

Punjab Municipal Development Fund Company (PMDFC)

"Improvement and Extension of Sewerage System in Bahawalnagar City"

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

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EXECUTIVE SUMMARY

This Environmental and Social Impact Assessment (ESIA) Report has been prepared for the project; Improvement and Extension of Sewerage System in Bahawalnagar City, 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 the consultants appointed by PMDFC.

ES-1. 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 Wastewater Treatment Plants
- Roads and Street Lights

ES-2. Project Overview

The project aims at improvement of infrastructure of municipal services in MC Bahawalnagar. This project includes the improvement and / or construction of disposal stations, force main and Waste Stabilization Pond in MC Bahawalnagar.

Punjab Cities Program (PCP) aims at improvement of infrastructure of municipal services including sewerage system for improved municipal service delivery.

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

- Improvement of service delivery level of the municipal services in the served areas of the city for provision of better basic urban services for improved livability of the citizen.
- Reduction in annual O&M charges of the infrastructure due to reduced repairs in the forthcoming years because of repair or replacement of infrastructure components.
- Reduction and prompt addressal of the public complaints regarding municipal service delivery.
- Reduction in surcharging and overflowing of sewers thus reducing waste water ponding in the city. The objectives of the projects are in line with Sector Objectives.
- Construction of wastewater treatment plant to avoid environmental hazards.

Further details are described in section-05: Description of Project.

ES-3. Project Location

The project is located in Bahawalnagar City, 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-west of Lahore and about 175 km (109 mi) miles at North-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 Project)*

ES-4. Project Proponent

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

ES-5. Brief Description of the Project

The existing sewerage system of the Bahawalnagar is designed as a combined system to cover about 60% area of the city. The system is comprised of approximately 178 km length of sewers with diameters ranging from 9 inch to 48 inch (R.C.C. pipes). There are 05 disposal stations (DS) in the city, 04 Nos. are operational while 1 DS is under Construction. The existing sewerage system is divided into three zones (Zone-1, Zone-2 & Zone 3). The wastewater from each zone is collected in DS and discharge in Sukh Bias Creek without any treatment. The Wastewater is also being used in agriculture fields without any treatment. There is no Wastewater Treatment Plant (WWTP) is Bahawalnagar City.

Existing sewerage system in Bahawalnagar City is equipped with the following assets.

- Sewer Lines
- Force Mains
- Disposal Stations

This project includes the improvement and / or construction of disposal stations, force main and Waste Stabilization Pond in MC Bahawalnagar. Project activities include;

- Rehabilitation of 07 disposal stations including pumping machineries, plaster of wall, painting etc.
- Laying of 20,000 Rft force main including excavation, backfilling and restoration of roads
- Replacement of 10,400 ft. sewer lines
- Construction of Wastewater Treatment Plant / Waste Stabilization Pond which involves excavation of ponds, construction of inlet channel and effluent channels and construction of office building and office.

Table 0-1, Scope of Work

Sr. No.	Proposed Works	Nos. / Length
1.	Rehabilitation of disposal stations	07 Nos.
2.	Laying of force main	20,000 Rft
3.	Replacement of sewer lines	10,400 ft.
4.	Construction of Wastewater Treatment Plant	01 No.

ES-6. Need of ESIA

As per Environmental and Social Management Framework (ESMF) of Punjab Cities Program (PCP), the projects under the scope of Waste Management which involves construction of wastewater treatment plants will fall in category E1 and may require to conduct Environmental & Social Impact Assessment (ESIA) study as per scope of work and environmental impacts.

According to the Review of IEE and EIA Regulations, 2022, the project falls under Schedule II (List of projects requiring an EIA), Category F (Water supply, Sewerage System and treatment), sub-clause (Wastewater channels / Sewerage System Schemes).

This project involves construction of 01 wastewater treatment plant, replacement of 10,400 ft. existing sewer lines, rehabilitation of 07 disposal

station and laying of 20,000 Rft force main.

The project corridor is in direct vicinity of Bahawalnagar city that may have minor mitigatable environmental impacts during construction works like dust generation, noise generation etc.

As there is no resettlement required for this project and project components are being constructed / rehabilitated on government owned land and no private land will be acquired but there might be some mitigatable issues related to social sector like privacy disturbance etc. during the construction phase of the project, so the project falls in S2 category for social component; for which, social management plan / measures mitigating social issues are given in this ESIA.

ES-7. Major Impacts and Mitigation Measures

In order to identify all the activities associated with the project during construction & operation phase with potential to cause significant environmental & social impacts and harm a thorough review has been conducted. 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 project will have positive impacts on the local population and country as a whole.

Table 0-2, Summary of Major Impacts During Construction & Operational Phase

Pollutants	Construction Phase	Operational Phase
Ambient air quality	• The impact on air quality is expected as a result of construction works, specifically excavation, which will generate dust with motorized equipment also generating gases. Smoke from vehicles, generator and other fuel consuming machinery and construction material.	• Resources utilization i.e., fuel and energy for the operation of pumps.
Noise and vibration	• During the construction of the project, a large amount of equipment and construction machinery will be utilized for construction. • The equipment would include excavators,	• Noise and vibration emission and associated impacts during repairs and maintenance is expected to be low and will emanate from motorized equipment. This impact is expected

	concrete mixer, trucks, generators and other machinery and vehicles. The operation and movement of such equipment will increase the noise and vibration in the project area and neighborhood residential may be disturbed by the noisy activities.	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	• Odor issues may arise from WWTP.
Flora and fauna	**Impact on Flora** • No trees are expected to cut during construction phase of the project. **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. Also due to sludge from septic tank	• Solid wastes will mainly emanate from the operational activities related to maintenance and 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
Soil Contamination	• Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the project	• Soil can be contaminated due to leaching of oil, fuel, from vehicles or machinery any stored oil. Storage & handling of hazardous

	area and in its nearby surroundings. • Spillage from the generators or from moving vehicle will cause contamination of soil at construction sites. • Solid wastes generation. • Hazardous materials.	chemicals.
Surface and Ground water contamination.	• Sewage and sanitary waste water generated from the construction site may contaminate groundwater, if not disposed of properly.	• Sewage and sanitary water generated from operational offices / domestic waste may contaminate groundwater, if not disposed of properly.
Health and safety issues	• Construction activities including excavations, backfilling involve inherent occupational 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 exceeds the permissible limits of PEQS, and improper practice of work during storage, handling and transportation of fuel.
Socioeconomic	• Disturbance to neighbors by constructional activities. • Employment opportunities will be generated for locals.	• Employment opportunities will be enhanced as staff will be hired for operational phase.
Gender & privacy issues	• 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.	• Privacy of the community may be disturbed.

	• Harassment issues.	
Land acquisition	• No private land will be acquired for the project. Project site is government owned land. • Proposed land for WWTP is said to be government owned land as per consultation conducted with MC and concerned patwari. • Route for laying pipelines is along the road and railway track (ROW of Highway Department and Railway Department), while seepage drain near WWTP is under jurisdiction of Irrigation Department; so, NOCs / Consent Letters must be obtained by MC before construction of the project.	• Nil
Mobility issues & Traffic management	• The roads maybe temporarily blocked at the active construction zone that may create problems of traffic for nearby community. • Blockage due to construction waste. • Blockage due to machinery and vehicles.	• The roads may be temporarily blocked at the active work zone during repair / maintenance in operational phase that may create problems of traffic for nearby community.
Loss of livelihood	• The project is of short duration (18 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	• The community health and safety must be ensured during repair / maintenance in operational phase

	trenches. • Accidents and disputes can also arise.	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 activities.	• Child labor might get involved in the construction activities during repair and maintenance.

Table 0-3, Summary of Recommendations During Construction & Operation Phase

Pollutants	Recommendation during Construction Phase	Recommendations during Maintenance / Operational Phase
Ambient Air Quality	• Tuning of vehicles should be made mandatory to reduce the emissions of NOx, SOx, CO and PM, 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. • To reduce fugitive dust emissions, 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 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 project will be implemented through the significant use of manual labor and

Pollutants	Recommendation during Construction Phase	Recommendations during Maintenance / Operational Phase
		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 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. 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	• 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.

Pollutants	Recommendation during Construction Phase	Recommendations during Maintenance / Operational Phase
	determine compliance will be done by the Supervision Consultant and corrective/ mitigation measures applied where necessary.	
Odor	• Nil	• Odor issues may arise during operation phase of the project. Buffer zone of minimum 500 meters will be provided between WWTP and nearby settlements. The buffer zone will be planted with trees and herbs in order to minimize the impact of odor on nearby settlements.
Impacts on flora and fauna	• In this 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 project sites through excavations for the 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.	• Maintenance and monitoring of plantation around the project corridor.
Solid Waste	• A site waste management	• The occurrence of these

Pollutants	Recommendation during Construction Phase	Recommendations during Maintenance / Operational Phase
	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 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.	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 project including the cement bags, grease and oil. Site for hazardous waste should we 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) to guide the disposal of all types of wastes emanating from the project.
Soil Erosion / Soil Contamination	• Soil contamination can be curtailed by reducing the oil spill at project construction areas by well maintaining the	• Soil contamination can be curtailed by reducing the oil spill at project construction areas by well maintaining and use

Pollutants	Recommendation during Construction Phase	Recommendations during Maintenance / Operational Phase
	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.	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 order to facilitate flow of the effluents. • Efforts will be made to	• Wastewater from WWTP will be discharged in nearby seepage canal / nullah after treatment, so no surface and ground water will be polluted. • During operation / maintenance works, wastewater may be generated from construction / maintenance works which should be disposed-off / discharged after treatment through septic tank.

Pollutants	Recommendation during Construction Phase	Recommendations during Maintenance / Operational Phase
	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. • First aid boxes should also be present on sites. • Construction safety SOPs should be followed. • Sign boards should be displayed at sites.	• 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.

Pollutants	Recommendation during Construction Phase	Recommendations during Maintenance / Operational Phase
		• Sign boards should be displayed at sites.
Socioeconomic	• People will be informed in advance when work is about to start at the site. • Job opportunities should be provided to local labors. • Privacy of neighbouring areas should not be disturbed. • Trainings should be provided to labors.	• 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. • Labors would be strictly asked to cater the privacy issues. • Staff's capacity-building / trainings.	• Workers would be trained to address privacy issues and ethically behaved. • Labors would be strictly asked to cater the privacy issues. • Staff's capacity-building / trainings.
Land acquisition	• Project land for construction of WWTP is government owned as per consultation conducted with MC and concerned patwari. Pipeline will be laid along / in ROW of the road and railway track; NOCs / consent letters will be obtained from concerned govt. departments / authorities by MC before the construction of the project. Applications will be submitted for relevant NOCs / consent letters by MC that will be submitted to EPA upon issuance.	• Nil
Traffic	• Provision of alternative	• Provision of alternative

Pollutants	Recommendation during Construction Phase	Recommendations during Maintenance / Operational Phase
management	routes. • Water sprinkling at project site at consecutive intervals. • Indicators / signboards regarding alternate routes should be provided at proper distance to avoid accidents. • Vehicles should be parked at designated points. • Machinery after use should be allocated to designated places. • Inform and coordinate the local residents regarding construction time schedule and also to display the details at project site for their convenience. • 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 project site).	routes. • Indicators / signboards regarding alternate routes should be provided at proper distance to avoid accidents. • Vehicles should be parked at designated points. • Machinery after use should be allocated to designated places. • Storage of construction material should be stored 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.	• The active construction zone must be cordoned off to avoid injuries due to accidents.

Pollutants	Recommendation during Construction Phase	Recommendations during Maintenance / Operational Phase
	• 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.	
Resettlement issues	• As no resettlement is required hence there will be no need for mitigation measures.	• Nil
Child protection	• Child labor must be prohibited on project site.	• Child labor must be prohibited on project site.

ES-8. Proposed Environmental Monitoring

To oversee the environmental performance of the 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 project development and compliances with PEQS and legal obligations. Monitoring for following Environmental Parameters is recommended:

ES-8.1 Ambient Air

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

ES-8.2 Noise

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

ES-8.3 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.

Schedule of Proposed Monitoring

Table 0-4, Proposed Monitoring Schedule

Sr. No.	Parameters	Monitoring Schedule
1.	Ambient Air Monitoring	Quarterly
2.	Noise Level Monitoring	Quarterly
3.	Water Quality Monitoring	Quarterly

ES-9. ESMMP Implementation and Monitoring Arrangements of ESIA

ES-9.1 MC Bahawalnagar

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

ES-9.1.1 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 provisions keeping in view his contract with MC Bahawalnagar. The Contractor will train his crews in all aspects for implementation of the ESIA. The contractor will report the progress of ESMMP to the Environmental Specialist of the consultant.

ES-9.1.2 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's ESM Wing.

ES-9.1.3 PMDFC ESM Wing

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

ES-10. ESIA Implementation and Monitoring Budget

The cost for the implementation of construction stage activities given in this ESIA will be included within the civil works for this project with total cost of the project is 1,293.067 million PKR. The total cost of ESIA implementation is 8,233,080 PKR. Detail is given in **Error! Reference source not found.**.

ES-11. Grievance Redress Mechanism

A site-based Grievance Redress Mechanism (GRM) for the project will be operational during the implementation of this 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 of PCP. 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 at both city and regional level.

The GRM will be accessible to diverse members of the communities including women, senior citizens, people with disabilities, laborers / workers, and other vulnerable groups. Culturally appropriate communication mechanisms will be used at all 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 the project "Improvement and Extension of Sewerage System in Bahawalnagar City" 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 this 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 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 project 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 Department (LG&CDD) 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

1.3 Project Overview

The project aims at improvement of infrastructure of municipal services in MC Bahawalnagar. This project includes the improvement and / or construction of disposal stations, force main and Waste Stabilization Pond in MC Bahawalnagar.

Punjab Cities Program (PCP) aims at improvement of infrastructure of municipal services including sewerage system for improved municipal service delivery.

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

- Improvement of service delivery level of the municipal services in the served areas of the city for provision of better basic urban services for improved livability of the citizen.
- Reduction in annual O&M charges of the infrastructure due to reduced repairs in the forthcoming years because of repair or replacement of infrastructure components.
- Reduction and prompt addressal of the public complaints regarding municipal service delivery.
- Reduction in surcharging and overflowing of sewers thus reducing waste water ponding in the city. The objectives of the projects are in line with Sector Objectives.

This project includes the improvement and / or construction of disposal stations, force main and Waste Stabilization Pond in MC Bahawalnagar. Project activities include;

- Rehabilitation of 07 disposal stations including pumping machineries, plaster of wall, painting etc.
- Laying of 20,000 Rft force main including excavation, backfilling and restoration of roads
- Replacement of 10,400 ft. sewer lines
- Construction of Wastewater Treatment Plant / Waste Stabilization Pond which involves excavation of ponds, construction of inlet channel and effluent channels and construction of office building and office.

1.4 Objective of ESIA

The major objective of this ESIA study is the identification of the possible and induced impacts of the proposed project on both short-term and long-term basis. The impact identification process focuses particularly on biophysical, socio-economic and cultural aspects of the environment. Based on the level and nature of these observations, 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 project lifecycle are anticipated and considered by the project proponent. It also serves as a framework for establishing 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 project area;

- To identify potential impacts of the proposed project on the physical, ecological and social aspects of the 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 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 WB's OPs,
- 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 Project

This project includes the improvement and / or construction of disposal stations, force main and Waste Stabilization Pond in MC Bahawalnagar. Project activities include;

- Rehabilitation of 07 disposal stations including pumping machineries, plaster of wall, painting etc.
- Laying of 20,000 Rft force main including excavation, backfilling and restoration of roads
- Replacement of 10,400 ft. sewer lines
- Construction of Wastewater Treatment Plant / Waste Stabilization Pond which involves excavation of ponds, construction of inlet channel and effluent channels and construction of office building and office.

Table 1-1, Scope of Work

Sr. No.	Proposed Works	Nos. / Length
1.	Rehabilitation of disposal stations	07 Nos.
2.	Laying of force main	20,000 Rft
3.	Replacement of sewer lines	10,400 ft.
4.	Construction of Wastewater Treatment Plant	01 No.

Hence this project falls in E-1 category for environmental perspective. However, project does not involve land acquisition or resettlement while some minor / mitigatable social impacts may anticipate, therefore, project has been categorized as S-2 for social perspective and a social management plan or measures to minimize / mitigate social impacts are given in this ESIA.

According to the Review of IEE and EIA Regulations, 2022, the project falls under Schedule II (List of projects requiring an EIA), Category F (Water supply, Sewerage System and treatment), sub-clause (Wastewater channels / Sewerage System Schemes).

1.6 The Proponent

Chief Executive Officer of Municipal Corporation Bahawalnagar, is responsible to get Environmental Approval for the said project as the proponent of this project, by submitting the Environmental and Social 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 project. Asian Consulting Engineers Private Limited is an independent consulting company working in the field of environment. AsCE

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: arslan.hanif@asiancon.com, aleem.butt@asiancon.com
Address: C-3, Jhelum Block, Green Forts-II, Lahore, Pakistan.

1.8 Brief Description of Project

The existing sewerage system of the Bahawalnagar is designed as a combined system to cover about 60% area of the city. The system is comprised of approximately 178 km length of sewers with diameters ranging from 9 inch to 48 inch (R.C.C. pipes). There are 05 disposal stations (DS) in the city, 04 Nos. are operational while 1 DS is under Construction. The existing sewerage system is divided into three zones (Zone-1, Zone-2 & Zone 3). The wastewater from each zone is collected in DS and discharge in Sukh Bias Creek without any treatment. The Wastewater is also being used in agriculture fields without any treatment. There is no Wastewater Treatment Plant (WWTP) is Bahawalnagar City.

Existing sewerage system in Bahawalnagar City is equipped with the following assets.

- Sewer Lines
- Force Mains
- Disposal Stations

This project includes the improvement and / or construction of disposal stations, force main and Waste Stabilization Pond in MC Bahawalnagar. Project activities include;

- Rehabilitation of 07 disposal stations including pumping machineries, plaster of wall, painting etc.
- Laying of 20,000 Rft force main including excavation, backfilling and restoration of roads
- Replacement of 10,400 ft. sewer lines
- Construction of Wastewater Treatment Plant / Waste Stabilization Pond which involves excavation of ponds, construction of inlet channel and effluent channels and construction of office building and office.

Table 1-2, Scope of Work

Sr. No.	Proposed Works	Nos. / Length
1.	Rehabilitation of disposal stations	07 Nos.
2.	Laying of force main	20,000 Rft
3.	Replacement of sewer lines	10,400 ft.
4.	Construction of Wastewater Treatment Plant	01 No.

1.9 Location

The project is located in Bahawalnagar City, 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-west of Lahore and about 175 km (109 mi) miles at North-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 of MC Bahawalnagar is given below in Figure 1-1;

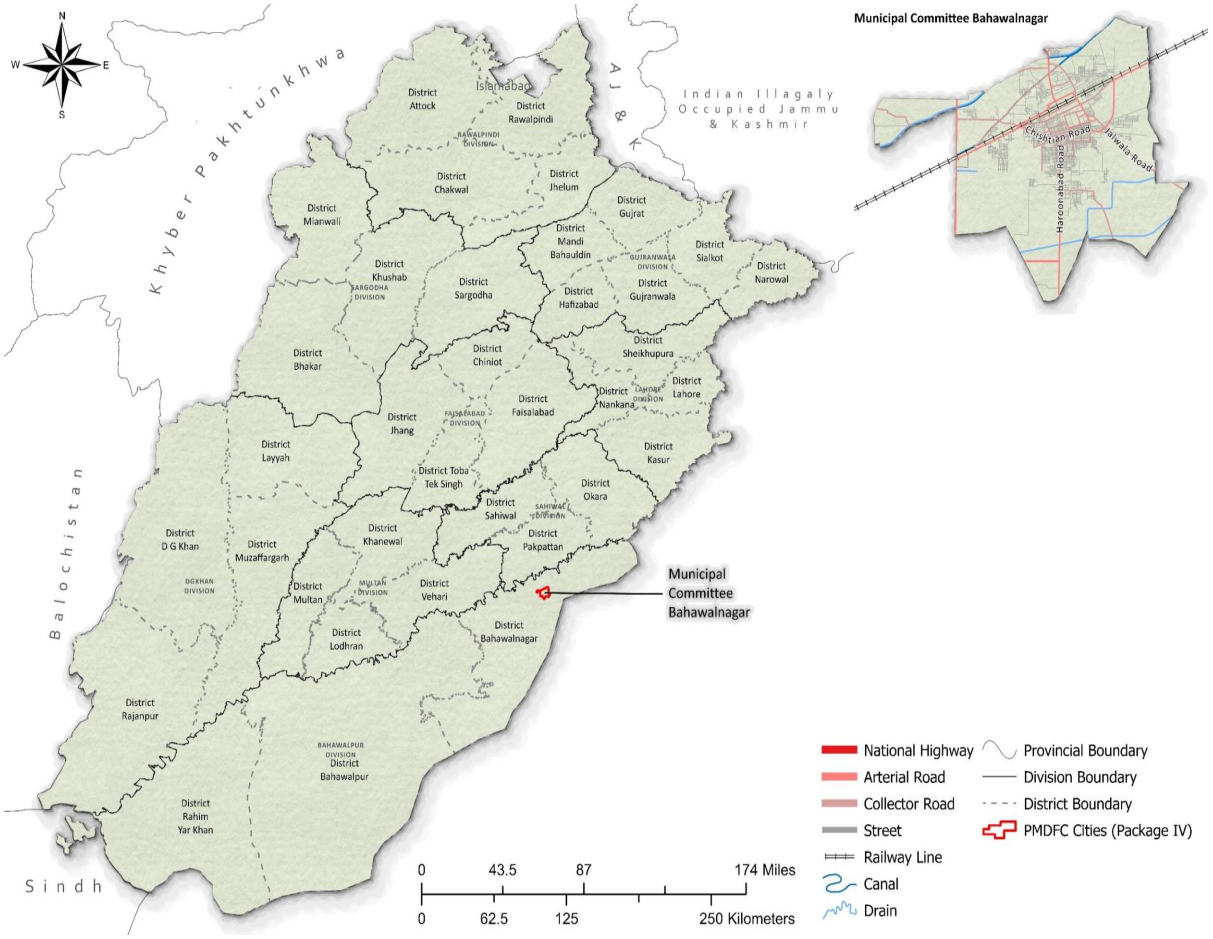


Figure 1-1, Location Map of MC Bahawalnagar

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 applicable to this 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 analysis 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 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 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 in October, 2023. 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 an EPA certified laboratory, was hired for physical environmental sampling and mobilized on October 8, 2023 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 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 project's actual 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 project. The area of influence is the area likely to be affected by the 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 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 meetings. The ESIA team met with the government functionaries, affected persons and local communities in project area. The objective of the consultation was to disseminate information about the 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 project on the physical, biological and socio-economic environment prevalent in the 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 project implementation remains sustainable.

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

An ESMMP for the proposed project activities is 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 project.
- Restrictions on design, timing and conduct of the project.
- Change Management Plan to cover unforeseen events / environmental conditions during the project.

1.11 Structure of Report

The structure of this report is listed below:

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

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

Section 3: Screening and Scoping of Project will discuss whether the project

requires an EIA or IEE and will discuss the spatial and temporal boundaries of the project. Important issued raised by the community during the consultative sessions and significant impact that are determined during the initial visits.

Section 4: Analysis of Alternatives enlists possible design, site / location alternatives for Improvement and Extension of Sewerage System in Bahawalnagar City, and their influence of environment and social situation.

Section 5: Description of the Project provides an overall description of the project including proposed alignment, design considerations and concepts, manpower requirement, waste generation, machinery and material requirements.

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

Section 7: Potential Environmental and Social Impacts and their Mitigations Measures identifies, predicts and evaluates impacts of the project activities during the construction and operation stages and deals with the measures proposed to mitigate potential environmental impacts of the proposed project.

Section 8: Environmental and Social Management and Monitoring Program outlines organizational framework, mitigation and monitoring plans training requirements, defines roles and responsibilities, estimates budgets requirements for satisfactory implementation.

Section 9: Stakeholder and Public Consultation identifies the main stakeholders and their concerns rose during scoping sessions and deals with the measures to mitigate the social impacts.

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

Section 11: Conclusion and Recommendation provides the results / conclusion of the ESIA study for the project and recommendations.

1.12 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-:

Table 1-3, 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.	M. Umair Iqbal	Environmentalist	BS Environmental Science, Government College University, Faisalabad
4.	Waqar Saleem	Sociologist and Resettlement Specialist	M.Phil. Sociology, University of Sargodha
5.	Asma Butt	Sociologist	M.Phil. Sociology, University of Punjab
6.	Muhammad Ibrar	Ecologist	M.Phil. Zoology, University of Punjab
7.	Sajjad Hussain	Chief Chemist	M.Phil. Chemistry, Govt. College University, Lahore

SECTION - 2: REGULATORY AND POLICY FRAMEWORK

This chapter provides details of the national / provincial legislation, regulations, EPA guidelines, World Bank Operational Policies and guidelines which are relevant and applicable to the project.

2.1 National and Provincial Legislative Framework

Table 2-1, National and Provincial Legislative Framework

Sr. No.	Act / Regulation	Description / Brief Coverage	Applicability / Relevance to the Project
1.	National Environmental Policy 2005	In March 2005, Government of Pakistan (GoP) launched its National Environmental Policy, which provides a framework for addressing the environmental issues. Section 5 of the policy commits for integration of environment into development planning as instrument for achieving the objectives of National Environmental Policy. It also provides broad guidelines to the Federal Government, Provincial Governments, Federally Administered Territories and Local Governments to address their environmental concerns and to ensure effective management of their environmental resources.	The core areas that are relevant in the context of the proposed project are pollution prevention during construction and conserving biodiversity and forestry.
2.	Punjab Environmental Protection Act, 1997 (Amended 2012)	The Punjab Environmental Protection Act, 1997 (Amended, 2012 & 2017) is comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment. The 'environment' has been	The provision of the act is applicable to proposed project for conducting an IEE / EIA according to section 12 and to obtain environmental approval from the EPA. The section 11 of the act is applicable in term of compliance with Punjab

		defined in the Act as: (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social 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 / IEE with the Provincial Agency designated by the Provincial EPAs an EIA / IEE, 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, legislatives powers related to environment and	Environmental Quality Standards (PEQS). Similarly, 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.

		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 responsible for the success of environmental assessments and that development projects are environmentally sound and sustainable.	
3.	Punjab Environmental Quality Standards (PEQS), 2016	PEQS promulgated recently in 2016. 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.	Punjab Environmental Protection, (Review of IEE	These regulations set out: Key policy and procedural requirements for filing an EIA; The purpose of environmental	The provisions of these regulations are applicable for environmental screening

	and EIA) Regulations, 2022	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 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.	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 to follow the procedure to file an Environmental study with Punjab-EPA and to understand its review process along with timelines to be followed.
5.	Pakistan Penal Code, 1860	The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions and disposal of effluents.	The provisions of the Penal Code, 1860 are applicable to the project in terms of penalties for effecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.
6.	The Canal and Drainage Act 1873 and	The Canal and Drainage Act 1873 (CDA) focuses on construction and	This act will be applicable as the project is for improvement and

	amendment 2016	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 wilfully damaged or obstructed the canal or "rendered it less useful."	extension of sewerage system in Bahawalnagar city, where WWTP is proposed to construct near a seepage drain.
7.	Punjab Municipal Water Act, 2014	The basic aim of the Act is to recognize, regulate and manage 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 elicit if there is misappropriation of water supply during construction activities and also due to sanitation services.
8.	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.

9.	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; • Advocacy: rights of workers and employers; • Skill development and employment; and • Manpower export	This act is applicable to protect the rights of labor involved in project implementation.
10.	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	This act is applicable to protect the rights of labor involved in the project implementation.

		agriculture sector, brick kilns, domestic work and begging.	
11.	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 situated in and around the Project area.	This act provides guidelines to protect the trees present around the project corridor.
12.	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 project.
13.	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	This act will not trigger as no land acquisition is required.

		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.	
14.	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.
15.	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 occur.
16.	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	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

		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.	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 proposed project.
17.	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 project.

18.	Katchi Abadis Act, 1987	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.
19.	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 which may be subsequently passed by any Court of competent jurisdiction.	This act will not trigger as no land acquisition is required.

20.	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 tease 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 form 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 project implementation.
21.	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,	This act will be triggered as WWTP and pipelines are proposed at the government lands.

		Provided that unless the Provincial Government by general or special order otherwise directs nothing in 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.	
22.	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 project.
23.	The West Pakistan Maternity Benefit Ordinance, 1958	The West Pakistan Maternity Benefit Ordinance of 1958 was a legislation enacted in the former state of West Pakistan, which is now part of present-day Pakistan. The ordinance was established to provide maternity benefits to women in employment. The ordinance mandated that every woman employed in an establishment was entitled to maternity benefits, including paid leave before and after childbirth.	The relevance of this act to the project will be to facilitate pregnant women worker.

		The main provisions of the ordinance included: **Duration of Maternity Leave:** Twelve weeks (06 weeks before the expected date of childbirth and 06 weeks after the childbirth). **Payment During Maternity Leave:** During the maternity leave, the female employee is entitled to receive her full wages. **Medical Allowance:** The employer is also responsible for paying a medical bonus of a certain amount to the pregnant woman. **Job Protection:** A woman availing maternity leave cannot be terminated from her job during her absence due to pregnancy. **Limitation on Heavy Work:** Prohibits employers from assigning heavy or dangerous work to pregnant women during the pregnancy and for a specified period after childbirth. **Notice Requirement:** An employee intending to avail maternity leave must provide her employer with a notice stating the expected date of childbirth at least six weeks before taking leave.	
24.	Protection of Trees and Brushwood Act, 1949	Act refers to save trees / brushwood / greenery / plantations to make the environment better for living.	This act will be triggered as saving trees / plantations is one of the major parts of this ESIA.

25.	Guidelines for Public Consultation, 1997	The Federal EPA provides these guidelines to deal with possible approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures the incorporation of their concerns in any impact assessment study. These guidelines cover: • Consultation, involvement and participation of stakeholders • Effective public consultation (planning, stages of EIA where consultation is appropriate) • Facilitation involvement (including the poor, women and Non-Governmental Organizations (NGOs)	This act will be applicable to this project as public consultation is an essential / mandatory part of ESIA.

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's 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 project area.

The Table 2-2 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 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's Work Environment Noise Limits

Sr. No.	Type of Work / Workplace	IFC's 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*

Sr. No.	Pollutants	USEPA		WHO / IFC		PEQS	
		Avg. Time	Standard	Avg. Time	Standard	Avg. Time	Standard
1.	SO_2	3 hrs 1 hr	0.5 ppm 75 ppb	24 hr	40 ug/m^3	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 (53 ppb) 100 ppb	24Hour 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	0.07ppm (148 ug/m^3)	8 hrs daily maximum 8hr mean peak season	100 ug/m^3 60 ug/m^3	1 hr	130 ug/m^3

Sr. No.	Pollutants	USEPA		WHO / IFC		PEQS	
		Avg. Time	Standard	Avg. Time	Standard	Avg. Time	Standard
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	5 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 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 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 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	Limites in db(A) Leq			
		PEQS		WHO / IFC	
		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 project.

* In instances where baseline noise levels are already exceeding the standards above, it will need to be ensured that the 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 for Frequencies <15Hz	Vibration Limit – PPV for Continuous Vibrations for 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 (7385-2) '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.	Parameters	Units	PEQS	WHO Standards
1.	Temperature (During Sample Collection)	OC	NS	NS
2.	Colour	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	0.01
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	NS
22.	Nitrite	mg/L	<3	3
23.	Magnesium	mg/L	NS	NS
24.	Calcium as Ca	mg/L	NS	NS
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	<0.005	0.02
31.	Cadmium	mg/L	0.01	0.003
32.	Mercury	mg/L	<0.001	0.001

Sr. No.	Parameters	Units	PEQS	WHO Standards
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	0.01
39.	Cyanide (CN)	mg/L	<0.05	0.07
40.	Manganese	mg/L	<0.5	0.5
41.	Total Coliforms	cfu/100ml	0/100 ml	0/100 ml
42.	Fecal Coli forms (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 project. Other are same in both case.

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

Sr. No.	Parameters	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.	(BOD_5)	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	--	--
13.	Sulfate ($SO4^{-2}$)	mg/L	600	--	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	--

Sr. No.	Parameters	Units	PEQS (Regional)	WHO Class – V (Agriculture)	FAO Standards
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 regulations and thus shall be applicable for the proposed sub-project. Other are same in both case.

