non-Objectable	Optimal
Turbidity*	SMWW 2130 B	< 3 NTU	0	Optimal
Total Hardness (as CaCO ₃) ^{mg}	SMWW 2340 C	< 500 mg/L	100	Optimal
Total Dissolved Solids (TDS) ^{mg}	SMWW 2340 C	< 1000 mg/L	364	Optimal
pH ^{mg}	SMWW 4500 H ^{mg} B	6.5-8.5	7.55	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	0.003	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.003 mg/L	0.003	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.03 mg/L	< 0.03	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	0.02	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	0.02	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	0.006	Optimal
Chloride (Cl) ^{mg}	SMWW 4500 Cl ^{mg} B	< 250 mg/L	40	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	< 0.004	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.145	Optimal
Cyanide (CN) ^{mg}	SMWW 4500 CN ^{mg} F	≤ 0.05 mg/L	0	Optimal
Fluoride (F) ^{mg}	SMWW 4500 F D	≤ 1.5 mg/L	0.12	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	< 0.003	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.3 mg/L	0.013	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	< 0.001	Optimal
Nickel (Ni)	SMWW 3113 B	< 0.02 mg/L	0.02	Optimal
Nitrate (NO ₃) ^{mg}	SMWW 4500 NO ₃ ^{mg} B	≤ 50 mg/L	1.52	Optimal
Nitrite (NO ₂) ^{mg}	SMWW 4500 NO ₂ ^{mg} B	≤ 3.0 mg/L	0.09	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	< 0.01	Optimal
Residual Chlorine (Cl) ^{mg}	SMWW 4500 Cl ^{mg} B	0.5 mg/L	0	Optimal
Phenolic Compounds (as Phenol) ^{mg}	SMWW 5530 D	NDVS	0.06	Optimal



29°56'33.744"N 73°22'21.348"E
Bahawalnagar GW 2

Groundwater samples were tested for 30 different selected parameters as per PEQS. Based on the laboratory test results, it was found that all the parameters of Groundwater samples are within the permissible limits.

6.2.8 Aquifer Sustainability Data

Ground water quality of city area is brackish and unfit for drinking purposes. A detail Hydrogeological study has been carried out by the Consultant to identify the new water source and available yield. Currently, tube wells are installed along the canals to meet the water demand of city and same strategy is being adopted to overcome the current shortfall as well as future water demand.

Fundamentally, all tube wells are extracting the water, which is being recharge by canals and this extraction of water would have primarily no substantial impact on ground water aquifer.

6.2.9 Surface water

Sulemanki head works is located about 2 kilometers (1 mile) from the Indian border on the Sutlej River. From here originate three major canals which supply irrigation water to a large area in Southern Punjab and the Bahawalnagar district. The Upper Pakpattan Canal arises from its right bank and two canals arise from the left. The canals on the left bank are Fordwah and Eastern Sadiqia Canal. The latter canal runs along the Pakistan-India border. After 74 km (46 mi) at Jalwala head works, Eastern Sadiqia Canal trifurcates into Sirajwah distributary, Malik Branch Canal and Hakara Branch Canal. River Satluj flow on its western side of the district. Which itself is dependent on rainy water and when excessive water is released by India. The current sub-project is rehabilitation of old and installation of new tube wells at Forwah and

Sadqia canals (20 new tube wells will be installed on Fordwah Canal, 08 tube wells will be rehabilitated on Fordwah Canal and 05 tube wells will be rehabilitated on Sadqia Canal). Flow of Fordwah Canal and Sadqia Canal is 2,800 Cusecs and 8,000 Cusecs respectively. Hydrogeology of Bahawalnagar is attached as Annexure Q.



Figure 6-8, Fordwah canal

6.2.10 Air Quality

Air quality in most of the sub-project area appears good based on observation during the study period. Emissions should be controlled at source under the EMP. There will be a few items of powered mechanical equipment to be used in the construction and rehabilitation works that may give rise to complaints of dust and other emissions; however, these should be minor and easily dissipated. Domestic sources of air pollution, such as emissions from wood and kerosene burning stoves as well as small diesel standby generators in some households, are minor.

The primary source of air pollution at the sub-project sites is the vehicular emissions, industries such as rice mills and the key pollutants likely to be found at sub-project proposed locations are Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), Sulfur Dioxide (SO_x) and Particulate Matter (PM). In order to determine the air quality of the area, Asian Environmental Services Private Limited – an EPA certified Lab had the requisite air sampling device and expertise for collection of samples.

The monitored parameters included Carbon mono-oxide (CO), Nitrogen oxides (NO_x), Sulphur oxides (SO_x), Particulate Matter (PM₁₀). The monitoring was carried by the field officers of Asian Environmental services on September 2, 2022 for a period of 24 hours to determine the baseline ambient air quality

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of the area and results are presented in Table 6-3 Table 6-3, and table 6-4, and reports are attached as Annexure-F.

Table 6-3, Ambient Air Quality Results Burhan Kot, Bahawalnagar (nearby Fordwah Canal)

Parameters	Unit	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO ₂) *	µg/m ³	24Hours	1.00	23.01	80.0	Optimal
Nitrogen Oxide (NO)*	µg/m ³	24Hours	1.00	15.52	40.0	Optimal
NO _x *	µg/m ³	24Hours	1.00	38.48	120.0	Optimal
Sulphur Dioxide (SO ₂) *	µg/m ³	24Hours	1.00	20.31	120.0	Optimal
Carbon Monoxide (CO) *	mg/m ³	24Hours	0.01	0.86	05.0	Optimal
Particulate Matter (PM ₁₀) *	µg/m ³	24Hours	1.00	105.48	150	Optimal
Particulate Matter (PM _{2.5}) *	µg/m ³	24Hours	1.00	31.75	35	Optimal
Total Particulate Matter (TSP)	µg/m ³	24Hours	1.00	202.64	500	Optimal



Figure 6-9, Ambient Air Monitoring at Burhan Kot, Bahawalnagar (nearby Fordwah Canal)

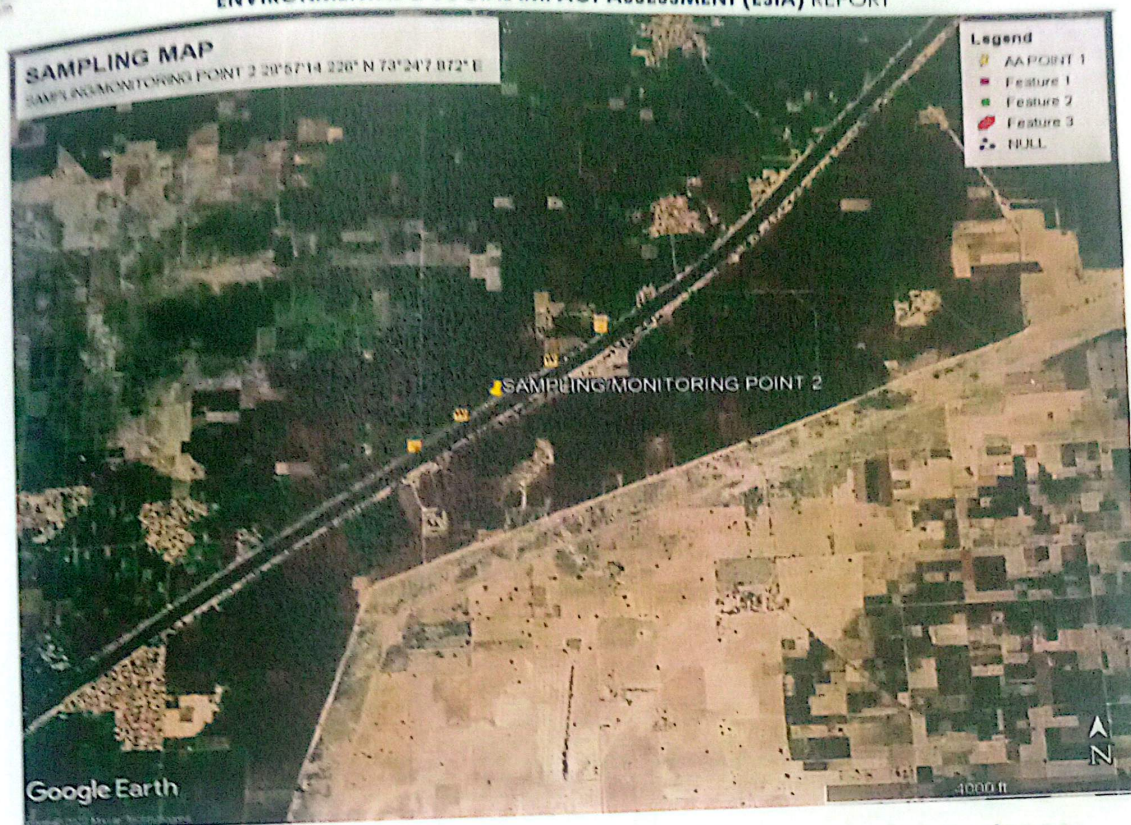


Figure 6-12, GIS Map of monitoring/sampling point 2 Godhuwala, Bahawalnagar (nearby Sadqia Canal)

Table 6-4, Ambient Air Quality Results at Godhuwala, Bahawalnagar (nearby Sadqia Canal)

Parameters	Units	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO ₂) *	µg/m ³	24Hours	1.00	20.17	80.0	Optimal
Nitrogen Oxide (NO)*	µg/m ³	24Hours	1.00	12.74	40.0	Optimal
NO _x *	µg/m ³	24Hours	1.00	32.87	120.0	Optimal
Sulphur Dioxide (SO ₂) *	µg/m ³	24Hours	1.00	18.11	120.0	Optimal
Carbon Monoxide (CO) *	mg/m ³	24Hours	0.01	0.82	05.0	Optimal
Particulate Matter (PM ₁₀)	µg/m ³	24Hours	1.00	112.35	150	Optimal
Particulate Matter (PM _{2.5})	µg/m ³	24Hours	1.00	34.28	35	Optimal
Total Particulate Matter (TSP)	µg/m ³	24Hours	1.00	210.10	500	Optimal

6.2.11 Noise

Noise from vehicles and other powered mechanical equipment is intermittent. There are also the occasional calls to prayer from the PA systems at the local mosques but there are no significant disturbances to the quiet rural setting. However, the construction from the proposed power expansion will use powered mechanical equipment. Subjective observations were made of background noise and also of individual vehicle pass by events.

Noise level of the sub-project area was monitored by field representative of Asian Environmental services on September 2, 2022 to determine the baseline noise levels at sub-project site using digital sound meter and the results are presented in Table 6-5 and Table 6-6 and reports are attached as Annexure-F.

Table 6-5, Noise Levels at Burhan Kot, Bahawalnagar (nearby Sadqia Canal)

Sr. No.	Time	Noise (Leq) dB(A)*		PEQS
1	21:00	58	Day Time	55
2	22:00	50		
3	23:00	61		
4	00:00	52		
5	01:00	48		
6	02:00	50	Night Time	45
7	03:00	45		
8	04:00	40		
9	05:00	55		
10	06:00	50		
11	07:00	51		
12	08:00	48		
13	09:00	50		
14	10:00	48		
15	11:00	55		
16	12:00	52		
17	13:00	58	Day Time	55
18	14:00	49		
19	15:00	65		
20	16:00	48		
21	17:00	52		
22	18:00	51		
23	19:00	54		
24	20:00	50		

*Parameters are approved with Punjab Environment Protection Agency.

Table 4-4. Noise Levels at Godhuwala, Bahawalnagar (nearby Sadqla Canal)

S. No.	Time	Noise (Leq) dB(A)*		PEQ5
1	22:00	45		
2	23:00	40		
3	00:00	48		
4	01:00	50		
5	02:00	47	Night Time	45
6	03:00	52		
7	04:00	50		
8	05:00	54		
9	06:00	48		
10	07:00	57		
11	08:00	52		
12	09:00	51		
13	10:00	48		
14	11:00	52		
15	12:00	50	Day Time	55
16	13:00	55		
17	14:00	60		
18	15:00	52		
19	16:00	51		
20	17:00	54		
21	18:00	48		
22	19:00	60		
23	20:00	49		
24	21:00	52		

*Parameters are approved with Punjab Environment Protection Agency.

6.2.12 Solid waste

In the Study Area, MC Bahawalnagar is responsible for solid waste management and working towards its continual improvement for collection and disposal efficiency.

6.3 BIOLOGICAL RESOURCES

6.3.1 Wildlife, Fisheries and Aquatic Biology

Wild pig is extremely common especially on the banks of the river. Hooper, wood pecker, pewit, crow and parrot are the common birds of the area. The common species of birds found in the district are Dove, Blue rock Pigeon, Peacock, Hooper, Sparrow, Kullil, Kal Kurchhi, Parrot Egrate & Paddy bird, Kite King Fisher, Sallow Amadvaf, Coot, Laghar, Shikra and Owl.



common peafowl



Ostrich



Black Swan



Black Buck

Figure 6-13, Fauna in Bahawalnagar

6.3.2 Vegetation cover and trees

The Van (*Salvadora oleoides*), Karil (*Capparis aphylla*), Jand (*Prosopis spicigera*), Beri (*Zizyphus jayaba*), mallha (*Zizyphus numularia*) and Shisham (*Dalbergia Sissoo*) are common species present in and surrounding areas of Bahawalnagar. There are no trees found in the route of water transmission lines. Trees, found at bank of canal where tube wells are proposed to be installed, will not be disturbed due to execution of this sub-project.



Water Supply Line along / in RoW of Railway Line Water Supply Line along / in RoW Railway Line Water Supply Line along / in RoW of Highway

Figure 6-14, Representative Pictures of Proposed Tube wells and Supply Lines

3 Wetlands

There are no wetlands nearby project site and in Bahawalnagar region.

3.4 Wildlife sanctuaries

The nearest wildlife sanctuary near Bahawalnagar is at Cholistan that is about 100km away from project site

3.5 Wildlife parks,

Bahawalnagar Wildlife Park is located at a distance of 550m away from project site. The Park was established in 1986-1988 under the development scheme "Captive Breeding of Blackbuck at Bahawalnagar. It covers an area of 15 acres. Some notable animal species in this area are Black Swan, common peafowl, Black Buck, Ostrich, Langoor, Rhesus Monkey etc.