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

regulations.

2.3 International Laws / Treaties

2.3.1 The World Bank's 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 Policy	Triggered?	Explanation
Environmental Assessment OP / 4.01	Yes	This project has been categorized as 'Category E-1'. The project activities under this category may potentially cause negative environmental and social impacts. The project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented.
Physical Cultural Resource OP / 4.11	No	The project does not lie in any 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 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 / ARAP.

2.3.2 World Bank Environmental, Health and Social Guidelines

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

- Environment, Health, and Safety (EHS) Guidelines prepared by International Finance Corporation and World Bank in 2007
- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues.
- Social Analysis Sourcebook

- WB Committee on disability-inclusive development
- WB guidelines on labour influx
- WB Group Gender Strategy

Labor's SOPs are attached as Annexure-14.

2.3.3 World Bank Policy Core Principles and Applicability on 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 project. ESMMP 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 8-2 prepared to mitigate all impacts anticipated during the course of the project.
Core Principle 3 Program procedures ensure adequate measures to protect public and worker safety against the potential risks associated with (a) construction and / or operations of facilities or other operational practices developed or promoted under the Program and (b) exposure to toxic chemicals, hazardous wastes, and otherwise dangerous materials	All the mitigation measures have been incorporated in the Table 8-2 to address risks associated with workers and community health and safety. Contractor will ensure compliance with these attributes.
Core Principle 4 Land acquisition and loss of access to natural resources are managed in a way that avoids or minimizes displacement, and affected people are assisted in	This core principle doesn't trigger in this project as no land acquisition is required for construction of WWTP and laying of pipelines.

Core Principles	Applicability
improving, or at least restoring, their livelihoods and living standards	
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 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 project.

2.3.4 The World Bank's Environmental Code of Practices

The World Bank's Environmental Code of Practices (ECoPs) address less significant environmental impacts and all general construction related impacts of the proposed 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

ECP 10: Protection of Flora

ECP 11: Protection of Fauna

ECP 12: Protection of Fisheries

ECP 13: Road Transport and Road Traffic Management

ECP 14: Construction Camp Management

ECP 15: Cultural and Religious Issues

ECP 16: Workers Health and Safe

SECTION - 3: SCREENING AND SCOPING OF PROJECT

3.1 Screening of the Project

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

As per ESMF of PCP, the projects under the scope of Waste Management which involves construction of wastewater treatment plants will fall in category E1 and may require to conduct Environmental & Social Impact Assessment (ESIA) study as per scope of work and environmental impacts.

According to the Review of IEE and EIA Regulations, 2022, the project falls under Schedule II (List of projects requiring an EIA), Category F (Water supply, Sewerage System and treatment), sub-clause (Wastewater channels / Sewerage System Schemes).

This project involves construction of 01 wastewater treatment plant, replacement of 10,400 ft. existing sewer lines, rehabilitation of 07 disposal station and laying of 20,000 Rft force main.

The project corridor is in direct vicinity of Bahawalnagar city that may have minor mitigatable environmental impacts during construction works like dust generation, noise generation etc.

As there is no resettlement required for this project and project components are being constructed / rehabilitated on government owned land and no private land will be acquired but there might be some mitigatable issues related to social perspective like privacy disturbance etc., during the construction phase of the project, so the project has been categorized as S2 for social component; for which, social management plan / measures mitigating social issues are given in this ESIA.

3.2 Spatial and Temporal Boundaries of Environmental Assessment

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

The spatial and temporal boundaries of the project can be observed through Figure 3-1.

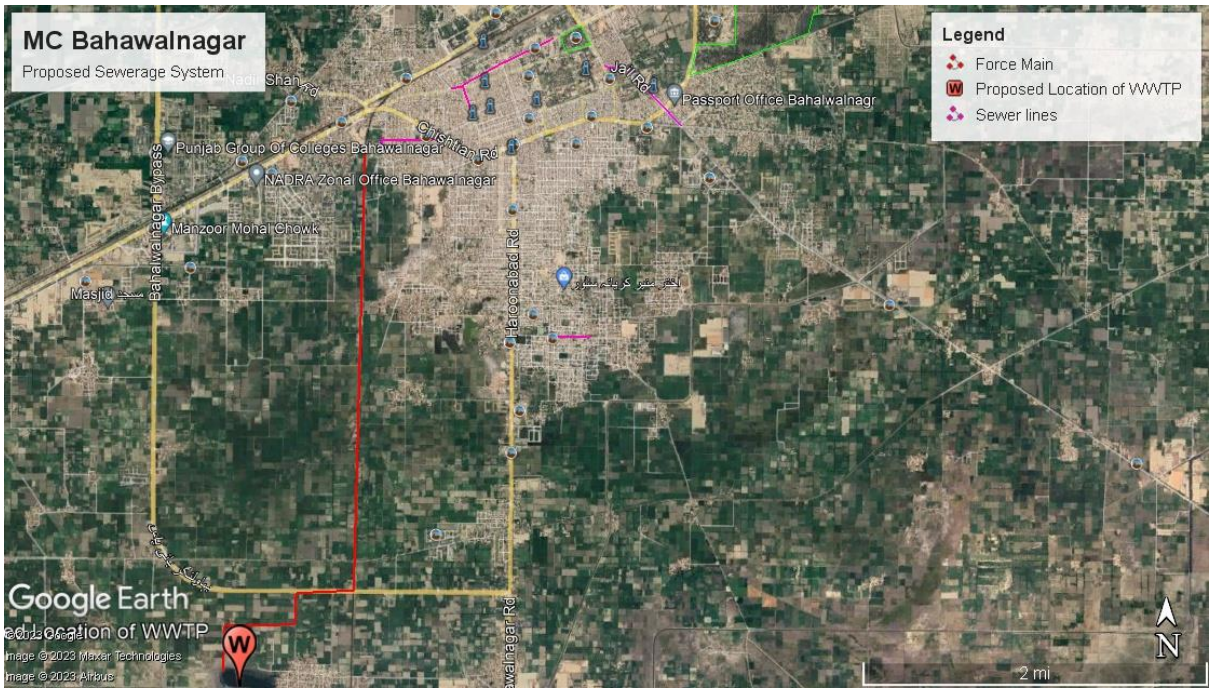


Figure 3-1, Google Map of the Project

3.3 Important Issues and Concerns Raised During Consultation

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

During the survey, respondents were inquired about their views regarding the perceived impacts of the 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 Significant Impacts and Factors to be Determined

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

SECTION - 4: ANALYSIS OF ALTERNATIVES

This chapter deals with the analytical overview of different alternatives that have been considered. The alternative analysis is mainly aimed to mitigate the adverse social & environmental impacts in the project and make technically feasible and economic & financially viable alternative. The analysis has been carried out critically so as to justify the need of the project and to select the most feasible alternative. Besides the economic viability; environmental sustainability and social soundness of the project has also been considered while analyzing different alternatives.

4.1 No Project Option (NPO) / No Project Alternative

This project is for the improvement / rehabilitation of existing sewerage system of MC Bahawalnagar and to construct wastewater treatment plant that will treat the wastewater before its final discharge.

A no project alternative entails no changes in the existing status of the site. Adopting no project alternative / NPO will have different advantages and disadvantages as well;

4.1.1 Advantages of NPO

Adopting no project alternative / NPO will save the World Bank's money, the efforts, time and resources that can be utilized on another project elsewhere in the province and short-term negative impacts that are envisaged during the execution of the project.

4.1.2 Disadvantages of NPO

Adopting NPO will generate more environmental, social and health issues in MC Bahawalnagar as untreated wastewater will be kept on discharging in open areas / agricultural field as usual, damaged / chocked / blocked sewer lines will not be rehabilitated which is dire need of residents to rehabilitate them, disposal stations will not be rehabilitated / improved; adopting NPO will require much more resources to rectify the issues that can be resolved through this project.

Therefore, in the light of the above discussion, proposed project is very much needed for the community and NPO is not acceptable for the project.

4.2 Location Alternatives / Site Alternatives

Three (03) different sites were considered for construction of wastewater treatment plant for Bahawalnagar. As per design engineers, almost 22 acres of land is required for construction of wastewater treatment plant in Bahawalnagar. Environmental & Social Experts along with WWTP Design Engineers visited all the sites to check / finalize which site is more suited and feasible as per design and environmental & social perspectives. Details of

these sites are given below;

4.2.1 Site-01

Site-01 is located in mauza Qamardin Bodla at northern side of Bahawalnagar with direct distance of almost 07 km. As per consultation conducted with MC, almost 17 acres of land is govt. owned at site-01. As per site visit, residents of nearby area have cultivated crops as encroachment on that land. Location marked at Google Maps and pictorial view of site are given below;



Figure 4-1, Site-01 for WWTP on Google Maps



Figure 4-2, Pictorial View of Site-01

4.2.2 Site-02

Site-02 is located near Arif Wala – Bahawalnagar Road at northern side of Bahawalnagar with direct distance of almost 5.5 km. As per consultation conducted with MC, land is privately owned and it is observed during field visit that the land is being cultivated by the owners / farmers and there are estimated 05 nos. of electric poles as well. Location marked at Google Maps and pictorial view of site are given below;



Figure 4-3, Site-02 for WWTP on Google Maps



Figure 4-4, Pictorial View of Site-02

4.2.3 Site-03

Site-03 is located near settlement Hafiz Wala at the southern side of Bahawalnagar with direct distance of almost 5.5 km. As per consultation conducted with MC and concerned patwari, 57 acres of land is govt. owned and freely available for the construction of WWTP. As per site visit, there are no encroachments on the site, rather there is a pond-like situation / slushy land as a seepage drain passes nearby. Location marked on Google Maps and pictorial view of site are given below;

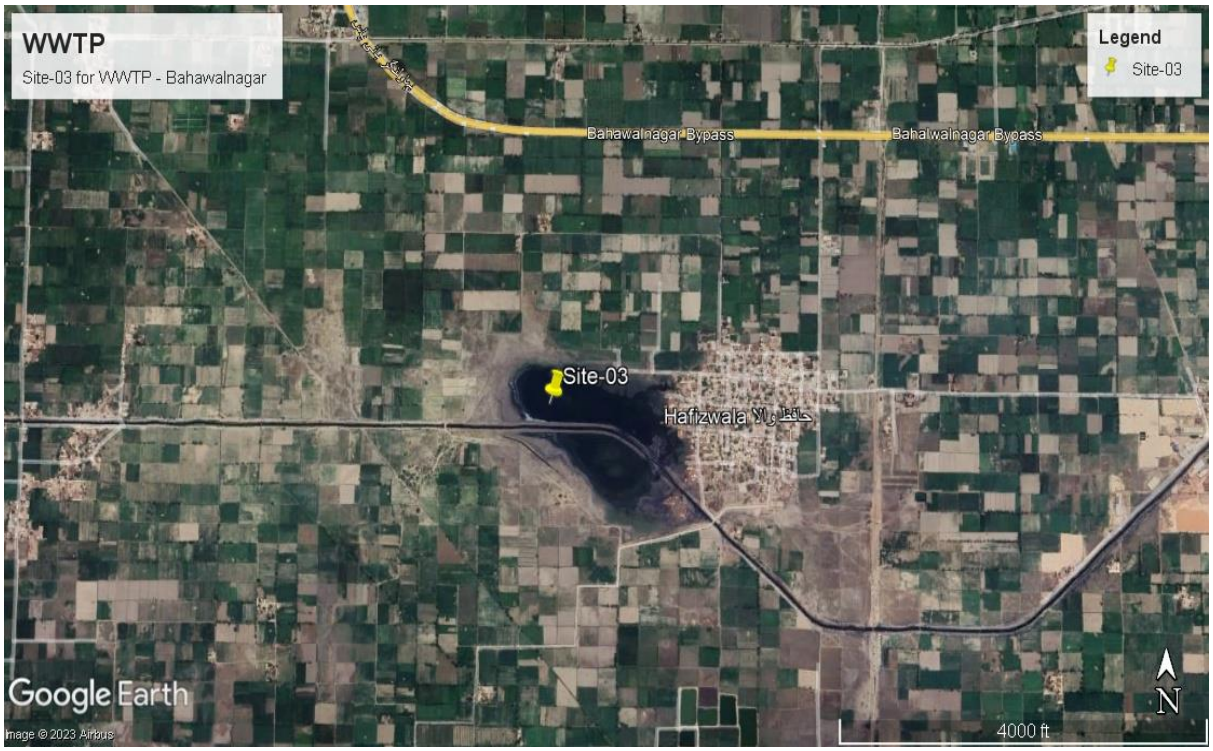


Figure 4-5, Site-03 for WWTP on Google Maps



Figure 4-6, Pictorial View of Site-03

4.2.4 Preferable Site for WWTP

Considering the design criteria, all 03 sites are favourable for construction of WWTP but site-01 and 02 require land acquisition and these sites are also surrounded by small settlements as well while site-03 is freely available govt. land and also there is only one settlement on the eastern side of the site. Land acquisition is an extensive and economic process, while construction of WWTP is a dire need of MC Bahawalnagar as per consultation conducted with local residents and MC; therefore, considering the environmental and social factors, it is determined that Site-03 is a more preferable location as compared to Site-01 and Site-02 for construction of wastewater treatment plant. Comparison of all sites is given under in Table 4-1;

Table 4-1, Comparison of WWTP Sites

Site-01	Site-02	Site-03
Not Preferable	**Not Preferable**	**Preferable**
• 17 acres land available as govt. land • Land acquisition required for 05 acres of land • Agricultural land • Crops are cultivated even on govt. land by nearby residents as encroachment • Compensations to be provided for crops / livelihood • Economically expensive as land acquisition required and compensation has to be provided for livelihood / crops, also at greater distance from MC Bahawalnagar as compared to site-02 & 03 • Surrounded by small settlements • HSE related impacts on surrounding settlements (dust, noise, odor, accidents etc.)	• Entirely private land • Land acquisition required for 22 acres of private land • Agricultural land • Compensations to be provided for crops / livelihood • Economically expensive as land acquisition required and compensation has to be provided for livelihood / crops • Presence of electric poles on site • Surrounded by settlements • HSE related impacts on surrounding settlements (dust, noise, odor, accidents etc.)	• Freely available govt. land • No encroachments • No crops • No electric poles • No land acquisition required • Nearby seepage drain for final discharge of treated wastewater • One settlement on eastern side of proposed site only, where buffer zone of minimum 500 m will be provided

4.3 Design / Technology Alternatives

Various technological options are available in case of wastewater treatment plant. Based upon available and practically implemented alternative MBBR, Activated Sludge Process, Trickling Filters and Waste Stabilization Ponds are considered for comparison purpose. The detail of these technological options is given below;

4.3.1 Option I – Moving Bed Bioreactor (MBBR)

Moving Bed Bioreactors (MBBR) biologically treat wastewater through the use of circulating moving media in aerobic activated sludge environments. The moving media is typically a floating plastic substrate colonized by a community of bacteria called a biofilm. Increased levels of biofilm enhance the biological treatment process by introducing a more robust microbial community to break down nutrients. A high treatment capacity and low maintenance requirements make MBBR systems ideal to most industrial and sewage applications.

A) Advantages

- There are no limitations of height as long as compressors can be suitably used.
- Circular structures can be used to economize on construction costs & time.
- The structures can be easily covered for indoor air quality when needed.
- Requires lower footprints compared to conventional activated sludge.
- Easy to operate and maintain.

B) Disadvantages

- The area per unit volume of the media offered by various vendors is different and also each vendor advocates his own criteria for the relative ratio of volume of media to volume of aeration tank, which makes it difficult to bring about a common and validated standard design criteria.
- The quality of plastic of media varies.
- The verification of whether the media is moving about the entire volume of the tank or merely clumping at the top layers and if so the method of mixing it up through the tank volume without shearing of the biomass on it are issues of infirmity and which may need gentle movers of the media through the volume of the tank.
- Furthermore, the media is a patented product.
- Higher energy input if used without bio-methanation.

4.3.2 Option II – Activated Sludge Process

Activated Sludge Process is the most common suspended growth process used for municipal wastewater treatment. Activated Sludge Process involved:

- Wastewater aeration in the presence of a microbial suspension,
- Solid-liquid separation following aeration,
- Discharge of clarified effluent,
- Wasting of excess biomass, and
- Return of remaining biomass to the aeration tank.

In activated sludge process wastewater containing organic matter is aerated in an aeration basin in which micro-organisms metabolize the suspended and soluble organic matter. Part of organic matter is synthesized into new cells and part is oxidized to CO_2 and water to derive energy. In activated sludge systems the new cells formed in the reaction are removed from the liquid stream in the form of a flocculent sludge in settling tanks. A part of this settled biomass, described as activated sludge is returned to the aeration tank and the remaining forms waste or excess sludge.

The advantages and disadvantages of this technology are given below:

A) Advantages

- Retention time in reactor tank is relatively short resulting in lesser foot print.
- BOD removal rate is superior, 85-95%.
- Transparency of treated effluent is high.
- Stability in sewage temperature fluctuation is inferior in comparison with other methods.

B) Disadvantages

- Primary Sedimentation Tank is required to reduce loading.
- Sludge treatment facility is required.
- Generated sludge volume is larger than from other methods.
- The system has many maintenance and inspection points. Thus, advanced / complicated operational techniques are needed.
- Energy Consumption is more.

4.3.3 Option III – Trickling Filters

The Trickling Filter is an aerobic treatment system that utilizes microorganisms attached to a medium to remove organic matter from wastewater. These systems are known as attached-growth processes. The trickling filter consists of a cylindrical tank and is filled with a high specific surface area material,

such as rocks, gravel, shredded PVC bottles, or special pre-formed plastic filter media. A high specific surface provides a large area for biofilm formation. Organisms that grow in the thin biofilm over the surface of the media oxidize the organic load in the wastewater to carbon dioxide and water, while generating new biomass. This happens mainly in the outer part of the slime layer, which is generally of 0.1 to 0.2 mm thickness.

The incoming pre-treated wastewater is 'trickled' over the filter, e.g., with the use of a rotating sprinkler. In this way, the filter media goes through cycles of being dosed and exposed to air. However, oxygen is depleted within the biomass and the inner layers may be anoxic or anaerobic.

The advantages and disadvantages of this technology are given below:

A) Advantages

- Simple & reliable process
- BOD removal rate is 80-90%
- Low energy requirement
- Less affected by sewage temperature fluctuation compared with Activated Sludge Method
- O&M is easy since no advanced / complicated operational technique is needed

B) Disadvantages

- Primary sedimentation tank must be installed to prevent clogging in the bio filter and distributor's nozzle
- A sludge treatment facility is needed as well
- Flies and odors are generated

4.3.4 Option IV – Waste Stabilization Ponds

Waste Stabilization Ponds (WSPs) are large, man-made water bodies in which blackwater, greywater or faecal sludge are treated by natural occurring processes and the influence of solar light, wind, microorganisms and algae. The ponds can be used individually, or linked in a series for improved treatment. There are three types of ponds, (1) anaerobic, (2) facultative and (3) aerobic (maturation), each with different treatment and design characteristics.

The advantages and disadvantages of this technology are given below:

A) Advantages

- Low cost for O&M
- Resistant to organic and hydraulic shock loads
- High reduction of solids, BOD and pathogens

- High nutrient removal if combined with aquaculture
- Low operating cost
- No electrical energy required
- No real problems with flies or odours if designed and maintained correctly
- Can be built and repaired with locally available materials
- Effluent can be reused in aquaculture or for irrigation in agriculture

B) Disadvantages

- Requires large land area
- High capital cost depending on the price of land
- Requires expert design and construction
- Sludge requires proper removal and treatment
- De-sludging (normally every few years)
- Mosquito control required
- If the effluent is reused, salinity needs to be monitored
- Not always appropriate for colder climates

4.3.5 Conclusion

After detailed analysis in terms of capital cost, O&M cost, site suitability, land area requirement, ease of maintenance, advantages & disadvantages and neighbourhood environment. The experts of design engineers and environmental & social experts decided to adopt Option-IV (Waste Stabilization Ponds – WSP) as a preferred technology over other technological option.

4.4 Environmental Alternatives

The environmental conditions of the project were overall in compliance with the PEQS as per the baseline environmental reports attached with this ESIA report. The construction works during this project will lead to momentary dust / particulate and gaseous pollution, that will eventually subside.

Overall, this project will lead to the improvement of environmental quality of project site as wastewater will be treated through WWTP / WSP before final discharge.

4.5 Economic Alternatives

Raw material for construction will be purchased from nearby area / from local vendors, 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 THE PROJECT

This chapter presents all aspects of the project. It describes the nature of the project, its location, designs and site layout / plan. It presents the activities that will be involved during all stages of 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 Overview of the Project

Following project has been designed to improve the existing infrastructure of sewerage system with the provision of better living standards and the environment for urban populations in project area.

"Improvement and Extension of Sewerage System in Bahawalnagar City"

This project includes the improvement and / or construction of disposal stations, force main and Waste Stabilization Pond in MC Bahawalnagar. Project activities include:

- Rehabilitation of 07 disposal stations including pumping machineries, plaster of wall, painting etc.
- Laying of 20,000 Rft force main including excavation, backfilling and restoration of roads.
- Replacement of 10,400 ft. sewer lines.
- Construction of Wastewater Treatment Plant / Waste Stabilization Pond which involves excavation of ponds, construction of inlet channel and effluent channels, and construction of office building and office.

Table 5-1, Scope of Work

Sr. No.	Proposed Works	Nos. / Length
1.	Rehabilitation of disposal stations	07 Nos.
2.	Laying of force main	20,000 Rft
3.	Replacement of sewer lines	10,400 ft.
4.	Construction of Wastewater Treatment Plant	01 No.

5.2 Objectives of the Project

The project aims at improvement of infrastructure of municipal services including sewerage system for improved municipal service delivery.

The Project comprises of the replacement of old, outlived, damaged or worn-out components in existing infrastructure for;

- Improvement of service delivery level of the municipal services in the served areas of the city for provision of better basic urban services for improved livability of the citizen.
- Reduction in annual O&M charges of the infrastructure due to reduced repairs in the forthcoming years because of repair or replacement of infrastructure components.
- Reduction and prompt addressal of the public complaints regarding municipal service delivery.
- Reduction in surcharging and overflowing of sewers thus reducing waste water ponding in the city. The objectives of the projects are in line with Sector Objectives.
- Construction of waste water treatment plant to avoid environmental hazards.

5.3 Location & Site Layout of the Project

The project is located in Bahawalnagar City, 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-west of Lahore and about 175 km (109 mi) miles at North-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. Project location map, site layout map and google map are given below in Figure 5-1, Figure 5-2 and Figure 5-3 respectively;

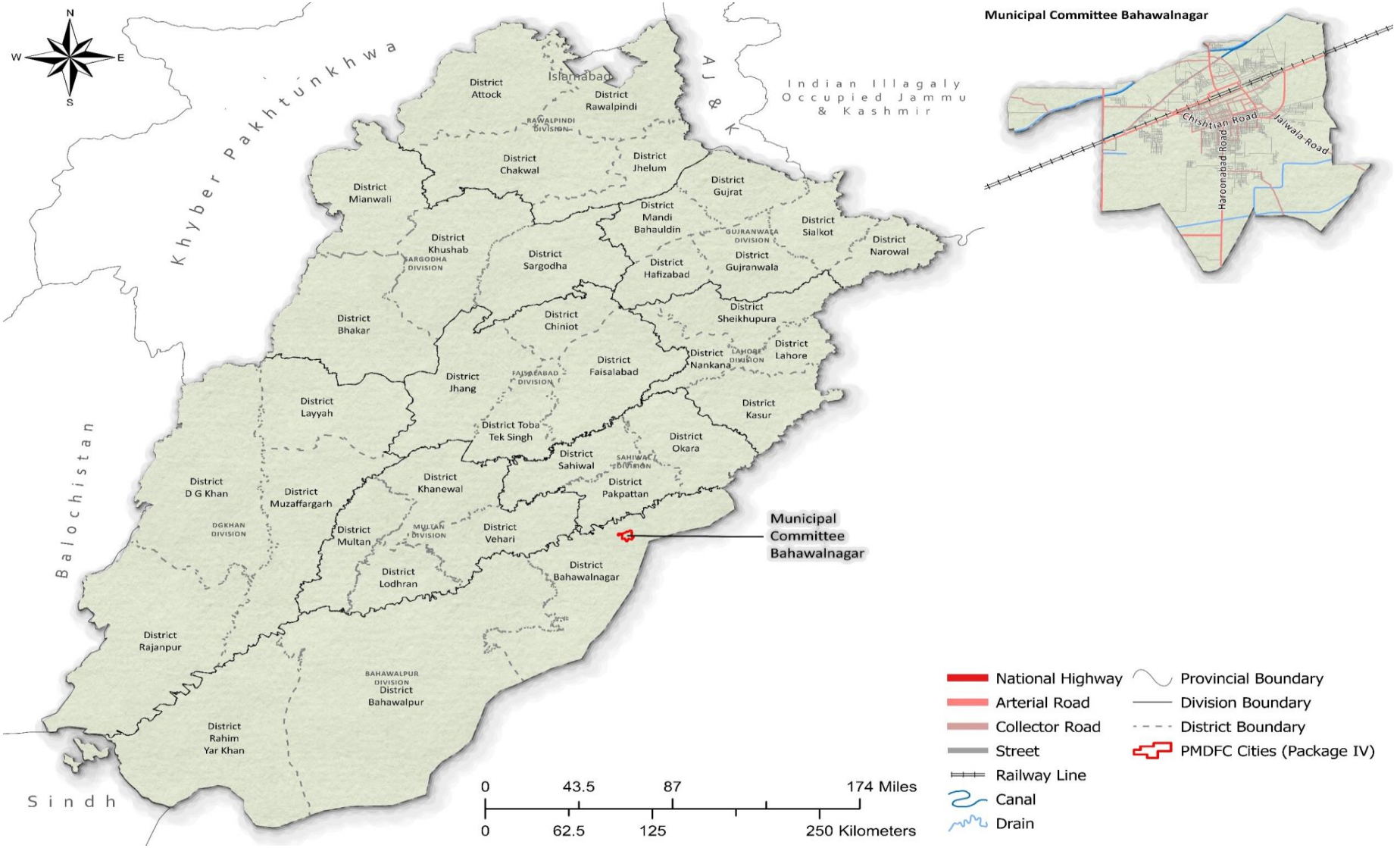


Figure 5-1, Project Location Map

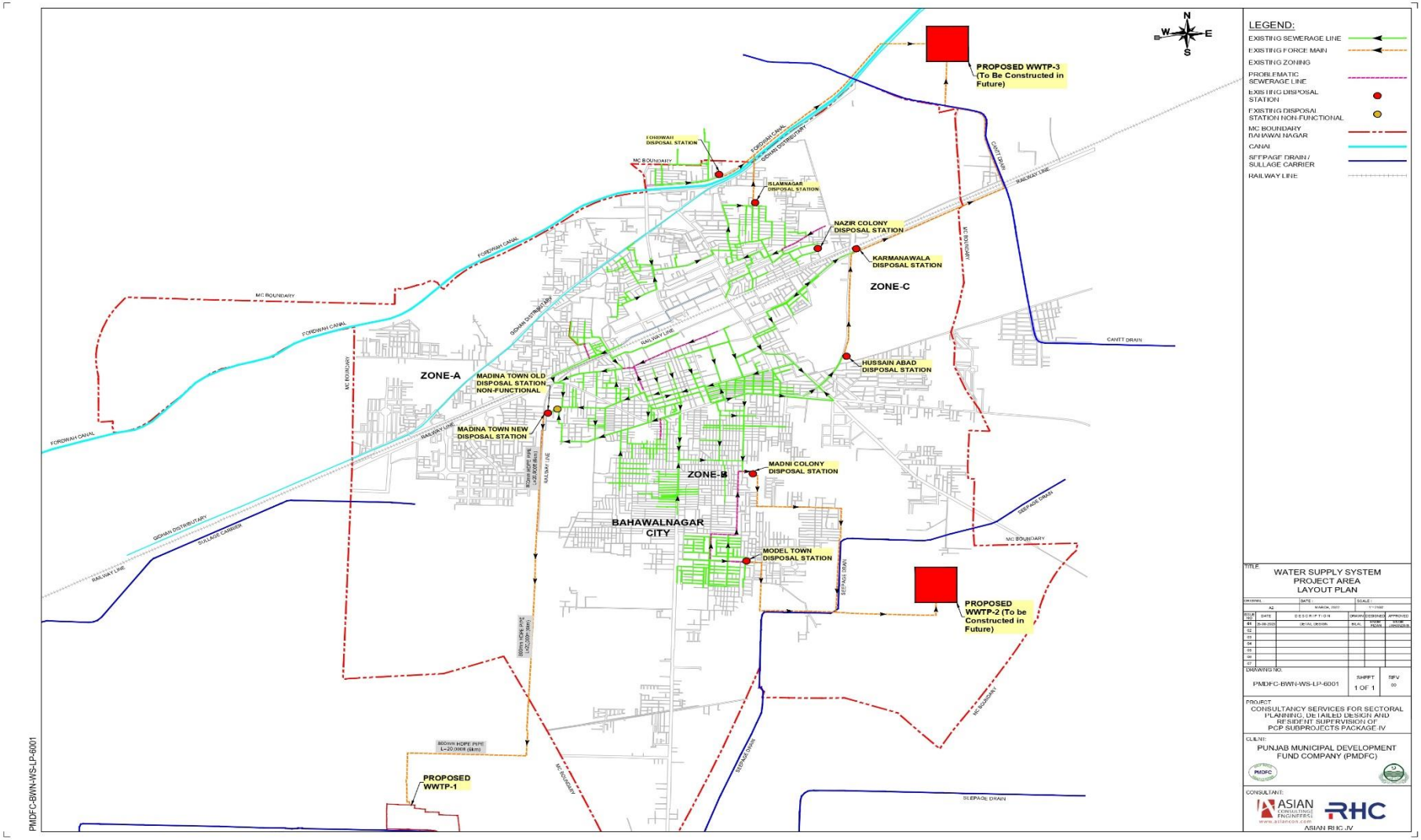


Figure 5-2, Project Layout Map

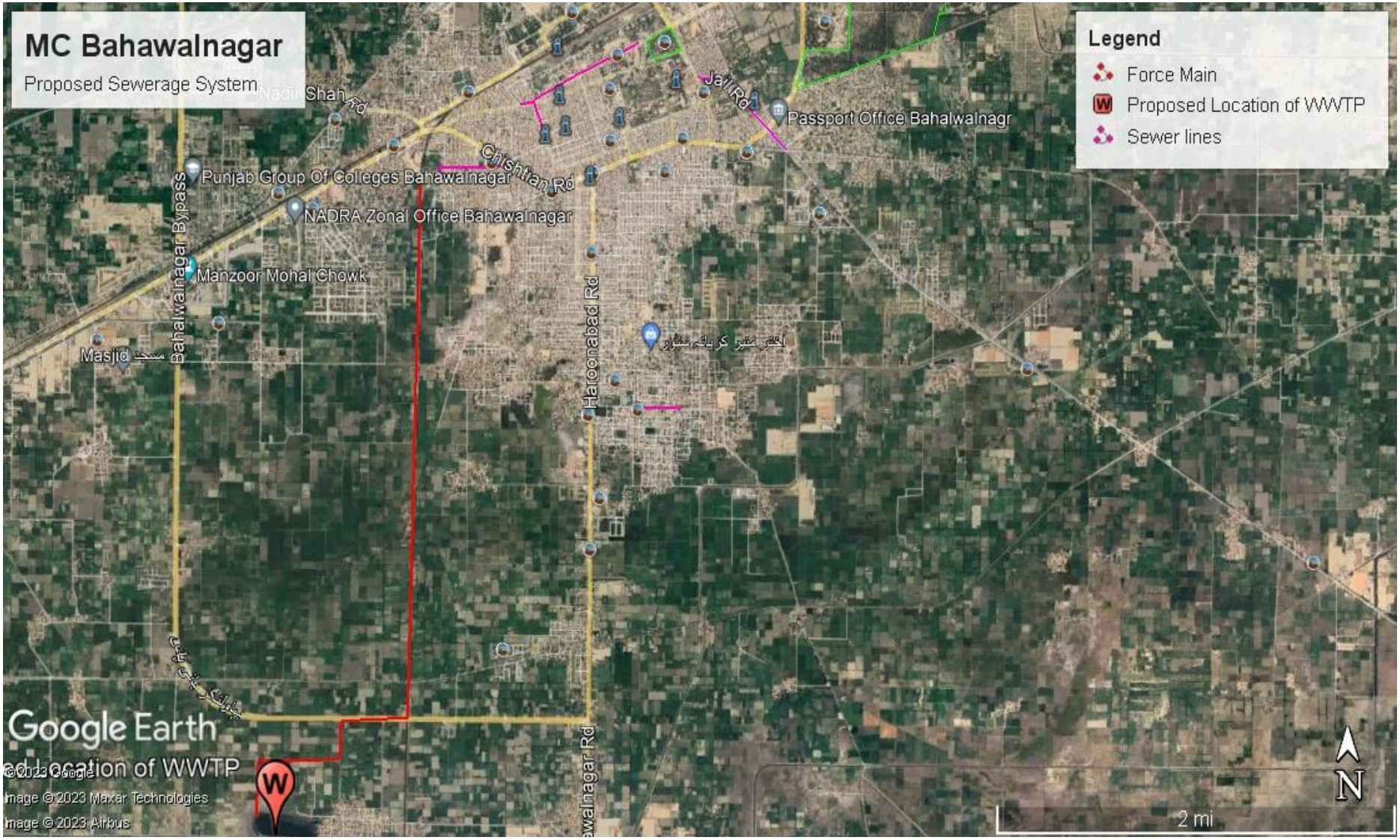


Figure 5-3, Project Google Map

The site has been selected on the recommendation of MC Bahawalnagar and PMDFC. 01 wastewater treatment plant will be constructed on available open space near Hafiz Wala village at southern side of the city. Following 07 disposal stations will also be rehabilitated:

- Islamnagar Disposal Station
- Nazir Colony Disposal Station
- Madina Town Disposal Station
- Hussain Abad Disposal Station
- Madni Colony Disposal Station
- Model Town Disposal Station
- Karamanwala Disposal Station

In order to make the system efficient, following missing links of sewers will be required to be laid:

Table 5-2, Sewer Lines Work

Sr. No.	From	To	Approximate Length in Feet	Dia. In Inches
1.	Melad Chowk	Mubarak gate chowk via Circular Road	1,000	18
2.	Eid Gah road (Laleka Chowk)	Alvi Bakers Basti Sadar Din	3,600	18
3.	Model Town	Near Disposal Model Town	1,300	18
4.	Hussain Abad Chowk	Waheed Arshad Chowk	2,500	24
5.	Madina Town	Madina Town Disposal	2,000	21

5.4 Land-Use on the Site

This project includes construction of one wastewater treatment plant, laying of 20,000 Rft force main, rehabilitation / improvement of 07 existing disposal stations and replacement of 10,400 ft. sewer lines in Bahawalnagar.

Site of proposed wastewater treatment plant is located near settlement Hafiz Wala at the southern side of Bahawalnagar with direct distance of almost 5.5 km. As per consultation conducted with MC and concerned patwari, 57 acres of land is govt. owned and freely available for the construction of WWTP. As per site visit / observations, there are no trees (although small bushes / grass exists) and no encroachments on the site, rather there is a pond-like situation / slushy land as a seepage drain passes nearby. Location marked on Google Maps and pictorial view of site are given below;

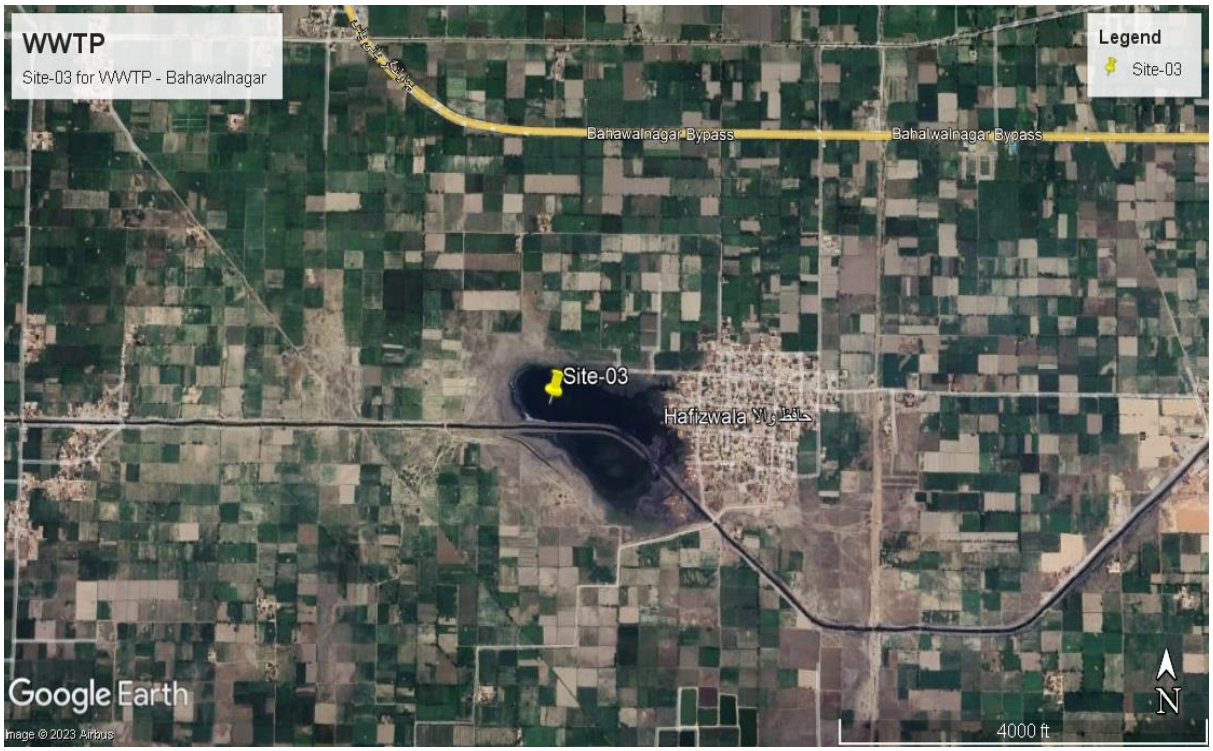


Figure 5-4, WWTP's Site on Google Maps



Figure 5-5, Pictorial View of WWTP's Site

Rehabilitation of following 07 existing disposal stations is also proposed in this project;

- Islamnagar Disposal Station
- Nazir Colony Disposal Station
- Madina Town Disposal Station
- Hussain Abad Disposal Station
- Madni Colony Disposal Station
- Model Town Disposal Station
- Karamanwala Disposal Station

Force main (20,000 Rft) from Madina Town disposal station to wastewater treatment plant will be laid along / in RoW of railway track and road.

10,400 ft. existing sewer lines will be replaced / rehabilitated (1,000 ft. from Melad Chowk to Mubarak Gate Chowk via Circular Road, 3,600 ft. from Eid Gah Road – Laleka Chowk to Alvi Bakers Basti Sadar Din, 1,300 ft. from Model Town to Near Disposal Station Model Town, 2,500 ft. from Hussain Abad Chowk to Waheed Arshad Chowk and 2,000 ft. from Madina Town to Madina Town Disposal Station). Representative pictures of project sites are given below in Figure 5-6;

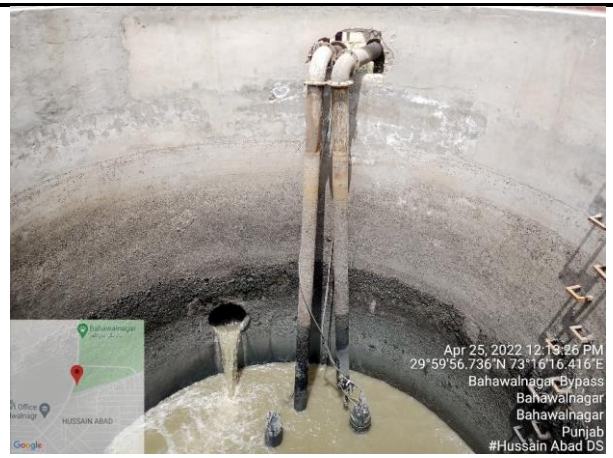
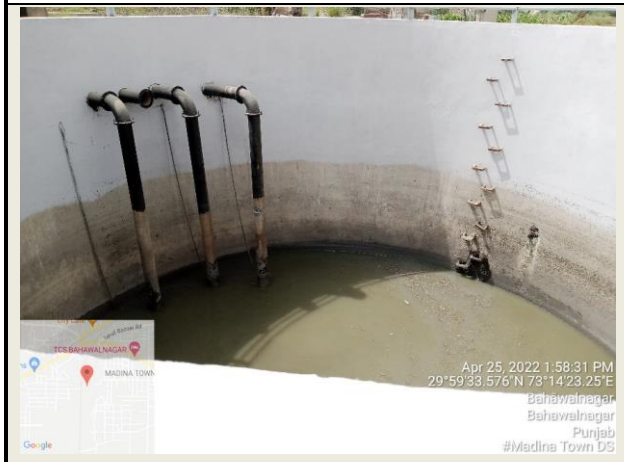
		
Nazir Colony Disposal Station	**Hussain Abad Disposal Station**	**Madina Town Road / Sewer Line**
		
Madina Town Disposal Station	**Route of Force Main along the Road**	**Proposed Site of WWTP**

Figure 5-6, Representative Pictures of Project Sites

5.5 Road Access

The main roads near project site are Bahawalnagar Bypass Road, Haroonabad – Bahawalnagar Road, Bahawalnagar – Chishtian Road, Minchinabad – Bahawalnagar Road, Chishtian Road, Madia Town Disposal Station Road, Model Town Road, Eid Gah Road, Khan Baba Road, Tehsil Bazar Road, Jail Road and other minor / link roads within the city.

5.6 Cost & Magnitude of the Project

Total cost of project is estimated to be 1,293.067 million PKR. The magnitude of the project is to improve the sewerage system of almost whole of the MC Bahawalnagar.

5.7 Labour Requirement

At the peak of construction activities, up to 30 laborers are likely to be employed for the work at project out of which approximately 75% of the workforce will be from the project area while almost 25% of labour (skilled) would be hired from outside the project area.

During operation phase, 27 employees would be required which would include Laboratory Technician, Sub-Engrs., Sanitary Supervisors, Sanitary Workers, Driver and Security Guard.

5.8 Schedule of Implementation

Detailed feasibility studies and designing of the project have been completed. Necessary legal, administrative and financial formalities have been also completed. The project is expected to be completed within 18 months from the date of project execution / environmental approval. Subsequently, the construction, operational and maintenance aspects of the project will be undertaken by the proponent.

5.9 Scope of Work

This project includes the improvement and / or construction of disposal stations, force main and Waste Stabilization Pond in MC Bahawalnagar. Project activities include;

- Rehabilitation of 07 disposal stations including pumping machineries, plaster of wall, painting etc.
- Laying of 20,000 Rft force main including excavation, backfilling and restoration of roads
- Replacement of 10,400 ft. sewer lines
- Construction of Wastewater Treatment Plant / Waste Stabilization Pond which involves excavation of ponds, construction of inlet

channel and effluent channels and construction of office building and office.

Table 5-3, Scope of Work

Sr. No.	Proposed Works	Nos. / Length
1.	Rehabilitation of disposal stations	07 Nos.
2.	Laying of force main	20,000 Rft
3.	Replacement of sewer lines	10,400 ft.
4.	Construction of Wastewater Treatment Plant	01 No.

5.10 Project Description

The existing sewerage system of the Bahawalnagar is designed as a combined system to cover about 60% area of the city. The system is comprised of approximately 178 km length of sewers with diameters ranging from 9 inch to 48 inch (R.C.C. pipes). There are 05 disposal stations (DS) in the city, 04 Nos. are operational while 1 DS is under Construction. The existing sewerage system is divided into three zones (Zone-1, Zone-2 & Zone 3). The wastewater from each zone is collected in DS and discharge in Sukh Bias Creek without any treatment. The Wastewater is also being used in agriculture fields without any treatment. There is no Wastewater Treatment Plant (WWTP) is Bahawalnagar City.

Existing sewerage system in Bahawalnagar City is equipped with the following assets.

- Sewer Lines
- Force Mains
- Disposal Stations

This project includes the improvement and / or construction of disposal stations, force main and Waste Stabilization Pond in MC Bahawalnagar. Project activities include;

- Rehabilitation of 07 disposal stations including pumping machineries, plaster of wall, painting etc.
- Laying of 20,000 Rft force main including excavation, backfilling and restoration of roads
- Replacement of 10,400 ft. sewer lines
- Construction of Wastewater Treatment Plant / Waste Stabilization Pond which involves excavation of ponds, construction of inlet

channel and effluent channels and construction of office building and office.

5.10.1 Proposed Sewerage Zones

According to topology and serving area, total city area is divided into three sewerage zones. Zones with proposed WWTPs has been shown in Figure 5-7.

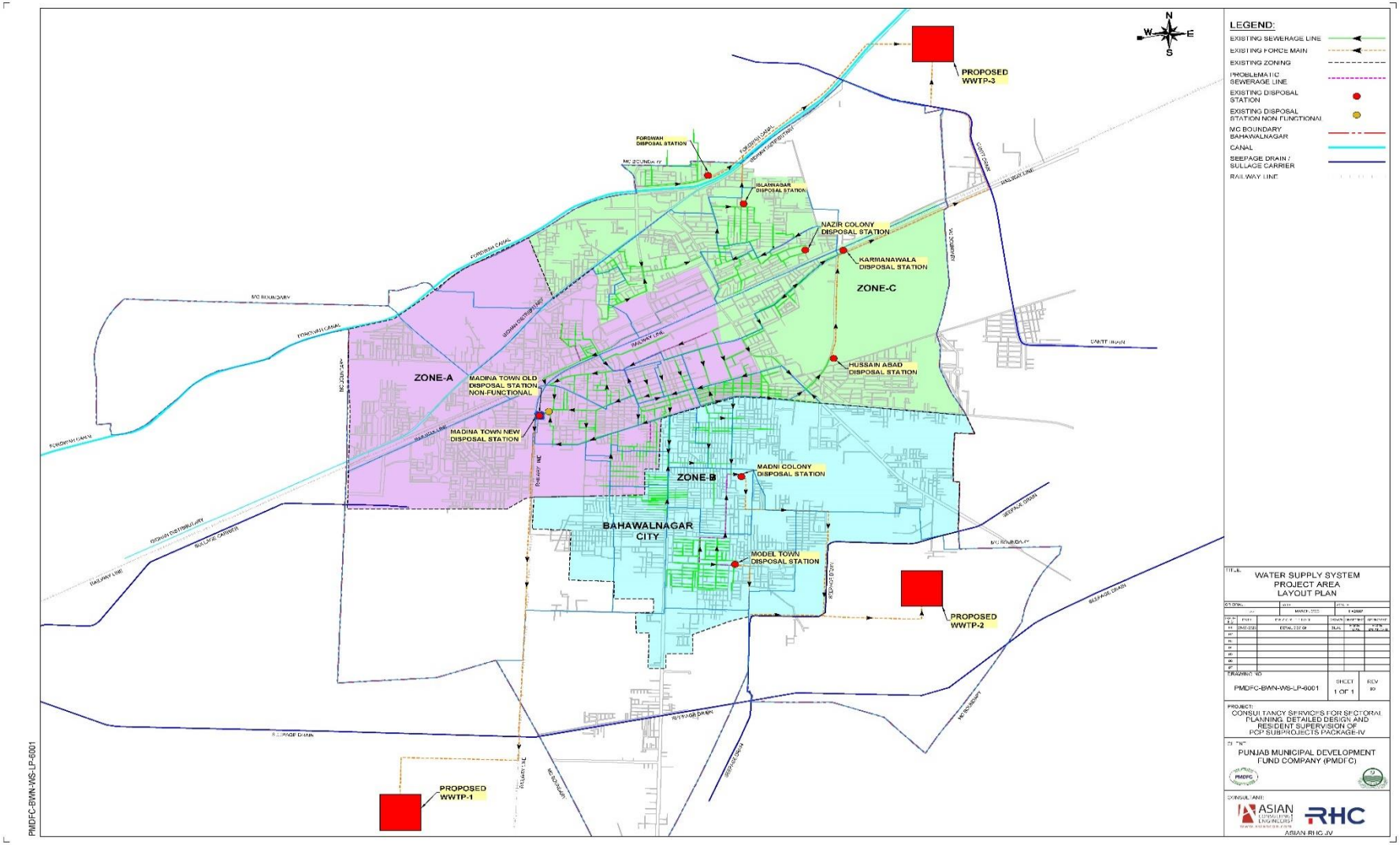


Figure 5-7, Proposed Sewer Zones in MC Bahawalnagar

A) Zone-A

Zone-A consists of the area above Gidhan Distributary. Block Area, Nizamabad and Madina Town lies in this zone. For this project, WWTP is being constructed for this zone only. All the wastewater flow from these areas disposes in Madina Town disposal station. To treat the waste water, a treatment plant has been proposed in the south near Hafiz Wala along with seepage drain as Government land is easily available there. The proposed force main for this zone will be 800mm diameter (PN-8). The length of the force main will be around 20,000 ft which will be laid along Bypass Road. The population in 2017 was 72,802 and will be 95,139 in 2032. All the pumps in the Madina town disposal station will be upgraded.

Disposal Station	Madina Town	
Population	2017	72,802
	2022	79,594
	2032	95,139
Avg. Domestic Flow	Cusec	4.508
	MGD	2.43
Avg. Non-Domestic Flow	Cusec	0.90
	MGD	0.49
Total Avg. Flow	Cusec	5.4
	MGD	2.91
Peak Factor		2.5
Peak Flow	Cusec	13.5
Infiltration (10% of Avg. Flow)	Cusec	0.5
Storm Water (50% of Peak Flow)	Cusec	6.8
Design Flow	Cusec	20.8
	MGD	11.21

1. Design of Force Main

Data			
Discharge	=	20.00	ft^3/sec
Length	=	20,000	ft
Velocity in pipe	=	6.00	ft/sec
Cross sectional area	=	3.33	sq.ft
Diameter of pipe	=	24.73	inches
Adopted size	=	28.50	inches
	=	**800 mm OD HDPE**	
Cross sectional area of adopted pipe	=	4.43	sq.ft
Actual velocity in pipe	=	4.52	ft/sec
$V^2/2g$	=	0.32	
Pipe			
Hazen William Formula		$V = 1.318 \times C \times R^{0.63} \times S^{0.54}$	

V	=	4.52	ft/sec
C	=	130	
R=D/4	=	0.594	ft
R^.63	=	0.7201	
S^.54	=	0.0366	
S	=	0.0022	ft/ft
L	=	20,000	ft
h_L = Ls x length of pipe	=	43.76	ft
20 % of head loss in fittings	=	8.75	ft
Total head loss in pipe (Fittings + Pipe)	=	**52.51**	**ft**
Level at Suction Point (Base level of Wet Well)	=	468.33	ft
Level at Delivery Point (WWTP)	=	497.00	ft
Elevation Difference (A)	=	28.67	ft
Head Loss in Pipe & Fittings (B)	=	52.51	ft
Total Head (A + B)	=	81	ft
Say	**=**	**85**	**ft**
Pressure of Pipe	=	2.54	Bars

2. Pumping Arrangements

Design Period of Pumps = 15 years

Designed Pumping Head = 85 ft

Total Requirement

Design Flow = 20 Cusecs

Pump	Flow (Cusec)	Flow (GPM)	Head (ft)	Pump type	Status
Pump # 1	5	1,870	85	Vertical Cordon Shaft Pumps	Working
Pump # 2	5	1,870	85	Vertical Cordon Shaft Pumps	Working
Pump # 3	5	1,870	85	Vertical Cordon Shaft Pumps	Working
Pump # 4	5	1,870	85	Vertical Cordon Shaft Pumps	Working
Pump # 5	5	1,870	85	Vertical Cordon Shaft Pumps	Stand-by

3. Delivery Pipe of Pump

Delivery Pipe			
Q	=	A x	V
Q	=	5	Cusec
V	=	6	ft/sec
Diameter	=	12.36	inch
	Say	14	inch

4. Comparison of Force main

Parameters	Unit	Alternative - 01	Alternative - 02	Alternative - 03	Alternative - 04
Diameter of Pipeline	mm	630	710	800	900

Inner diameter of Pipeline	mm	570.00	642.20	723.80	814.20
	in	22.44	25.28	28.50	32.06
Velocity in Pipeline	ft/sec	7.29	5.74	4.52	3.57
Head Loss incl. fitting losses	ft	168.18	94.08	52.54	29.62
Total Pumping Head	ft	196.85	122.75	81.21	58.29

Based on Head and considering the capital cost, 800mm HDPE force main has been considered.

B) Zone-02

Zone-02 lies in the South-East of the city. Madni Town and Madina town disposal station lies in this zone. Disposal stations are currently disposing wastewater in the seepage drain. A separate wastewater treatment plant in required in this zone as it is difficult to divert all flow to WWTP-01. The population in the year 2032 will be 62,572 persons and the design flow will be 10.24 MGD. Two force main will be laid separately. One force main will be combination of force mains of Fordawa and Islamnagar Disposal station and other force main be combination of force main of Nazir Colony and Karmanwala disposal station.

C) Zone-03

This system's disposal facility is located in Islam Nagar, and waste water from it is pumped through a 24" force main into a seepage drain. For the purpose of collecting waste water from the aforementioned areas, the main outfall sewer is 36" RCC pipe.

This zone also comprises of Nazir Colony and Ford Wah disposal stations. Nazir colony disposal station has aged its life and its wastewater was bypassed into Islam Nagar DS but now it is being disposed of into the Railway seepage drain. Ford Wah disposal station receives wastewater from its nearby areas through 24" incoming sewer and ultimate disposal is done through 10" PVC force main into the cant seepage drain. Force main coming out from Nazir colony and Ford Wah disposal station will be combined and then dispose of the sewage into WWTP-03.

5.10.2 Repairs / Replacements in the Existing Disposal Stations

Seven out of existing 08 disposal stations will be rehabilitated / improved by repairs and replacement of the worn out, outlived, dormant, missing, and damaged components. The detail of the works / installations included in this project for each of the seven disposal stations is given below:

A) Islamnagar Disposal station

i. Replacement of 4 (2.5cfs) Pumps with motors (40HP)

B) Nazir Colony Disposal Station

i. Replacement of 2 Pumps (1.5cfs) with motors (20HP)
ii. Replacement of suction and delivery having diameter of 8" for all pumping units
iii. Construction of Pump House
iv. Construction of Screening Chamber
v. Rehabilitation of Wet Well
vi. Rehabilitation of Electric Control Equipment

C) Madina Town Disposal Station

i. Supplying and installation of 2 Pumps (1.5cfs) with motors (30HP)

D) Hussain Abad disposal Station

i. Electric wiring (40HP) of 2 motors
ii. Boundary Wall and gate
iii. Repair of 8" Check Valve

E) Madni Colony Disposal Station

i. Replacement of Pumping machineries including Valves, Suction Pipe & Delivery Pipe
ii. Replacement of Pen Stock of Screening Chamber
iii. Replacement of Suction pipe (24") and Delivery Pipe (20")

F) Model Town Disposal Station

i. Replacement of 03 Non sullage Pumping Unit.
ii. Replacement of suction (8") and delivery (8") pipes of all pumping units
iii. Repair of One Pump House, two collecting Tanks and one screening chamber
iv. Repair of Boundary wall and staff quarter
v. Rehabilitation of electric control equipment

G) Karmanwala Disposal Station

i. Boundary Wall and gate
ii. Replacement of Sluice Valve (8")

5.10.3 Replacement of Sewer Lines

In order to make the system efficient, following missing links of sewers will be required to be laid:

Table 5-4, Sewer Lines Work

Sr. No.	From	To	Approximate Length in Feet	Dia. In Inches
1.	Melad Chowk	Mubarak gate chowk via Circular Road	1,000	18
2.	Eid Gah road (Laleka Chowk)	Alvi Bakers Basti Sadar Din	3,600	18
3.	Model Town	Near Disposal Model Town	1,300	18
4.	Hussain Abad Chowk	Waheed Arshad Chowk	2,500	24
5.	Madina Town	Madina Town Disposal	2,000	21

5.10.4 Wastewater Treatment Plant

A) Objectives of Wastewater Treatment

a) Under the existing laws, all the wastewaters, originating from any source, and being discharged to an inland water body, within Punjab, shall conform to the requirements of the applicable Punjab Environmental Quality Standards (PEQS).

b) In raw municipal wastewaters, typically, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS) and oil & grease, exceed the PEQS limits. Therefore, STPs shall be designed, primarily, to bring these parameters within the PEQS limits, prior to their discharge to the natural water body, directly, or indirectly.

c) Applicable PEQS limits, for the treated effluent, prior to their discharge, are as given in Table 5-5, PEQS Limits for Treated EffluentTable 5-5;

Table 5-5, PEQS Limits for Treated Effluent

Parameters	PEQS Limits
Biochemical Oxygen Demand – BOD (mg/l)	80
Chemical Oxygen Demand – COD (mg/l)	150
Total Suspended Solid – TSS (mg/l)	200
Oil & Grease (mg/l)	10

B) Design Wastewater Flows and Characteristics

a) The process design of the STPs shall primarily be carried out at the anticipated maximum-day BOD and TSS pollution loads, whereas the hydraulic design of all the sewage conveyance and transfer components shall be carried out at peak flows. The design sewage flows, average-day, max-day and peak-hour, shall be as determined for the design of the respective sewerage systems.

b) MARA (2003) suggests per capita daily BOD contribution value of 40 grams, for the municipal wastewater, for developing countries. Same is adopted for the project.

c) MARA (2003) suggests a COD-to-BOD ratio, for the typical municipal wastewater, as 2.00. Same is adopted. Consequently per capita daily COD contribution works out to be 80 grams.

d) Keeping in view, the typical ratio of TSS-to-BOD, in municipal wastewaters, per capita daily TSS contribution is taken as 50 grams.

e) For the given constant daily BOD, COD and TSS contributions, their concentration in wastewater will vary inversely with the quantity of wastewater flows. These concentrations, during average-day and max-day flow shall, therefore, be determined, accordingly, as part of the analysis for the STPs.

C) Proposed Treatment Technology

In view of the recommendations, made by the HUD&PHED-Punjab Technical Committee, and the factors and considerations, as reiterated below, Waste Stabilization Ponds (WSPs) system is proposed, for the treatment of sewage, prior to its disposal:

a) It is established that local municipal bodies, particularly of intermediate cities, at present or in near future, would not be in a position to afford the high recurring operation & maintenance costs (mainly owing to high electric energy requirement), associated with the treatment systems other than waste stabilization ponds. Consequently, provision of any of the mechanized systems, would, ultimately lead to non-operation of these treatment plants and mere wastage of the capital investments made on this account.

b) Mechanized treatment systems invariably need a higher level of operational skill, responsibility, supervision and control, for their proper functioning, which under the prevailing conditions is envisaged to be difficult to be maintained by the local municipal bodies. Under these circumstances, the treatment systems, which are relatively easy to monitor, operate and maintain need be adopted. WSPs are almost self-operating and do not need much operational intervention, for their proper functioning.

c) Climatic conditions, of the area, in terms of high ambient temperatures and longer durations of intense solar radiation, which enhance microbial activity and photosynthetic production of algal oxygen, favour the selection of WSPs.

d) In contrast with mechanized treatment systems, WSPs systems do not have any permanent structure, except for wastewater screening and pumping station and plant building, if any. Consequently, they offer a much higher degree of flexibility in terms of system change in future. If in future, the conditions governing the selection are changed, the land used for ponds can easily be reclaimed and put to other urban uses and a mechanized treatment system with much lesser area requirement can be installed in its place.

e) Floating treatment wetlands (FTWs) or islands are small artificial platforms that allow these aquatic emergent plants to grow in water that is typically too deep for them. Their roots spread through the floating islands and down into the water creating dense columns of roots with lots of surface area. Floating Wetlands will be installed in Facultative ponds, which will reduce the area significantly to half.

D) Proposed System and Facilities

a) The facilities, required for each STP, shall comprise the following:

1) Raw Wastewater Screening and Pumping Station
2) Raw Wastewater Distribution Mains (Lined Channels or Pipes)
3) Waste Stabilization Ponds – WSP(Earthen)
4) Treated Effluent Channel (Earthen)
5) Plant Building
6) Roads
7) Boundary Fence
8) Electrical Transmission Line to Plant
9) Transformer

b) Each STP shall be provided with two or more equal-size WSP Units, of specified treatment capacity, placed in parallel.

c) One WSP Unit shall comprise two facultative ponds, of equal surface area, placed in series, with the upstream pond provided with deepened anaerobic zone at inlet, to act as an anaerobic pond. This provision is to optimize the utilization of the available space.

d) Deepened anaerobic zone, provided at the start of the upstream facultative pond, shall act as pre-treatment and help to significantly reduce the surface area and volume requirements of the subsequent facultative ponds, for the required degree of treatment,

by removing a significant amount of influent BOD and TSS. Anaerobic zone shall be of such depth, to exclude oxygen and encourage the growth of anaerobic bacteria, to degrade the organic matter in the influent and to produce anaerobic biomass and Methane (CH4).

e) In facultative ponds, biological treatment of wastewater is carried out, by symbiosis of algae and bacteria. The principal source of oxygen, required for aerobic treatment in upper pond layers, is oxygen transferred from atmosphere by diffusion and wind mixing, as well as the algal oxygen produced by photosynthetic process. In lower layers of ponds, treatment takes place under anaerobic conditions.

f) In a typical WSP Unit, two ponds, in series, are provided, because of the established fact that ponds in series (two or more) are more efficient than one pond, with equal total detention periods.

g) Maturation ponds, to be provided after facultative ponds, are used for the additional removal of pathogenic agents such as bacteria, fungi, protozoa and viruses. Since the objective of the treatment is merely to conform to the PEQS, which does not impose any limit on the bacteriological quality of the treated effluents; therefore, no maturation ponds would be provided. Under the local conditions, this would be an unnecessary cost, on account of additional land acquisition and construction.

E) Waste Stabilization Ponds (WSPs)

Waste Stabilization Ponds (WSPs), also termed as oxidation ponds, are large earthen basins, in which raw wastewater is treated entirely by natural processes, involving both algae and bacteria. They are the most important method of wastewater treatment in hot climates. However, since the rate of oxidation is slow so large areas are required for their construction. The area requirement is of the order of 10 times of those required for activated sludge (conventional) or trickling filter process. Their specific advantages are simple operation, low operation & maintenance costs and no sludge management problem. Quantities of sludge produced are less, due to long stabilization periods and no daily waste sludge disposal is needed. Accumulated sludge, in the ponds, need to be removed, after very long operational durations of the order of 3-5 years.

Generally, the flow-through system comprises of anaerobic, facultative and maturation (optional) ponds, in series.

Table 5-6 presents, in summarized form, the overall qualitative analysis with respect to certain key parameters.

Table 5-6, A Qualitative Analysis with Respect to Certain Key Parameters

Sr. No.	Parameters	Waste Stabilization Pond
1.	Plant Area Requirement	Very High
2.	Operation and Maintenance Cost	Minimum
3.	Process Energy Requirement	Nil
4.	Operational Supervision & Control	Minimum
5.	Construction Cost	Moderate
6.	Capital Cost	High [1]
7.	Process Mechanical Equipment	No
8.	Quantities of Sludge Produced	Minimum
[1] Largely depends upon the cost of land		

F) Design Basis and Criteria

1. General

The process design of the WSPs shall, primarily, be based upon the provisions, laid down in MARA (2003), which is deemed to be the most authentic practicing literature on designs of such treatment systems, in developing countries.

2. Design Temperature

Design capacities of WSPs, for required degree of treatment, are inversely related to the ambient temperatures. Higher ambient temperatures are favourable, owing to enhanced microbial activity and photosynthetic production of algal oxygen.

Generally, minimum of the mean monthly ambient temperatures, in an area, is taken as design temperature, which would normally occur in January or December.

At the design stage, ambient temperature data, for the area, would be collected, from the meteorological department, and analysed. However, it is estimated that in the area, under consideration, mean monthly ambient temperatures would remain equal or above 20^{O} C, for about 9 months (March to November) of the year.

Report (2018), by the HUD&PHED-Punjab Technical Committee, recommends that in order to make the system economical, and reduce the land requirements and costs, design temperature shall be taken as 20^{O} C, for areas of central and southern Punjab. Same is adopted for the Project. This will partly compromise the efficiency of the system, only during 3 months of the year.