4.3.6 Forests

Bahawalnagar forest is located at a distance of about 400m from project site with The Van (*Salvadora oleoides*), Karil (*Capparis aphylla*), Jand (*Prosopis*

Land use

The land use pattern in Bahawalnagar is mixed with planned and unplanned areas. The city can be divided into two parts by a railway track that runs north east to south west direction. The northern part of the town is unplanned area. A canal namely Fard head Wah canal is situated in the north of the town and one of its branches passes through the town. Here the predominant use of land is residential. There are many vacant plots between developed residential blocks. The central part comprises of public buildings like DPO House, Rangers House, Session House, Rest house, Public Health office, Government offices and Session courts.

There is industry on the extreme eastern side of the town. This is a cotton industry. The southern part of the town has a massive area under commercial activity. There are some public buildings also like Police station, Office Nazim and Naib Nazim, SDO office, Eid gah, Veterinary hospital, Railway House and market committee office. The educational institutions are spread over the town in all directions. Government college for Boys and Girls are in the southern part of the town. Some other colleges are present in the south eastern side.

The town has developed its residential area more on the southern side. There are two open spaces in the town one is in the central part and the other is the stadium in the eastern side on By pass Minchanabad road. There are four graveyards in the town (Planning Report 2008, PMDFC).

4 Languages

Punjabi is main language of the people. Urdu is after Punjabi. Siraki is also well-spoken language in Marwat area.

5 Literacy rate and Education Facilities

The literacy ratio in Bahawalnagar district has increased from 28% in 1998 to 54% in 2017. The literacy ratio for males is 67.3% and 44.1% for females. A number of government and private schools are present in Bahawalnagar including DPS, The Educators, Galaxy public school etc. There are about 26 notable colleges in Bahawalnagar, most of them are government colleges

Table 4-7. Demographic data*

Population 1996

	Area (sq. km.)	All sexes	Male	Female	Trans-gender	Sex ratio	Population density/ sq. km.	Urban population	Avg. pop. density	Population (sq. km.)
Chowdurgar District	4,878	2,975,656	1,510,427	1,464,900	329	928.11	335.17	27,863	5.69	2,790,000
Total	1,729	413,390	415,255	398,046	189	916.32	475.44	23,503	5.38	547,000

6.4.6 Health Facilities

District Head quarter Hospital is the main hospital in Bahawalnagar. Other than Tehsil Headquarter hospitals are functional in all 4 districts. A few private hospitals such as Zeeshan Health Care Hospital and Al Raheem Pharmacy Hospital and small clinics are available for the patients.

6.4.7 Health problems

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

6.4.8 Social Conflicts

There are no conflicts reported in the sub-project area.

6.4.9 Household Information

The 2017 Census the population showed the district is predominantly Muslims i.e., 99.58 percent. The next higher percentage is of Christians with 0.25 percent, followed by others 0.13 percent while other minorities like Ahmadi, Hindu (Jati), Scheduled Castes etc. are very small in number.

There is small difference in proportion of population of Muslims between rural and urban areas. Christians are mostly living in urban areas representing 0.5 percent as compared to 0.2 percent in rural areas. Ahmadi are small in proportion in rural than urban areas. The Bahawalnagar city is named as Shahr-e-Wafa as people are very loving and caring here.

6.4.10 Settlement of Respondents

Majority of the population of Bahawalnagar District is native and only 2.3% people are migrant.

6.4.11 Family System

Majority of the community live in joint family arrangements while some younger population prefers living in separate family units. In the joint family system, the eldest male member takes care of all the family members and is the final decision-making authority particularly for issues regarding the public domain. This system also provides social security for family members during periods of individual un-employment and financial crisis. These communities believe that the joint family system is a more economical way of living as they often work together on the same land and are able to share their joint incomes to support the entire family, including elderly relatives who are unable to work.

6.4.12 Source of Livelihood and Income

The total economically active population 92.6% was registered as employed in Labor force survey 2020-2021. Nearly three fifths i.e., 43.6% for agriculture,

23.0% are for industry and 33.4% for Services industry. The difference in proportions of employed population was significant between the genders and urban and rural residences.

6.4.13 Agricultural land status

Cotton, wheat, rice and sugarcane are the cash crops of the district. Among the fruits, mango, and guava are also source on income for the agriculture community. Besides, peas, ladyfinger and chillies are also grown in the district in minor quantities.

6.4.14 Horticulture

The main fruits grown in the area mango, citrus and orange gardens are found in Bahawalnagar district. However, this area is famous for mango. According to a survey of agriculture development the total area of the district covered by the mango garden is 22,625 acres and numbers of garden owners are 3,052 throughout the district.

6.4.15 Road and rail network

District Bahawalnagar is well connected by roads; Provincial Road also passes through Bahawalnagar. Besides, farm to market roads have been constructed throughout the district. In addition, to roads of Punjab Road Department, these of national road authorities, district councils and other local bodies are available in the district. There is a network of metaled and un-metaled roads in the district. There are also metaled canal roads. All tehsil headquarters and important towns are connected through metaled roads.

Although Bahawalnagar is not situated at main railways track so that people of sub-division of Bahawalnagar have not facility of travelling by train to Lahore, Multan, and Rawalpindi etc.

Bahawalnagar district is not linked by air with other parts of the country but it is connected with other parts of the country through Bahawalpur and Multan Airport which are about 150 and 200 km away from Bahawalnagar.

6.4.16 Energy Sources

More than 78 percent housing units are using wood as cooking fuel in their houses while 4 percent are using gas for their purpose. About 2 percent are using kerosene oil and 21 percent are using other sources of cooking fuel in their houses.

6.4.17 Community Based Organization (CBOs) and NGOs

There are several NGOs in Bahawalnagar district such as Lok Sanjh Foundation, Human Rights Protection Office, National Rural Support Program-Sub-project Office etc.

6.4.18 Local Government and Administration

Local level elected representatives are active in the sub-project areas. Union council chairman along with other elected councilors work on local or union

level development. District level development activities are the mandate of the district council which is headed by the Chairman District Council. Government functionaries, Bahawalnagar consists of Commissioner, Deputy Commissioner (DC), Additional Deputy Commissioner, Assistant Commissioner, revenue officers, and officer's in charge of line departments.

6.4.19 Law and Order Situation

The law-and-order situation in Bahawalnagar district, including the sub-project area, is normal and under the control of the district administration and law enforcement agencies (police).

6.4.20 Community Awareness about Sub-project Works

The communities residing at sub-project area are well aware about the proposed sub-project works and implementation. During screening and development of ESIA, public consultations are held regarding sub-project activities.

6.4.21 Community Demands

During public consultations and baseline data collection activities on sub-project for the improvement of water supply, basic priority needs of the communities were also determined which are as follows:

- Creation of jobs under the sub-project
- Provision of clean and uninterruptable supply of water

6.5 PHYSICAL CULTURAL RESOURCES

Sites of religious importance like mosques have been found within 100 m of the proposed sub-project. Around 03 no. of mosques found within 100 m boundary Sensitive receptors like schools, colleges, hospital and clinics have been found. Around 09 no. of schools and colleges, 03 no. of hospitals and 04 no. of clinics have been found within 100 meter of project boundary. The mitigation measures like operating the equipment with muffling devices, use localized noise barriers, regular maintenance of machinery equipment's and regular monitoring and reporting will be adopted to encounter the im. act near sensitive receptors.

6.6 INDUSTRIES IN MC BAHAWALNAGAR

There are estimated 40 number of industrial units in MC Bahawalnagar. These include rice units, ice units, cotton mills and flour mills. As per consultation and confirmation from MC, there is no such industrial unit in MC Bahawalnagar that discharges its effluent in Fordwah Canal or Sadqia Canal.

6.7 SUITABILITY OF SITE

The sub-project does not fall in any sensitive zone. The sub-project is the rehabilitation of 13 existing tube wells on Fordwah Canal and Sadqia Canal (08 tube wells on Fordwah Canal & 05 tube wells on Sadqia Canal) and installation of new tube wells on Fordwah Canal. 03 overhead tanks / GSTs will be constructed in Madian Town and Satluj Park (02 in Madina Town and 01 in Satluj Park). The existing transmission lines will be rehabilitated. Therefore, the site is suitable for the sub-project.

SECTION - 7: POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

7.1 GENERAL

This chapter identifies the potential impacts related with Preconstruction, construction and operation phases of the Sub-project on the physical, ecological and socio-economic domains of the environment. Accordingly, mitigation measures have been proposed to mitigate the negative impacts and to enhance the positive impacts.

7.2 APPROACHES AND METHODOLOGY

During the preparation for the sub-project construction phase the future contractors must be notified and prepared to co-operate with the executing agency, sub-project management, supervising consultants and local population in the mitigation of impacts. Furthermore, the contractor must document the implement the EMP in full and be ready to engage trained environmental management staff to audit the effectiveness and review mitigation measures as the sub-project proceeds. The effective implementation of the EMP will be prepared and must be audited and this will be considered as the most important part of planning. In this regard the proponent must fulfil the requirements of the law and guidance prepared by EPA on the environmental aspects of power sub-projects and the recommendations already made for sub-projects in this ESIA and under EIA/IEE regulation and Punjab Environmental Protection Act (2012).

For impact identification, various ESIA methodologies are available including the checklists, interaction matrices, networks and overlays. Among these four methods, following three are used in ESIA of Rehabilitation and Improvement of Water Supply System in MC Bahawalnagar, Punjab

1. Sub-project Interaction Matrix
2. Checklists
3. Overlays

Interaction matrix is a two-dimensional matrix wherein the sub-project actions are placed along one axis (i.e., along y-axis) and on the other axis there are different environmental parameters likely to be affected by the proposed sub-project actions grouped into categories i.e., Physical, Ecological & Socio-economic Environment. Interaction matrix is used in this sub-project due to the following reasons:

It provides cause-effect relationship between the sub-project actions and resulting consequences impacts.

It provides nature (+ve or -ve) and weighting of different impacts.

It provides cumulative impacts of a sub-project.

Matrix grouped sub-project actions into temporal phases. For the impact

assessment, sub-project interaction matrix is used by dividing the sub-project action into different phases (Preconstruction, construction and operation). The environmental impacts are divided into three main categories including physical, ecological and socio-economic domains. The environmental impacts of the sub-project actions are identified and weighed into the following categories:

- +3 = Extremely Beneficial
- +2 = Potentially Positive
- +1 = Slightly Positive
- 0 = Insignificant
- 1 = Slightly Negative
- 2 = Potentially Negative
- 3 = Extremely Negative

The assignment of significance is based on the previous knowledge and professional judgment of ESIA team experts. It may be noted that the environmental parameters, which are not related to the implementation of the sub-projects, have not been considered in the matrix.

7.2.1 Checklist

The assignment of significance is based on the previous knowledge and professional judgment of ESIA team experts. The sub-project Checklist has been developed for "without" and "with mitigation". It may be noted that the environmental parameters, which are not related to the implementation of the sub-projects, have not been considered in the matrix.

7.2.2 Overlays

In order to identify spatial based impacts, overlays were used. An overlay is based on a set of transparent maps, each of which represents the spatial distribution of an environmental characteristic (for example, susceptibility to erosion). Information for an array of variables is collected for the standard geographical units within the study area, and recorded on a series of maps, typically one for each variable. These maps are overlaid to produce a composite. The resulting composite maps characterize the area's physical, social, ecological, land use and other relevant characteristics, relative to the location of the proposed development.

7.3 CHARACTERISTICS OF IMPACTS

The predicted impacts have been characterized; various aspects of the impact characterized include:

- Nature (direct/indirect)
- Duration of impact (Short term, medium term, Long term)
- Geological extend (local, regional)
- Timing (Sub-project phase)

Reversibility of impact (Reversible/Irreversible)

Likelihood of the impact (certain, likely, unlikely, rare)

Impact consequence severity (major, moderate, minor)

Significance of impact (High, medium, low)

The above aspects of environmental characterization are defined in Table 7-1.

Table 7-1, Impact Characterization

Nature	Direct: The environmental parameter is directly changed by the sub-project. Indirect: The environmental parameter changes as a result of change in another parameter
Duration of Impacts	Short-term: lasting only for the duration of the sub-project such as noise from the construction activities. Medium-term: Lasting for a period of few months to a year after the sub-project before naturally reverting to the original condition such as loss of vegetation due to clearing of campsite, contamination of soil or water by fuels or oil. Long-term: lasting for a period much greater than medium term impact before naturally reverting to the original condition such as loss of soil due to soil erosion.
Geographical Extent	Local, regional (spatial dimension)
Timing	Construction and Operation
Reversibility of Impact	Reversible: when a receptor resumes its pre-sub-project condition. Irreversible: when a receptor does not or cannot resume its pre-sub-project condition.
Likelihood of the Impact	Almost Certain: Impact expected to occur under most circumstances. Likely: Impact will probably occur under most circumstances. Possibly: Impact may possibly occur at some time. Unlikely: Impact could occur at some time. Rare: Impact may occur but only under exceptional circumstances.
Impact Consequences severity	Major: When an activity causes irreversible damage to a unique environmental feature; causes a decline in abundance or change in distribution over more than one generation of an entire population of species of flora and fauna; has long term effects (period of years) on socioeconomic activities of significance on regional level. Moderate: When an activity causes long-term (period of years), reversible damage to a unique environmental feature; causes reversible damage or change in abundance or distribution over one generation of a population of flora or fauna; have

	short-term effects (period of years) on socioeconomic activities of significance on regional level. Minor: When an activity causes short-term (period of a few months), reversible damage to a unique environmental feature; slight reversible damage to a few species of flora or fauna within a population over a short period; has short-term (period of months) effects on socioeconomic activities of local significance. Negligible: when no measurable damage to physical, socioeconomic, or biological environment above the existing level of impact occurs.
	Categorized as High, Medium, Low Based on the consequence, likelihood, reversibility, geographical extent, and duration; level of public concern; and conformance with legislative or statutory requirements.

The impact characterization due to Design, Location, Construction and operational phase is given in their respective sections.

7.4 ENVIRONMENTAL IMPACTS AND THEIR MITIGATION DURING PRE-CONSTRUCTION PHASE

7.4.1 Environmental impacts regarding sub-project location

The sub-project is for water supply system that will be constructed mostly on the land owned by Municipal Corporation. However, some patches of land for transmission line are in the right of way Highway Department, Forest Department, Railway department, Irrigation Department and a street of private residential colony. Therefore, these major stakeholders must be consulted before commencement of sub-project.

Impact Significance

High

Mitigation

All the relevant stakeholders have been consulted during the survey. Applications will be submitted for relevant NOCs/ consent letters that will be submitted to EPA upon issuance.

Residual Impact: The impact of project location will be low adverse in nature after taking the above-mentioned mitigations

7.4.2 Environmental impacts regarding sub-project Design

The sub-project is to be designed in a way that it guarantees all compliance with the Punjab Environmental Quality Standards (PEQS). Efforts will be made to save the trees that are coming in ROW of the sub-project.

Impact Significance

Medium

Mitigation

Sub-project design will be modified in order to save trees that may come in the right of way of the sub-project. The design is made by taking in consideration that minimum impact will occur on the nearby surface water bodies.

Residual Impact: The impact of project design will be low adverse in nature after taking the above-mentioned mitigations

7.5 ENVIRONMENTAL IMPACT AND THEIR MITIGATION DURING CONSTRUCTION PHASE

7.5.1 Physical impacts

A) Soil contamination

- Soil Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the Sub-project Site and in its nearby surroundings. Spillage from the generator or from moving vehicle will cause contamination of soil at construction sites.
- Construction site will generate about 0.5 kg/person/day solid wastes from site camps and construction debris from construction activities. Although quantity of waste is much less, inappropriate disposal methods will have a negative impact on the physical environment of the sub-project area.

Impact Significance

Medium

Mitigation

Good engineering practices will help in controlling soil erosion at construction sites. Following measures will be adopted as per site conditions:

- Soil contamination can be curtailed by reducing the oil spill at sub-project construction areas by well maintaining the construction vehicles as well as generators.
- The Contractor is required to impart proper training to his workforce in the handling and proper disposal of solid waste.
- Proper drainage facility will be provided to avoid the water accumulation, which will minimize the soil contamination.
- Ground shall be leveled to avoid slopes.
- Proper solid waste management plan should be developed by the Contractor and implemented to avoid the litter and any other waste problems.

Residual Impact: The impact of Soil contamination will be low adverse in nature after taking the above-mentioned mitigations

Sewage and sanitary waste water generated from the construction site may contaminate groundwater, if not disposed of properly. The tube wells are being constructed on the embankment of Fordwah canal and rehabilitation proximity to surface water bodies may lead to contamination of surface water bodies during construction activities such as excavation activities (trenching) and associated run-off, oil leaks, accidental spilling of fuel oils and unintentional disposal construction material.

Mitigation Measures of Impacts on Water Resources

- Sewage from construction camp will be disposed off using septic tank which has been designed properly keeping in view the following parameters:
 - Soil stratigraphy of site
 - Depth of groundwater table
 - Discharge of sewage from construction camp
- The septic tank has been designed by the Design Consultant according to the relevant standards. The example of the septic tank is shown in Figure below:

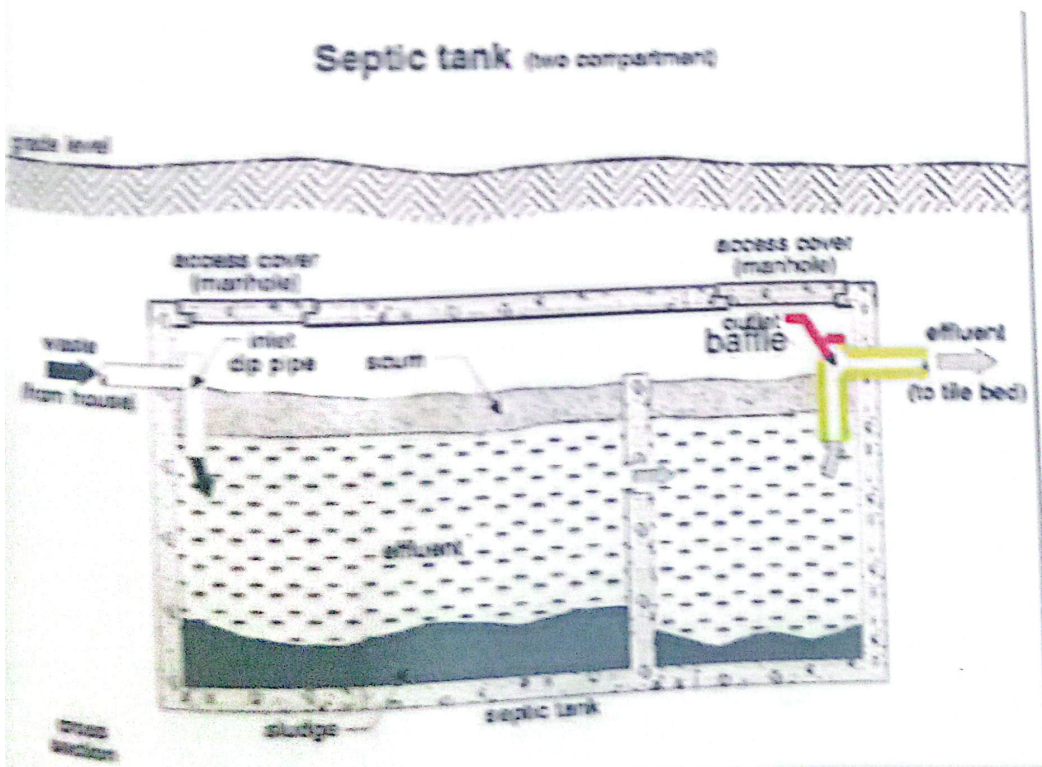


Figure 7-1. Septic tank

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- Avoid accidental spills of oil and lubricants through good practice. Prepare and implement Emergency Response Procedures in case of any spill hazards.
- Construction site effluent drainage should be established in areas with adequate natural drainage channels in order to facilitate flow of the effluents.
- Efforts will be made to make sure that the surface water quality is not disturbed in any way during the construction activities and contingency plans will be made to ensure that.

Residual Impact: The impact of surface and ground water quality will be low adverse in nature after taking the above-mentioned mitigations.

Impact on Ambient air quality

The impact on air quality is expected within the area of the working corridor. The impact on air quality is expected as a result of construction works, specifically excavation of the trenches which will generate dust with motorized equipment also generating gases. The processes which will generate pollutants emission are: transport of material, movement of machinery and vehicles on site and excavation works.

It is not expected that significant impact will occur on local residents or that emissions will exceed regulatory permissible ground-level concentrations. All air emission impacts will be of temporary nature, location specific and reversible. The impact on air quality is considered to be insignificant if appropriate mitigation measures are implemented such as dust suppression techniques, regular maintenance of vehicles, use of high-quality fuel, etc.

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

Impact Significance

High

Mitigation Measures of Impacts on Ambient Air Quality

- Tuning of vehicles should be made mandatory to reduce the emissions of NOx, SOx, CO and PM10.
- Equipment and vehicles powered with diesel should be well maintained to minimize particulate emissions.

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- Heavy trucks carrying earth, sand, aggregate and other materials should be kept covered during transportation of materials and during storage at site with tarpaulin.
- The fugitive dust emission will not be a problem because the roads are paved but for the precautionary measure sprinkling of water by water trucks will be done.
- As well as the temporary boundary wall made of wood will be constructed that will act as barrier for air emissions going towards residential area.

Residual Impact: The Impact of Ambient air quality will be low adverse in nature after taking the above-mentioned mitigations

2) Impact on Ambient Noise Levels & Vibration

During the implementation of the sub-project a large amount of equipment and construction machinery will be utilized for construction. The equipment would include excavators, concrete mixer, trucks and other machinery and vehicles. The operation and movement of such equipment will increase the noise and vibration in the Sub-project Area and Neighbourhood residential may be disturbed by the noisy activities. The impact will be significant when compared to the without sub-project situation.

During excavation activities (trenching), noise sources will include, vehicles used to transportation of materials and equipment to the site. The construction and more specifically excavation of the trenches for the pipelines will be through the use of hand-held equipment (manual labor) with very limited use of mechanized machinery which would be sources of noise and vibration.

Impact Significance

High

Mitigation Measures of Impacts on Noise & Vibration

- During the construction phase of the sub-project, it is expected that elevated levels of noise will be produced in the construction area. Pipeline construction would progress along the route and, as a result, all noise impacts would be temporary.
- For the construction machinery generating noise level in excess of that prescribed in PEQS and WHO limits. Contractor will make arrangements to bring the noise level within applicable limits (including proper tuning of vehicles and mufflers/silencers). Movements of the trucks and other construction machinery causing high noise levels must be restricted at night time to avoid disturbance to the nearby locality. Truck drivers should be instructed not to play loud music especially night and stop use of horn.
- As well as the temporary boundary wall made of wood planks will be constructed that will act as barrier.



- Regular monitoring to determine compliance will be done by the Supervision Consultant and corrective mitigation measures applied where necessary.

Residual Impact: The impact of Ambient Noise and vibration will be low adverse in nature after taking the above-mentioned mitigations

Disposal of Construction Debris & Garbage

During construction phase of the Sub-project, large quantity of construction waste will produce, the disposal of which, if not managed properly, could have negative impacts on the site and surrounding areas.

Construction materials including concrete waste, wood, steel, packaging plastics etc., could be dispersed that may result in the blockage of drainage channels if not disposed of at approved disposal sites.

Impact Significance

High

Mitigations

A site waste management plan should be made the responsibility of the construction contractor to provide for the designation of appropriate waste storage area on the site and a schedule for the timely collection and removal of construction debris to an approved dump site.

- The organic waste produced during site clearing should be mechanically mulched and composted at the site and used for landscaping.
- Arrangements should be made for regular garbage collection and removal of sewage from the construction site.
- A barrier between surface water bodies and the active construction zone should be made to make sure that no construction debris is disposed-off intentionally or unintentionally in the canals.

Residual Impact: The impact of construction Debris and Garbage will be low adverse in nature after taking the above-mentioned mitigations

Traffic annoyance

There construction activities will occur in certain sections in densely populated areas and along the existing Right of Way (ROW) where there is motorised and non-motorised traffic especially in the residential areas. Snarl ups due to blockage of the road could lead to traffic as well as potential risk for accidents especially where construction is on-going with little room for pedestrian access.

Impact Significance

Medium

Mitigation

During the construction phase traffic control measurement will be implemented. All raw materials will be transported to the site at night time due to at night time traffic flow very low in the sub-project area.

The contractor will prepare a detailed traffic management plan (TMP) which will elaborate how traffic will be managed during construction, including need for diversions (if necessary).

The construction method will mainly be through manual equipment which will reduce the potential for traffic blockages that would be caused when using motorised equipment like excavators.

The contractor will barricade all areas of work along the road to reduce accidents and offer alternative pedestrian walk ways as necessary.

Visual Impact: The impact of traffic annoyance will be low adverse in nature after taking the above-mentioned mitigations

Impact on Utilities

Utilities (ground) along the sub-project area that may be damaged as a result of the excavation for the pipelines include fibre optic cables, sewerage, existing water pipelines and in exception cases electricity lines. Damage to these utilities due to excavation may cause interruptions to services associated with the same.

Impact Significance

Medium

Mitigation

The impact is not expected to be significant because there is no utilities present in the sub-project routes. However, as a general rule, before excavation, the location and routes of all utilities have been identified and in case of the need for relocating utilities that may be along the proposed lines, the contractor MUST work with the utility company before commencement of any excavations to relocate such utilities at contractors cost before commencing excavations.

Visual Impact: The impact on utilities will be low adverse in nature after taking the above-mentioned mitigations

Ecological Environment

Impacts on Ecological Environment

Impact on Flora

A few trees are present at the embankment of canal that will be protected during construction activities.

Disturbance to Fauna:

No impacts on fauna is envisaged.



Impact significance:

High

Mitigations

In this sub-project, low impact is expected on vegetation and any fauna in the area since the pipeline routes are devoid of significant unique floral and faunal life.

The clearing of sub-project sites through excavations for the pipelines (reservoir) will not adversely affect flora and fauna and all the impacts caused by construction work on flora and fauna are of temporary and reversible in nature and can be mitigated by appropriate good working practices that are prescribed in this ESIA.

Residual Impact: The impact on flora and fauna will be low adverse in nature after taking the above-mentioned mitigations

Socio Economic Environment

Impacts to Occupational Health and Safety

Construction activities including excavations, backfilling involve inherent occupation health risks related to operation of equipment and machineries. In the absence of sufficient management of Health and Safety (H&S) issues, the workforce may suffer injury or death.

Impact Significance

High

Mitigations Measures of Impacts to Occupational Health and Safety

Occupational health and safety impacts during construction are considered to be of moderate insignificance. The construction activities will use a mix of hand-held tools and mechanized equipment and machinery in digging the trenches. Experienced and trained personnel will be engaged in operating equipment.

Health safety procedure is also prepared and will be implemented. Training of workers in the construction safety procedures, environmental awareness, and equipping all construction workers with safety boots, helmets, gloves, ear plugs, and protective masks, and monitoring their proper and sustained usage.

Residual Impact: The impact to Occupational Health and Safety will be low adverse in nature after taking the above-mentioned mitigations

Impacts on Local Population

No specific serious adverse impacts on community health and safety are expected as a result of construction and operation of rehabilitation and improvement of Water Supply System for MC Bahawalnagar.

The population residing in and the surroundings of the Sub-project Area will

- There is potential hazard risk from open trenches in the vicinity of populated areas during the construction
- Insecurity problems may arise for the local population due to the Contractor's workers during the construction phase
- Community may face the noise and dust problems during the construction activities.
- Theft problems to the community by the Contractor's workers and vice versa.