3. Design Criteria for Anaerobic Zone

Volumetric Capacity: Volumetric capacity of the zone shall be determined on the basis the following two criteria, and larger of the value shall be

adopted:

a. Volumetric BOD Loading Rates (g-BOD/m3-d), Table 5-7

b. Detention Period (d)

Table 5-7, Permissible Volumetric BOD Loading Rates (MARA, 2003)

Design Temperature – T	Volumetric BOD Loading	BOD Removal
(^{0}C)	(g-BOD/m^3-d)	(%)
< 10	100	40
10 – 20	20 (T) – 100	2 (T) + 20
20 – 25	10 (T) + 100	2 (T) + 20
> 25	350	70

4. Other Criteria

Table 5-8, Anaerobic Zone: Other Criteria

Parameter	MARA (2003)	Adopted
Design Temperature (^{0}C)		20
Volumetric BOD Loading (g-BOD/m^3-d) – Per Table 5-7	300	300
Detention Period @ Average Day Flow (d)	> 1.0	1.0
BOD Removal Efficiency (%) – Per Table 5-7	60	50
Liquid Depth (m)	2 – 5	3.50
Free Board (m)	0.5 – 1	0.50
Side Slope		
Internal	1V:3H	1V:1½H
External	1V: 1½–2H	1V:1H

5. Design Criteria for Facultative Ponds

Surface Area of Pond: Surface area of the pond shall be determined on the basis the Surface BOD Loading Rate (L_S), in accordance with the following Equation [MARA, 2003]:

$L_S = 350 \{1.107 – 0.002 (T)\}^{T-25}$

Where;

L_S = Surface BOD Loading Rate (kg-BOD/ha-d)

T = Design Temperature (^{0}C)

BOD Removal Efficiency: BOD removal efficiency of the facultative ponds shall be determined by employing the following relationships [MARA, 2003]:

$S_E = S_I / (1 + K_T T_D)$

$K_T = K (1.05)^{T-20}$

Where;

S_I = Influent BOD (mg/l)

S_E = Effluent BOD (mg/l)

T_D = Detention Time (d)

K_T = Reaction rate constant at temperature T (^{0}C), (1/day)

K = Reaction rate constant at 20 ^{0}C, 1/day = 0.10

T = Design Temperature (^{0}C)

In the case of floating wetlands in WSP, the area of Facultative Ponds will be reduced to half.

5.10.5 Design of Proposed Wastewater Treatment Plant (WWTP)

Bahawalnagar is divided into three sewerage zones. This section presents the preliminary design of all the key component facilities for the proposed Wastewater Treatment Plant (WWTP).

A) Design Flow and Characteristics

Wastewater treatment plant will be design on average day flow of the project area. The design flow has been calculated in Table 5-9.

Table 5-9, Design Flow

Sr. No.	Parameters	WWTP
1.	Ultimate Served Population – Projected (2032)	95,139
2.	Average Sewage Flow	
	Domestic Sewage Flow (GPD)	3,044,457
	Com. & Institutional Sewage Flow (GPD)	30,444
	Infiltration (GPD)	30,444
3.	Total Average Sewage Flow	
	MGD (Plant Design Flows)	2.92
	Cusecs	5.41
4.	Influent BOD @ average flow (mg/l)	250

B) General Design Basis

- The process design of the wastewater treatment plants (WWTPs) shall be carried out at average sewage flows.
- WWTPs shall be designed primarily to bring the BOD, TSS values of sewage / wastewater within the PEQS limits and WHO Guidelines.
- Economy of costs, capital as well as operational, maximum dependence upon local resources and efficient performance are kept in view while designing proposed sewage/wastewater treatment facilities.

C) Design of Key Components of WWTP

Major components for WWTP are given below;

1. Anaerobic Pond

Anaerobic pond shall be provided in parallel for primary treatment of sewage / wastewater. This will receive wastewater and reduce BOD of the sewage/wastewater through anaerobic processes. Due to high water table in Bahawalnagar, the depth of Anaerobic Pond has been taken as 1.5m or 4.5m.

Phasing wise Design summary of Anaerobic Ponds (APs) is presented in Table 5-10.

Table 5-10, Design Summary of Anaerobic Zone

Description	Values
Population (Persons)	95,139
No of Anaerobic Ponds	4
Average sewage Flow rate (m^3/day)	13,236
Average sewage Flow rate (Cusec)	5.41
Average sewage Flow rate per AT	3,309
Temperature (Degree Celsius)	20
Volumetric loading (λ_v) (g/m^3.d)	300
Influent BOD Li (mg/l)	250
Volume of AP (V_a)	2,758
Check Detention time (d)	0.83
Detention time (d)	1
Volume (m^3)	3,309
Assume depth (m)	1.5
Mid depth area (m^2)	2,206
L:W	2
Mid depth Length (m)	33.2
Mid depth Width (m)	66.4
BOD removal (%)	60
BOD removal	0.6
Remaining BOD (mg/L)	100
Side slopes H:V	1.5
Width at bottom level (m)	64.2
Width at top water level (m)	68.7
Free Board (m)	0.5
Extreme top width of AP	70.2
Length at bottom level (m)	31.0
Length at top water level (m)	35.5
Extreme Top Length (m)	37.0
Area of Anaerobic Pond (m^2)	2,594
Total area of Anaerobic Pond (m^2)	10,375
Total area of Anaerobic Pond (ha)	1.0

Description	Values
Total area of Anaerobic Pond (acre)	2.6

Desludging of Anaerobic Ponds is normally carried out after 2 - 3 years. Drying of sludge is proposed to be carried out inside anaerobic pond on periodic basis separately for each terrain/module. During desludging period, flow to respective anaerobic pond will be closed. It is recommended that desludging shall be carried out in summer season when temperature would be more than 20°C so that remaining anaerobic pond may take increased flow without compromising treatment efficiency.

2. Facultative Ponds

For secondary treatment, Facultative Pond (FP) have been proposed. Total 04 ponds have been proposed for this zone.

Phasing wise design summary of Facultative Ponds (FP) is presented in Table 5-11.

Table 5-11, Design Summary of Facultative Pond

Description	Values
BOD applied to FP Lfp (mg/l)	100
Surface loading (λ_s) (kg -BOD/ha.d)	280
No of Facultative Ponds	4
Flow at each Facultative Pond	3,309
Mid depth area (m^2) of FP (A_f)	11,818
Assume Depth (m)	1.5
Volume of FP (V_f)	17727.1
Check Detention time (d)	5.4
K20 (1/d)	0.1
Kt (1/d)	0.100
Check effluent BOD (L_e)	65
BOD removal %	35
Extreme top width of FP (m)	70
Width of FP at top water level (m)	69
Mid depth width of FP (m)	66
Bottom width of FP (m)	64
Mid depth length of FP (m)	178
Bottom length of FP (m)	176
Length at top water level (m)	180
Extreme top length of FP(m)	182
Area of Facultative Pond (m2)	12,748
Total Area of All Facultative Ponds	50,994
Total area of Facultative Pond (ha)	5
Total area of Facultative Pond (acre)	12.60

3. Total Area Requirement

Total Area Requirement for WWTP for Year 2032 of Bahawalnagar city is;

Area required for Anaerobic Pond	=	2.6 Acre
Area Required for Facultative Pond	=	12.60 Acre
Total Area required	=	15.2 Acre

After adding 25% Additional area for Embankment, Disposal Station and Other Services, Total preliminary Area requirement for WWTP is 19 acres.

5.10.6 Site Identification of WWTP

Government land has been identified by MC on priority basis for WWTP as it is readily available and does not require acquisition. The land is available along Hafizwala in the south of Bahawalnagar. Seepage drain passes along the proposed site. Treated water will be disposed of in the drain. The water table is too high is the proposed area. Schematic figure of WWTP is given below in Figure 5-8 and Plan & Section of WWTP is given below in Figure 5-9.

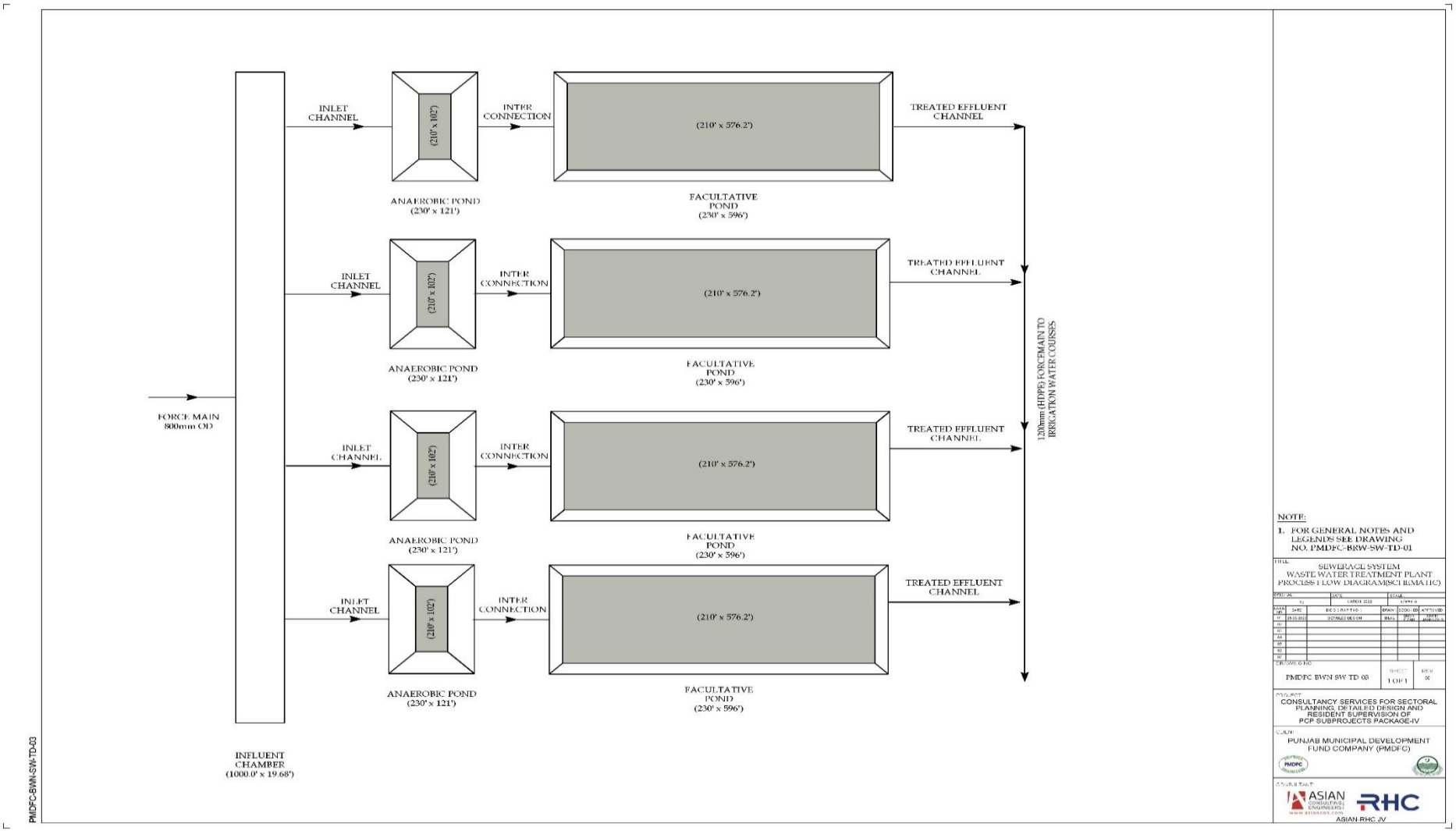


Figure 5-8, Schematic Figure of WWTP

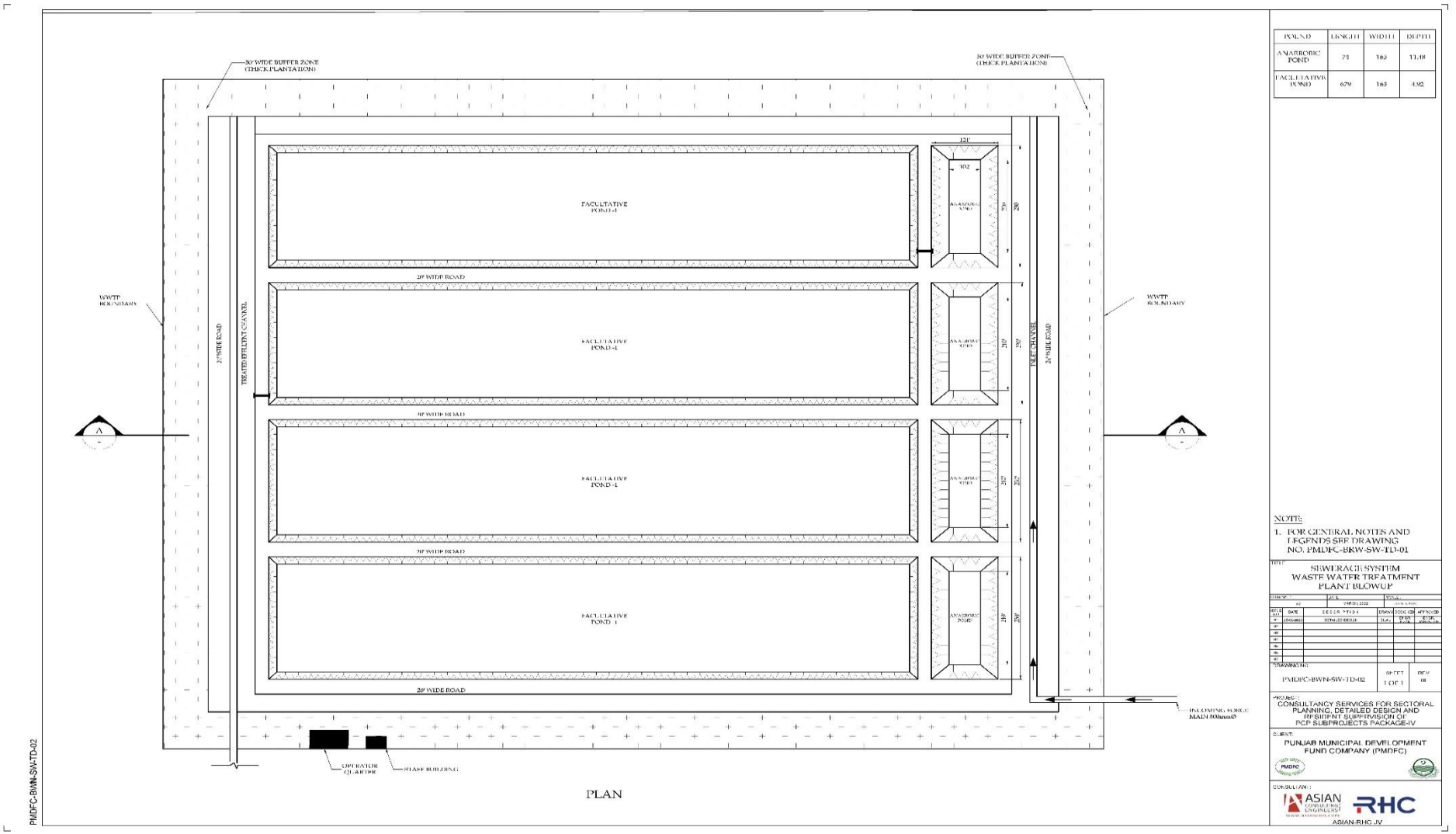


Figure 5-9, Plan & Section of WWTP

5.11 Water Consumption and Wastewater Generation

Ground water will be the main source of water during construction phase. In constructional phase, 1,500 gallons/day water will be used. During operation, 1,350 gallons/day water will be use. Wastewater produced will be domestic wastewater.

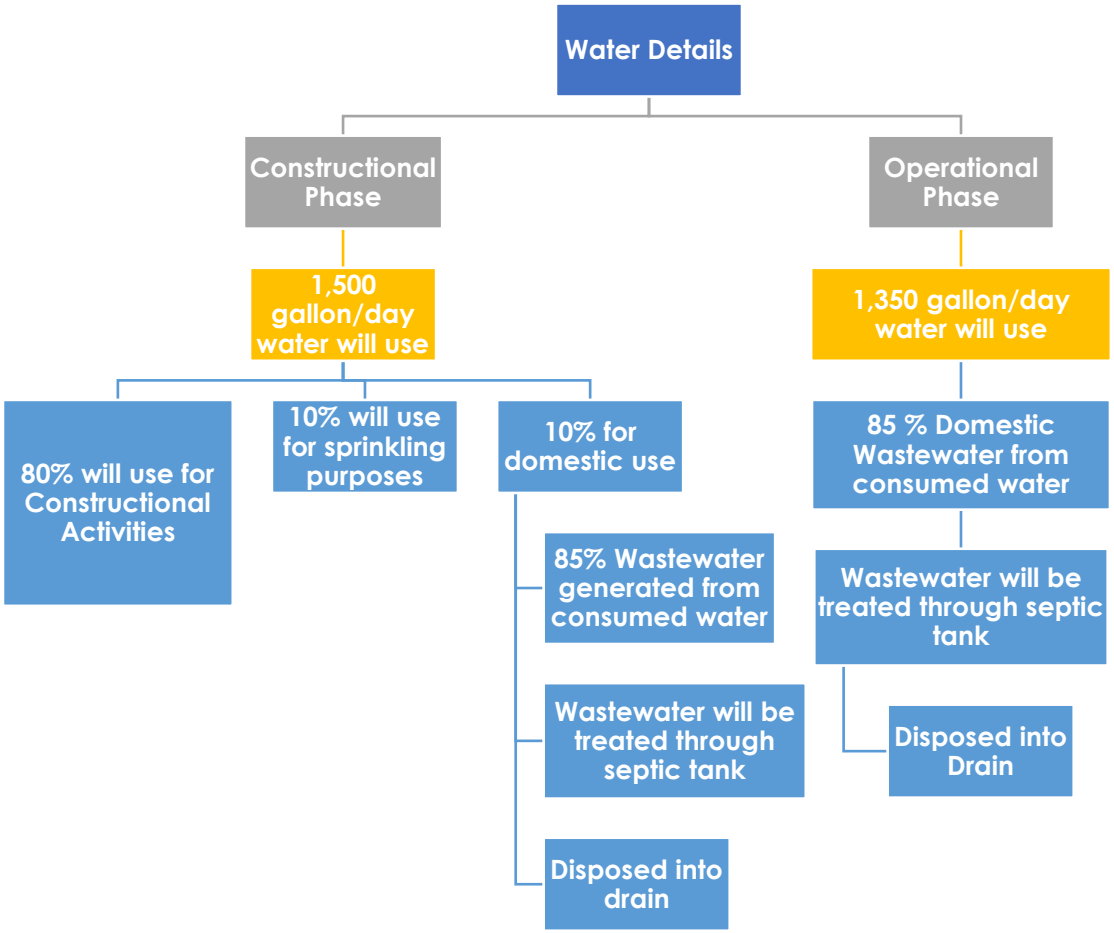


Figure 5-10, Estimated Water Balance

5.12 Solid Waste

The amount of solid waste produced during construction phase will be 13.5kg/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 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 12.15 kg/day. Only domestic waste will be produced that will be handed over to local waste contractor.

5.12.1 Waste Management and Disposal

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

- Fuel, oils, and chemicals;
- Sewage;
- Campsite waste;
- Medical waste;
- Demolition waste;
- Packing waste; and,
- Excess construction material.

Table 5-12, 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
Disposable 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 Machinery & Equipment

It is estimated that the equipment / machinery given below will be required to complete the different project engineering activities:

Table 5-13, Required Machinery / Equipment

Sr. No.	Equipment / Machinery	Sr. No.	Equipment / Machinery
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

Sr. No.	Equipment / Machinery	Sr. No.	Equipment / Machinery
9.	Jack hammer	10.	Pipeline pressure testing equipment
11.	Compressor	12.	Butt fusion equipment
13.	Generator	14.	Water pumps

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

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 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 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 projects, attached as Annexure-14)*

5.16.1 Proposed Campsite Locations

Two locations have been proposed / suggested for contractor's campsite. Both the locations are near project site. Location 01 is near Bahawalnagar

Bypass Road, at a distance of almost 1,000 meters from the location of WWTP and near to the location of proposed force main, and it is almost 600 meters away from housing communities / any sensitive receptor. Location 02 is also near Bahawalnagar Bypass Road, at a distance of almost 1,800 meters from the location of proposed force main and WWTP and it is almost 540 meters away from housing communities / any sensitive receptor. Locations of proposed campsites marked on Google Maps are shown below in Figure 5-11 and Figure 5-12 respectively.

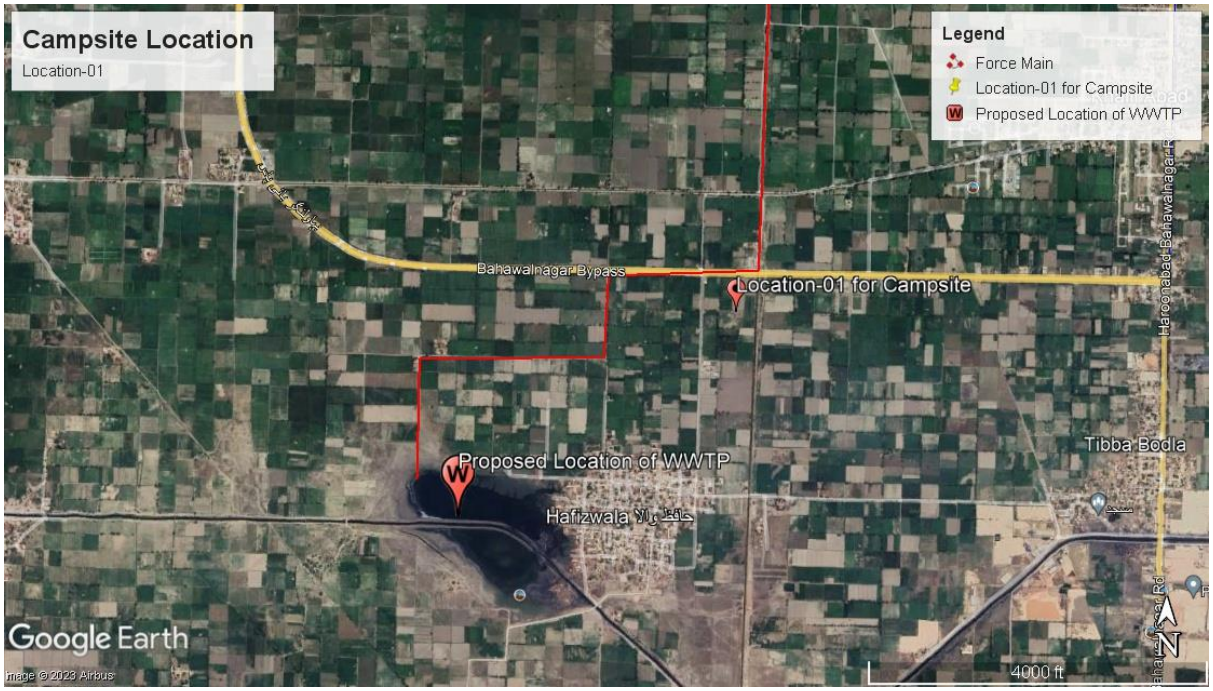


Figure 5-11, Proposed Location-01 for Campsite

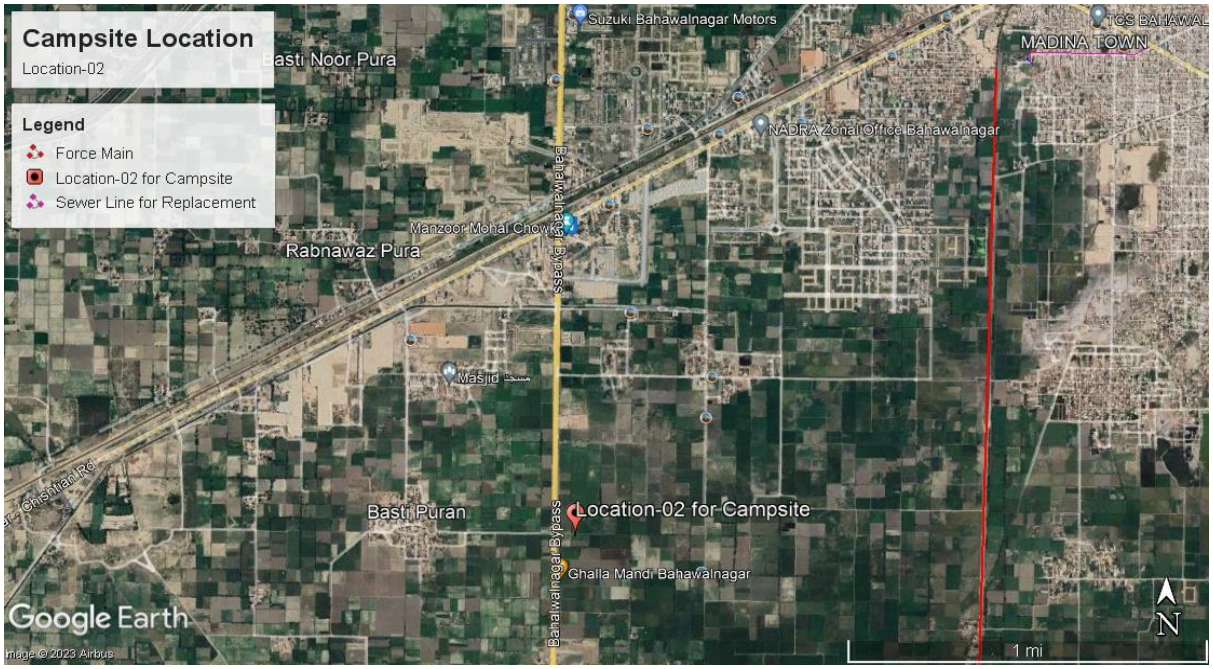


Figure 5-12, Proposed Location-02 for Campsite

5.17 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 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 project.

5.17.1 Details of Restoration and Rehabilitation at the End of Project Life

At the end of the life of the 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. Existing utilities being affected by the project activities will be rehabilitated to its original state.

5.18 Government & Local Approvals

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

SECTION - 6: DESCRIPTION OF ENVIRONMENTAL AND SOCIAL BASELINE

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

Multiple site visits were 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 project impacts were identified. Secondary data was collected from available literature and District Census Report (DCR) etc.

6.1 General Characteristics of Project Area

The project is for improvement and extension of sewerage system in Bahawalnagar city, which includes;

- Rehabilitation of 07 disposal stations (Islamnagar Disposal Station, Nazir Colony Disposal Station, Madina Town Disposal Station, Hussain Abad Disposal Station, Madni Colony Disposal Station, Model Town Disposal Station and Karamanwala Disposal Station) including pumping machineries, plaster of wall, painting etc.
- Laying of 20,000 Rft force main including excavation, backfilling and restoration of roads.
- Replacement of 10,400 ft. sewer lines (Melad Chowk to Mubarak Gate Chowk via Circular Road: 1,000 ft., Eid Gah Road to Alvi Bakers Basti Sadar Din: 3,600 ft., Model Town to near Disposal Station: 1,300 ft., Hussain Abad Chowk to Waheed Arshad Chowk: 2,500 ft. and Madina Town to Madina Town Disposal: 2,000 ft.).
- Construction of Wastewater Treatment Plant / Waste Stabilization Pond (near village Hafiz Wala at southern side of Bahawalnagar) which involves excavation of ponds, construction of inlet channel and effluent channels and construction of office building and office.

The sites of disposal stations and sewer lines included in this project are located in urban area while location of WWTP is along village Hafiz Wala. The main roads near project site are Bahawalnagar Bypass Road, Haroonabad – Bahawalnagar Road, Bahawalnagar – Chishtian Road, Minchinabad – Bahawalnagar Road, Chishtian Road, Madia Town Disposal Station Road, Model Town Road, Eid Gah Road, Khan Baba Road, Tehsil Bazar Road, Jail Road and other minor / link roads within the city.

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 Sutlej 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.

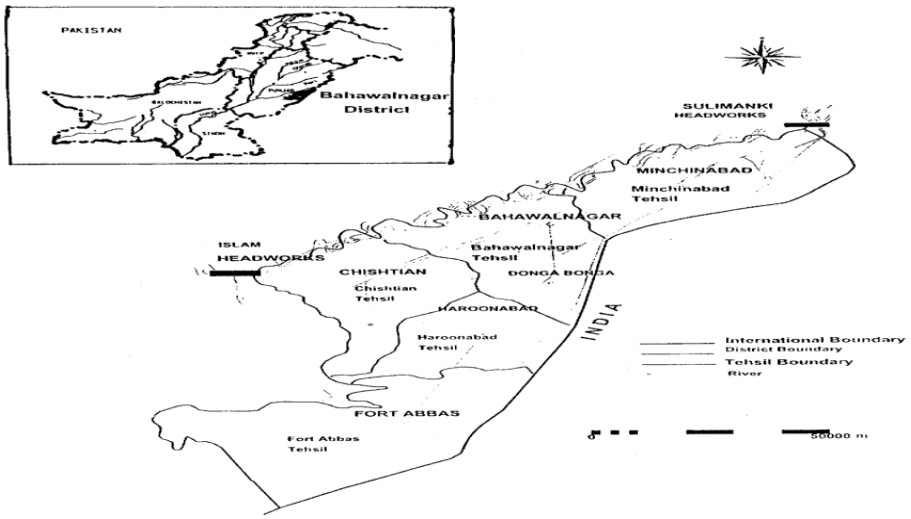


Figure 6-1, Administrative Map of Bahawalnagar[1]

6.2.2 Topography

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

[1] (source: Cheema, M. & Mirza, Z. & 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.)

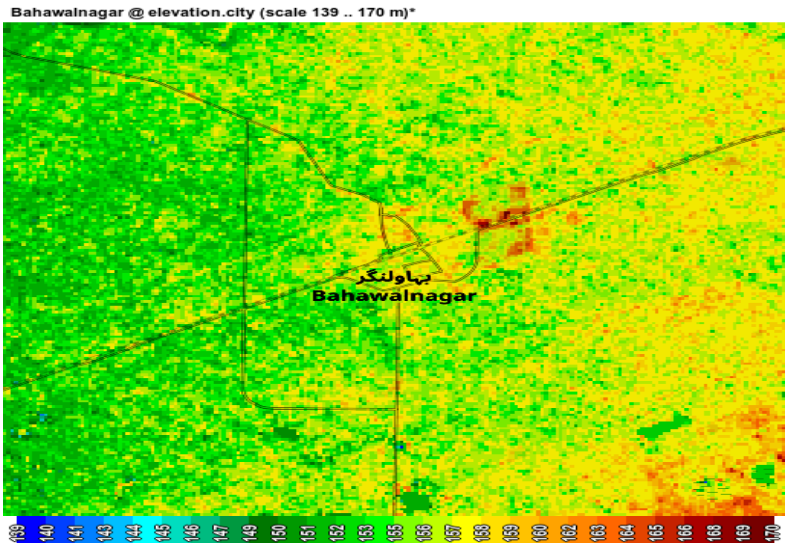


Figure 6-2, Topography of Bahawalnagar[2]

6.2.3 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 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.

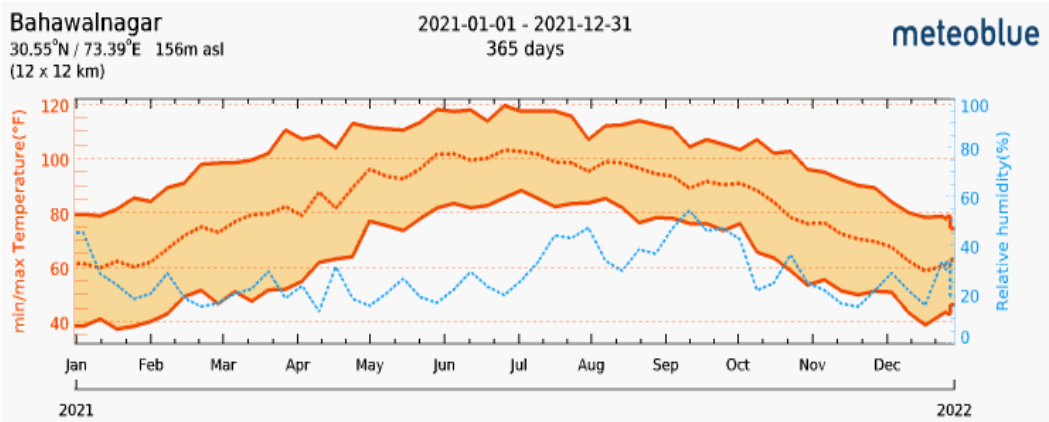


Figure 6-3, Maximum and Minimum Temperature[3]

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.