Impact Significance

Medium

Mitigations Measures of Impacts on Local Population/Workforce

- The potential hazard risk from open trenches in the vicinity of populated areas should be mitigated by appropriate warnings and fencing.
- Contractor should select specific timings for heavy machinery operation so as to cause least disturbance to the population considering their peak movement hours.
- Effective construction controls may be made by the Contractor to avoid inconvenience to the population due to noise, smoke and fugitive dust.
- Haul-trucks carrying concrete, aggregate and sand fill materials will be kept covered with tarpaulin to help contain the construction materials being transported to the specific site.
- The Contractor should warn the workers not to involve in any theft activities and if anyone would involve in such type of activities, he will have to pay heavy penalty and would be handed over to police. Similarly, at the time of hiring labor/workers, Contractor has to ensure that the workers should be of good repute/character.
- Health impacts associated with air and dust emissions on the community is also expected to be very insignificant, short term and localized.
- The contractor will prepare an Occupational Health and Safety Plan for minimizing occupational and community health and safety impacts.

Residual Impact: The impact on Local Population/Workforce will be low adverse in nature after taking the above-mentioned mitigations

Impacts on Public Health and Safety Hazard

Construction activities, particularly excavation and movement of haul trucks and machinery may prove dangerous for the safety of the workers as well as for local residents.

The storage of all solid waste shall be practiced so as to prevent the attraction, harborage or breeding of insects or rodents, and to eliminate

conditions harmful to public health or which create safety hazards, odors, unsightliness or public nuisance.

Impact Significance

Medium

Mitigation Measures of Impacts on Public Health and Safety Hazards

Contractor will ensure the provision of medicines, first aid kits, emergency vehicles, etc. at the work place. Compliance with the safety precautions for construction workers as per International Labour Organization (ILO) Convention No. 62 will be ensured by the Contractor.

The active construction zone must be cordoned off to avoid injuries due to accidents.

Residual Impact: The impact on Public Health and Safety Hazard will be low adverse in nature after taking the above-mentioned mitigations

D) Public Health Diseases

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

E) Resettlement Impacts

No person will be displaced due to the sub-project activities. Therefore, there is no need for the development of a resettlement action plan.

F) Gender Based Violence

Gender-Based Violence (GBV) is an umbrella term for any harmful act that is perpetrated against a person's will and that is based on socially ascribed (i.e., gender) differences between males and females. It includes acts that inflict physical, sexual or mental harm or suffering, threats of such acts, coercion, and other deprivations of liberty. These acts can occur in public or in private. The construction of the highway is likely to exacerbate any of the various forms of GBV described below and could be perpetrated between workers themselves, between bosses and workers and between workers and the community members.

The term GBV is used to underscore systemic inequality between males and females (which exists in every society in the world) and acts as a unifying and foundational characteristic of most forms of violence perpetrated against women and girls. The 1993 United Nations Declaration on the Elimination of Violence against Women defines violence against women as "any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women." The nine core types of GBV are: -

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

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

G) **Child Protection**

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

The Contractor will ensure the Code of Conduct is signed at the Corporate and individual workers levels in regard to observing Child Protection aspects of the sub-project. This will be complied with under the supervision of the PMDFC and Supervision Consultant.

H) **Labor Influx and Recruitment**

The sub-project will involve recruitment of labourers which may lead to influx of persons looking for work in the sub-project area. The significance of labour influx is expected to be low or moderate and mostly unskilled in nature. The Contractor will comply with the national labour laws and develop a code of conduct and submitted to PMDFC before commencement of construction

1. **Residual Impact:** The impact of vibration will be low adverse in nature after taking the above-mentioned mitigations.

7.6 **ENVIRONMENTAL IMPACTS AND MITIGATIONS MEASURES DURING THE SUB-PROJECT OPERATION**

7.6.1 **Consumption of Contaminated Water**

Consumption of (untreated) contaminated domestic water could lead to health impacts on the consumers of the water from the pipeline. The maintenance of the pipelines requires excavations and unblocking the pipe

which could lead to contamination of the water during the process.

Impact Significance:

High

Mitigation Measures

The water supply will be closed down during construction phase ensure that no polluted water gets into water supply.

Residual Impact: The impact of Consumption of contaminated domestic water will be low adverse in nature after taking the above-mentioned mitigations.

7.6.2 Solid Waste Generation

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

- Excavated soil
- Cement storage bags and other packets from materials used during repair and maintenance.
- Spillage of oil and grease from machines used in excavation, repair and maintenance and transportation activities may also encompass solid wastes.

Impact Significance:

Low

Mitigation Measures

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

Residual Impact: The impact of solid waste generation will be low adverse in nature after taking the above-mentioned mitigations.

7.6.3 Visual Impacts

Visual related impacts mainly include re-opening the trenches where the pipelines are laid to facilitate repair and maintenance which could be an eye-sore and a health hazard. This impact is not considered to be significant

and will be experienced for a short period of time because of the immediate backfilling of the trenches by the excavated soil/spoil.

Impact Significance:

Medium

Mitigation

The trenches should be backfilled immediately and excess spoil material is disposed of as soon as possible.

Residual Impact: The visual impact will be low adverse in nature after taking the above-mentioned mitigations.

7.6.4 Impacts to Occupational Health and Safety

Operation and maintenance of the pipeline will involve workers whose safety may be at risk as a result of operation of equipment among others.

Mitigation measure

- The construction activities will mostly use hand held tools in digging the trenches with very limited use of excavators.
- Experienced and trained personnel will be engaged in operating equipment.

Impact Significance:

Medium

Residual Impact: The impact to Occupational Health and Safety will be low adverse in nature after taking the above-mentioned mitigations.

7.6.5 Impacts on Community Health and Safety

No specific serious adverse impacts on community health and safety are expected as a result of operation activities of Water Supply System. There is a potential hazard risk from open trenches during the repair phases that could lead to community health and safety risks should be mitigated by appropriate warnings and fencing. Health impacts associated with air and dust emissions on the community is also expected to be very insignificant short term and localized during the operation phase with respect to repair and maintenance.

7.6.6 Impacts on Traffic

The maintenance and repair activities will occur in certain sections in dense populated areas and along the existing Right of Way (ROW) where there is motorised and non-motorised traffic especially in the residential areas. Snags due to blockage of the road could lead to traffic as well as potential for accidents especially where construction is on-going with little room for pedestrian access.

Impact Significance:

Medium

Mitigation

- The contractor will prepare a detailed traffic management plan (TMP) which will elaborate how traffic will be managed during repair and maintenance activities including need for diversions (if necessary).
- The method will mainly be through manual equipment which will reduce the potential for traffic blockages that would be caused when using motorised equipment like excavators.
- The contractor will barricade all areas of work along the road to reduce accidents and offer alternative pedestrian walk ways as necessary.

Residual Impact: The impact of traffic will be low adverse in nature after taking the above-mentioned mitigations.

7.6.7 Impact on Air Quality

The impact on air quality during repairs and maintenance (operation phase) is expected to occur within the pipeline route only. The impact on air quality is expected as a result of repair works, which may specifically entail excavation (opening) of the trenches and may generate dust with motorized equipment also generating gases. The processes which will generate pollutants emission are: transport of material, movement of machinery and vehicles on site and excavation works. It is not expected that significant impact will occur on local residents or that emissions will exceed regulatory permissible ground-level concentrations. All air emission impacts will be of temporary nature, location specific and reversible. The impact on air quality is considered to be insignificant if appropriate mitigation measures are implemented such as dust suppression techniques, regular maintenance of vehicles, use of high-quality fuel, etc.

Further, the sub-project will be implemented through the significant use of manual labour and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery.

Residual Impact: The impact of vibration will be low adverse in nature after taking the above-mentioned mitigations.

7.6.8 Noise and Vibration Emission Impacts

Noise emission and associated impacts during repairs and maintenance is expected to be low and will emanate from motorized equipment.

Mitigation Measure

Experienced only in cases where motorized equipment is used. The repair and maintenance works will mainly be carried out during the daylight working hours with no night working expected unless it is an emergency e.g. pipe burst

or blockage. Mitigation measures will prescribe daylight working hours in the most affected zones.

Impact Significance

This impact is expected to be low in nature and short term

Residual Impact: The impact of noise and vibration will be low adverse in nature after taking the above-mentioned mitigations.

7.6.9 Assessing impacts

Planning for environmental assessment depends upon reliably predicting sub-project impacts on resources and managing those impacts to achieve the greatest gain or the smallest loss. The basis of the prediction is the knowledge of the proposed sub-project and of local resources with which it is expected to interact. Two types of information are, therefore, needed: a comprehensive description of all resources likely to be affected by each of the sub-project components, and an understanding of the sub-project component itself. The baseline information given in the previous section includes all resources, natural and human and all aspects of those resources that may be expected to be touched, directly or indirectly, by the sub-project. Conversely, sub-project information will include all aspects of construction or operation that might affect the environment.

7.6.10 Approach to Assessment

Various components of the sub-project will interact with local resources in different ways. Therefore, it is useful to divide the sub-project into units small enough that the interactions may be examined individually as well as collectively. The main construction components of the sub-project are Excavations, Concrete, Mixing, Finishing. Each of these is in effect a sub-project itself. Various aspects of each component are treated separately. They are examined both in terms of construction period and much longer period of sub-project operation.

Some component of the sub-project has positive and some have negative impact on environment and on the different factors like socio-economy of the community.

7.6.11 Negative impact

This sub-project has no potential negative impacts on environment as well on the socio-economic feature of community. Anyhow it has some impacts which have discussed as well as their mitigatory measures have well defined in the previous section.

7.6.12 Positive impacts

The positive impacts of the sub-project are given as under:-

- The sub-project is in MC Bahawalnagar there will be demand for workers, both skilled and unskilled. This will include opportunities for local people,

both directly on the construction site and also indirectly in related service work.

- Safe drinking water in adequate amount will be provided to community during operation. As new pipeline and tubewells will be installed that will reduce the wastage of drinking water due to leakage and its contamination.

7.7

CUMULATIVE AND INDUCED IMPACTS

The cumulative impact assessment (CIA) examined the interaction between the project's residual effects (i.e., those effects that remain after mitigation measures have been applied) and those associated with other past, existing, and reasonably foreseeable future projects or activities. The interaction of residual effects associated with multiple projects and/or activities can result in cumulative impacts, both positive and negative. The projects potential cumulative effects were considered with respect to valued components (VCs) in environmental and socioeconomic categories, in four areas:

- (i) of any potential residual project effects that may occur incrementally over time;
- (ii) consideration of other known relevant projects or activities within the specified study area boundaries, even if not directly related to the project;
- (ii) potential overlapping impacts that may occur due to other developments, even if not directly related to the proposed sub-project;
- (iv) and future developments that are reasonably foreseeable and sufficiently certain to proceed.

The project has identified the VCs as air quality, noise, water quality, socioeconomic and socio-community components, and human health. There are no foreseeable projects that will overlap with the project. The spatial boundary of the project is the area along Fordwah canal and Sadqia canal and areas where transmission lines are to be installed the temporal boundary can be considered as the whole MC Bahawalnagar.

Key VCs identified included air quality, water quality and noise that can impact public health, access to livelihood opportunities. The overall perception of stakeholders in the long-term perspective was highly positive and they considered it as an important development for the local economy.

While the project will meet the Punjab Environmental Quality Standards (PEQS) for air quality, mitigation of noise will be required to meet at least the baseline levels within the corridor of impact.

7.8

POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

Besides the concrete measures to be adopted as described above, the quality of environment will further be enhanced through the running of sub-project in complete accordance with the 5RS Principles- Reduce, Reuse, Recycle, Refurbish and Retrofit. Good housekeeping practices will be the order of the day.

SECTION - 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PROGRAM**8.1 OBJECTIVE**

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

8.2 INSTITUTIONAL ARRANGEMENTS**8.2.1 MC Bahawalnagar**

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

8.2.2 PMDFC ESM Wing

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

8.2.3 The Contractor

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

The ESIA will be an integral part of the contract document. The bid would include a detailed environmental mitigation budget as part of the engineering costs of the respective works. Contractor will engage environmentalist to fulfill the above requirements.

8.2.1. Consultant

The Environment Specialist of the consultant will be responsible for the on-field supervision and monitoring of the implementation of ESIA being done by the contractor. The contractor will report the progress of ESIA to the Environmental Specialist of consultant. And the Environment Specialist of the consultant will

review the progress to PMDPC ESM-Wing. PMDPC ESM-Wing will then formulate a comprehensive report to be submitted to World Bank regarding the progress of implementation of ESIA.

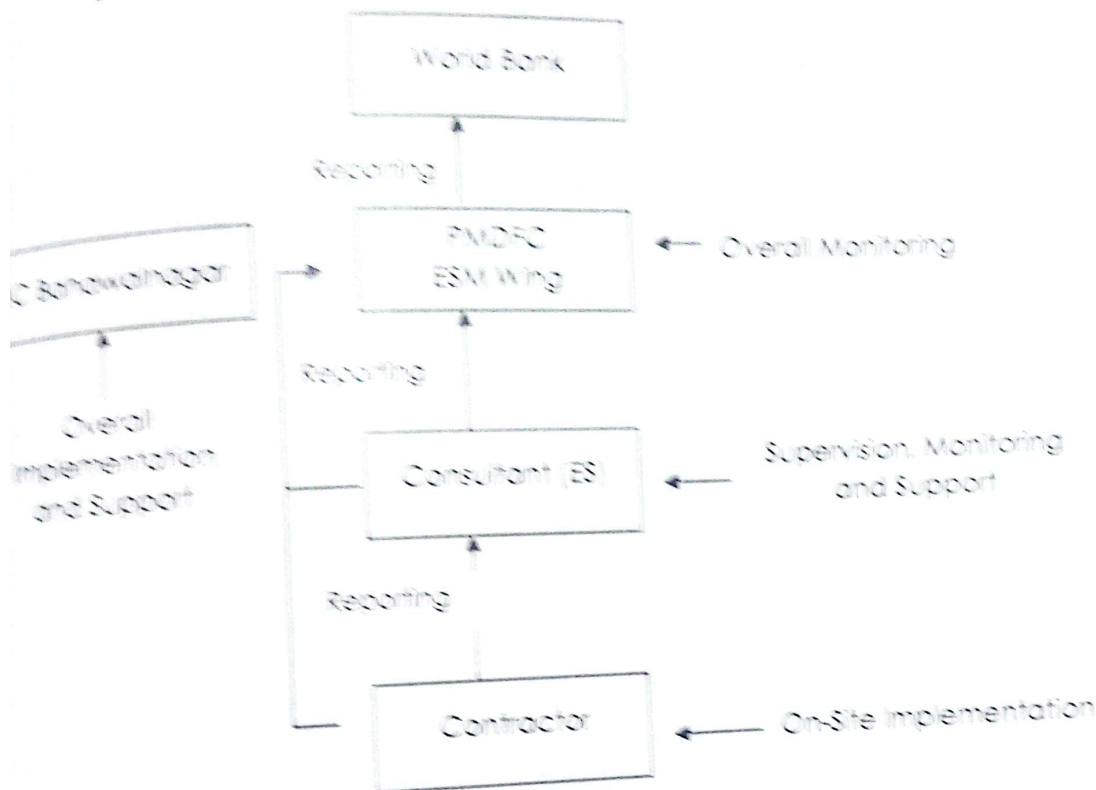


Figure 8-1. ESIA Implementation Framework

8.3 MITIGATION PLAN

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

8.4 MONITORING PLAN

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

14.4.1. Monitoring Mechanism

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

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA) REPORT

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

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

Monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be performed at two levels. At the PMDFC, the environmental team will do ESIA compliance monitoring to ensure that the mitigation plans are being effectively implemented.

5

REPORTS

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

Table 8-1, Reporting Mechanism

Distribution of Periodic Reports	Prepared by	Reviewed by	Approval
Weekly	Contractor /Environment Specialist (consultant)	Supervision Consultant/ Environment Specialist (consultant)	PMDFC -ESM/ World Bank
Quarterly	Contractor /Environment Specialist (consultant)	Supervision Consultant/ Environment Specialist (consultant)	PMDFC -ESM/ World Bank
Annual	Contractor /Environment Specialist (consultant)	Supervision Consultant/ Environment Specialist (consultant)	PMDFC -ESM/ World Bank
Final	Contractor /Environment Specialist (consultant)	Supervision Consultant/ Environment	PMDFC -ESM/ World Bank

8.6

INCLUSION OF ESIA IN BIDDING / CONTRACT DOCUMENTS

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

8.7

MONITORING OF ENVIRONMENTAL AND SOCIAL NON-COMPLIANCE

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

8.8

ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

The environmental and social aspect based on the project components are explained in the table 8-3 while the impacts based on the aspects defined by the components activities its mitigation measures, monitoring indicators, frequency and responsibility has been discussed in Environmental and Social Management and Monitoring Plan (ESMMP) in table 8-4.

Table 8-2, Project Component / Activities / Environmental Aspect Matrix

Components	Activities	Environmental and social Aspects
Proposed New Tube wells	Excavation	• Soil contamination • Contamination of Surface and Groundwater Resources • Ambient Air Quality • Noise and vibration • Disposal of Construction Debris & Garbage • Land acquisition

Components	Activities	Environmental and social Aspects
		• Labor camp management
	Boring/Drilling/Jetting	• Soil contamination • Contamination of Surface and Groundwater Resources • Ambient Air Quality • Noise and vibration • Disposal of Construction Debris & Garbage • Traffic annoyance
	Construction of Room	• Ambient Air Quality • Noise and vibration • Disposal of Construction Debris & Garbage • Labor camp management • Gender issue
	Plastering & Whitewash	• Soil contamination • Contamination of Surface and Groundwater Resources • Disposal of Construction Debris & Garbage
Proposed Transmission and Distribution Network	Installation of Machinery	• Ambient Air Quality • Noise and vibration
	Excavation	• Soil contamination • Contamination of Surface and Groundwater Resources • Ambient Air Quality • Noise and vibration • Disposal of Construction Debris & Garbage • Impact on Utilities

Components	Activities	Environmental social Aspects and
		- Land acquisition - Labor camp management
	Backfilling	- Soil contamination - Contamination of Surface and Groundwater Resources - Disposal of Construction Debris & Garbage - Traffic issues
	Roads and Canals Crossing	- Soil contamination - Contamination of Surface and Groundwater Resources - Ambient Air Quality - Noise and vibration - Disposal of Construction Debris & Garbage - Impact on Utilities
	Laying & Fitting of Pipes	- Noise and vibration - Traffic issues
	Jointing of Pipes	Noise and vibration
	Installation of valves	Noise and vibration
	Disinfection of Installed Water Pipe	Noise and vibration
	Consumer connections	- Ambient Air Quality - Noise and vibration
Ground Storage Tanks	Excavation	- Soil contamination - Contamination of Surface and Groundwater Resources - Ambient Air Quality - Noise and vibration

Components	Activities	Environmental and social Aspects
		• Disposal of Construction Debris & Garbage • Impact on Utilities • Labor camp management • Gender issue • Traffic annoyance
	Construction of storage tank	• Ambient Air Quality • Noise and vibration • Disposal of Construction Debris & Garbage • Health and safety
	Plastering	• Disposal of Construction Debris & Garbage
	Installation of Machinery	• Noise and vibration • Health and safety

Proposed Sub-project Activities	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods		
	High	Medium	Low						
A. IMPACTS DUE TO SUB-PROJECT LOCATION									
Site Selection	The sub-project is for water supply system that will be constructed mostly on the land owned by Municipal Corporation. However, some patches of land for transmission line are in the right of way of Highway Department, Railway department, Irrigation Department and a street of private housing authority. Therefore, these major stakeholders must be consulted before commencement of sub-project.			All the relevant stakeholders have been consulted during the survey. Applications will be submitted for relevant NOCs / consent will be obtained by MC and submitted to EPA upon issuance.	MC Bahawalnagar/ PMDEC	ESFPs Supervisory consultant			
B. IMPACTS DUE TO SUB-PROJECT DESIGN									

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Sub-project design	The sub-project is to be designed in a way that it guarantees all compliance with the Punjab Environmental Quality Standards (PEQS). Efforts will be made to save the trees that are coming in ROW of the sub-project.				Sub-project design will be modified in order to save trees that may come in the right of way of the sub-project. The design is made by taking in consideration that minimum impact will occur on the nearby surface water bodies	Design consultant	• ESFPs • Supervisory consultant	
C. REPAIR/REHABILITATION/ CONSTRUCTION PHASE								
Physical Impacts								
Labour camp management	• Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of				• Labor camps should be at least 1km away from the residential areas. • Provide adequate health care facilities within construction sites. • Provide first aid facility round the clock. • Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse.	Contractor	• ESFPs • Supervisory consultant	

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	nearby communities. - There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. - Child labour and school drop out - Health Safety attributes				- Ensuring that children and minors are not employed directly or indirectly on the project. - Children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Pakistani Labor Laws and Employment of Child Act (1977).¹¹ - Communication on hiring criteria, minimum age, and applicable laws. - Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. - Maintain the PPE properly by cleaning dirty ones and replacing them with the			

¹¹ ECP 16: Worker Health and Safety

Proposed Sub-project Activities	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Action/ Monitoring parameters/ Monitoring methods
	High	Medium	Low				
Soil contamination	Soil Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the Sub-project Site and in its nearby surroundings. Spillage from the generator or from moving vehicle will cause			damaged ones, - Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job. EHS SOPs of labor developed by PMDFC must be followed. SOPs are attached as Annexure O	Contractor	- ESFPs - Supervisory consultant	- Equipment washing method and frequency to be regulated/ controlled. - Vegetation to control erosion.

Section - 8: Environmental AND SOCIAL Management and Monitoring Program

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	contamination of soil at construction sites. Construction site will generate about 0.5 kg/person/day solid wastes from site camps and construction debris from construction activities. Although quantity of waste is much less, inappropriate disposal methods will have a negative impact on the physical environment of the sub-project area.				- Ground shall be leveled to avoid slopes. - Proper solid waste management plan should be developed by the Contractor and implemented to avoid the litter and any other waste problems.			
Contamination of Surface and	Sewage and waste water generated				Sewage from construction camp will be disposed of using septic tank			Checking of septic tanks

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	associated run-off, oil leaks, accidental spilling of fuel oils and unintentional disposal construction/mat erial.							
Ambient Air Quality	The impact on air quality is expected within the area of the working corridor. The impact on air quality is expected as a result of construction works, specifically excavation of the trenches which will generate dust with motorized equipment also generating gases. The processes which will generate pollutants emission are: transport of material, movement of machinery and vehicles on site and excavation works.				- Tuning of vehicles should be made mandatory to reduce the emissions of NOx, SOx, CO and PM10. - Equipment and vehicles powered with diesel should be well maintained to minimize particulate emissions. - Haul-trucks carrying, earth, sand, aggregate and other materials should be kept covered during transportation of materials and during storage at site, with tarpaulin. - The fugitive dust emission will not be a problem because the roads are paved but for the precautionary measure sprinkling of water-by-water trucks will be done.	Contractor	- ESPPs - Supervisory consultant	Ambient air quality monitoring through EPA certified Lab

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Noise and vibration	During the implementation of the sub-project a large amount of equipment and construction machinery will be utilized for construction.				As well as the temporary boundary wall made of wood will be constructed that will act as barrier for air emissions going towards residential area.			
	The equipment would include excavators, concrete mixer, trucks and other machinery and vehicles. The operation and movement of such equipment will increase the noise and vibration in the Sub-project Area and				- During the construction phase of the sub-project, it is expected that elevated levels of noise will be produced in the construction area. Pipeline construction would progress along the route and, as a result, all noise impacts would be temporary. - For the construction machinery generating noise level in excess of that prescribed in PEQS and WHO limits, Contractor will make arrangements to bring the noise level within applicable limits (including proper tuning of vehicles and mufflers/silencers). Movements of the trucks and other construction machinery causing high noise levels must be restricted at night time to avoid disturbance to the nearby locality. Truck drivers should be instructed not to play	Contractor	- ESFPs - Supervisory consultant	Noise level monitoring EPA certified lab

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	Neighborhood residential may be disturbed by the noisy activities. - During excavation activities (trenching), noise sources will include, vehicles used to transportation of materials and equipment to the site. - The construction and more specifically excavation of the trenches for the pipelines will be through the use of hand-held equipment (manual labor) with very limited use of mechanized				loud music especially night and stop use of horn. - As well as the temporary boundary wall made of wood planks will be constructed that will act as barrier. - Regular monitoring to determine compliance will be done by the Supervision Consultant and corrective/ mitigation measures applied where necessary.			



Proposed Sub-project Activities	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
	High	Medium	Low				
Disposal of Construction Debris & Garbage	machinery which would be sources of noise and vibration. - During construction phase of the Sub-project, large quantity of construction waste will produce, the disposal of which, if not managed properly could have negative impacts on the site and surrounding areas. - Construction materials including concrete waste, wood, steel, packaging plastics etc., could be dispersed that may result in the blockage of drainage			- A site waste management plan should be made the responsibility of the construction contractor to provide for the designation of appropriate waste storage area on the site and a schedule for the timely collection and removal of construction debris to an approved dump site. - The organic waste produced during site clearing should be mechanically mulched and composted at the site and used for landscaping. - Arrangements should be made for regular garbage collection and removal of sewage from the construction site. - A barrier between surface water bodies and the active construction zone should be made to make sure that no construction debris is disposed	Contractor	- ESFPs - Supervisory consultant	Placement of solid waste storage containers at camp sites. Collection and disposal into AAC containers

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Impact on Utilities	Construction activities can result in the generation of wastewater, oil spillage from machinery, domestic waste from labour camps and construction related solid waste.				The contractor will barricade all areas of work along the road to reduce accidents and offer alternative pedestrian walk ways as necessary.	Contractor	- ESFPs - Supervisory consultant	
					This impact is not expected to be significant because there is no utilities present in the sub-project routes. However, as a general rule, before excavation, the location and routes of all utilities have been identified and in case of the need for relocating utilities that may be along the proposed lines, the contractor MUST work with the utility company before commencement of any excavations to relocate such utilities at contractors cost before commencing excavations. - Measures for fire prevention and firefighting. - Indicators on site (for example, heavy rainfall) that will prompt the shutdown of specified areas of work. - Procedure for shutdown of site, including transfer of plant.			
Emergency Response Plan						Contractor	ESFPs	Following EHS labor SOPs

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	Uncontrolled releases of hazardous materials may result from small cumulative events, or from more significant equipment failure associated with events such as manual or mechanical transfer between storage systems or process equipment.				- materials and personnel to safe areas (for example in the event of a flood). - Emergency evacuation procedure for staff and members of the public likely to be impacted by an emergency event on site (for example: fire or blast). - Where practicable, avoiding or minimizing the use of hazardous materials. - Emergency lighting of adequate intensity should be installed and automatically activated upon failure of the principal artificial light source to ensure safe shut-down, evacuation etc. - The contractor will prepare emergency shutdown procedures and evacuations to cover all staffs and affected members of the public in the event of any emergency incident (such as traffic accident and fire). The contractor will ensure emergency access routes are		• Supervisory consultant	

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Proposed Sub-project Activities	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
	High	Medium	Low				
				well-known and have appropriate signage. Identification of locations of hazardous materials and associated activities on an emergency plan. Training should incorporate information from Material Safety Data Sheets for hazardous materials being handled. MSDSs should be readily accessible to employees in their local language.			
Ecological Impacts							

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Biodiversity (Fauna and Flora)	Impact on Flora A few trees and vegetation is present near the sites for proposed installation of tube wells. However, it will be made sure that no tree is cut during the construction work by changing the positions of tube wells on the canal bank by few feet. No trees / vegetation will be affected during the construction of transmission main as well. Disturbance to Fauna: No negative impacts on fauna are envisaged.				- In this sub-project, low impact is expected on vegetation (small grass / shrubs) since the pipeline routes are devoid of significant unique floral and faunal life. - The clearing of sub-project sites through excavations for the pipelines (reservoir) will not affect flora and fauna. No tree will be cut.	Contractor	- ESFPs - Supervisory consultant	Maintenance and monitoring of tree plantation
Social Impacts								
Sub-sub-project will have positive outcomes for the local communities as by the provision of good state of art infrastructure.					Occupational health and safety impacts during construction is			Following EHS labor SOPs
Health and	Construction activities including							