[2] *https://en-gb.topographic-map.com/map-sht1f3/Bahawalnagar/*
[3] *meteoblue*

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.

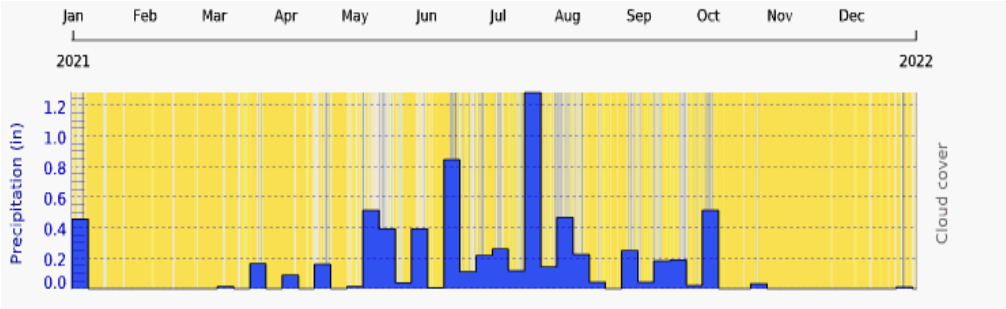


Figure 6-4, Annual Precipitation[4]

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 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.

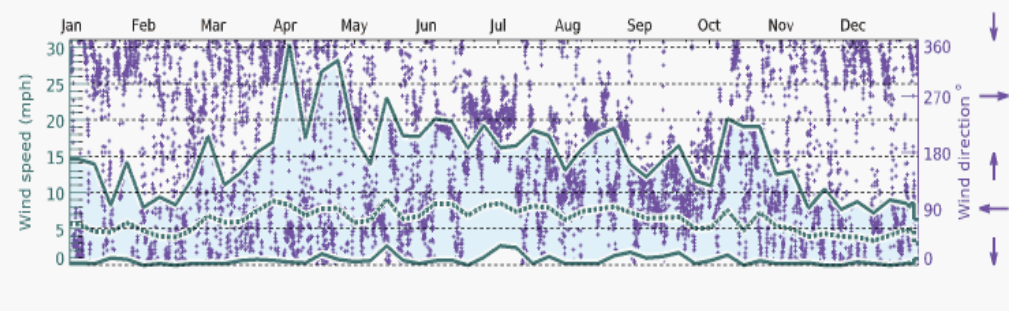


Figure 6-5, Wind Speed[5]

[4] *meteoblue*
[5] *Meteoblue*

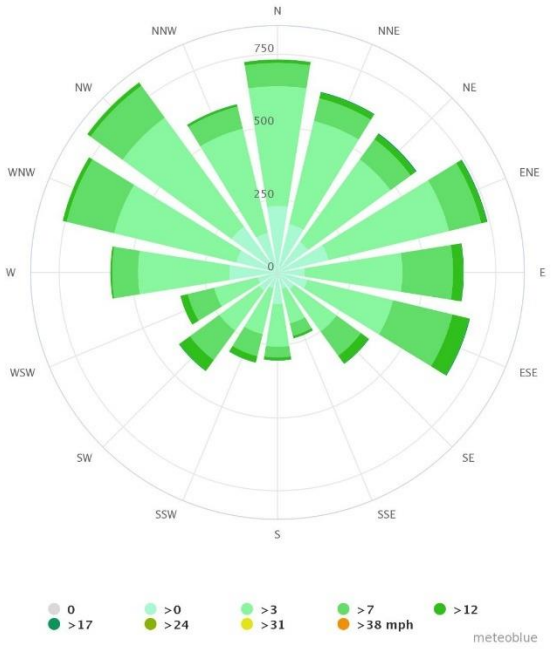


Figure 6-6, Wind Rose[6]

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*

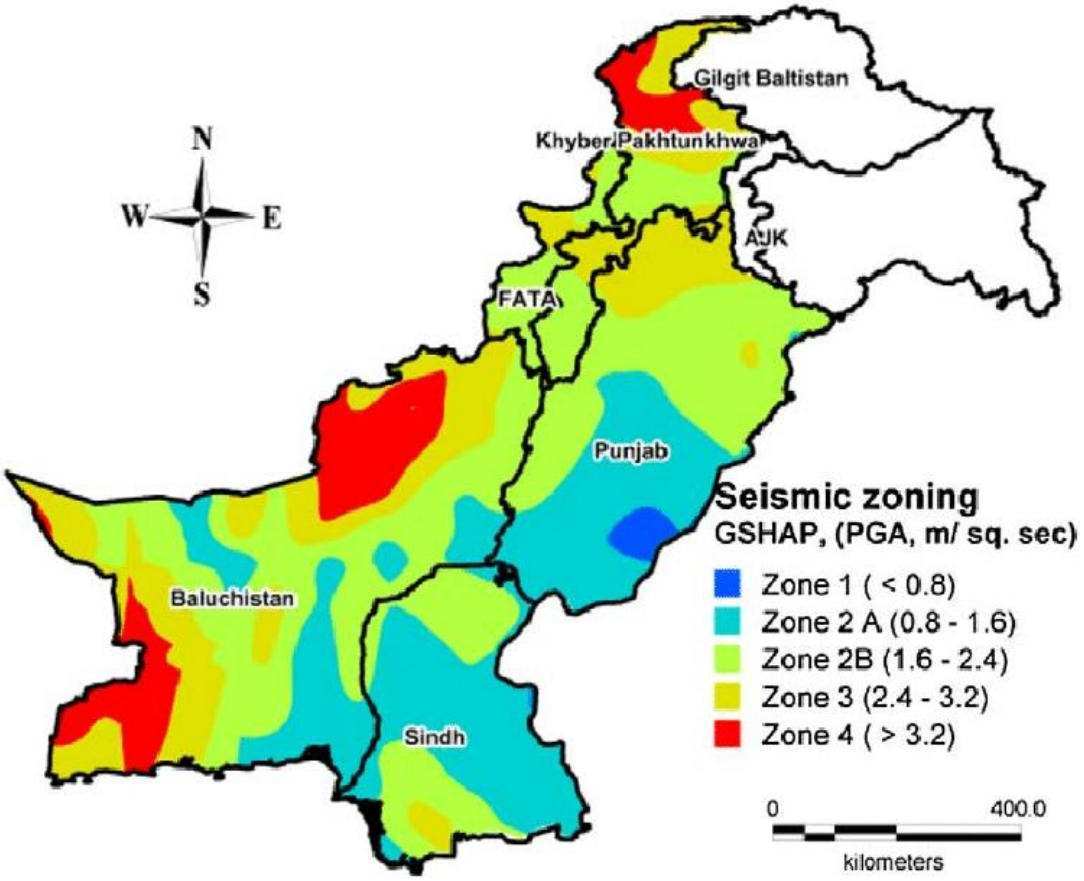


Figure 6-7, Seismic Zones of Pakistan[7]

6.2.7 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 mains 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.[8]

To check the quality of the water in the area, ground water was collected by

[7] *(Geological Survey of Pakistan)*
[8] *IEE Report for The Conversion of 66 KV to 132 KV Fort Abbas Grid Station and Faqirwali to Fortabbas 132KV STD Transmission Line (District Bahawalnagar)*

Field officers of Asian Environmental Services Private Limited – an EPA Certified Lab on October 10, 2023 and analyzed. The detail of the water quality of the project area is given below:

Table 6-1, Ground Water Analysis Results near Madina Town

Parameters	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Lab Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	< 5 NTU	**31**	N.A.	High
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	**652**	± 5.14	High
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	**1328**	± 8.02	High
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.13	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	<0.005	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	<0.005	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	<0.0035	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	<0.02	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	<0.006	N.A.	Optimal
Chloride (Cl^-) **	SMWW 4500 Cl^- B	< 250 mg/L	128	± 1.73	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	<0.004	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.164	N.A.	Optimal
Cyanide (CN^-)*	SMWW 4500 CN^- F	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F^-)**	SMWW 4500 F^- C	≤ 1.5 mg/L	0.30	± 0.103	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	<0.005	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	<0.015	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	<0.02	N.A.	Optimal
Nitrate (NO_3^-) *	SMWW 4500 NO_3^- D	≤ 50 mg/L	1.72	± 1.20	Optimal
Nitrite (NO_2^-) *	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	<0.01	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500 Cl^- B	0.5 mg/L	0	N.A.	Optimal
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS	0	N.A.	-
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.049	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU/100 mL	0	N.A.	Optimal

Parameters	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Fecal Coliforms *	SMWW 9222 D	0 CFU/100 mL	0	N.A.	Optimal



Figure 6-8, Ground Water Sampling near Madina Town

Table 6-2, Ground Water Analysis Results near Hafiz Wala

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Lab Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	< 5 NTU	0	N.A.	Optimal
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	**884**	± 5.14	High
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	**1952**	± 11.40	High
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.28	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	<0.005	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	<0.005	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	<0.0035	N.A.	Optimal

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Boron (B)	SMWW 3113 B	0.3 mg/L	<0.02	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	<0.006	N.A.	Optimal
Chloride (Cl^-) **	SMWW 4500 Cl^- B	< 250 mg/L	**271**	± 2.87	High
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	<0.004	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.164	N.A.	Optimal
Cyanide (CN^-)*	SMWW 4500 CN^- F	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F^-)**	SMWW 4500 F^- C	≤ 1.5 mg/L	0.67	± 0.103	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	<0.005	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	<0.015	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	<0.02	N.A.	Optimal
Nitrate (NO_3^-) *	SMWW 4500 NO_3^- D	≤ 50 mg/L	1.65	± 1.20	Optimal
Nitrite (NO_2^-) *	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.22	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	<0.01	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500 Cl^- B	0.5 mg/L	0	N.A.	Optimal
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS	0	N.A.	-
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.048	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU/100 mL	0	N.A.	Optimal
Fecal Coliforms *	SMWW 9222 D	0 CFU/100 mL	0	N.A.	Optimal



Figure 6-9, Ground Water Sampling near Hafiz Wala

Groundwater samples were tested for 30 different selected parameters as per PEQS. Based on the laboratory test results, it was found that most of the parameters at both locations / in both water samples are within prescribed limits of PEQS while some parameters i.e., Turbidity, Total Hardness (as $CaCO_3$) and Total Dissolved Solids (TDS) were not in permissible limits of PEQS in Madina Town-Ground Water Sample, and, Total Hardness (as $CaCO_3$), Total Dissolved Solids (TDS) and Chloride (Cl-) were not on permissible limits of PEQS in Hafiz Wala-Ground Water Sample. Baseline Environmental Monitoring Reports are attached as Annexure-06.

6.2.8 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.

6.2.9 Air Quality

Air quality in most of the project area appears good based on observation during the study period. Emissions should be controlled at source under the ESIA. 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 project sites is the vehicular emissions, industries such as rice mills and the key pollutants likely to be found near project proposed locations are Carbon Monoxide (CO), Oxides of Nitrogen (NOx), Sulfur Dioxide (SOx) 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 Monoxide (CO), Nitrogen Oxides (NOx), Sulphur Oxides (SOx), Particulate Matter (PM). The monitoring was carried by the filed officers of Asian Environmental Services Private Limited on October 8, 2023 to October 9, 2023 for the period of 24 hours at Madina Town and October 9, 2023 to October 10, 2023 for the period of 24

hours at Hafiz Wala to determine the baseline ambient air quality of the area and results are presented in Table 6-3 and Table 6-4, respectively and pictorial views monitoring are shown in Figure 6-10 and Figure 6-11, respectively. Baseline Environmental Monitoring Reports are attached as Annexure-06.

Table 6-3, Ambient Air Quality Results near Madina Town

Parameters	Units	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO_2) *	µg/m³	24Hours	1.00	32.97	80.0	Optimal
Nitrogen Oxide (NO)*	µg/m³	24Hours	1.00	14.94	40.0	Optimal
NO_x*	µg/m³	24Hours	1.00	47.85	120.0	Optimal
Sulphur Dioxide (SO_2) *	µg/m³	24Hours	1.00	37.31	120.0	Optimal
Carbon Monoxide (CO) *	mg/m³	24Hours	0.01	1.80	05.0	Optimal
Particulate Matter (PM_{10}) *	µg/m³	24Hours	1.00	100.31	150	Optimal
Particulate Matter ($PM_{2.5}$) *	µg/m³	24Hours	1.00	20.56	35	Optimal
Total Particulate Matter (TSP)	µg/m³	24Hours	1.00	138.04	500	Optimal



Figure 6-10, Ambient Air Monitoring near Madina Town

Table 6-4, Ambient Air Quality Results near Hafiz Wala

Parameters	Units	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO_2) *	µg/m³	24Hours	1.00	37.71	80.0	Optimal
Nitrogen Oxide (NO)*	µg/m³	24Hours	1.00	15.37	40.0	Optimal
NO_x*	µg/m³	24Hours	1.00	53.02	120.0	Optimal
Sulphur Dioxide (SO_2) *	µg/m³	24Hours	1.00	33.23	120.0	Optimal
Carbon Monoxide (CO) *	mg/m³	24Hours	0.01	9.99	05.0	Optimal
Particulate Matter (PM_{10}) *	µg/m³	24Hours	1.00	101.49	150	Optimal
Particulate Matter ($PM_{2.5}$) *	µg/m³	24Hours	1.00	22.11	35	Optimal
Total Particulate Matter (TSP)	µg/m³	24Hours	1.00	137.99	500	Optimal



Figure 6-11, Ambient Air Monitoring near Hafiz Wala

6.2.10 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 project will use powered mechanical equipment. Subjective observations were made of background noise and also of individual vehicle pass by events.

Noise levels of the project area was monitored by field representative of Asian Environmental Services Private Limited on October 8, 2023 to October 9, 2023 for 24 hours at Madina Town and on October 9, 2023 to October 10, 2023 for 24 hours at Hafiz Wala to determine the baseline noise levels at project area using digital sound meter and the results are presented in Table 6-5 and Table 6-6, respectively. Baseline Environmental Monitoring Reports are attached as Annexure-06.

Table 6-5, Noise Level Monitoring Results at Madina Town

Sr. No.	Time	Noise dB(A)		PEQS
1	07:00	40	Day Time	55
2	08:00	41		
3	09:00	42		
4	10:00	42		
5	11:00	43		
6	12:00	44		
7	13:00	45		
8	14:00	45		
9	15:00	45		
10	16:00	44		
11	17:00	43		
12	18:00	42		
13	19:00	42		
14	20:00	43		
15	21:00	43		
16	22:00	42	Night Time	45
17	23:00	42		
18	00:00	41		
19	01:00	41		
20	02:00	40		
21	03:00	40		
22	04:00	39		
23	05:00	38		
24	06:00	38		

Table 6-6, Noise Level Monitoring Results at Hafiz Wala

Sr. No.	Time	Noise dB(A)		PEQS
1	07:30	39	Day Time	55
2	08:30	39		
3	09:30	40		
4	10:30	41		
5	11:30	41		
6	12:30	41		
7	13:30	42		
8	14:30	43		

Sr. No.	Time	Noise dB(A)		PEQS
9	15:30	44		
10	16:30	45		
11	17:30	44		
12	18:30	46		
13	19:30	43		
14	20:30	43		
15	21:30	42		
16	22:30	41	Night Time	45
17	23:30	40		
18	00:30	40		
19	01:30	39		
20	02:30	38		
21	03:30	38		
22	04:30	39		
23	05:30	40		
24	06:30	40		

6.2.11 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 packer, 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, Kualil, Kal Kurchhi, Parrot Egrate & Paddy bird, Kite King Fisher, Sallow Amadvat, Coot, Laghar, Shikra and Owl.



Common peafowl



Ostrich



BlackSwan



Black Buck

Figure 6-12, Fauna in Bahawalnagar

6.3.2 Vegetation Cover and Trees

The Van (Salvadora oleoides), Karil (Capparis aphylla), Jand (Prosopis spicigera), Beri (Zizyphys jajaba), mallha (Zizyphus numularia) and Shisham (Dalbergia Sissoo) are common species present in and surrounding areas of Bahawalnagar. There are no trees found on the proposed land for WWTP and in the route of force main / sewer lines. Bushes / grass exists near project site.

6.3.3 Wetlands

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

6.3.4 Wildlife sanctuaries

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

6.3.5 Wildlife Parks

Bahawalnagar Wildlife Park is located at a distance of almost 600m 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.

6.3.6 Forests

Bahawalnagar forest is located at a distance of about 500m from project site with The Van (Salvadora oleoides), Karil (Capparis aphylla), Jand (Prosopis spicigera), Beri (Zizyphys jajaba), mallha (Zizyphus numularia) and Shisham (Dalbergia Sissoo) being the common species.

6.3.7 Game Reserves

The nearest game reserve near Bahawalnagar is at Islam Headwords that is about 90km away from project site.



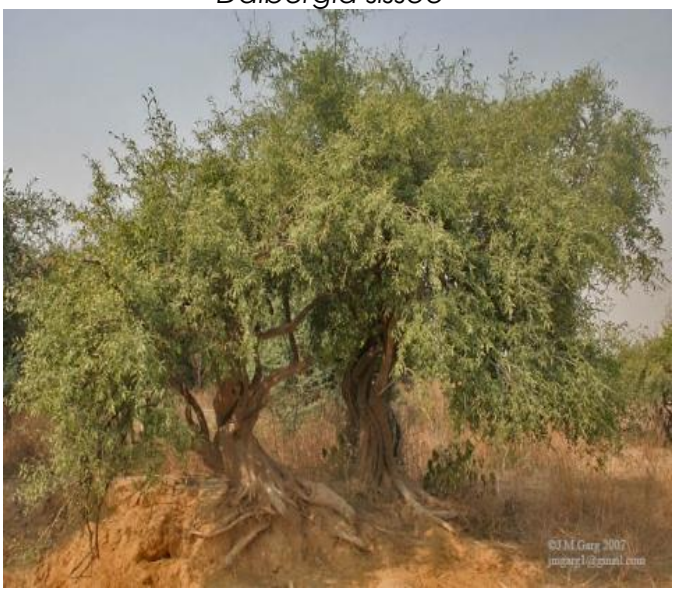
Zizyphus Numularia



Dalbergia sissoo



Prosopis Spicigera



Salvadora Oleoides

Figure 6-13, Flora in Bahawalnagar

6.4 Social and Cultural Resources

6.4.1 Population Communities and Employment

The total population of Bahawalnagar district is 2,975,656 and MC Bahawalnagar 813,390 is as per census 2017.

6.4.2 Gender Status

At the time of the 2017 census, tehsil Bahawalnagar had a population of

813,390 of which 415,255 were males and 398,046 females.

6.4.3 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 Ford 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).

6.4.4 Languages

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

6.4.5 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 61.3% 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 6-7, Demographic Data[9]

Tehsil	Area (sq. km.)	Population 2017								Population 1998	1998 – 2017, Avg. Annual Growth Rate (%)
		All Sexes	Male	Female	Transgender	Sex Ratio	Population on Density Per Sq. Km.	Urban Proportion	Avg. HH Size		
Bahawalnagar District	8,878	2,975,656	1,510,427	1,464,900	329	103.11	335.17	20.83	6.16	2,061,447	1.95
Bahawalnagar Tehsil	1,729	813,390	415,255	398,046	89	104.32	470.44	23.83	6.08	541,553	2.16

[9] *National Census Data: Pakistan Bureau of Statistics 2017*

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 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. Ahmadis are small in proportion in rural that urban areas. The Bahawalnagar city is names 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 unemployment 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 unmetalled 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 etc.

6.4.18 Local Government and Administration

Local level elected representatives are active in the project areas. Union council chairman along with other elected councillors 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 project area, is normal and under the control of the district administration and law enforcement agencies (police).

6.4.20 Community Awareness about Project Works

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

6.4.21 Community Demands

During public consultations and baseline data collection activities on project for the improvement and extension of sewerage system, basic priority needs of the communities were also determined which are as follows:

- Creation of jobs under the project
- Improvement and / or provision of sewerage system

6.5 Physical Cultural Resources

Sites of religious importance like mosques and graveyard have been found within 100 m of the proposed project. Around 10 no. of mosques and 01 no. of graveyard found within 100 m boundary. Sensitive receptors like schools, university, hospitals and clinics have been found. Around 11 no. of schools, 01 no. of university, 05 no. of hospitals and 01 no. of clinic 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 impact 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.

6.7 Suitability of Site

The project does not fall in any sensitive zone. The project is for the improvement and extension of sewerage system in the city which includes rehabilitation of 07 disposal stations (Islamnagar Disposal Station, Nazir Colony Disposal Station, Madina Town Disposal Station, Hussain Abad Disposal Station, Madni Colony Disposal Station, Model Town Disposal Station and Karamanwala Disposal Station), laying of 20,000 Rft force main, replacement of 10,400 ft. sewer lines (Melad Chowk to Mubarak Gate Chowk via Circular Road: 1,000 ft., Eid Gah Road to Alvi Bakers Basti Sadar Din: 3,600 ft., Model Town to near Disposal Station: 1,300 ft., Hussain Abad Chowk to Waheed Arshad Chowk: 2,500 ft. and Madina Town to Madina Town Disposal: 2,000 ft.) and construction of one (01) Wastewater Treatment Plant / Waste Stabilization Pond (near village Hafiz Wala at southern side of Bahawalnagar).

The sites of disposal stations and sewer lines included in this project are located in urban area while location of WWTP is along village Hafiz Wala. The main roads near project site are Bahawalnagar Bypass Road, Haroonabad – Bahawalnagar Road, Bahawalnagar – Chishtian Road, Minchinabad – Bahawalnagar Road, Chishtian Road, Madia Town Disposal Station Road, Model Town Road, Eid Gah Road, Khan Baba Road, Tehsil Bazar Road, Jail Road and other minor / link roads within the city. Therefore, the sites included in this project are suitable for the project.

6.8 Socio-Economic and Cultural Environment as per Survey

This section addresses the socio-economic and cultural aspects of the project area. The available reports and documents were thoroughly examined during the desk study. A group of specialists conducted on-site visits to assess the proposed project of "Improvement and Extension of Sewerage System in Bahawalnagar City", gathering baseline data from both directly and indirectly affected individuals including perspectives related to the sewerage system. The information revealed from this report aids the project planners, local authorities and policymakers in making informed decisions to ensure the adequacy and suitability of essential services (Construction of Wastewater Treatment Plant, Repair and Rehabilitation of existing Sewerage Infrastructure, and Maintenance of Choked Sewer Lines) for the residents, further promoting the overall well-being and sustainability of the city.

The basic objectives of the social surveys were to:

- Get the primary data from the various sources.

- Informed people about the objective and purpose of the proposed project.
- Understand the specific needs and concerns of residents regarding the sewerage system.
- Identify the potential impacts associated with the implementation of the proposed project.
- Get feedback from the community about the project related social issues.
- And address the mitigation measures about the social issues in the report.

6.8.1 Methodology for Socio-Economic Survey

A socio-economic survey of the settlements around the project area was conducted by a team of experts using a specific methodology which is described and discussed in this section. The methodology, underlying principles, and practices adopted for the survey were designed to ensure that accurate and comprehensive data could be collected, that would accurately reflect the true socio-economic characteristics of the respondents.

Initially, a preliminary survey was conducted by the team of experts then a comprehensive field survey was carried out afterwards.

Population statistics were collected from the secondary data source which is District Census Report (DCR). According to the (DCR) 2022, the total population of the Bahawalnagar City is estimated as 177106 individuals.

The sample size of 69 individuals was determined using the Standard Statistical Formula with a confidence level of 90% and a confidence interval of 10%. The respondents were selected through Simple Random Sampling, which falls under the type of Probability Sampling techniques. Data from the respondents was collected using interview Schedule technique. A total of 69 questionnaires were designed to collect baseline data on demographic and socio-economic indicators. In addition, extensive Consultations and Focus Group Discussions (FGDs) were conducted during the socio-economic survey in order to inform individuals about project-related activities and record their opinions.

During the survey, participants were asked for information regarding their Demographic characteristics including name, age, location, education level, language, marital status, and caste etc.

In the Occupation and Sources of Income section of the survey questionnaire, respondents were asked about their occupation, income, and sources of income.

The infrastructure present in the Sub Project Area part of the survey

questionnaire sought information from respondents regarding amenities such as water supply, electricity, sewerage/drainage system, and telephone facilities.

The Availability of Social Services section of the survey questionnaire included questions on facilities like health services, educational institutions, and offices etc.

Lastly, the respondents' information and perceptions about the project were assessed in the Sewerage Infrastructure section of the checklist.

In order to quantify the existing baseline conditions of the study area, collected data was digitized and analyzed by using Statistical Package for Social Sciences (SPSS) software and Microsoft Excel because they offer quicker and easier access to basic functions and are also useful for obtaining precise and accurate baseline data results.

6.8.2 Socio-economic Environment of Project Area

Bahawalnagar is the administrative center of Bahawalnagar District, located in the southeastern region of Punjab near the India border. Geographically positioned at 29°59'0" North latitude and 73°15'0" East longitude, it is bordered by the Sutlej River to the north, covering a distance of approximately six miles. Similar to many cities in Punjab, Bahawalnagar's economy heavily relies on agriculture. The region is renowned for cultivating crops such as cotton, sugarcane, rice, and wheat. Among the fruits, mango, and guava is also source of income for the agricultural community. Besides, peas, ladyfinger and chilies are also grown in the city in minor quantities. A significant portion of its population derives their livelihood from farming and related activities. In terms of cuisine preferences among locals in this area are simple yet noteworthy Punjabi dishes.

The city, similar to many parts of Punjab, possesses a rich cultural heritage. Traditional music, dance, and local festivals are integral parts of the local culture. The society is influenced by both traditional values and modern influences, creating a blend of customs and practices. Punjabi serves as the predominant language spoken in the designated area with Urdu and Saraiki being secondary languages used.

The project area is characterized by a strong presence of Punjabi culture. Inhabitants of this area come from diverse backgrounds, with the majority belonging to low-income and middle-income socioeconomic classes, although there are also some individuals from higher income brackets. The most prevalent dress style among the people in the project area is Shalwar Kameez. Traditional attire is commonly worn by females, who often embellish their outfits with ornamental accessories as well. Additionally, various castes can be found residing within the project area. Convenient transportation options connect the region to other cities and towns through an established

road network, including buses and private vehicles that are widely utilized for commuting purposes.

6.8.3 Political and Administrative Setup

The project area is located in the city of Bahawalnagar that serves as one of the subdivisions within the district and consists of 31 Union Councils which are under the supervision of a Deputy Commissioner. This Deputy Commissioner holds a high-ranking position in the provincial civil service and bears responsibility for managing all aspects of district administration. These responsibilities encompass various government functions such as maintaining law and order, overseeing revenue collection, and ensuring implementation of governmental policies at the district level.

Government functionaries, consists of Commissioner, Deputy Commissioner (DC), Additional Deputy Commissioner (ADC), Assistant Commissioner (AC), revenue officers, and officer's in-charge of line departments. Additionally, there exists a municipal administration structure with either a mayor or chairman leading it based on the specific local government system in place. This administrative figure takes charge of overall management within the city and collaborates with elected representatives from different wards to form a council commissioning them to serve their respective roles effectively.

6.8.4 Land Acquisition

During the survey, it was identified that project land for construction of Waste Water Treatment Plant (WWTP) is government owned as per consultation conducted with Municipal Committee (MC) and concerned patwari which is approximately 57 acres, therefore, no land acquisition nor resettlement issue had been identified. However, route for laying pipelines is along the road and railway track (ROW of Highway Department and Railway Department), while seepage drain near WWTP is under jurisdiction of Irrigation Department; so, NOCs / Consent Letters must be obtained from these concerned government departments / authorities by MC before construction of the project.

6.8.5 Industries in Municipal Committee (MC) Bahawalnagar

There are estimated 40 number of industrial units in MC Bahawalnagar. These include rice units, ice units, cotton mills and flour mills.

6.8.6 Demographic Profile

A demographic profile or information is the gathering of data about individuals concerning certain characteristics such as gender, age, occupation, income, qualification, and residence. A detailed description of the socio-demographic characteristics of the respondents is given below.

A) Households Surveyed in the Residential Area

For the present study, the project area is divided into three zones. All these zones fall under the Bahawalnagar City. The major areas and number of households surveyed within the vicinity of the study area are shown in Table 6-8.

Table 6-8, No. of Households Surveyed in the Residential Area

Sr. No.	Zone	Area Name	No. of Households
1.	Zone-A	Makkah Town, Madina Town, Dinpur Sharif	55
2.	Zone-B	Model Town	08
3.	Zone-C	Khadim Abad, Nazir Colony	06
	Total		**69**

The table indicates that the majority of the households surveyed were present in the Zone-A whose Disposal Station is connected with the Waste Water Treatment Plant and will provide services to the residents of Zone-A. This facility will cater both Zone-A residents and also accommodate 60% of the population from Zone-B and Zone-C.

B) Gender Ratio of Respondents

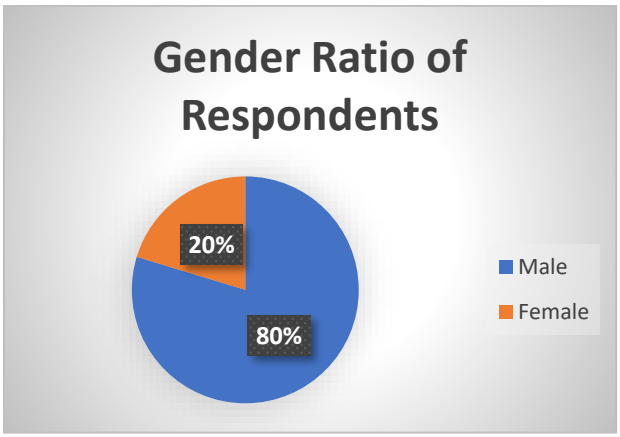
The gender ratio of respondents contacted is shown in Table 6-9.

Table 6-9, Gender Ratio of Respondents

Sr. No.	Gender	Frequency	Percentage (%)
1.	Male	55	79.7
2.	Female	14	20.3
	Total	**69**	**100**

According to the table, the majority of the respondents i.e., 79.7% identify as Male, while 20.3% of respondents identifies as Female.

This data highlights the need for a targeted approach in the proposed project by taking into account the specific needs and concerns of both male and female residents.



Graph: Gender Ratio of Respondents

C) Age

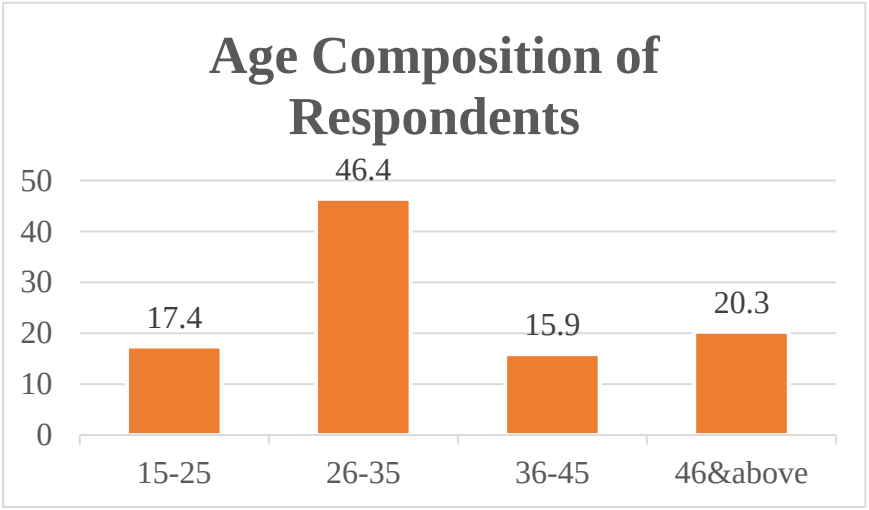
The demographic characteristic of age is shown in Table 6-10.