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Safety Measures	excavations, backfilling involve inherent occupation health risks related to operation of equipment and machineries. In the absence of sufficient management of Health and Safety (H&S) issues, the workforce may suffer injury or death. Impact Significance				considered to be of moderate in significance. The construction activities will use a mix of hand-held tools and mechanized equipment and machinery in digging the trenches. Experienced and trained personnel will be engaged in operating equipment. Health safety procedure is also prepared and will be implemented. Training of workers in the construction safety procedures, environmental awareness, and equipping all construction workers with safety boots, helmets, gloves, ear plugs, and protective masks, and monitoring their proper and sustained usage.	Contractor	• ESFPs • Supervisory consultant	
Job opportunities	It will lead to an increase in economic activity and contribute to local area economic development.				Priority will be given to local area inhabitants for skilled and unskilled labour jobs. Majority of labour need will be met from the sub-project areas. The sub-project will also require skilled workers and these may be available from the community. It is anticipated that approximately 75% of the	Contractor	• ESFPs • Supervisory consultant	

Impacts on Local Population	- No specific serious adverse impacts on community health and safety are expected as a result of construction and operation of rehabilitation and improvement of Water Supply System for MC Bahawalnagar. - The population residing in and the surroundings of the Sub-project Area will be affected during the construction phase as follows: - There is potential hazard risk from open trenches in the vicinity of populated areas during construction - Insecurity problems may arise for the local population due to the Contractor's workers during the construction phase		- The potential hazard risk from open trenches in the vicinity of populated areas should be mitigated by appropriate warnings and fencing. - Contractor should select specific timings for heavy machinery operation so as to cause least disturbance to the population considering their peak movement hours. - Effective construction controls may be made by the Contractor to avoid inconvenience to the population due to noise, smoke and fugitive dust. - Haul-trucks carrying concrete, aggregate and sand fill materials will be kept covered with tarpaulin to help contain the construction materials being transported to the specific site. - The Contractor should warn the workers not to involve in any theft activities and if anyone would involve in such type of activities, he will have to pay heavy penalty and would be handed over to police. Similarly, at the time of hiring labor/workers, Contractor has to ensure that the workers should be of good repute/character. - Health impacts associated with air and dust emissions on the community is also expected to	Contractor - ESFPs - Supervisory Consultant
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Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	- Community may face the noise and dust problems during construction activities. - Theft problems to the community by the Contractor's workers and vice versa.				- be very insignificant, short term and localized. - The contractor will prepare an Occupational Health and Safety Plan for minimizing occupational and community health and safety impacts.			
Impacts on Public Health and Safety Hazard	- Construction activities, particularly excavation and movement of haul trucks and machinery may prove dangerous for the safety of the workers as well as for local residents. - The storage of all solid waste shall be practiced so as to prevent the				- Contractor will have rented out houses for Contractor will ensure the provision of medicines, first aid kits, emergency vehicles, etc. at the work place. - Compliance with the safety precautions for construction workers as per International Labour Organization (ILO) Convention No. 62 will be ensured by the Contractor. - The active construction zone must be cordoned off to avoid injuries due to accidents.	Contractor	- ESFPs - Supervisory consultant	

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	attraction, or harborage breeding of insects or rodents, and to eliminate conditions harmful to public health or which create safety hazards, odors, unsightliness or public nuisance.							
Gender issue	- Sub-project activities may cause hindrance to especially for women during construction stage. - Privacy of the community may be disturbed.				- Workers would be trained to address privacy issues and ethically behaved. - Labours would be strictly asked to cater the privacy issues. - staff capacity-building	Contractor	- ESFPs - Supervisory consultant	
	Traffic Management				- Provision of alternative routes - Water sprinkling at sub-project site at consecutive intervals - Indicators/signboards regarding alternate routes should be provided at proper distance to avoid accidents	Contractor	ESFPs	Traffic management plan

Proposed Sub-project Activities	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
	High	Medium	Low				
Road Safety				- Inform and coordinate the local residents regarding construction time schedule and also to display the details at sub-project site for their convenience (Public consultation has been carried out. Performa is attached as Annex H). - Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and inconvenience to the local residents; - In case of any complaint, focal person of GRC may contact (details will be highlighted at sub-project site).		Supervisory consultant	
- Economic issues may arise due to; - loss of land, - structures/assets - productive plants - livelihood - shopkeepers				- No land acquisition is involved - No Public structures are found to be affected in the sub-project area because they are not fallings in ROW - No tree plantation is found - No livelihood will be affected by sub-project activity	Contractor	- ESFPs - DPO-ESM - SPO ID/PD	

Proposed Sub-project Activities	Magnitude of Impacts			Milligallon Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
	High	Medium	Low				
vendors (Mobile/permanent)				- No shops were found to be affected as located out of ROW. - No permanent vendors were observed during social and environmental assessment survey - In case of any complaint, focal person of GRC may contact and his contact details will be provided at sub-project site.			
D. OPERATION/MAINTENANCE PHASE							
Consumption of Contaminated Water	Consumption of (untreated) contaminated domestic water could lead to health impacts on the consumers of the water from the pipeline. The maintenance of the pipelines requires excavations and unblocking the pipe which could lead to contamination of the water during the process			The water supply will be closed down during construction phase ensure that no polluted water gets into water supply.	Contractor	- ESFPs - DPO-ESM - SPO ID/PD - ES (Consultant)	Monitoring of water quality through EPA certified lab

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Solid Waste Generation	Solid wastes will mainly emanate from the operation activities related to maintenance operations and will include among others: - Excavated soil - Cement storage bags and other packets from materials used during repair and maintenance. - Spillage of oil and grease from machines used in excavation, repair and maintenance and transportation activities may also encompass solid wastes.				- The occurrence of these wastes is expected to be minimal because of the expected use of manual equipment and labor which would reduce wastes associated with oil spills, repair and maintenance. - The soil excavated during maintenance will be used as backfill and thereby reducing the generation of spoil material and related waste pollution concern. - There will be limited hazardous wastes generated from this sub-project including the cement bags, grease and oil. - All wastes including will be disposed in an approved waste disposal site. The operator will develop a Waste Management Plan (WMP) to guide the disposal of all types of wastes emanating from the sub-project	Contractor	- ESFPs - DPO-ESM - SPO ID/PD - ES (Consultant)	Placement of solid waste storage containers at camp sites. Collection and disposal into MC containers
Visual Impacts	Visual related impacts mainly include re-opening the trenches				This impact is not considered to be significant and will be experienced for a short period			

Proposed Sub-project Activities	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
	High	Medium	Low				
where the pipelines are laid to facilitate repair and maintenance which could be an eye-sore and a health hazard..				of time because of the immediate backfilling of the trenches by the excavated soil/spoil The impact significance is expected to be low in nature, short term and reversible if the trenches are backfilled immediately and excess spoil material is disposed of as soon as possible.	Contractor	- ESFPs - DPO-ESM - SPO ID/PD - ES (Consultant)	
Operation and maintenance of the pipeline will involve workers whose safety may be at risk as a result of operation of equipment among others				Occupational health and safety impacts during operation/maintenance and repair is considered to be of moderate in significance due to the expected use of non-mechanized equipment and machinery. The construction activities will use hand held tools in digging the trenches with very limited use of excavators. Experienced and trained personnel will be engaged in operating equipment.	Contractor	- ESFPs - DPO-ESM - SPO ID/PD - ES (Consultant)	Following EHS labor SOPs
Impacts to Occupational Health and Safety							
Impacts on Community	No specific serious adverse impacts on community health and safety are			health and safety risks should be mitigated by appropriate warnings and fencing. Health impacts associated with air and			

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actual Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Health and Safety	expected as a result of operation activities of Water Supply System. There is potential hazard risk from open trenches during the repair phases that could lead to community health and safety risks				dust emissions on the community is also expected to be very insignificant, short term and localized during the operation phase with respect to repairs and maintenance.	Contractor	• ESFPs • DPO-ESM • SPO ID/PO • ES (Consultant)	
	There maintenance and repair activities will occur in certain sections in densely populated areas and along the existing Right of Way (ROW) where there is motorised and non-motorised traffic especially in the residential areas. Snarl ups due to blockage of the road could lead to traffic as well as potential risk for accidents especially where construction is on-going with little				• The contractor will prepare a detailed traffic management plan (TMP) which will elaborate how traffic will be managed during repair and maintenance activities including need for diversions (if necessary). • The method will mainly be through manual equipment which will reduce the potential for traffic blockages that would be caused when using motorised equipment like excavators. • The contractor will barricade all areas of work along the road to reduce accidents and offer alternative pedestrian walk ways as necessary.	Contractor	• ESFPs • DPO-ESM • SPO ID/PO	Traffic management plan

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
	room for pedestrian access.							
Impact on Air Quality	The impact on air quality during repairs and maintenance (operation phase) is expected to occur within the pipeline route only. The impact on air quality is expected as a result of repair works, which may specifically entail excavation (opening) of the trenches and may generate dust with motorized equipment also generating gases. The processes which will generate pollutants are: emission transport of material, movement of machinery and vehicles on site and excavation works.				- It is not expected that significant impact will occur on local residents or that emissions will exceed regulatory permissible ground-level concentrations. All air emission impacts will be of temporary nature, location specific and reversible. The impact on air quality is considered to be insignificant if appropriate mitigation measures are implemented such as dust suppression techniques, regular maintenance of vehicles, use of high-quality fuel, etc. - Further, the sub-project will be implemented through the significant use of manual labour and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery.	Contractor	- ESFPs - DPO-ESM - SPO ID/PD - ES (Consultant)	
	Noise emission and associated impacts				The repair and maintenance works will mainly be carried out			
Noise and Vibration								

Section - 8: Environmental AND SOCIAL Management and Monitoring Program

Proposed Sub-project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring parameters/ Monitoring methods
		High	Medium	Low				
Emission Impacts	during repairs and maintenance is expected to be low and will emanate from motorized equipment. This impact is expected to be low in nature and short term, experienced only in cases where motorized equipment is used.				during the daylight working hours with no night working expected unless it is an emergency e.g. pipe burst or blockage. Mitigation measures will prescribe daylight working hours in the most affected zones.	Contractor	• ESFPs • DPO-ESM • SPO ID/PD • ES (Consultant)	

Figure 2-2: Environmental Monitoring Plan

Environmental monitoring will be carried out to ensure that all construction activities comply and adhere to environmental provisions and standard specifications, so that all mitigation measures are implemented.

Sr. #	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
1.	Noise and vibration	• Use of machineries and equipment having less noise. • Provision for personal protective equipment (PPE's), ear muffs/ear plugs to workers.	Scheme Site	Monthly	It will be conducted before, during and after completion of civil work. in this regard, an environmental	• ESFPs • DPO-ESM • SPO ID/PD

Sr. #	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
2.	Dust	- Noise level testing will be carried through EPA ***certified Lab. - Provision for personal protective equipment (PPE's) Mask. - Avoiding construction activities during nights. - Sprinkling of water and removal of excess matter/construction debris from the site as soon as possible.	Scheme Site	Monthly	compliance report will be submitted It will be conducted during and after completion of civil work. In this regard, an environmental compliance report will be submitted.	- ESFPs - DPO-ESM - SPO ID/PD
3.	Air Quality	Air quality will be analyzed in through EPA ***certified Lab.	Scheme Site	Monthly	It will be conducted before, during and after completion of civil work. In this regard, an environmental compliance report will be submitted.	- ESFPs - DPO-ESM - SPO ID/PD
4.	Provision of first aid in case of any emergency	- First Aid will be provided immediately to save the life of Affected Peoples. - Ambulance will be called up to shift the affected persons to the nearest medical facility.	Scheme Site	Immediate as per need	First Aid Box will be provided at site.	- ESFPs - DPO-ESM - SPO ID/PD
5.	Health, Safety and Environmental needs	Adequate safety precautions such as helmets, safety shoes, gloves, etc. should be provided to the labour.	Scheme Site	Once during construction activities	During construction of sub-project, Health Safety attributes will be provided and environmental compliance report should be submitted.	- ESFPs - DPO-ESM - SPO ID/PD

Sr. #	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting Frequency	Responsibility
6.	Public Consultation	Local residents in the sub-project area will be informed about the sub-project details, sub-project schedule and GRM	Scheme Site	Two times (during and post construction) In case of any complaint, emergency visit will be organized.	During and after completion of sub-project; social compliance report will be submitted.	- ESFPs - DPO-ESM - SPO ID/PO
7.	Vehicle Movement Mobility issues	- Provision of alternative routes - Indicators/signboards regarding alternate routes should be provided at proper distance - In case of any complaint, focal person of GRC may contact and his contact details will be provided at sub-project site.	Scheme Site	During construction, alternative routes will be provided. In case of any complaint, emergency visit will be organized.	During and after completion of sub-project; environmental and social monitoring report will be submitted	- ESFPs - DPO-ESM - SPO ID/PO
8.	Obstruction in public access	- Provision of alternate routes - Construction should start from either side of the road	Scheme Site	Once during construction activities	During and after completion of sub-project; environmental and social monitoring report will be submitted.	- ESFPs - DPO-ESM - SPO ID/PO
9.	Economic Losses	- loss of land, - damage to structures - damage to trees/plants - negative impacts on livelihood in form of blockage of passage for shopkeepers	Scheme Site	Three times (pre, during and post construction) In case of any complaint.	During and after completion of sub-project; environmental and social monitoring report will be submitted	- ESFPs - DPO-ESM - SPO ID/PO

Sr. #	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
		as well as vendors (Mobile/permanent)		emergency visit will be organized.		
10.	Privacy Issues	- Contractors would be trained to address privacy issues to behave ethically. - Labours will be strictly asked to respect privacy of local residents. - Training on observing/respecting and local norms.	Scheme Site	Once during construction	During and after completion of sub-project; environmental and social monitoring report will be submitted	- ESFPs - DPO-ESM - SPO ID/PD

8.9

Sub-project: Rehabilitation and Improvement of Water Supply System in MC
Bahawalnagar, Punjab.

Table 8-4, ESIA Implementation Budget

Item	Quantity	Tentative Cost /Item (Rs)*	Total Cost
Labor Safety			
Face Masks (3 PLY) - box	50	300/-	15,000/-
Safety Hard Helmets	30	3,000/-	90,000/-
Safety Shoes	30	3,000/-	90,000/-
Hand Gloves	50	1,000/-	50,000/-
Ear Plugs	50	500/-	25,000/-
Reflective Safety Vest	30	1,000/-	30,000/-
Safety Goggles	30	500/-	15,000/-
First Aid Box Complete	2	10,000/-	20,000/-
Infrared Thermometer (Benetech GM-2000 or equivalent)	1	40,000/-	40,000/-
Sub-Total			375,000
Working Site Safety			
Safety Signs	8	15,000/-	120,000/-
Safety Cones	20	1,000/-	20,000/-
Safety Tape	50	1,500/-	75,000/-
Portable Delineator with chain	50	2,200/-	110,000/-
Emergency Portable Lights	10	3,000/-	30,000/-
Solid Waste Collection Drums with Cover	10	12,000/-	120,000/-
Fire Fighting Equipment Purchase and Refilling	2	10,000/-	20,000/-
Sub-Total			495,000
Others			
Hiring of Environmental Specialist (for 03 months)	1 (for 03 months)	80,000/-	240,000/-
Hiring of HSE Expert (for 03 months)	1 (for 03 months)	80,000/-	240,000/-
Training (HSE & Environment related trainings)	Lump sum		100,000/-
Site Hanging Waste Bins	18	12,000/-	216,000/-
Digital Sound Level Meter	1	30,000/-	30,000/-

Item	Quantity	Tentative Cost /Item (Rs)*	Total Cost
Labor Campsite Management	Lump sum		200,000/-
Water Sprinkling	Lump sum		200,000/-
Environmental Monitoring (Ambient Air, Noise Level, Drinking Water, Surface Water & Vehicular Emission Monitoring) – per month	2	200,000/-	400,000/-
Sub-Total (PKR)			1,626,000/-
Grand Total (PKR)			2,496,000/-

8.10 PROPOSE EMP REPORTING AND REVIEWING PROCEDURE OF EPA

All the precautionary measures are suggested in EMP to minimize the pollution creating by construction and operation of sub-project. Reporting and reviewing procedure is following:

- ESIA Report & File Submission
- SIR Letter
- Review of ESIA Report
- Issuance of Query letters by EPA
- Submission of satisfactory replies of Query Letter
- Public hearing
- Expert committee meeting and presentation
- DG EPA meeting and Presentation
- NOC issuance
- Proper Follow up of case from submission to Issuance of NOC

8.11 CONTRACTOR'S TRAINING

In order to comply with the anticipated environment and social attributes as described in ESIA of the PCP funded schemes of MC Bahawalnagar, to ensure meetings will be held with the contractors of MC Bahawalnagar, to ensure the socially acceptable and environmentally sustainable situation during execution of the Sub-project.

The Contractor will also be briefed about procedures and methods for complying with environmental and social management conditions, and any specific conditions specified in an ESMMP; a description of specific mitigation measures that will be implemented in order to minimize adverse impacts; a description of all planned monitoring activities.

Trainings for contractors will be organized when the bidding process will be completed. Contractors shall be bound for environmental and social compliance.

Contractors have to comply with the following responsibilities:

- Observation of timings and make a schedule that the surrounding communities should not be affect from noise pollution, air emissions and disturbances in their routine work.
- Usage of machinery/equipment producing negligible/low noise.
- Ensure health, safety and protective measures including safety equipment, safe drinking water, first aid boxes etc. to the workforce as per nature of their jobs.
- Water sprinkling to avoid air pollution.
- Indicate alternate routes and provide indicators on suitable places during work timings.
- Local labor should be preferred to work.
- Child labor is strictly prohibited as per labor law. All labor should be more than 14 years of age individually.
- Proper disposal of wastes and garbage.
- Health, safety and protective measures for the labor.
- Notice board of emergency numbers should be placed on proper place.

Contractors shall also provide safety equipment i.e., PPEs, safe drinking water, first aid boxes etc. to the workforce as per nature of their jobs. By ensuring all these mitigation measures; not only their company profile shall boost up but also enable them to qualify and win the future sub-projects.

Components	Audience	Level	Modality	Frequency	Responsibility
ESMF Site Specific requirements and E&S Management and Mitigation Plan	MO-I MO-P and field MC staff ¹²	Training	Briefing Presentations Mock Activities	Before execution of sub-project and time to time instructions	PMDFC ESM team
ESIA Implementation and Monitoring Plan	MO-I MO-P field MC staff	Training	Briefing Presentations Mock Activities		
	Contractor	Awareness and sensitization	Briefing	At the time of Contract signing and	DPO-ESM ESFPs

¹² For ESFPs and MC field staff, PMDFC will organize time to time trainings and a training / capacity building program has been designed in this regard

Components	Audience	Level	Modality	Frequency	Responsibility
EHS SOPs for Labor/Workers (including women workers)	Labor	Awareness and sensitization	Briefing	Before execution Before execution and time to time during execution	DPO-ESM ESFPs
	Contractor	Awareness and sensitization	Briefing and Illustrations	Before execution and time to time during execution	DPO-ESM ESFPs
	Labor/workers	Awareness and sensitization on SOPs Training on Use of PPEs	Presentations Illustrations Mock activities Resource material	Before execution and time to time during execution	DPO-ESM ESFPs
GRM	Contractor	Awareness and sensitization	Briefing	Before execution and time to time during execution	DPO-ESM ESFPs
	Labor/workers	Awareness and sensitization	Briefing and resource material	Before execution and time to time during execution	DPO-ESM ESFPs
	Public/communities	Awareness	Briefing during public consultation Resource material	Before and during execution	DPO-ESM ESFPs

SECTION - 9: STAKEHOLDERS AND PUBLIC CONSULTATION

PROPOSANTS ENVIRONMENTAL MANAGEMENT TEAM

the Environmental and social management team will be taking charge of the proposed sub-project consists of the following members;

1. ESM wing Members of MC Bahawalnagar
2. ESM wing members of PMDC
3. The contractor

RESPONSIBLE AUTHORITY

Overall responsibility for Environmental Management and Monitoring will rest with MC Bahawalnagar. ESM Wing will provide support to ESFPs for managing environmental and social aspects of the sub-sub-project and implementation of the present ESIA.

The EPA shall be the responsible authority for reviewing, site inspection and provision of environmental approval for the sub-project.

SUB-PROJECT STAKEHOLDERS

Sub-project stakeholders were engaged in the review and discussions on various sub-project aspects social and environmental issues at the early stage of impact assessments for feedback. There are two categories of stakeholders in sub-project.

Table 9-1, Sub-project stakeholders

Individual / community stakeholders	All sub-project affected persons, households and communities. Sub-project beneficiaries for instance, residents of the sub-project area, users of the road, vulnerable and gender.
Institutional Stakeholders	Forest department, Irrigation department, Environment department, Municipal Corporation, Highway Department The contractors, construction workers, financing institutions like the World Bank, mass media/civil society members, consultants and sub-project advisors

Public Disclosure of Information, which give high priority to public consultation and participation in designing and implementation of a socially and environmentally responsible sub-project, is derived from various policy / legislative tools, as summarized in 9-1.

Table 9-2. Frameworks for Consultation

Legal/Policy Source	Regulations/Safeguard Policy requirements
Government of Pakistan	Environmental Protection Agency (EPA) 1997 Guidelines for Public Consultation requires public consultation and



Legal/Policy Source	Regulations/Safeguard Policy requirements
	involvement in sub-project planning and implementation. The policy and procedures require proponents to consult with affected community and relevant NGO during preparation reports. The guidelines contain a number of references of need for Public Involvement
World Bank	Pakistan Environmental protection agency guidelines 2000 OP.4.01, Clause 15 described that for all Categories A and B sub-projects proposed for IBRD or IDA financing, during the EA process, the borrower consults sub-project-affected groups and local nongovernmental organizations (NGOs) about the sub-project's environmental aspects and takes their views into account. The borrower initiates such consultations as early as possible. In addition, the borrower consults with such groups throughout sub-project implementation as necessary to address EA-related issues that affect them.

Modes of Consultations

Consultation with the public and institutional stakeholders was done on 8-9-2022 using the following Consultative meetings held with the general stakeholders.

- Scoping sessions held with local communities

The concerns raised by the stakeholders were considered in developing the ESIA, in order to enhance sub-project acceptability among the general public on social considerations. Consultative Process

There are two types of stakeholders related to the sub-project i.e., primary and secondary stakeholders. Primary stakeholders are those which are directly affected by the Sub-project activities and secondary stakeholders are those which are affected indirectly.

Primary Stakeholders: Affected Wider Community

The Sub-project area is of both commercial and residential in nature. Sub-project area inhabitants are direct beneficiaries of sub-project interventions as it will resolve their long-standing issue of availability of uninterrupted water supply. Table 9-5 provides a summary of the public consultations. Figure 9-1 shows pictorial record of public consultation

Following is the list of public stakeholders consulted on 08-09-2022.

9-3. Public Consultation

Sr No.	Name	Contact No.	Profession
1.	Nadeem Javed	0303-9908756	Petrol Station worker
2.	Malik Qasim	0307-2385716	Hawker / Vendor

Sr No.	Name	Contact No.	Profession
3.	Shahid Akhtar	0333-6328996	Shopkeeper
4.	Muhammad Saleem		Student
5.	Muhammad Rashid	0307-2923886	Tailor
6.	Muhammad Usman	0300-7979977	Shopkeeper
7.	Taseer Usman	0300-7922660	Shopkeeper
8.	Muhammad Usman	0301-4709399	Hawker / Vendor
9.	Salman Saleem	0304-8242958	Shopkeeper

9.3.2 Secondary Stakeholders: Department and Agencies

The Sub-project area lies in the jurisdiction of MC Bahawalnagar and MC Bahawalnagar has an ambit of providing safe drinking water to the citizens. Public has complained about unavailability of water for various domestic needs that's why MC Bahawalnagar has suggested the sub-project for improvement and rehabilitation of water supply in the city. Several other institutional stakeholders were also engaged in the consultation process. The summary of institutional stakeholder consultation is given in table 9-4. Figure 9-2 shows pictorial record of consultation with government bodies.

Following is the list of institutional stakeholders consulted on 08-09-2022.

Table 9-4, Institutional stakeholders

Sr. No.	Department	Person Consulted	Person's Designation
1.	Municipal Corporation	Mr. Ather	Sub-Engineer
2.	Municipal Corporation	Rashid Hussain Shah	Incharge Water Supply
3.	EPA	Muhammad Saeed	Inspector
4.	Highway	Muhammad Iqbal	Head Drafts Man
5.	Irrigation	Muhammad Ali	SDO
6.	Forest	Haider Mahmood	Sr. Cleric

9.3.3 ENVIRONMENTAL PRACTITIONER AND EXPERT

Team of Asian Consulting Engineer visited the sub-project site, had discussion with stakeholders and consulted with the local people of nearby to evaluate the sub- project socio-economic impacts. People of the area belong to different professions like mostly belong to employment, own businesses, doctors, some of them communicated but according to social value of the area they mostly hesitate to communicate comfortably. People provide the massive information about the sub- project and have positive remarks regarding the sub-project development. The Asian team have endeavored to hold consultative sessions with a number of prominent stakeholders (Sub-project Proponent, Government departments, line agencies, and affected persons of the sub- project Area) to evince their views on the sub-project and

their opinions, suggestions, understanding on various issues and concerns. The consultations aimed specifically at:

- Dissemination of sub-project information through discussions, education and liaison.
- Eliciting the comments and feedback on the sub-project.
- Documentation of information narrated by the stakeholders.
- Documentation of mitigation measures proposed by the stakeholders.
- Incorporation of public concerns and their addresses in the ESIA.

9.3.4 Disclosure of sub-project Information

The Sub-project ESIA will be uploaded on the sub-project websites, hard copies shall be sent to all institutional stakeholder's offices. The Sub-project ESIA will be disclosed internally within the Bank. Before start of physical works on the sub-project, the Sub-project ESIA will be thoroughly briefed to the Contractor to implement ESIA provisions in its letter & spirit. Contractor will keep copy of ESIA on the site and will also brief his labor about its attributes. PCP ESSs team also designed HSE Booklet and flexes to guide Contractor about HSE aspects required to be addressed during the construction phase. Contractor will also install sub-project information boards on the sub-project site. Contractor's Environmentalist will implement ESIA in its true essence.

9.3.5 Future Consultation Plan

The stakeholder consultation is a continuous process, and should be carried out throughout the life of sub-project. The consultations carried out during the present ESIA stage and reported are essential among the initial steps in this process. During the subsequent sub-project phases as well, participation of the sub-project stakeholders needs to be ensured. MC Bahawalnagar Supervision staff will ensure time to time consultation with locals to get their feedback on sub-project activities and their related complaints.

9.4 SUMMARY OF ISSUES RAISED BY AFFECTED AND WIDER COMMUNITY

A summary of the key issues raised by stakeholders and how these are being addressed by Sub-project Proponent is provided in Table below.

Table 9-5, Summary of issues/concern/ suggestion by public stakeholder and commitments made by Proponent

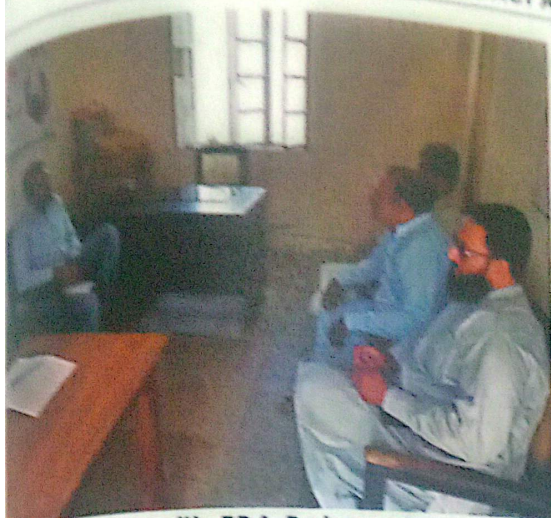
Location	Name	Concern/suggestion/issues	Response
MC Bahawalnagar	Student	Employment opportunities should be provided to the locals during the construction and	It will be made sure that 75% of the workforce will be employed from the sub-project area.