Table 6-10, Age Composition of the Respondents

Sr. No.	Frequency Distribution	Number	Percentage (%)
1.	15 - 25	12	17.4
2.	26 - 35	32	46.4
3.	36 - 45	11	15.9
4.	46 & Above	14	20.3
	Total	**69**	**100**

Based on the data in this table, it can be observed that 17.4% of participants fall within the age range of 15-25 years, while 46.4% are aged between 26-35 years. Additionally, individuals ranging from 36-45 years make up 15.9% of respondents, and those aged above 46 constitute a further 20.3%.

These figures in the table shows that respondents are mature enough to express their opinions about the project.



Graph: Age Composition of the Respondents

D) Caste

The survey revealed that the study area predominantly consists of the following major castes: Arain, Syed, Qureshi, Wattu, Bodla, Mohl, Abbasi, Rajpoot, Joiya, Jatt and Sheikh.

Project planners should take these caste dynamics into account to promote inclusivity and community engagement. Tailoring awareness campaigns and engagement strategies to resonate with the cultural values and preferences of these castes can foster a sense of ownership among the residents. Additionally, involving representatives from these castes in decision-making processes can enhance the project's credibility and foster a collaborative approach, essential for the successful implementation of the Wastewater Treatment Plant in Bahawalnagar City.

E) Language

The most common widely spoken primary language in the project area is Punjabi which is also known as the mother tongue in Bahawalnagar City. Additionally, Urdu, Saraiki, and English are also spoken and understood by residents of this region.

The prevalence of Punjabi as the primary and widely spoken language, coupled with the familiarity of residents with Urdu, Saraiki, and English, holds vital implications for project communication and outreach. To ensure effective community engagement and dissemination of information, project materials, awareness campaigns, and public consultations should primarily be conducted in Punjabi, respecting it as the mother tongue of Bahawalnagar City. Simultaneously, providing information in Urdu, Saraiki, and English can enhance accessibility for a wider audience, fostering inclusivity and understanding among diverse linguistic groups. Tailoring communication to align with these languages can bridge potential communication gaps and promote a more comprehensive engagement with the local community in the Wastewater Treatment Plant project.

F) Education

Education distribution of the survey is shown in Table 6-11.

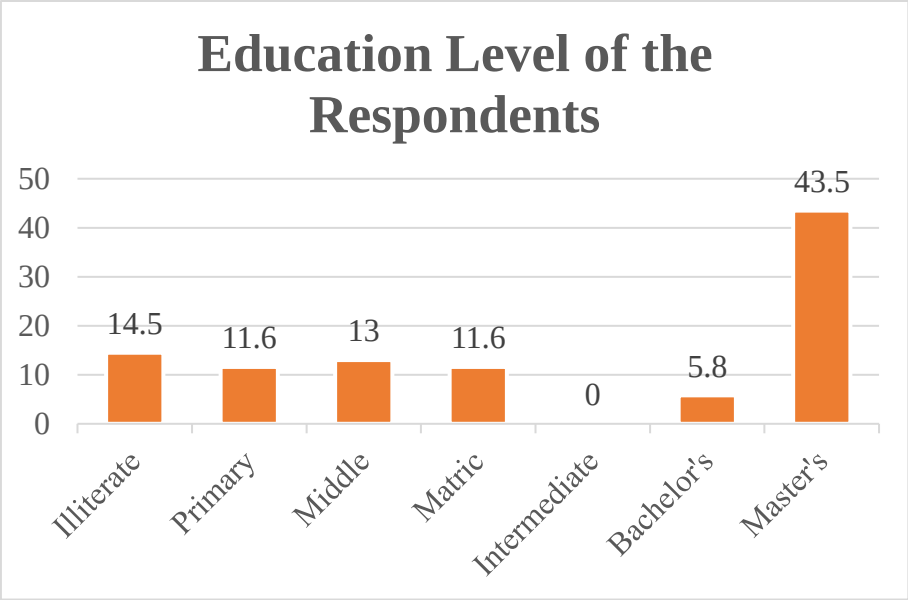
Table 6-11, Education Level of the Respondents

Sr. No.	Education Level	Number	Percentage (%)
1.	Illiterate	10	14.5
2.	Primary	08	11.6
3.	Middle	09	13
4.	Matric	08	11.6
5.	Intermediate	0	0

Sr. No.	Education Level	Number	Percentage (%)
6.	Bachelor's	04	5.8
7.	Master's	30	43.5
	Total	**69**	**100**

Based on the data presented in this table, it is evident that a significant portion of respondents possess advanced levels of education. Specifically, 14.5% are unable to read or write, while 11.6% have received primary level education and another 13% have completed middle school. Additionally, 11.6% hold matriculation degrees and 5.8% have obtained bachelor's degrees; however, the majority of participants (43.5%) possess master's degrees. In conclusion, the survey results indicate that a considerable number of respondents exhibit a high educational attainment level.

This information is important for the project planners as it suggests that a substantial number of residents in the city, especially those with master's degrees, are likely to comprehend and engage effectively with this project. This high level of education among the residents can be leveraged to enhance awareness, community engagement, and successful implementation of the improvement and extension of sewerage system project in Bahawalnagar City. Additionally, it indicates a potential resource of skilled labor and expertise within the local population, which could be valuable for the project's long-term sustainability and success.



Graph: Education Level of the Respondents

G) Marital Status

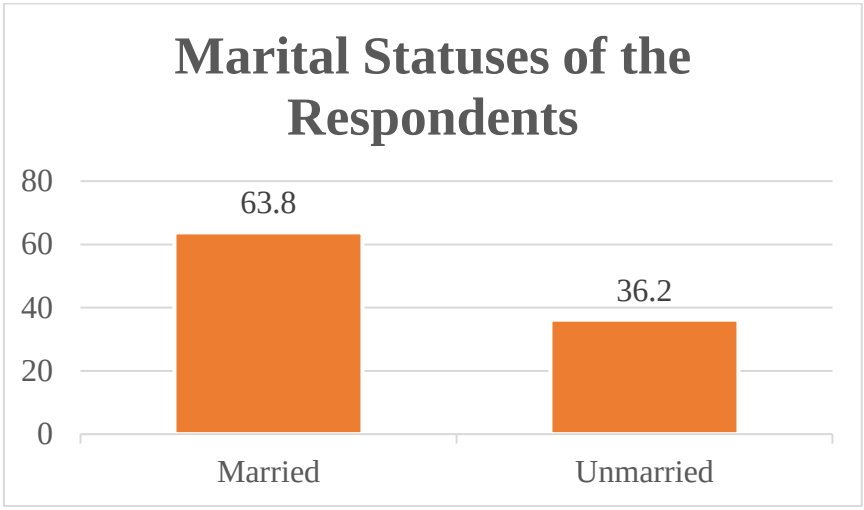
Marital status distribution of the survey is shown in Table 6-12.

Table 6-12, Marital Statuses of the Respondents

Sr. No.	Marital Status	Number	Percentage (%)
1.	Married	44	63.8
2.	Unmarried	25	36.2
3.	Divorced	0	0
	Total	**69**	**100**

According to the survey, 63.8% of the respondents are married and 36.2% are unmarried or single.

These findings underscore the importance of comprehensive urban planning and infrastructure development, ensuring that the wastewater treatment plant and similar facilities are designed to accommodate the needs of a varied and growing population. Effective planning and implementation are key to ensuring the well-being and sustainable development of Bahawalnagar city and its residents.



Graph: Marital Statuses of the Respondents

H) Total Dependents

The number of individuals who rely on the respondents is shown in Table 6-13.

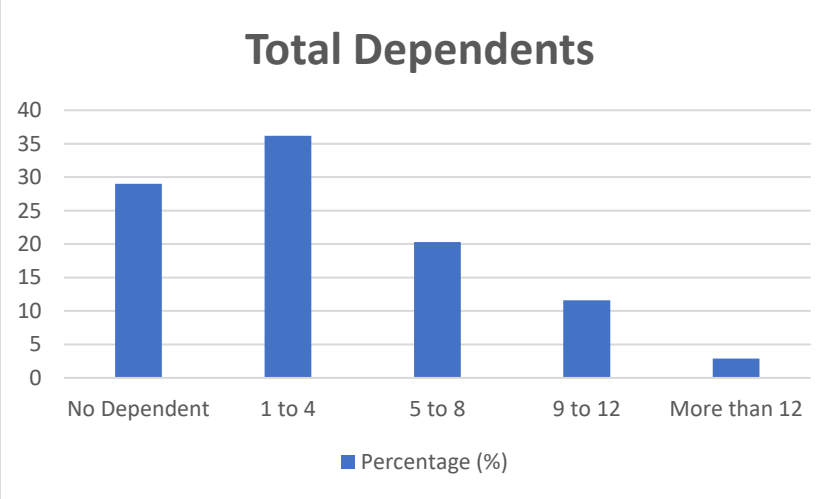
Table 6-13, Total Dependants

Sr. No.	Total Dependents (Individuals)	Number	Percentage (%)
1.	No Dependent	20	29
2.	1-4	25	36.2
3.	5-8	14	20.3
4.	9-12	08	11.6

Sr. No.	Total Dependents (Individuals)	Number	Percentage (%)
5.	More than 12	02	2.9
	Total	**69**	**100**

The table illustrates the count of people dependent on the survey participants. Most participants, precisely 36.2%, support 1 to 4 dependents. In contrast, 29% have no dependents, while 20.3% are responsible for 5 to 8 individuals. Additionally, 11.6% have 9 to 12 dependents, and only a small percentage have more than 12 dependents.

The data highlights the diverse familial responsibilities of the surveyed individuals which is important for planning the resources and infrastructure for the proposed project.



Graph: Total Dependents

6.8.7 Occupation and Sources of Income

The economic characteristics include occupation, income, and sources of income etc.

A) Occupation

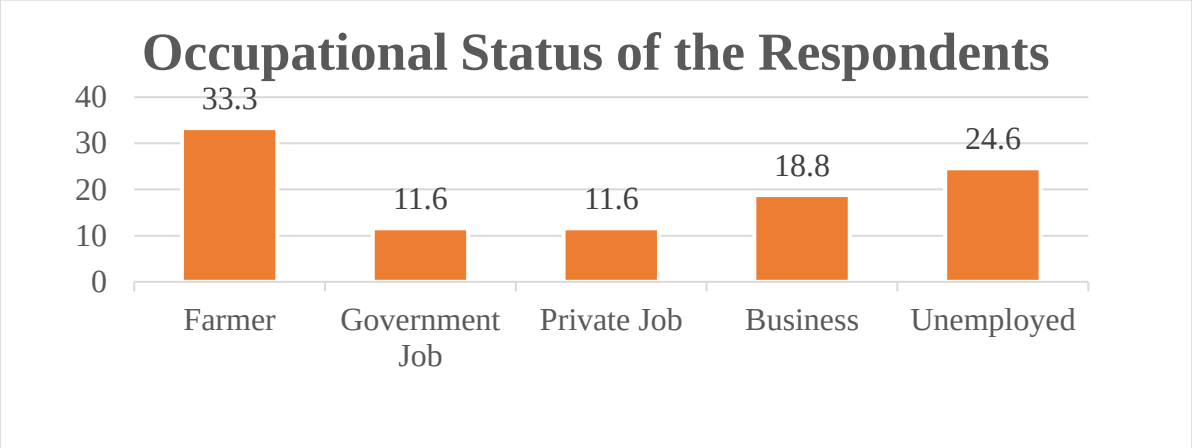
Occupations of the selected respondents are shown in Table 6-14.

Table 6-14, Occupational Status of the Respondents

Sr. No.	Occupation	Number	Percentage (%)
1.	Farmer	23	33.3
2.	Government Job	08	11.6
3.	Private Job	08	11.6
4.	Business	13	18.8
5.	Unemployed	17	24.6
	Total	**69**	**100**

The above table represents the occupational distribution of the respondents. According to the data, 24.6% of respondents are without a job. Among those considered "economically active," 33.3% are engaged in farming, 11.6% are employed in government positions, and an equal percentage is working in the private sector. Additionally, 18.8% of participants are involved in business activities.

The provided data sheds light on the occupational landscape of the respondents. The substantial 24.6% of individuals without employment underlines the prevalent joblessness in the area, signifying a significant area of focus for local development initiatives. Among the economically active respondents, the dominance of farming at 33.3% showcases the agricultural nature of the region's economy. The balanced employment rates in government positions and the private sector at 11.6% each indicate a diverse employment scenario, suggesting a scope for collaboration between public and private sectors. Moreover, the 18.8% participation in business activities signifies entrepreneurial potential, providing a foundation for economic growth and potential partnerships in the context of the proposed project. Understanding these occupational dynamics is vital for tailoring employment-focused strategies and community engagement programs connected to the proposed project in Bahawalnagar city.



Graph: Occupational Status of the Respondents

B) Household Income Levels

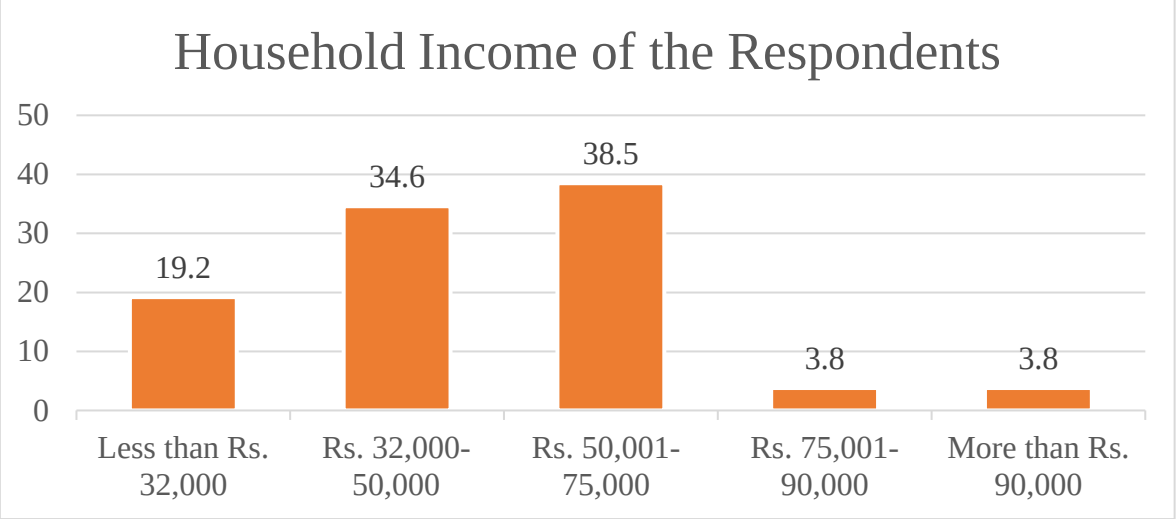
During the socio-economic survey, respondents were inquired about their total family monthly income from all sources. Table 6-15 shows the income levels of the respondents.

Table 6-15, Household Income Levels

Sr. No.	Income Level (Pak rupees)	Number	Percentage (%)
1.	Less than Rs. 32,000	10	19.2
2.	Rs. 32,000-50,000	18	34.6

Sr. No.	Income Level (Pak rupees)	Number	Percentage (%)
3.	Rs. 50,001-75,000	20	38.5
4.	Rs. 75,001-90,000	02	3.8
5.	More than Rs. 90,000	02	3.8
	Total	**52**	**100**

Based on the data presented in the table, it can be observed that 19.2% of the participants earn less than Rs. 32,000 monthly. Additionally, 34.6% fall within the income bracket of Rs. 32,000 to Rs. 50,000 per month, while 38.5% earn between Rs. 50,001 and Rs. 75,000 monthly. Furthermore, 3.8% have a monthly income ranging from Rs. 75,001 to Rs. 90,000, and an equal percentage of respondents earn more than Rs. 90,000 monthly.



Graph: Household Income of the Respondents

C) Sources of Income

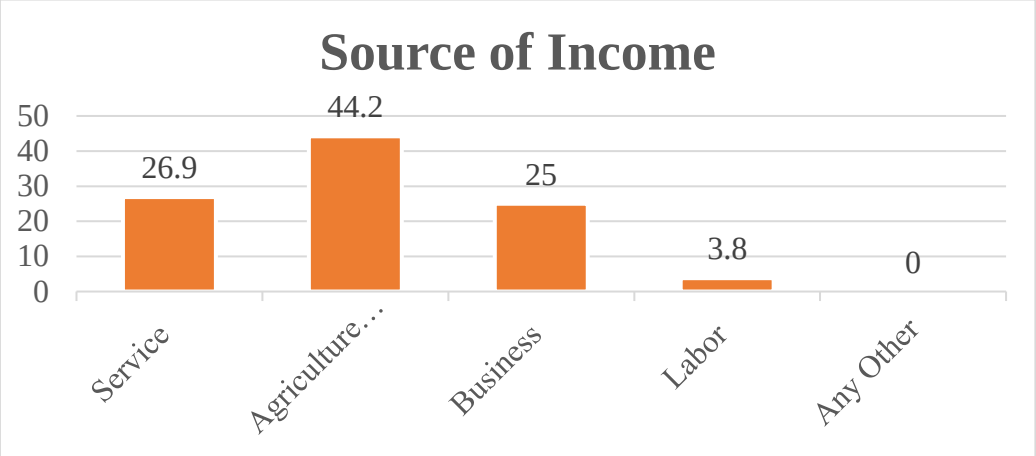
Sources of income survey findings of selected respondents are shown in Table 6-16.

Table 6-16, Sources of Income Distribution of the Respondents

Sr. No.	Source	Number	Percentage (%)
1.	Service	14	26.9
2.	Agriculture / Livestock	23	44.2
3.	Business	13	25
4.	Labor	02	3.8
5.	Any Other	0	0
	Total	**52**	**100**

Based on the data presented in the table, it can be observed that 26.9% of participants are involved in service-related occupations, while 44.2% are engaged in agriculture and livestock activities. Another 25% reported being self-employed as business owners or entrepreneurs, while a smaller proportion (3.8%) work as daily wage laborer.

These findings indicate that a significant number of respondents still rely heavily on traditional agricultural practices for their livelihoods, underscoring the importance of promoting sustainable farming methods to enhance their economic well-being. Moreover, the substantial percentage of individuals involved in agriculture/livestock highlights the need for targeted interventions and investments within this sector to drive economic growth effectively. Moreover, understanding the community's economic activities is essential for ensuring sustainable development and effectively addressing the needs of the population.



Graph: Source of Income

6.8.8 Housing Profile

The housing profile shows the housing conditions of the respondents.

A) Types of Construction

Table 6-17 shows the type of construction of the house in the Project Area.

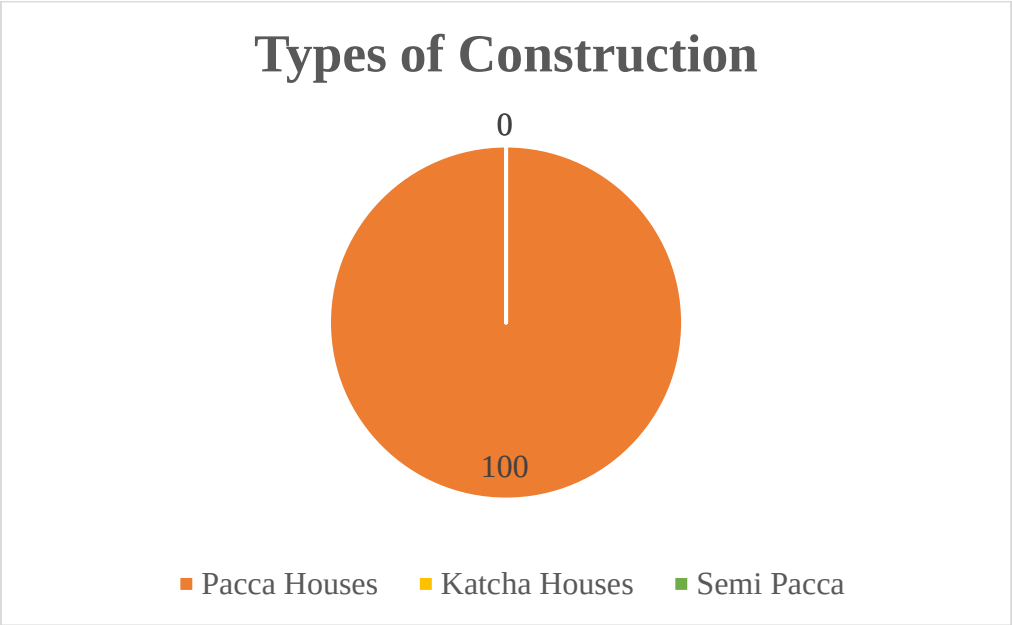
Table 6-17, Types of Construction

Sr. No.	Construction Type	Number	Percentage (%)
1.	Pacca Houses	69	100
2.	Katcha Houses	0	0
3.	Semi Pacca	0	0
	Total	**69**	**100**

Based on the data in the table, it can be observed that all respondents reported living in pacca (concrete) houses. However, none of the participants reside in katcha (mud) or semi pacca dwellings.

The data from the survey indicates a notable trend among the residents of Bahawalnagar City regarding their housing structures. The absence of respondents living in katcha or semi pacca dwellings suggests a prevalent preference for more stable and durable concrete houses within the

community. Understanding the housing patterns is essential for urban planning and infrastructure development, including the construction of vital facilities like wastewater treatment plants.



Graph: Types of Construction

B) Estimated Number of Houses in the Sub Project Area

Based on the survey findings, a large portion of participants indicated that Bahawalnagar City is home to an estimated 25,000 to 30,000 residences. The average number of houses in the city was calculated at around 27,500.

C) Estimated Household Size

Based on the survey findings, a significant number of participants indicated that households typically consist of four to eight members. However, the average household size was found to be around six individuals.

D) Estimated Population

Estimated Population = Household Size * No. of Houses

27,500 * 6 = 165,000

The accurate population estimates are essential for the proper functioning and efficiency of wastewater treatment facilities in Bahawalnagar city. Therefore, proper planning based on these estimates ensures that the treatment plant can effectively manage and treat the wastewater generated by the city's residents, contributing to a cleaner and healthier environment for the community.

6.8.9 Social Amenities

In the socio-economic survey conducted to establish the social foundation of the project area, participants were asked about the utilities in their locality. All respondents reported having access to electricity at their homes. PTCL services were accessible in various areas, and a majority of participants owned mobile phones. Some households used solar panels for electricity and water supply. However, a small number of respondents expressed discontent with the sewerage and drainage facilities. It's important to note that there is no availability of Sui Gas in the area. The table illustrates the status of social amenities on a scale.

Table 6-18, Social Amenities in the Project Area

Sr. No.	Social Amenities	Scale	Number	Percentage (%)
1.	Truck / Bus Terminals	Yes	69	100
		No	0	0
		Total	**69**	**100**
2.	Railway Tracks	Yes	69	100
		No	0	0
		Total	**69**	**100**
3.	Gas Pipelines	Yes	0	0
		No	69	100
		Total	**69**	**100**
4.	Shopping Area/Markets	Yes	69	100
		No	0	0
		Total	**69**	**100**
5.	Tubewells	Yes	69	100
		No	0	0
		Total	**69**	**100**
6.	Telephone Lines	Yes	69	100
		No	0	0
		Total	**69**	**100**
7.	Water Supply Network	Yes	69	100
		No	0	0
		Total	69	100
8.	Sewerage System	Yes	39	56.5
		No	30	43.5
		Total	**69**	**100**
9.	Drainage System	Yes	49	71
		No	20	29
		Total	**69**	**100**
10.	Electricity Transmission Lines	Yes	69	100
		No	0	0

Sr. No.	Social Amenities	Scale	Number	Percentage (%)
		Total	**69**	**100**
11.	Storm Water drains	Yes	0	0
		No	69	100
		Total	**69**	**100**
12.	Disposal Stations	Yes	69	100
		No	0	0
		Total	**69**	**100**

A) Mode of Transport

The survey revealed that a significant portion of the participants opt for motorcycles as their primary mode of transportation. However, there are also some respondents who rely on cars or public transport to commute.

6.8.10 Availability of Social Services

Social services include healthcare, education and employment support etc. The detail information on each of these services is given below.

A) Educational Facilities

There are number of government and private educational institutions are present in Bahawalnagar that are imparting education from the level of mosque or primary up to post graduate levels.

Table 6-19, Educational Facilities

Sr. No.	Name of Institution	Education Level	For Boys / Girls
1.	Government High School Model Town for Girls	Secondary	Girls
2.	Elementary School for Boys	Secondary	Boys
3.	Madrassa Jamia Abdullah Bin Masood	Primary / Islamic	Boys
4.	Allama Iqbal Open University	Higher Secondary	Co-education
5.	Virtual University	Higher Secondary	Co-education
6.	Al-Fazal Public School	Secondary	Co-education
7.	The Educators	Secondary	Co-education
8.	Galaxy Public School	Secondary	Co-education
9.	DPS Bahawalnagar	Secondary	Co-education

B) Health Facilities

In Bahawalnagar City, numerous healthcare facilities are available. However, if residents of Bahawalnagar City require specialized medical services, they must travel to Lahore due to the lack of advanced healthcare facilities locally.

Table 6-20, Health Facilities

Sr. No.	Health Facilities	Government / Private
1.	District Head Quarter Hospital Bahawalnagar	Government
2.	Zeeshan Health Care Hospital	Private
3.	Zafar Hospital	Private
4.	Mushtaq Surgi Med Hospital Bahawalnagar	Private
5.	Maternity Home Model Town Bahawalnagar	Government
6.	Al Raheem Pharmacy Hospital	Private
7.	Kalsoom Hospital and Maternity Home	Private

C) Offices

In the survey, the offices which is identified within the project area is shown in Table 6-21.

Table 6-21, Offices

Sr. No.	Office	Government / Private
1.	Assistant Commissioner Office Bahawalnagar	Government
2.	NADRA Zonal Office Bahawalnagar	Government
3.	Passport Office Bahawalnagar	Government
4.	Family Welfare Center	Government
5.	Tehsil Population Welfare Office	Government
6.	Punjab Rural Municipal Services Company (PRMSC) Bahawalnagar	Government
7.	Irrigation Office	Government
8.	Meezan Bank	Private

6.8.11 Sewerage Infrastructure

Sewerage infrastructure typically includes systems of pipes, drains, and other structures used for the collection, transport, treatment, and disposal of wastewater and sewage. These systems are important for public health and environmental sustainability. The presence or absence of a proper sewerage system greatly impacts the sanitation and overall well-being of communities. Therefore, in the present project survey, various questions related to sewerage infrastructure were asked from the respondents. A detailed analysis of each question is given below.

A) Availability of Sewerage System

In Zone-A, the survey revealed that a significant number of respondents in Makkah Town do not have access to a sewerage system. However, some households have taken initiative and created their own systems for waste disposal in nearby open areas. In Dinpur Sharif, residents mentioned the

presence of an open drainage system, while Madina Town has a sewerage system but it is frequently blocked or damaged. Similarly, in Zones B and C, there are existing sewerage systems; however, they suffer from blockages or damages.

The availability of proper sewage disposal infrastructure greatly impacts the sanitation and overall well-being of communities. It is important to address the inadequate sewage facilities specially in Zone-A to enhance the health and living conditions of its residents.

B) Type of Sewerage System (Open or Closed)

Based on the survey, Makkah Town and Dinpur Sharif in Zone-A lack a proper sewerage system. In contrast, Madina Town in Zone-A as well as Zones B and C have successfully implemented closed sewerage systems.

The presence or absence of adequate sewage infrastructure is important for determining community sanitation standards and overall welfare. Therefore, it is essential to address the insufficient sewage disposal facilities in Zone-A to improve the health and living conditions of its residents.

C) Current Issues Related to Sewerage System

Some common issues reported by respondents are:

- No sewerage system available in many areas of city.
- Sewerage systems are deteriorating, leading to leaks, cracks, and collapses.
- Existing sewerage systems are unable to handle the increased volume of wastewater.
- Choked sewerage systems leading to blockages, corrosion and clogged pipelines.
- Ground water mixes with sewer water through cracks and leaks.
- Sewer pipelines carry both stormwater and sewer water.
- Waterborne diseases arise from the presence of sewage-contaminated water in public areas.

D) Satisfaction of Local Community with the Current Services

The survey revealed that most respondents are dissatisfied with the existing services provided by the Municipal Committee (MC).

The findings emphasize a pressing need for immediate improvements in the services offered by the Municipal Committee (MC). Addressing the concerns voiced by the respondents is important to ensure the effective operation of the project and to enhance overall public satisfaction with municipal services. Therefore, urgent actions and strategic initiatives are imperative to meet the community's expectations and to uphold the standards of a functional and efficient waste management system in the city.

E) Signs of Choked/Damaged Sewers or Ponding

Survey participants reported that the current sewage pipelines are damaged, choked and blocked.

The feedback from survey participants underscores the critical need for immediate attention to the city's sewage infrastructure. The revelation about the deteriorated and blocked sewage pipelines emphasizes the urgency of repair and maintenance efforts. Addressing these issues is essential not only for the effective functioning of the proposed project but also for ensuring the overall environmental and public health standards in the city. Therefore, timely action is imperative to prevent further deterioration and to establish a reliable and efficient sewage system in Bahawalnagar City.

F) Drinking Water Contaminates with Waste water

Respondents disclosed that clean drinking water becomes contaminated with wastewater.

The survey highlights the urgency of taking immediate actions and extensive measures to prevent this contamination.

G) Repair / Maintenance / Rehabilitation Requirement of Current Sewerage System

In the survey, participants stated that the current sewerage system needs repairs, maintenance, and rehabilitation.

The feedback of the respondents underscores the critical importance of addressing these issues promptly to ensure a functional and efficient wastewater treatment plant, vital for the community's health and well-being.

H) Percentage of Community Being Served by Sewerage System

According to the participants, only around 35% to 40% of the local community is being served by the existing sewerage infrastructure.

The survey findings highlight the limited coverage of the sewerage system in Bahawalnagar City. This indicates a significant gap in providing essential sanitation services to a considerable portion of the population. Therefore, addressing this disparity is essential for ensuring a healthier and more sanitary living environment for a larger segment of the community.

I) Bill Payment

Residents in areas without a sewerage system are not subjected to any billing by the Municipal Committee (MC). However, in areas where sewerage infrastructure exists, households used to pay an annual fee ranging from Rs. 1200 to 1400. Recently, this fee structure has been revised and changed to a quarterly payment of Rs. 1200 to 1500 per household.

This payment structure acknowledges the financial burden on residents, however, ensuring a sustainable funding model for the maintenance and

expansion of the sewerage infrastructure.

J) Current Requirements of Local Community Being Fulfilled by Current Sewerage System

The survey revealed that numerous areas lack adequate sewerage systems, and in those areas where such systems exist, repairs and rehabilitation are urgently required. Considering these conditions, the existing sewerage system only partially meets the needs of the local community.

The widespread lack of adequate sewerage systems, coupled with the urgent requirement for repairs and rehabilitation in existing systems, highlights the significant challenges faced by the local community. The current sewerage system, despite its presence, falls short in meeting the community's needs effectively. Therefore, addressing these issues is imperative to ensure a healthier environment and an enhanced quality of life for the residents of Bahawalnagar City.

K) Government Efforts for Future Sewerage System Requirements

According to the survey, all respondents expressed their views about the Government efforts for future sewerage system requirements. The views are:

- Government should establish a well-functioning sewerage system within the city.
- Government should conduct thorough assessments of current sewerage systems in the city and anticipate future needs based on population growth, urbanization trends, and industrial developments.
- Governments should allocate sufficient budgets for the construction, maintenance, and improvement of sewage treatment plants, pipelines, and related facilities.

L) Stormwater Drains

During the survey, it was identified that there is a lack of stormwater drainage infrastructure within the designated project region.

According to the findings, the lack of stormwater drainage infrastructure poses a significant challenge to effectively manage stormwater runoff. This lack of infrastructure can also lead to detrimental consequences such as flooding and property damage. Therefore, implementing appropriate stormwater drainage infrastructure is important to mitigate the negative impacts of stormwater runoff.

M) Ultimate Disposal for Wastewater (Water Body / Irrigation / Sem Nullah)

According to the survey, all respondents stated that open areas are used for the final disposal of wastewater.

The survey revealed that a lack of proper wastewater infrastructure and limited access to sanitation facilities further exacerbate the problem, leading

to improper disposal of wastewater. Additionally, this practice poses significant risks to the environment and public health. Moreover, the accumulation of wastewater in open spaces is a growing concern that needs to be urgently addressed.

N) Treatment for Wastewater Before Disposal

Based on the survey findings, it is evident that all participants unanimously agreed on the necessity of wastewater treatment prior to its disposal.