Location	Name	Concern/suggestion/Issues	Response
		operation of the sub-project.	
	Shopkeeper	Will the current water supply be interrupted during sub-project construction phase?	Water supply will be interrupted for a short period of time, that will be pre-informed to the residents. It will be made sure that least inconvenience to the residents.
	Shopkeeper	Will my land be acquired during the construction of new tube wells or transmission lines?	Majority of the land in the sub-project corridor is owned by MC Bahawalnagar, no private land is acquired. If any land comes within the right of way of the sub-project then due compensation will be provided as O.P 4.11 of World Bank
	Hawker/vendor	The sub-project is a good initiative and will improve the water supply of the area.	Efforts will be made to improve the water supply of the area.
	Hawker/vendor	GST should be constructed as a part of the sub-project	GSTs at appropriate areas are a part of sub-project component.
	Tailor	Privacy of people should be upheld during construction phase of the sub-project.	Contractors will provide trainings to workers regarding gender and privacy issues.
	Petrol station worker	Will there be any closure of roads during	Most of the transmission lines are at the utility

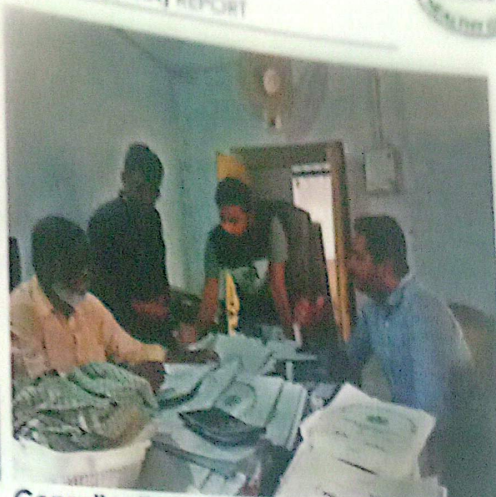
Location	Name	Concern/suggestion/issues	Response
		Construction phase?	Corridors of roads and no roads will be closed down. In case of road closures, the nearby community will be informed beforehand and alternative routes will be provided.
	Shopkeeper	Water quality of the area should not be disturbed during construction phase.	During construction phase the water supply will be closed until the work is completed hence no water will be polluted during rehabilitation/construction process.
	Shopkeeper	The greenery of the area should not be disturbed.	Effort will be made to protect as much trees/plants possible by making changes in design.

Table 9-6. Summary of issues/concern/ suggestion by public stakeholder and commitments made by Proponent

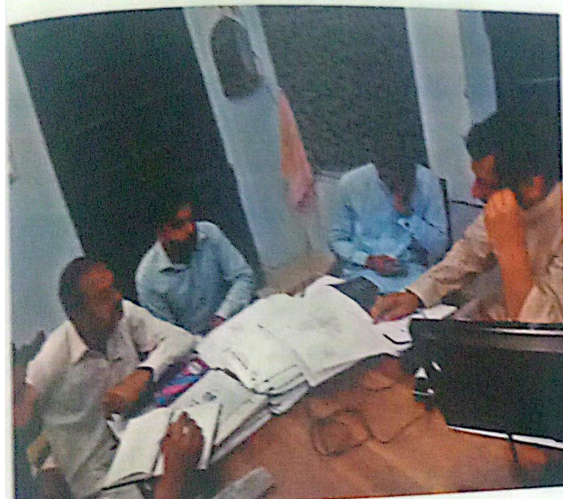
Respondent	Concern/suggestion/issues	Response
Muhammad Saeed, Inspector EPA field office	EPA should be kept in loop during the sub-project process. NOC from EPA head office should be taken before commencement of works.	Comments are noted.
Muhammad Iqbal, Head Drafts Man Highway	The transmission lines are passing through By Pass Road Bahawalnagar. If the construction comes within RoW of the road then a request for NOC should be submitted to Highway department before commencement of work.	Comments are noted and a letter will be written to the department by MC before the execution of the sub-project.
Muhammad Ali, SDO, Irrigation department	As tube wells will be installed in RoW of Irrigation Department (Fordwah Canal Division) and transmission lines may pass through minor distributary. A letter should be written to Irrigation regarding information and intimation before commencement of work.	Concern is noted and a letter will be written for formal correspondence by MC.
Haider Mahmood, Sr. Cleric, Forest Department	As tube wells are proposed on the bank of Fordwah Canal where trees are planted by Forest Department, so a letter should be written to the district forest office before the execution of the sub-project.	A formal letter will be written to District Forest office by MC. And efforts will be made not to affect any tree during the execution of the sub-project.



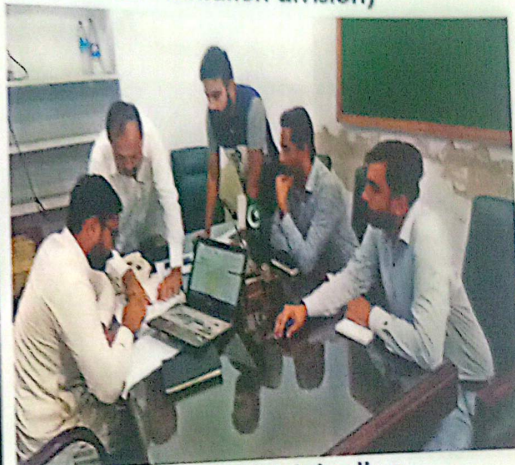
Consultation with EPA Bahawalnagar



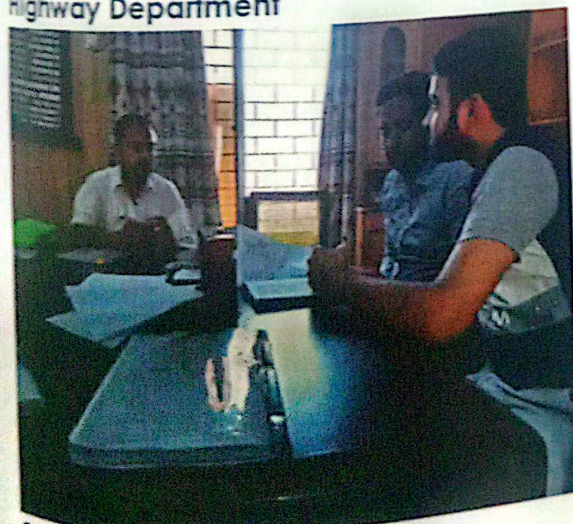
Consultation with Forest Department
(canal side Plantation division)



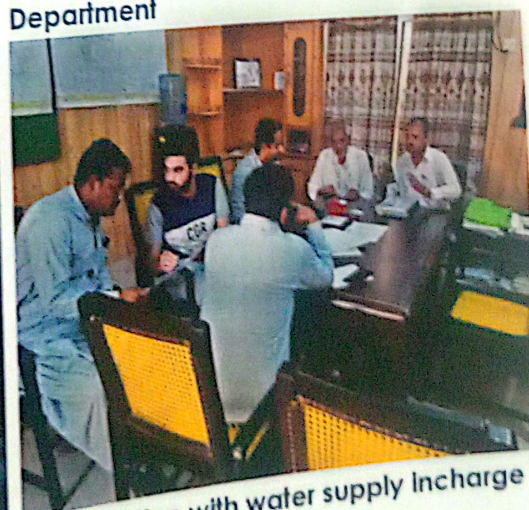
Consultation with Head draftsman
Highway Department



Consultation with SDO Irrigation
Department



Consultation with Sub-Engineer
MC Bahawalnagar



Consultation with water supply Incharge
MC Bahawalnagar

Figure 9-2, Consultation with institutional stakeholders

Section - 10: GRIEVANCE REDRESS MECHANISM

In order to receive and facilitate the resolution of affected people's concerns, complaints, and grievance about the sub-project's environmental and social impacts, an Environmental Grievance Redress Mechanism (GRM) has already been established. The GRM will address affected people's concerns and complaints effectively and promptly using an understandable and transparent process that is gender responsive, culturally appropriate and readily accessible to all segments of the affected people at no costs and without retribution.

The Grievance Redress Mechanism (GRM) will be consistent with the requirements of the World Bank Core Principle "1.2f Responsiveness and accountability through stakeholder consultation, timely dissemination of program information, and through responsive grievance redress measures". Under Core Principle 1: "Environmental and social management procedures and processes are designed to: (a) avoid, minimize or mitigate adverse impacts; (b) promote environmental and social sustainability in program design; and (c) promote informed decision making relating to a program's environmental and social effects" to ensure mitigation of communities' concerns, risk management, and maximization of environmental and social benefits. The overall objective of the GRM is therefore to provide a robust system of procedures and processes that provides for transparent and rapid resolution of concerns and complaints identified at the local level.

The GRM will be accessible to diverse members of the communities, including women, senior citizens, and people with disabilities, laborers/workers, and other vulnerable groups. Culturally appropriate communication mechanisms will be used at all Sub-project sites both to spread awareness regarding the GRM process as well as complaints management. ESMF GRM will be integrated with the PCP's overall program GRM hotline to be developed by the Consultants under the scope of PCP.

10.1 GRM AT SUB-PROJECT SITE

Grievance Redress Mechanism (GRM) is to provide a robust system of procedures and processes that provides for transparent and rapid resolution of concerns and complaints identified at the local level. For integration of GRM into existing Complaint Tracking System (CTS), Grievance Redress Committee (GRC)-MC Bahawalnagar will be notified under umbrella of Punjab Cities Program (PCP) comprising of the following members and TORs.

Chief Officer MC Bahawalnagar

Chairperson

Municipal Officer (Infrastructure Development)

Municipal Officer (Planning)

Municipal Officer (Regulation)

Convener

Member

Member

TORs of GRC-MC Bahawalnagar are as followed:

- ESFPs designated by the MC Bahawalnagar for environmental and social management will be responsible to manage the GRM effectively. The ESFPs with the support of DPO-ESM will play an instrumental role in steering the GRC functions both at city and regional level.
- CO MC Bahawalnagar will be responsible to share monthly recorded grievances data with regional GRC.

10.2

GRM AT REGIONAL LEVEL

Grievance Redress Committee at Regional level will also be notified under umbrella of Punjab Cities Program (PCP) comprising of the following members and TORs:

- Deputy Program Officer (Environmental & Social Management)
Chairperson & Convener
- Deputy Program Officer (Infrastructure Development)
Member
- Deputy Program Officer (Institutional Strengthening)
Member

TORs of GRC-Regional are as followed:

- Committee will be responsible to manage the GRM effectively as per data provided by MC Bahawalnagar GRC.
- DPO-ESM will support ESFPs in steering the GRC functions both at city and regional level.
- DPO-ESM will maintain monthly complaint records from ESFPs.

A Grievance Redress Committee (GRC-PMDFC/LG&CDD) will be responsible to oversee the overall functions of the GRM at a strategic level including monthly reviews. It will be headed by the Secretary LG&CDD.

TYPES OF GRIEVANCES



Figure 10-1, Types of grievances

10.3.1 Procedures

The tracking and documenting of grievance resolutions will include the following elements:

- ✓Tracking complainant(s) from sub-projects sites (field and community level) to CPMT;
- ✓Dedicated staff to update the database routinely;
- ✓Promote transparency, publicize how complaints are being handled, and periodically evaluate the overall functioning of the mechanism;
- ✓Processes for informing stakeholders about the status of a case; and
- ✓Procedures to retrieve data for reporting purposes, including the periodic reports form ESFPs and DPO-ESM and document into the monthly progress reports.

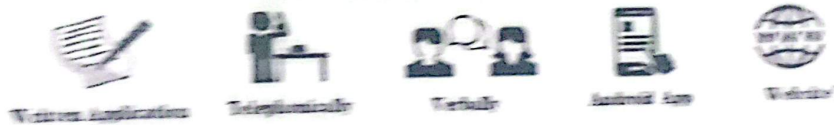
Public Complaints Center (PCC) which will be responsible to receive, log, and resolve complaints in local offices. The Grievance Redress Committee at the WC level will review and identify actions to be taken to address the complaints at its weekly meetings.

If not satisfactorily resolved by the WC and regional level, then the grievance will be referred for consideration by GRC at the PMOPC/LG&CCD level within a week.

Every effort will be made to address or resolve grievances within the following fixed timelines, which will be an indicator against the performance of the handling system. Acknowledgement of a written submission will be issued to the complainant within three working days.

If the complainant is not satisfied, the complainant will have the option to seek redress through the court of law. (This mechanism developed for GRM is tentative and will be finalized after hiring of consultant for GRM).

Made of Complaint



Grievance Redress Mechanism



Figure 11-2. GRM

SECTION - 11: CONCLUSION & RECOMMENDATIONS

Based on the study conducted for Environmental and Social Impact Assessment (ESIA) for the subject sub-project, the following conclusions are made:

CONCLUSION

11.1

The ESIA study reveals that the sub-project is economically viable and socially acceptable and the proponent will implement the sub-project in the environment friendly manner. The proponent will adopt all the necessary measures to control any impact if resulting from the sub-project. The proponent will provide the safe drinking water, safe working environment, proper training and first aid facility to all workers and staff. The sub-project will generate additional jobs during construction and operation phases.

RECOMMENDATIONS

11.2

In view of the comprehensive screening process and findings of the present study there is no need of conducting further investigations.

- Tree plantation inside and near the sub-project area is recommended.
 - The Management of will continue to assist the local communities as a corporate social responsibility (CSR).
 - Any seepage and leakage will be controlled through proper mitigation measures.
 - Sound proof room should be constructed for generator to control its sound (If required).
 - Use of narcotics and smoking must be prohibited during working, filling or handling of fuel.
 - PPEs must be provided to workers such as gloves, masks, ear muffs /etc.
 - Proper solid waste management system must be adopted.
 - Safety signs, safety board's etc. must be placed on site during various developmental stages.
 - Machinery will never be left in running condition.
 - First Aid measures, health & safety Equipment (PPEs) will be provided to workers.
 - Fire Fighting station & system will be installed.
 - The management of subject sub-project will assist the local communities as a corporate social responsibility.
 - Jobs and employment will be provided to the local area.
- The present ESIA report is enough to meet the administrative and legal framework. After the complete study of the sub-project, it is concluded that sub-project will not have significant adverse impacts on the nearby community and on environment. Overall, the sub-project will have positive impacts on the local population and country as a whole. Therefore, it is requested for the environmental approval for the subject sub-project. No private land will be acquired during this sub-project and no resettlement will be required. Sub-project will be executed on government owned land. As 20 new tube wells will be installed on the bank of Fordwah Canal / in RoW