The social survey indicates a strong consensus among the respondents regarding the importance of wastewater treatment. This underscores the growing recognition of the negative impacts of untreated wastewater on public health and the environment, as well as the need for effective measures to mitigate these.

SECTION - 7: POTENTIAL ENVIRONMENTAL & SOCIAL IMPACTS AND MITIGATION MEASURES

7.1 General

This chapter identifies the potential impacts related with preconstruction, construction and operation phases of the project on the physical, ecological and socioeconomic 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 project construction phase, the future contractors must be notified and prepared to cooperate with the executing agency, project management, supervising consultants and local population in the mitigation of impacts. Furthermore, the contractors must document the implementation of ESIA in full and be ready to engage trained environmental management staff to audit the effectiveness and review mitigation measures as the project proceeds. The effective implementation of the ESIA 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 and the World Bank on the environmental and social aspects of projects and the recommendations already made for project in this ESIA, ESMF for PCP, 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 this project; Improvement and Extension of Sewerage System in Bahawalnagar City:

1) Project Interaction Matrix
2) Checklists
3) Overlays

7.2.1 Project Interaction Matrix

Interaction matrix is a two-dimensional matrix wherein the 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 project actions grouped into categories i.e., Physical, Ecological & Socioeconomic Environment. Interaction matrix is used in this project due to the following reasons:

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

- It provides nature (+ve or –ve) and weighting of different impacts.
- It provides cumulative impacts of a project.

Matrix grouped project actions into temporal phases. For the impact assessment, project interaction matrix is used by dividing the project action into different phases (preconstruction, construction and operation). The environmental impacts are divided into three main categories including physical, ecological and socioeconomic domains. The environmental impacts of the 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 project have not been considered in the matrix.

7.2.2 Checklist

The assignment of significance is based on the previous knowledge and professional judgment of ESIA team experts. The 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 project, have not been considered in the matrix.

7.2.3 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 (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

Impact Characterization	
Nature	**Direct:** The environmental parameter is directly changed by the 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 project such as noise from the construction activities. **Medium-term:** Lasting for a period of few months to a year after the project before naturally reverting to the original condition 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-project condition. **Irreversible:** When a receptor does not or cannot resume its pre-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 of statutory requirements.

The impact characterization due to design, location, construction and operational phase is given in their respective sections.

7.4 Environmental & Social Impacts and Their Mitigations During Pre-Construction Phase

7.4.1 Impacts Regarding Project Location

The project is for sewerage system that will be constructed / executed on the govt. owned land. Force main and sewer lines are to be constructed / laid in RoW of roads / railway track. As a seepage drain passes near the proposed site of WWTP which is said to be under the jurisdiction of Irrigation Department. Therefore, these departments; Highway Department, Railway Department and Irrigation Department must be consulted before commencement of project.

A) Impact Significance

- High

B) Mitigations

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.

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

7.4.2 Impacts Regarding Project Design

The project is to be designed in a way that it guarantees all compliance with the Punjab Environmental Quality Standards (PEQS).

A) Impact Significance

- Medium

B) Mitigations

The design is made by taking in considerations that minimum impacts will occur on the environment.

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

7.5 Impacts and Their Mitigations During Construction Phase

7.5.1 Physical Impacts

A) Soil Contamination

- Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the 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 0.45 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 project area.

1. Impact Significance

- Medium

2. Mitigations

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 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.

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

B) Contamination of Surface and Groundwater Resources

Sewage and sanitary wastewater generated from the construction site may contaminate groundwater, if not disposed of properly. Although there is no canal near project site but there is a seepage drain near proposed site of WWTP which can be more polluted if wastewater generated from construction activities is disposed of in it without treatment or there can be leakage / seepage through the ground if accidental spills occur.

1. Mitigation Measures of Impacts on Water Resources

- Sewage from construction camp will be disposed of using septic tank which has been designed properly keeping in view the following parameters:
  - Soil stratigraphy at 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;

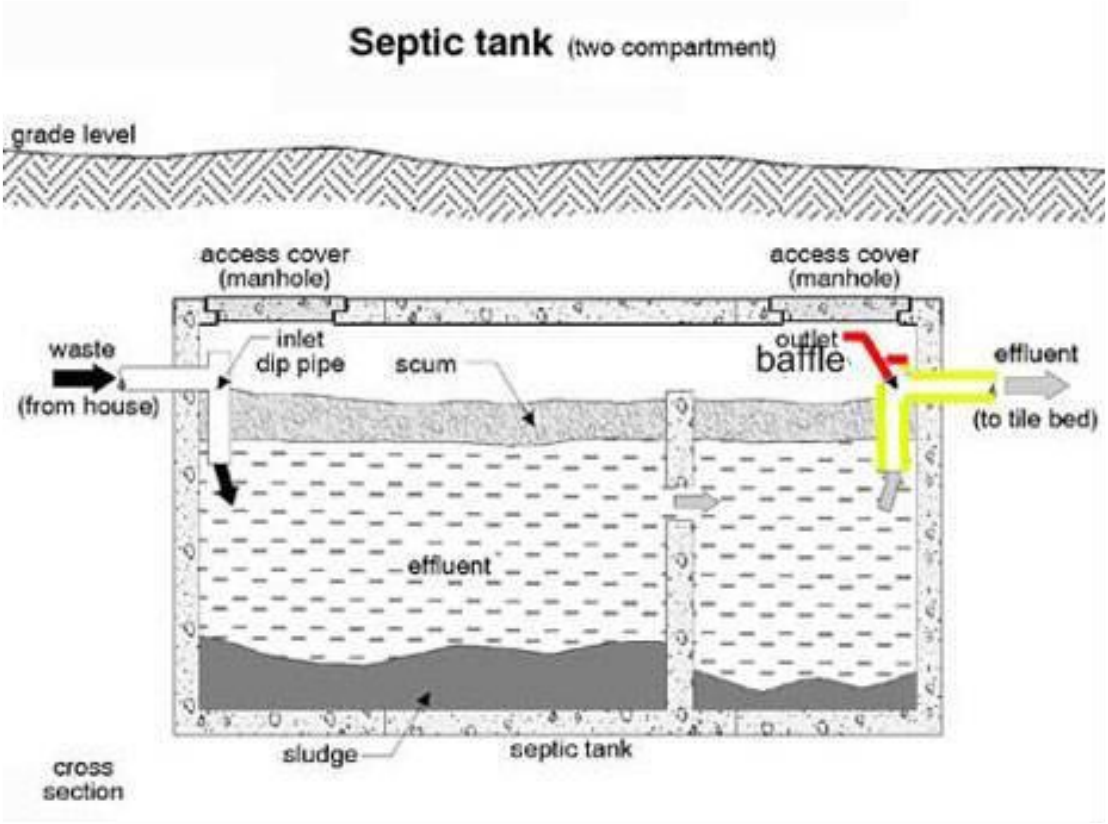


Figure 7-1, Septic Tank

- 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 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.

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

C) Impacts 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 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. Sources of air pollutants from the construction works will include traffic in and out of the site emitting and earth works at site during the excavation of trenches.

1. Impact Significance

- High

2. Mitigation Measures of Impacts on Ambient Air Quality

- Tuning of vehicles should be made mandatory to reduce the emissions of NOx, SOx, CO and PM_{10}.
- 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.
- 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.

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

D) Impacts on Ambient Noise Levels & Vibration

During the implementation of the 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 project area and neighbourhood residential may be disturbed by the noisy activities. The impact will be significant when compared to the without 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.

1. Impact Significance

- High

2. Mitigation Measures of Impacts on Noise & Vibration

- During the construction phase of the project, it is expected that elevated levels of noise will be produced in the construction area. Pipeline construction would progress along the route and, as a result, all noise impacts would be temporary.
- 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.

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

E) Disposal of Construction Debris & Garbage

During construction phase of the 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.

1. Impact Significance

- High

2. 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.

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

F) 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.

1. **Impact Significance**

- Medium

2. **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 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.

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

G) Impact on Utilities

The utilities (ground) along the project area that may be damaged as a result of the excavation for the pipelines include fibre optic cables, sewerage lines, 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.

1. Impact Significance

- Medium

2. Mitigation

This impact is not expected to be significant because there is no utilities present in the 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.

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

7.5.2 Ecological Environment

A) Impacts on Ecological Environment

1. Impact on Flora

- No trees exist at the proposed site of wastewater treatment plant. Anyhow, small grass / bushes exist at the site.

2. Disturbance to Fauna

- No impacts on fauna is envisaged.

3. Impact significance

- High

4. Mitigations

In this 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 project sites through excavations 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. As it is suggested to plant 10 new trees of almost 06 ft. height if a tree has to be cut due to any mishap / accident.

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

7.5.3 Socioeconomic Environment

A) 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.

1. Impact Significance

- High

2. 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.

Heath 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.

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

B) Impacts on Local Population

- No specific serious adverse impacts on community health and safety are expected as a result of construction and operation of the project.
- The population residing in and the surroundings of the 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 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.

1. Impact Significance

- Medium

2. 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.

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

C) 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.

1. Impact Significance

- Medium

2. 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.

3. **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 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 phase of the project 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 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 project. This will be complied with under the supervision of the PMDFC and Supervision Consultant.

H) Labor Influx and Recruitment

The project will involve recruitment of labourers which may lead to influx of persons looking for work in the 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 Mitigation Measures During Project Operation

7.6.1 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.

A) Impact Significance:

- Low

B) 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 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 project.

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

7.6.2 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.

A) Impact Significance

- Medium

B) Mitigation

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

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

7.6.3 Impacts to Occupational Health and Safety

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

A) 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.

B) Impact Significance

- Medium

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

7.6.4 Odor Issues

The processing of wastewater and sludge will cause odour which will be nuisance to the nearby settlements. This will have impact on health of inhabitants living in surroundings of the treatment plants.

A) Mitigation Measures

Buffer zones of almost 500 meters have been proposed along all the boundary walls of the treatment plants. The buffer zone will be planted with trees and herbs in order to minimize the impact of odour on nearby settlements.

B) Impact Significance

- Medium

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

7.6.5 Insect Breeding

The source of wastewater will provide ideal condition for breading of mosquitoes and other insects. The nutrient-rich water found in clarifiers, sedimentation areas and treatment basins is an ideal production area for mosquitoes that will cause severe problem to the inhabitants of nearby settlements and to the staff employed at treatment plants.

A) Mitigation Measures

- Larvicide is the most effective control technique for mosquito breeding. The primary larvicide used by wastewater treatment facilities is Bacillus thuriengiensis israelensis (Bti). Bti is a naturally occurring bacteria that will not interfere with the existing bacterial process occurring at a WWTP.
- Mosquito repelling plants that include Citronella, Horsemint and Marigolds should be planted in buffer zones and inside treatment plants.

B) Impact Significance

- Medium

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

7.6.6 Sludge Disposal

The sludge will be generated from the wastewater treatment plants if not disposed or manage properly then it can cause severe environment problem as well as risk to human health.

A) Mitigation Measures

- Sewerage sludge is organic in nature and contains useful amounts of plant nutrients such as nitrogen, phosphorus and essential trace elements and can be used as organic fertilizer or soil conditioner after treatment.
- Where the treatment of sludge is not possible then it should be incinerated at 900 °C.

B) Impact Significance

- Medium

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

7.6.7 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 the project. There is 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 repairs and maintenance.

7.6.8 Impacts on Traffic

The 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 room for pedestrian access.

A) Impact Significance:

- Medium

B) 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 motorized 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.

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

7.6.9 Impact on Air Quality

The impact on air quality during repairs and maintenance (operation phase) is expected to occur within the pipeline route and WWTP site 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 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.

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

7.6.10 Noise and Vibration Emission Impacts

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

A) 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.

B) Impact Significance

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

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

7.7 Assessing Impacts

Planning for environmental assessment depends upon reliably predicting 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 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 project components, and an understanding of the 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 project. Conversely, project information will include all aspects of construction or operation that might affect the environment.

7.7.1 Approach to Assessment

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

Some component of the project has positive and some have negative impact on environment and on the different factors like socioeconomic features of the community.

7.7.2 Negative Impacts

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

7.7.3 Positive Impacts

The positive impacts of the project are given as under:

- The 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.
- Sanitation features / sewerage features of the city will be enhanced as disposal stations of MC will be rehabilitated, chocked / worn-out sewer lines will be rehabilitated and a wastewater treatment plant will be constructed which will treat wastewater before final disposal.

7.8 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 project's potential cumulative effects were considered with respect to valued components (VCs) in environmental and socioeconomic categories, in four areas:

- of any potential residual project effects that may occur incrementally over time;
- consideration of other known relevant projects or activities within the specified study area boundaries, even if not directly related to the project;
- potential overlapping impacts that may occur due to other developments, even if not directly related to the proposed project;
- 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 Hafiz Wala village where WWTP will be constructed, force main for WWTP and Nazir Colony Disposal Station, disposal stations that will be rehabilitated and sewer lines that will be replaced / rehabilitated / improved.

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.

7.9 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 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 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's environmental legislation and applicable World Bank Core Principles. After the preparation of ESMF, PMDFC's ESM Wing outlined site-specific ESMMP for the Contractors and executing agency. Environmental and Social Screening Checklists were prepared by PMDFC's ESM Wing with the help of the field teams and was used to assess the potential impacts of 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 of PMDFC will provide support to ESFPs for managing environmental and social aspects of the project and implementation of the present ESIA. The specific responsibilities of the institutions involved in the ESIA implementation are described below:

A) 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 contractor will report the progress of ESIA to the Environmental Specialist of the consultant.

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 fulfil the above requirements.

B) Supervision 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 report the progress to PMDFC's ESM Wing.

C) PMDFC's ESM Wing

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

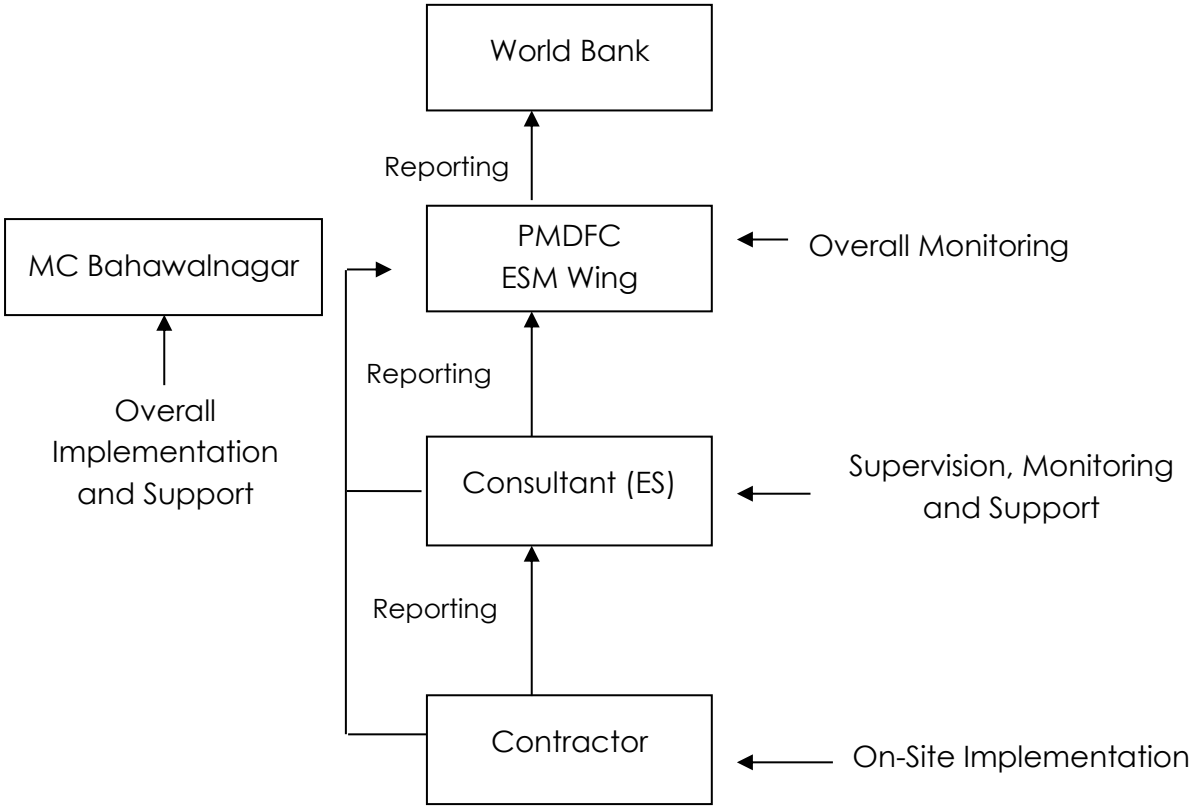


Figure 8-1, ESIA Implementation Framework

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 project. The Contractor is responsible for implementation of ESIA with the co-operation of executing and implementing agencies and local communities of the project.

8.4 Monitoring Plan

Monitoring Plan is also associated with mitigation plan during the different stages of the project. It ensures that mitigation measures are being effectively implemented. The monitoring of the 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.

8.4.1 Monitoring Mechanism

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

- **Compliance Monitoring:** Which checks whether the actions proposed by the ESIA have been carried out by visual observation, photographic documentation and the use of checklists prepared for the ESIA;
- **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 ESIA 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.

8.5 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 project based on safeguard implementation status. The monitoring reports will also include process and outcome of consultations with the project affected persons, if any. The distribution of periodic reports is given below:

Table 8-1, Reporting Mechanism

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

Distribution of Periodic Reports Report	Prepared by	Reviewed by	Approval
Annual	Contractor / Environment Specialist (consultant)	Supervision Consultant / Environment Specialist (consultant) / ESM – PMDFC	PMDFC – ESM / World Bank
Final	Contractor / Environment Specialist (consultant)	Supervision Consultant / Environment Specialist (consultant) / ESM – PMDFC	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 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 8-2.

Table 8-2, Environmental and Social Management and Monitoring Plan

1. Improvement and Extension of Sewerage System in Bahawalnagar City – WWTP

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
A. Impacts due to Project Location								
Site Selection	The project is for sewerage system that will be constructed on govt. owned land. However, RoW of Highway and Railway Department will be utilized for the construction of force main and sewer lines. While location of WWTP is said to be under the jurisdiction of ADCR and there is also a seepage drain in which wastewater after treatment from WWTP will be disposed which is under jurisdiction of Irrigation Department. Therefore, these major stakeholders must be consulted before commencement of 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 / PMDFC	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
B. Impacts due to Project Design								
Project Design	The project is to be designed in a way that it guarantees all compliance with the Punjab Environmental Quality Standards (PEQS).				The design is made by taking in consideration that minimum impact will occur on the environment.	Design consultant	• ESFPs • Supervisory Consultant • ESM-PMDFC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
C. Construction Phase / Repair / Rehabilitation								
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 nearby communities. • There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. • Health & Safety issues				• Labor camps should be 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. • 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). • Communication on hiring criteria, minimum age, and applicable laws. • Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks,	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the 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.			
Soil contamination	• Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the 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 0.45				• Soil contamination can be curtailed by reducing the oil spill at 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	• Equipment washing method and frequency to be regulated / controlled. • Vegetation to control erosion.

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	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 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 Groundwater Resources	• Sewage and sanitary wastewater generated from the construction site may contaminate groundwater, if not disposed of properly. • Although there is no canal near project site but there is a seepage drain near proposed site of WWTP which can be more polluted if wastewater generated from construction activities is disposed of in it without treatment or there can be leakage / seepage through the ground if accidental spills occur.				• 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 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	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	• Checking of septic tanks constructed for sewage. • Monitoring of surface water quality through EPA certified Lab

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					contingency plans will be made to ensure that.			
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 PM. • 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. • 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Ambient air quality monitoring through EPA certified Lab

Proposed 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 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 project area and 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				• During the construction phase of the project, it is expected that elevated levels of noise will be produced in the construction area. Pipeline construction would progress along the route and, as a result, all noise impacts would be temporary. • 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Noise level monitoring by an EPA certified lab

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	(manual labor) with very limited use of mechanized machinery which would be sources of noise and vibration.				• Regular monitoring to determine compliance will be done by the Supervision Consultant and corrective / mitigation measures applied where necessary.			
Disposal of Construction Debris & Garbage	• During construction phase of the 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.				• 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	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	• Placement of solid waste storage containers at camp sites. • Collection and disposal into MC's containers.

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					debris is disposed-off intentionally or unintentionally in the canals.			
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 motorized and non-motorized 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.				• 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 motorized 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 • Supervisory Consultant • ESM-PMDFC	Traffic management plan

Proposed 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.				This impact is not expected to be significant because there is no utilities present in the 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	
Emergency Response Plan	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.				• 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, 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	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Following EHS SOPS

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					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 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			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					Data Sheets for hazardous materials being handled. MSDSs should be readily accessible to employees in their local language.			
Ecological Impacts								
Biodiversity (Fauna and Flora)	**Impact on Flora:** No trees exist at the proposed site of wastewater treatment plant. Anyhow, small grass / bushes exist at the site **Disturbance to Fauna:** No negative impacts on fauna are envisaged.				• In this 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 project sites through excavations for the pipelines (reservoir) will not affect flora and fauna. No tree will be cut. • In case of any mishap / accident, if a tree is disturbed or cut, 10 new trees of almost 06 ft. height will be planted by the contractor.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Maintenance and monitoring of tree plantation
Social Impacts								
Project will have positive outcomes for the local communities as by the provision of good state of art infrastructure.								
Health and Safety Measures	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				Occupational health and safety impacts during construction 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	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Following EHS labor SOPS

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	workforce may suffer injury or death. Impact Significance				personnel will be engaged in operating equipment. Heath 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.			
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 project areas. The project will also require skilled workers and these may be available from the community. It is anticipated that approximately 75% of the workforce will be from project area while 25% of labour (skilled) would be hired from outside the project area. This labour influx may have a positive impact on social norms, culture and economy of the area.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
Impacts on Local Population	• No specific serious adverse impacts on community health and safety are expected as a result of				• The potential hazard risk from open trenches in the vicinity of populated areas should be mitigated by appropriate warnings and fencing.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	construction and operation of the project. • The population residing in and the surroundings of the 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 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.				• 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			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					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.			
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,				• 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 • ESM-PMDFC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	odors, unsightliness or public nuisance.							
Gender issue	• Project activities may cause hindrance to mobility especially for women during construction stage. • Privacy of the community may be disturbed.				• Workers would be trained to address privacy issues and ethically behaved. • Labor would be strictly asked to cater the privacy issues. • staff capacity-building	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
Traffic Management	• Blocking of road may hamper public mobility due to increase in number of vehicles • Road Safety				• Provision of alternative routes • Water sprinkling at project site at consecutive intervals • Indicators / signboards regarding alternate routes should be provided at proper distance to avoid accidents • Inform and coordinate the local residents regarding construction time schedule and also to display the details at project site for their convenience • Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and inconvenience to the local residents;	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Traffic management plan

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					• In case of any complaint, focal person of GRC may contact (details will be highlighted at project site).			
Economic Issues	Economic issues may arise due to loss of; • land, • structures / assets • productive plants • livelihood And, disturbance to • shopkeepers • vendors (Mobile / permanent)				• No land acquisition is involved • No public structures are found to be affected in the project area because they are not falling in ROW • No tree plantation is found • No livelihood will be affected by project activity • 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 project site.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
D. Operation / Maintenance Phase								
Solid Waste Generation	Solid wastes will mainly emanate from the operation activities related to maintenance operations and will include among others:				• The occurrence of these wastes is expected to be minimal because of the expected use of manual equipment and labor which would	Contractor	• ESFPs • ESM-PMDFC)	• Placement of solid waste storage containers at camp sites.

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	• 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.				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 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 project			• Collection and disposal into MC's containers
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 • The impact significance is expected to be low in nature, short term and reversible if the trenches	Contractor	• ESFPs • ESM-PMDFC)	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					are backfilled immediately and excess spoil material is disposed of as soon as possible.			
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				• 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 • ESM-PMDFC)	Following EHS labor SOPS
Odor Issues	The processing of wastewater and sludge will cause odor which will be nuisance to the nearby settlements. This will have impact on health of inhabitants living in surroundings of the treatment plants.				• Buffer zones of 500 meters have been proposed along all the boundary walls of the treatment plants. The buffer zone will be planted with trees and herbs in order to minimize the impact of odor on nearby settlements.	Contractor	• ESFPs • ESM-PMDFC)	
Insect Breeding	The source of waste water will provide ideal condition for breading of mosquitoes and other insects. The nutrient-rich water found in clarifiers, sedimentation areas and				• larvicide is the most effective control technique for mosquito breeding. The primary larvicide used by wastewater treatment facilities is Bacillus thuriengiensis israelensis (Bti). Bti is a naturally	Contractor	• ESFPs • ESM-PMDFC)	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	treatment basins is an ideal production area for mosquitoes that will cause severe problem to the inhabitants of nearby settlements and to the staff employed at treatment plants.				occurring bacteria that will not interfere with the existing bacterial process occurring at a WWTP. • Mosquito repelling plants that include Citronella, Horsemint and Marigolds should be planted in buffer zones and inside treatment plants.			
Sludge Disposal	The sludge will be generated form the waste water treatment plants if not disposed or manage properly then it can cause severe environment problem as well as risk to human health.				• Sewerage sludge is organic in nature and contains useful amounts of plant nutrients such as nitrogen, phosphorus and essential trace elements and can be used as organic fertilizer or soil conditioner after treatment • Where the treatment of sludge is not possible then it should be incinerated at 900°C.	Contractor	• ESFPs • ESM-PMDFC)	
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 sewerage system. There is potential hazard risk from open trenches during the repair phases that could lead to community health and safety risks				• 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 repairs and maintenance.	Contractor	• ESFPs • ESM-PMDFC)	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
Impacts on Traffic	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 motorized and non-motorized 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.				• 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 motorized 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 • ESM-PMDFC)	Traffic management plan
Impact on Air Quality	The impact on air quality during repairs and maintenance (operation phase) is expected to occur within the pipeline route and at the site of WWTP or at disposal stations. The impact on air quality is expected as a result of repair works, which may specifically entail excavation (opening) of the trenches and				• 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	Contractor	• ESFPs • ESM-PMDFC)	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	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.				insignificant if appropriate mitigation measures are implemented such as dust suppression techniques, regular maintenance of vehicles, use of high-quality fuel, etc. • Further, the project will be implemented through the significant use of manual labour and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery.			
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. This impact is expected to be low in nature and short term, 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.	Contractor	• ESFPs • ESM-PMDFC))	-

8.8.2 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. No.	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. • Noise level testing will be carried through EPA certified Lab.	Scheme Site	Quarterly	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
2.	Dust	• 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	Quarterly	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	Scheme Site	Quarterly	It will be conducted	• ESFPs • DPO-ESM

Sr. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
		Lab.			before, during and after completion of civil work. In this regard, an environmental compliance report will be submitted.	• 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 helmets, safety shoes, gloves, etc. should be provided to the labour.	Scheme Site	Once during construction activities	During construction of project, Health Safety attributes will be provided and environmental compliance report should be submitted.	• ESFPs • DPO-ESM • SPO ID/PD
6.	Public Consultation	• Local residents in the sub-	Scheme Site	• Two times	During and after	• ESFPs

Sr. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
		project area will be informed about the sub-project details, sub-project schedule and GRM		(during and post construction) • In case of any complaint, emergency visit will be organized.	completion of project; social compliance report will be submitted.	• DPO-ESM • SPO ID/PD
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 project; environmental and social monitoring report will be submitted	• ESFPs • DPO-ESM • SPO ID/PD
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 project; environmental and social monitoring report will be submitted.	• ESFPs • DPO-ESM • SPO ID/PD

Sr. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
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 as well as vendors (Mobile / permanent)	Scheme Site	Three times (pre, during and post construction) In case of any complaint, emergency visit will be organized.	During and after completion of project; environmental and social monitoring report will be submitted	• ESFPs • DPO-ESM • SPO ID/PD
10.	Privacy Issues	• Contractors would be trained to address privacy issues / behave ethically. • Labor 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 project; environmental and social monitoring report will be submitted	• ESFPs • DPO-ESM • SPO ID/PD

8.8.3 ESIA Implementation Budget

Project: Improvement and Extension of Sewerage System in Bahawalnagar City.

Item	Quantity	Tentative Cost per Item (PKR)	Total Cost (PKR)
Labor Safety			
Face Masks (3 PLY) - box	110	400	44,000
Safety Hard Helmets	30	3,000	90,000
Safety Shoes	30	3,000	90,000
Hand Gloves - box	110	1,500	165,000
Ear Plugs	30	500	15,000
Reflective Safety Vest	30	1,000	30,000
Safety Goggles	30	500	15,000
First Aid Box Complete	03	10,000	30,000
Infrared Thermometer (Benetech GM-2200 or equivalent)	02	40,000	80,000
Sub-Total			**559,000**
Working Site Safety			
Safety Signs	10	15,000	150,000
Safety Cones	20	1,000	20,000
Safety Tape	30	1,500	45,000
Portable Delineator with chain	20	2,200	44,000
Emergency Portable Lights	05	3,000	15,000
Solid Waste Collection Drums with Cover	10	12,000	120,000
Fire Fighting Equipment Purchase and refilling	03	10,000	30,000
Sub-Total			**424,000**
Others			
Hiring of Environmental Specialist (for 06 months)	01	100,000	600,000
Hiring of HSE Expert (for 06 months)	01	100,000	600,000
Training (HSE & Environment related trainings)	Lump sum	-	100,000
Pole Hanging Waste Bins	10	12,000	120,000
Digital Sound Level Meter	02	30,000	60,000
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)	02	200,000	400,000
Sub-Total (PKR)			**2,280,000**
Grand Total (PKR)			**3,263,000**
15% Contingency (PKR)			**489,450**
Grand Total with 15% Contingency (PKR)			**3,752,450**

2. "Improvement and Extension of Sewerage System in Bahawalnagar City – Force main"

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
E. Impacts due to Project Location								
Site Selection	The project is for sewerage system that will be constructed on govt. owned land. However, RoW of Highway and Railway Department will be utilized for the construction of force main and sewer lines. While location of WWTP is said to be under the jurisdiction of ADCR and there is also a seepage drain in which wastewater after treatment from WWTP will be disposed which is under jurisdiction of Irrigation Department. Therefore, these major stakeholders must be consulted before commencement of 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 / PMDFC	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
F. Impacts due to Project Design								
Project Design	The project is to be designed in a way that it guarantees all compliance with the Punjab Environmental Quality Standards (PEQS).				The design is made by taking in consideration that minimum impact will occur on the environment.	Design consultant	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
G. Construction Phase / Repair / Rehabilitation								
Physical Impacts								

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
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 nearby communities. • There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. • Health & Safety issues				• Labor camps should be 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. • 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). • 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	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the 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.			
Soil contamination	• Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the 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 0.45 kg/person/day solid wastes from site camps and				• Soil contamination can be curtailed by reducing the oil spill at 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	• Equipment washing method and frequency to be regulated / controlled. • Vegetation to control erosion.

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	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 project area.				• 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 Groundwater Resources	• Sewage and sanitary wastewater generated from the construction site may contaminate groundwater, if not disposed of properly. • Although there is no canal near project site but there is a seepage drain near proposed site of WWTP which can be more polluted if wastewater generated from construction activities is disposed of in it without treatment or there can be leakage / seepage through the ground if accidental spills occur.				• 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 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	• Checking of septic tanks constructed for sewage. • Monitoring of surface water quality through EPA certified Lab

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
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 PM. • 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. • 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Ambient air quality monitoring through EPA certified Lab
Noise and vibration	• During the implementation of the project a large amount of equipment and				• During the construction phase of the project, it is expected that elevated levels of noise will be	Contractor	• ESFPs • Supervisory Consultant	Noise level monitoring by

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	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 project area and 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 machinery which would 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		• ESM-PMDFC	an EPA certified lab

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	sources of noise and vibration.				corrective / mitigation measures applied where necessary.			
Disposal of Construction Debris & Garbage	• During construction phase of the 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.				• 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	• Placement of solid waste storage containers at camp sites. • Collection and disposal into MC's containers.

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
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 motorized and non-motorized 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.				• 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 motorized 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 • Supervisory Consultant • ESM-PMDFC	Traffic management plan
Impact on Utilities	Construction activities can result in the generation of				This impact is not expected to be significant because there is no utilities	Contractor	• ESFPs	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	wastewater, oil spillage from machinery, domestic waste from labour camps and construction related solid waste.				present in the 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.		• Supervisory Consultant • ESM-PMDFC	
Emergency Response Plan	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.				• 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, 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).	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Following EHS SOPS

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					• 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 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			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					should be readily accessible to employees in their local language.			
Ecological Impacts								
Biodiversity (Fauna and Flora)	**Impact on Flora:** No trees exist at the proposed site of wastewater treatment plant. Anyhow, small grass / bushes exist at the site **Disturbance to Fauna:** No negative impacts on fauna are envisaged.				• In this 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 project sites through excavations for the pipelines (reservoir) will not affect flora and fauna. No tree will be cut. • In case of any mishap / accident, if a tree is disturbed or cut, 10 new trees of almost 06 ft. height will be planted by the contractor.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Maintenance and monitoring of tree plantation
Social Impacts								
Project will have positive outcomes for the local communities as by the provision of good state of art infrastructure.								
Health and Safety Measures	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				Occupational health and safety impacts during construction 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 personnel will be engaged in operating equipment.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Following EHS labor SOPS

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					Heath 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.			
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 project areas. The project will also require skilled workers and these may be available from the community. It is anticipated that approximately 75% of the workforce will be from project area while 25% of labour (skilled) would be hired from outside the project area. This labour influx may have a positive impact on social norms, culture and economy of the area.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
Impacts on Local Population	• No specific serious adverse impacts on community health and safety are expected as a result of construction and operation of the project.				• 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	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	• The population residing in and the surroundings of the 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 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.				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.			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					• 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.			
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.				• 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 • ESM-PMDFC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
Gender issue	• Project activities may cause hindrance to mobility especially for women during construction stage. • Privacy of the community may be disturbed.				• Workers would be trained to address privacy issues and ethically behaved. • Labor would be strictly asked to cater the privacy issues. • staff capacity-building	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
Traffic Management	• Blocking of road may hamper public mobility due to increase in number of vehicles • Road Safety				• Provision of alternative routes • Water sprinkling at project site at consecutive intervals • Indicators / signboards regarding alternate routes should be provided at proper distance to avoid accidents • Inform and coordinate the local residents regarding construction time schedule and also to display the details at project site for their convenience • 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	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Traffic management plan

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					(details will be highlighted at project site).			
Economic Issues	Economic issues may arise due to loss of; • land, • structures / assets • productive plants • livelihood And, disturbance to • shopkeepers • vendors (Mobile / permanent)				• No land acquisition is involved • No public structures are found to be affected in the project area because they are not falling in ROW • No tree plantation is found • No livelihood will be affected by project activity • 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 project site.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
H. Operation / Maintenance Phase								
Solid Waste Generation	Solid wastes will mainly emanate from the operation activities related to maintenance operations and will include among others: • Excavated soil				• 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.	Contractor	• ESFPs • ESM-PMDFC)	• Placement of solid waste storage containers at camp sites. • Collection and disposal

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	• 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 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 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 project			into MC's containers
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 • The impact significance is expected to be low in nature, short term and reversible if the trenches are backfilled immediately and	Contractor	• ESFPs • ESM-PMDFC)	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					excess spoil material is disposed of as soon as possible.			
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				• 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 • ESM-PMDFC)	Following EHS labor SOPS
Odor Issues	The processing of wastewater and sludge will cause odor which will be nuisance to the nearby settlements. This will have impact on health of inhabitants living in surroundings of the treatment plants.				• Buffer zones of 500 meters have been proposed along all the boundary walls of the treatment plants. The buffer zone will be planted with trees and herbs in order to minimize the impact of odor on nearby settlements.	Contractor	• ESFPs • ESM-PMDFC)	
Insect Breeding	The source of waste water will provide ideal condition for breading of mosquitoes and other insects. The nutrient-rich water found in clarifiers, sedimentation areas and treatment basins is an ideal				• larvicide is the most effective control technique for mosquito breeding. The primary larvicide used by wastewater treatment facilities is Bacillus thuriengiensis israelensis (Bti). Bti is a naturally occurring bacteria that will not	Contractor	• ESFPs • ESM-PMDFC)	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	production area for mosquitoes that will cause severe problem to the inhabitants of nearby settlements and to the staff employed at treatment plants.				interfere with the existing bacterial process occurring at a WWTP. • Mosquito repelling plants that include Citronella, Horsemint and Marigolds should be planted in buffer zones and inside treatment plants.			
Sludge Disposal	The sludge will be generated form the waste water treatment plants if not disposed or manage properly then it can cause severe environment problem as well as risk to human health.				• Sewerage sludge is organic in nature and contains useful amounts of plant nutrients such as nitrogen, phosphorus and essential trace elements and can be used as organic fertilizer or soil conditioner after treatment • Where the treatment of sludge is not possible then it should be incinerated at 900°C.	Contractor	• ESFPs • ESM-PMDFC)	
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 sewerage system. There is potential hazard risk from open trenches during the repair phases that could lead to community health and safety risks				• 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 repairs and maintenance.	Contractor	• ESFPs • ESM-PMDFC)	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
Impacts on Traffic	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 motorized and non-motorized 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.				• 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 motorized 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 • ESM-PMDFC)	Traffic management plan
Impact on Air Quality	The impact on air quality during repairs and maintenance (operation phase) is expected to occur within the pipeline route and at the site of WWTP or at disposal stations. The impact on air quality is expected as a result of repair works, which may specifically entail excavation (opening) of the trenches and				• 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	Contractor	• ESFPs • ESM-PMDFC)	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	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.				insignificant if appropriate mitigation measures are implemented such as dust suppression techniques, regular maintenance of vehicles, use of high-quality fuel, etc. • Further, the project will be implemented through the significant use of manual labour and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery.			
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. This impact is expected to be low in nature and short term, 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.	Contractor	• ESFPs • ESM-PMDFC))	-

8.8.4 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. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
11.	Noise and vibration	• Use of machineries and equipment having less noise. • Provision for personal protective equipment (PPE's), ear muffs / ear plugs to workers. • Noise level testing will be carried through EPA certified Lab.	Scheme Site	Quarterly	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
12.	Dust	• 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	Quarterly	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
13.	Air Quality	• Air quality will be analyzed in through EPA certified	Scheme Site	Quarterly	It will be conducted	• ESFPs • DPO-ESM

Sr. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
		Lab.			before, during and after completion of civil work. In this regard, an environmental compliance report will be submitted.	• SPO ID/PD
14.	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
15.	Health, Safety and Environmental needs	• Adequate safety precautions such helmets, safety shoes, gloves, etc. should be provided to the labour.	Scheme Site	Once during construction activities	During construction of project, Health Safety attributes will be provided and environmental compliance report should be submitted.	• ESFPs • DPO-ESM • SPO ID/PD
16.	Public Consultation	• Local residents in the sub-	Scheme Site	• Two times	During and after	• ESFPs

Sr. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
		project area will be informed about the sub-project details, sub-project schedule and GRM		(during and post construction) • In case of any complaint, emergency visit will be organized.	completion of project; social compliance report will be submitted.	• DPO-ESM • SPO ID/PD
17.	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 project; environmental and social monitoring report will be submitted	• ESFPs • DPO-ESM • SPO ID/PD
18.	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 project; environmental and social monitoring report will be submitted.	• ESFPs • DPO-ESM • SPO ID/PD

Sr. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
19.	Economic Losses	• loss of land, • damage to structures • damage to trees/plants • negative impacts on livelihood in form of blockage of passage for shopkeepers as well as vendors (Mobile / permanent)	Scheme Site	Three times (pre, during and post construction) In case of any complaint, emergency visit will be organized.	During and after completion of project; environmental and social monitoring report will be submitted	• ESFPs • DPO-ESM • SPO ID/PD
20.	Privacy Issues	• Contractors would be trained to address privacy issues / behave ethically. • Labor 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 project; environmental and social monitoring report will be submitted	• ESFPs • DPO-ESM • SPO ID/PD

8.8.5 ESIA Implementation Budget

Project: Improvement and Extension of Sewerage System in Bahawalnagar City.

Item	Quantity	Tentative Cost per Item (PKR)	Total Cost (PKR)
Labor Safety			
Face Masks (3 PLY) - box	110	400	44,000
Safety Hard Helmets	30	3,000	90,000
Safety Shoes	30	3,000	90,000
Hand Gloves - box	110	1,500	165,000
Ear Plugs	30	500	15,000
Reflective Safety Vest	30	1,000	30,000
Safety Goggles	30	500	15,000
First Aid Box Complete	3	10,000	30,000
Infrared Thermometer (Benetech GM-2200 or equivalent)	2	40,000	80,000
Sub-Total			**559,000**
Working Site Safety			
Safety Signs	10	15,000	150,000
Safety Cones	20	1,000	20,000
Safety Tape	30	1,500	45,000
Portable Delineator with chain	20	2,200	44,000
Emergency Portable Lights	5	3,000	15,000
Solid Waste Collection Drums with Cover	10	12,000	120,000
Fire Fighting Equipment Purchase and refilling	3	10,000	30,000
Sub-Total			**424,000**
Others			
Hiring of Environmental Specialist (for 06 months)	1	100,000	600,000
Hiring of HSE Expert (for 06 months)	1	100,000	600,000
Training (HSE & Environment related trainings)	Lump sum		100,000
Pole Hanging Waste Bins	10	12,000	120,000
Digital Sound Level Meter	2	30,000	60,000
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)	2	200,000	400,000
Sub-Total (PKR)			**2,280,000**
Grand Total (PKR)			**3,263,000**
15% Contingency (PKR)			**489,450**
Grand Total with 15% Contingency (PKR)			**3,752,450**

3. "Improvement and Extension of Sewerage System in Bahawalnagar City – Rehabilitation work

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
I. Impacts due to Project Location								
Site Selection	The project is for sewerage system that will be constructed on govt. owned land. However, RoW of Highway and Railway Department will be utilized for the construction of force main and sewer lines. While location of WWTP is said to be under the jurisdiction of ADCR and there is also a seepage drain in which wastewater after treatment from WWTP will be disposed which is under jurisdiction of Irrigation Department. Therefore, these major stakeholders must be consulted before commencement of 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 / PMDFC	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
J. Impacts due to Project Design								
Project Design	The project is to be designed in a way that it guarantees all compliance with the Punjab Environmental Quality Standards (PEQS).				The design is made by taking in consideration that minimum impact will occur on the environment.	Design consultant	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
K. Construction Phase / Repair / Rehabilitation								
Physical Impacts								

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
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 nearby communities. • There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. • Health & Safety issues				• Labor camps should be 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. • 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). • 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	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the 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.			
Soil contamination	• Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the 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 0.45 kg/person/day solid wastes from site camps and				• Soil contamination can be curtailed by reducing the oil spill at 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	• Equipment washing method and frequency to be regulated / controlled. • Vegetation to control erosion.

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	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 project area.				• 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 Groundwater Resources	• Sewage and sanitary wastewater generated from the construction site may contaminate groundwater, if not disposed of properly. • Although there is no canal near project site but there is a seepage drain near proposed site of WWTP which can be more polluted if wastewater generated from construction activities is disposed of in it without treatment or there can be leakage / seepage through the ground if accidental spills occur.				• 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 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	• Checking of septic tanks constructed for sewage. • Monitoring of surface water quality through EPA certified Lab

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
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 PM. • 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. • 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Ambient air quality monitoring through EPA certified Lab
Noise and vibration	• During the implementation of the project a large amount of equipment and				• During the construction phase of the project, it is expected that elevated levels of noise will be	Contractor	• ESFPs • Supervisory Consultant	Noise level monitoring by

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	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 project area and 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 machinery which would 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		• ESM-PMDFC	an EPA certified lab

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	sources of noise and vibration.				corrective / mitigation measures applied where necessary.			
Disposal of Construction Debris & Garbage	• During construction phase of the 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.				• 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.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	• Placement of solid waste storage containers at camp sites. • Collection and disposal into MC's containers.

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
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 motorized and non-motorized 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.				• 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 motorized 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 • Supervisory Consultant • ESM-PMDFC	Traffic management plan
Impact on Utilities	Construction activities can result in the generation of				This impact is not expected to be significant because there is no utilities	Contractor	• ESFPs	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	wastewater, oil spillage from machinery, domestic waste from labour camps and construction related solid waste.				present in the 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.		• Supervisory Consultant • ESM-PMDFC	
Emergency Response Plan	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.				• 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, 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).	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Following EHS SOPS

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					• 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 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			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					should be readily accessible to employees in their local language.			
Ecological Impacts								
Biodiversity (Fauna and Flora)	**Impact on Flora:** No trees exist at the proposed site of wastewater treatment plant. Anyhow, small grass / bushes exist at the site **Disturbance to Fauna:** No negative impacts on fauna are envisaged.				• In this 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 project sites through excavations for the pipelines (reservoir) will not affect flora and fauna. No tree will be cut. • In case of any mishap / accident, if a tree is disturbed or cut, 10 new trees of almost 06 ft. height will be planted by the contractor.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Maintenance and monitoring of tree plantation
Social Impacts								
Project will have positive outcomes for the local communities as by the provision of good state of art infrastructure.								
Health and Safety Measures	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				Occupational health and safety impacts during construction 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 personnel will be engaged in operating equipment.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Following EHS labor SOPS

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					Heath 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.			
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 project areas. The project will also require skilled workers and these may be available from the community. It is anticipated that approximately 75% of the workforce will be from project area while 25% of labour (skilled) would be hired from outside the project area. This labour influx may have a positive impact on social norms, culture and economy of the area.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
Impacts on Local Population	• No specific serious adverse impacts on community health and safety are expected as a result of construction and operation of the project.				• 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	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	• The population residing in and the surroundings of the 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 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.				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.			

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					• 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.			
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.				• 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 • ESM-PMDFC	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
Gender issue	• Project activities may cause hindrance to mobility especially for women during construction stage. • Privacy of the community may be disturbed.				• Workers would be trained to address privacy issues and ethically behaved. • Labor would be strictly asked to cater the privacy issues. • staff capacity-building	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
Traffic Management	• Blocking of road may hamper public mobility due to increase in number of vehicles • Road Safety				• Provision of alternative routes • Water sprinkling at project site at consecutive intervals • Indicators / signboards regarding alternate routes should be provided at proper distance to avoid accidents • Inform and coordinate the local residents regarding construction time schedule and also to display the details at project site for their convenience • 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	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	Traffic management plan

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					(details will be highlighted at project site).			
Economic Issues	Economic issues may arise due to loss of; • land, • structures / assets • productive plants • livelihood And, disturbance to • shopkeepers • vendors (Mobile / permanent)				• No land acquisition is involved • No public structures are found to be affected in the project area because they are not falling in ROW • No tree plantation is found • No livelihood will be affected by project activity • 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 project site.	Contractor	• ESFPs • Supervisory Consultant • ESM-PMDFC	-
L. Operation / Maintenance Phase								
Solid Waste Generation	Solid wastes will mainly emanate from the operation activities related to maintenance operations and will include among others: • Excavated soil				• 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.	Contractor	• ESFPs • ESM-PMDFC)	• Placement of solid waste storage containers at camp sites. • Collection and disposal

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	• 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 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 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 project			into MC's containers
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 • The impact significance is expected to be low in nature, short term and reversible if the trenches are backfilled immediately and	Contractor	• ESFPs • ESM-PMDFC)	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
					excess spoil material is disposed of as soon as possible.			
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				• 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 • ESM-PMDFC)	Following EHS labor SOPS
Odor Issues	The processing of wastewater and sludge will cause odor which will be nuisance to the nearby settlements. This will have impact on health of inhabitants living in surroundings of the treatment plants.				• Buffer zones of 500 meters have been proposed along all the boundary walls of the treatment plants. The buffer zone will be planted with trees and herbs in order to minimize the impact of odor on nearby settlements.	Contractor	• ESFPs • ESM-PMDFC)	
Insect Breeding	The source of waste water will provide ideal condition for breading of mosquitoes and other insects. The nutrient-rich water found in clarifiers, sedimentation areas and treatment basins is an ideal				• larvicide is the most effective control technique for mosquito breeding. The primary larvicide used by wastewater treatment facilities is Bacillus thuriengiensis israelensis (Bti). Bti is a naturally occurring bacteria that will not	Contractor	• ESFPs • ESM-PMDFC)	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	production area for mosquitoes that will cause severe problem to the inhabitants of nearby settlements and to the staff employed at treatment plants.				interfere with the existing bacterial process occurring at a WWTP. • Mosquito repelling plants that include Citronella, Horsemint and Marigolds should be planted in buffer zones and inside treatment plants.			
Sludge Disposal	The sludge will be generated form the waste water treatment plants if not disposed or manage properly then it can cause severe environment problem as well as risk to human health.				• Sewerage sludge is organic in nature and contains useful amounts of plant nutrients such as nitrogen, phosphorus and essential trace elements and can be used as organic fertilizer or soil conditioner after treatment • Where the treatment of sludge is not possible then it should be incinerated at 900°C.	Contractor	• ESFPs • ESM-PMDFC)	
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 sewerage system. There is potential hazard risk from open trenches during the repair phases that could lead to community health and safety risks				• 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 repairs and maintenance.	Contractor	• ESFPs • ESM-PMDFC)	-

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
Impacts on Traffic	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 motorized and non-motorized 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.				• 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 motorized 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 • ESM-PMDFC)	Traffic management plan
Impact on Air Quality	The impact on air quality during repairs and maintenance (operation phase) is expected to occur within the pipeline route and at the site of WWTP or at disposal stations. The impact on air quality is expected as a result of repair works, which may specifically entail excavation (opening) of the trenches and				• 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	Contractor	• ESFPs • ESM-PMDFC)	

Proposed Project Activities	Potential Impacts	Magnitude of Impacts			Mitigation Measures	Implementing Agency	Monitoring Responsibility	Actions/ Monitoring Parameters/ Monitoring Methods
		High	Medium	Low				
	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.				insignificant if appropriate mitigation measures are implemented such as dust suppression techniques, regular maintenance of vehicles, use of high-quality fuel, etc. • Further, the project will be implemented through the significant use of manual labour and mostly through manual equipment for digging the trenches. This minimizes the air quality impacts from motorized machinery.			
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. This impact is expected to be low in nature and short term, 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.	Contractor	• ESFPs • ESM-PMDFC))	-

8.8.6 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. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
21.	Noise and vibration	• Use of machineries and equipment having less noise. • Provision for personal protective equipment (PPE's), ear muffs / ear plugs to workers. • Noise level testing will be carried through EPA certified Lab.	Scheme Site	Quarterly	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
22.	Dust	• 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	Quarterly	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
23.	Air Quality	• Air quality will be analyzed	Scheme Site	Quarterly	It will be	• ESFPs

Sr. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
		in through EPA certified Lab.			conducted before, during and after completion of civil work. In this regard, an environmental compliance report will be submitted.	• DPO-ESM • SPO ID/PD
24.	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
25.	Health, Safety and Environmental needs	• Adequate safety precautions such helmets, safety shoes, gloves, etc. should be provided to the labour.	Scheme Site	Once during construction activities	During construction of project, Health Safety attributes will be provided and environmental compliance report should be submitted.	• ESFPs • DPO-ESM • SPO ID/PD

Sr. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
26.	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 project; social compliance report will be submitted.	• ESFPs • DPO-ESM • SPO ID/PD
27.	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 project; environmental and social monitoring report will be submitted	• ESFPs • DPO-ESM • SPO ID/PD
28.	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 project; environmental and social monitoring report will be submitted.	• ESFPs • DPO-ESM • SPO ID/PD

Sr. No.	Identified environmental and social issues	Monitoring Parameters	Monitoring Site	Monitoring Frequency	Reporting frequency	Responsibility
29.	Economic Losses	• loss of land, • damage to structures • damage to trees/plants • negative impacts on livelihood in form of blockage of passage for shopkeepers as well as vendors (Mobile / permanent)	Scheme Site	Three times (pre, during and post construction) In case of any complaint, emergency visit will be organized.	During and after completion of project; environmental and social monitoring report will be submitted	• ESFPs • DPO-ESM • SPO ID/PD
30.	Privacy Issues	• Contractors would be trained to address privacy issues / behave ethically. • Labor 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 project; environmental and social monitoring report will be submitted	• ESFPs • DPO-ESM • SPO ID/PD

8.8.7 ESIA Implementation Budget

Project: Improvement and Extension of Sewerage System in Bahawalnagar City.

Item	Quantity	Tentative Cost per Item (PKR)	Total Cost (PKR)
Labor Safety			
Face Masks (3 PLY) - box	110	400	44,000
Safety Hard Helmets	30	3,000	90,000
Safety Shoes	30	3,000	90,000
Hand Gloves - box	110	1,500	165,000
Ear Plugs	30	500	15,000
Reflective Safety Vest	30	1,000	30,000
Safety Goggles	30	500	15,000
First Aid Box Complete	3	10,000	30,000
Infrared Thermometer (Benetech GM-2200 or equivalent)	2	40,000	80,000
Sub-Total			**559,000**
Working Site Safety			
Safety Signs	10	15,000	150,000
Safety Cones	20	1,000	20,000
Safety Tape	30	1,500	45,000
Portable Delineator with chain	20	2,200	44,000
Emergency Portable Lights	5	3,000	15,000
Solid Waste Collection Drums with Cover	10	12,000	120,000
Fire Fighting Equipment Purchase and refilling	3	10,000	30,000
Sub-Total			**424,000**
Others			
Hiring of Environmental Specialist (for 06 months)	1	100,000	600,000
Hiring of HSE Expert (for 06 months)	1	100,000	600,000
Training (HSE & Environment related trainings)	Lump sum		100,000
Pole Hanging Waste Bins	10	12,000	120,000
Digital Sound Level Meter	2	30,000	60,000
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)	2	200,000	400,000
Sub-Total (PKR)			**2,280,000**
Grand Total (PKR)			**3,263,000**
15% Contingency (PKR)			**489,450**
Grand Total with 15% Contingency (PKR)			**3,752,450**

a. Proposed ESIA Reporting and Reviewing Procedure oF EPA

All the precautionary measures are suggested in ESIA to minimize the pollution created / anticipated impacts by construction and operation of 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

b. Contractor's Training

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

Components	Audience	Level	Modality	Frequency	Responsibility
ESMF Site Specific requirements and E&S Management and Mitigation Plan	MO-I MO-P and MC field staff[10]	Training	Briefing Presentations Mock Activities	Before execution of project and time to time instructions	PMDFC ESM team
ESIA Implementation and Monitoring Plan	MO-I MO-P MC field staff	Training	Briefing Presentations Mock Activities		
	Contractor	Awareness and sensitization	Briefing	At the time of Contract signing and before execution	DPO-ESM ESFPs
	Labor	Awareness and sensitization	Briefing	Before execution and time to time during execution	DPO-ESM ESFPs
EHS SOPs for	Contractor	Awareness	Briefing and	Before	DPO-ESM

10 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
Labor/Workers (including women workers)		and sensitization	Illustrations	execution and time to time during execution	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

2. STAKEHOLDER AND PUBLIC CONSULTATION

a. Proponents Environmental Management Team

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

- ESFPs – MC Bahawalnagar
- ESM wing of PMDFC
- The Contractor

b. 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 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.

c. Project Stakeholders

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

Table 2-1, Project Stakeholders

Individual / Community stakeholders	All project affected persons, households and communities. Project beneficiaries for instance, residents of the project area, users of the road, vulnerable and gender.
Institutional Stakeholders	Environmental Protection Agency, Irrigation Department, Municipal Corporation, Highway Department, Railway Department The contractors, construction workers, financing institutions like the World Bank, mass media / civil society members, consultants and 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 project, is derived from various policy / legislative tools, as summarized in Table 2-2.

Table 2-2, Framework 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 involvement in 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 Pakistan Environmental protection agency guidelines 2000.
World Bank	OP.4.01, Clause 15 described that for all Categories A and B projects proposed for IBRD or IDA financing, during the EA process, the borrower consults project affected groups and local non-governmental organizations (NGOs) about the 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 project implementation as necessary to address EA-related issues that affect them. Environmental and Social Standard 10 (Stakeholder Engagement and Information Disclosure) recognizes the importance of open and transparent engagement.

i. Modes of Consultations

Consultation with the public and institutional stakeholders was done on 6th & 7th October, 2023 using the following Consultative meetings held with the general stakeholders.

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

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

1. Primary Stakeholders: Affected Wider Community

The project area is of both commercial and residential in nature. Project area inhabitants are direct beneficiaries of project interventions as it will resolve their long-standing issue of sewerage system. Table 2-3 provides public consultation record, Table 2-5 provides suggestions / concerns given by general public and Figure 2-1 shows representative pictures of public

consultation.

Table 2-3, Public Consultation

Sr. No.	Name	Contact No.	Profession / Designation
1.	Ali Rizwan	0301-7169372	Intern in Agriculture Department – Bahawalnagar
2.	Nadeem Javed	0303-9908756	Petrol station worker
3.	Muhammad Usman	0301-4709399	Hawker / Vendor
4.	Muhammad Idrees	0308-7263018	Shopkeeper
5.	Usman Ali		Student
6.	Zaheer Abbas	0302-6161713	Advocate in High Court
7.	Muhammad Tariq	0304-6957287	Shopkeeper
8.	Mehboob Rehman	0302-7028622	Clerk
9.	Syed Wasim Ahmed	0333-6334979	Ex-Officer at Family Planning Department
10.	Ruqaiya Bibi	0313-6260221	Housewife
11.	Zia-ur-Rehman	0300-0088754	Private servant
12.	Ali Raza	0301-7380662	Farmer
13.	Muhammad Zaman	0346-6354272	Farmer

2. Secondary Stakeholders: Department and Agencies

The project area lies in the jurisdiction of MC Bahawalnagar and MC Bahawalnagar has an ambit of providing safe and properly working sewerage system / facilities to the citizens. Public has filed complaints about issues of current sewerage system, that's why MC Bahawalnagar has suggested the project for improvement and extension of sewerage system in the city. Several other institutional stakeholders were also engaged in the consultation process. Table 2-4 provides institutional / departmental consultations record, summary of institutional stakeholder consultation is given in Table 2-6 and representative pictorial view of institutional consultation is shown in Figure 2-2.

Table 2-4, Institutional / Departmental Consultation

Sr. No.	Department	Person	Designation
1.	Municipal Corporation	Abdul Razzaq	MOI
2.	Municipal Corporation	Muhammad Imran	Sub-Engr.
3.	Environmental Protection Agency	Baber Khan	DO – Environment
4.	Highway Department	Muhammad Iqbal	Head Drafts Man
5.	Irrigation Department	Muhammad Irfan	Sub. Engr.
6.	Wildlife Department	Munawar Hussain	Wildlife Officer
7.	Forest Department	Mr. Naveed	SDO
8.	Social Welfare Department	Ms. Riffat Anjum	Social Welfare Officer

ii. Environmental Practitioner and Expert

Team of Asian Consulting Engineers Private Limited visited the project site, had discussion with stakeholders and consulted with the local people of nearby to evaluate the project's socio-economic impacts. People of the area belong to different professions like mostly belong to employment, own businesses, farming, 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 project and have positive remarks regarding the project development. Team Asian have endeavoured to hold consultative sessions with a number of prominent stakeholders (Project proponent, Government departments, line agencies, and affected persons of the project area) to evince their views on the project and their opinions, suggestions, understanding on various issues and concerns. The consultations aimed specifically at:

- Dissemination of project information through discussions, education and liaison.
- Eliciting the comments and feedback on the 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.

iii. Disclosure of Project Information

The project's ESIA will be uploaded on the project's websites, hard copies shall be sent to all institutional stakeholder's offices. The ESIA will be disclosed internally within the Bank. Before start of physical works on the project, the 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's ESM 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 project information boards on the project site. Contractor's Environmentalist will implement ESIA in its true essence.

iv. Future Consultation Plan

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

d. 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 project proponent is provided in Table below.

Table 2-5, Summary of Concerns / Suggestions by Public

Location	Name / Designation / Department	Concern / Suggestion	Response
MC Bahawalnagar	Ali Rizwan	Employment opportunities should be provided to the locals during the construction and operation of the project.	It will be made sure that 75% of the workforce will be employed from the project area.
	Usman Ali	Will disposal station of Model Town be rehabilitated?	Total 07 disposal stations including Model Town Disposal station will be rehabilitated in this project.
	Muhammad Zaman	Will there be land acquisition for construction of WWTP?	WWTP has been proposed on govt. owned land which is freely available, so land acquisition will not be required.
	Ali Raza	This project is the dire need of the city.	Efforts will be made to improve the current sewerage issues through this project.
	Ruqaiya Bibi	Privacy of people should be upheld during construction phase of the project.	Contractor will provide trainings to workers regarding gender and privacy issues.
	Muhammad Tariq	The greenery of the area should not be disturbed.	Plantation will be done to enhance the acceptability of the project and to make the project more environment friendly.
	Muhammad Idrees	There is a significant level of pollution resulting from the excessive discharge of wastewater into open drains that need to be managed effectively.	Efforts will be made to improve the current sewerage issues through this project.

Location	Name / Designation / Department	Concern / Suggestion	Response
	Zaheer Abbas	The increased volume of wastewater on roads generated from choked / damaged pipelines is a critical problem for the residents that needs to be address.	The project has been developed to effectively address this particular issue by rehabilitating the existing sewerage system.
	Mehboob Rehman	Wastewater overflows from open drains that causes diseases and bad odor, therefore, it should be changed into underground sewerage systems.	Efforts will be made to improve the current sewerage issues through this project.
	Syed Wasim Ahmed	Concerns about the maintenance of the sanitation system raised.	Efforts will be made to improve the current sewerage issues through this project.
	Zia-ur-Rehman	Choked or Damaged sewer lines should be repaired.	Efforts will be made to improve the current sewerage issues through this project.



Figure 2-1, Public Consultation

Table 2-6, Summary of Concerns / Suggestion by Stakeholders and Response by Proponent

Person	Concern / Suggestion	Response
Babar Khan, DO – EPA	EPA should be kept in loop during the project process. NOC from EPA head office should be obtained before commencement of works.	Comments are noted.
Muhammad Iqbal, Head Drafts Man Highway	As proposed force main and rehabilitation of sewer lines are in RoW of roads, NOC should be obtained from Highway Department.	Comments are noted and a letter will be written to the department by MC before the execution of the project.
Muhammad Irfan, Sub. Engr., Irrigation Department	As a seepage drain passes near the proposed site of WWTP and as per AsCE-RHC JV – consultant's design Engr. of WWTP, almost 10 cusec treated wastewater will be discharged in the seepage drain. A letter should be written to Irrigation Department and NOC should be obtained by MC Bahawalnagar before commencement of work. Further, the drain has following properties: • Width = 12 ft • Depth = 5.5 ft. • Free Board = 1.5 ft. • Side Slope = 2.5*01 • Surface Width = 52 ft. • Discharge / Flow = 201 Cusecs As per Irrigation Department, 10 cusecs	Noted, and a letter will also be written to the department for NOC before execution of the project.

	water can be discharged into seepage drain as it has enough capacity to cater this discharge / flow. Irrigation Department has funds for desilting and to build / construct banks of the drain at project site, anyhow, costing of this should be included in PC-1 of the project.	
Munawar Hussain, District Wildlife Officer	There are no wildlife species near the project site. Plantation should be ensured near / around the project site to make the project more environment friendly.	Suggestions are noted.
Mr. Naveed, SDO, Forest Department	Forest "Bahawalnagar Plantation" is a reserved forest, project activities should not be conducted within the forest.	Concerns are noted, project is designed is a way that no forest area of "Bahawalnagar Plantation" will be utilized in this project.
Ms. Riffat Anjum, Social Welfare Officer	The government's effort is admirable; however, it would have been more effective if the MC team had arranged a site visit for us to gather our inputs. Our opinions would be better or more effective after seeing the site. Additionally, if the project needs any support from the social welfare department, then we would be delighted to organize campaigns in support / favor of the project in Bahawalnagar City.	Suggestions are noted.



EPA Bahawalnagar



ADCR – Bahawalnagar



Highway Department



Sub-Engr. – MC



MOI – MC Bahawalnagar



District Wildlife Officer

Figure 2-2, Representative Pictures of Consultation with Departments / Institutional Stakeholders

3. GRIEVANCE REDRESS MECHANISM

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

The 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.*

a. GRM at 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) — Convener
- Municipal Officer (Planning) — Member
- Municipal Officer (Regulation) — Member

TORs of GRC – MC Bahawalnagar are as following:

- 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.

b. 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:

- DPO ESM — Chairperson & Convener
- DPO ID — Member
- DPO IS — 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.

c. Types of Grievances

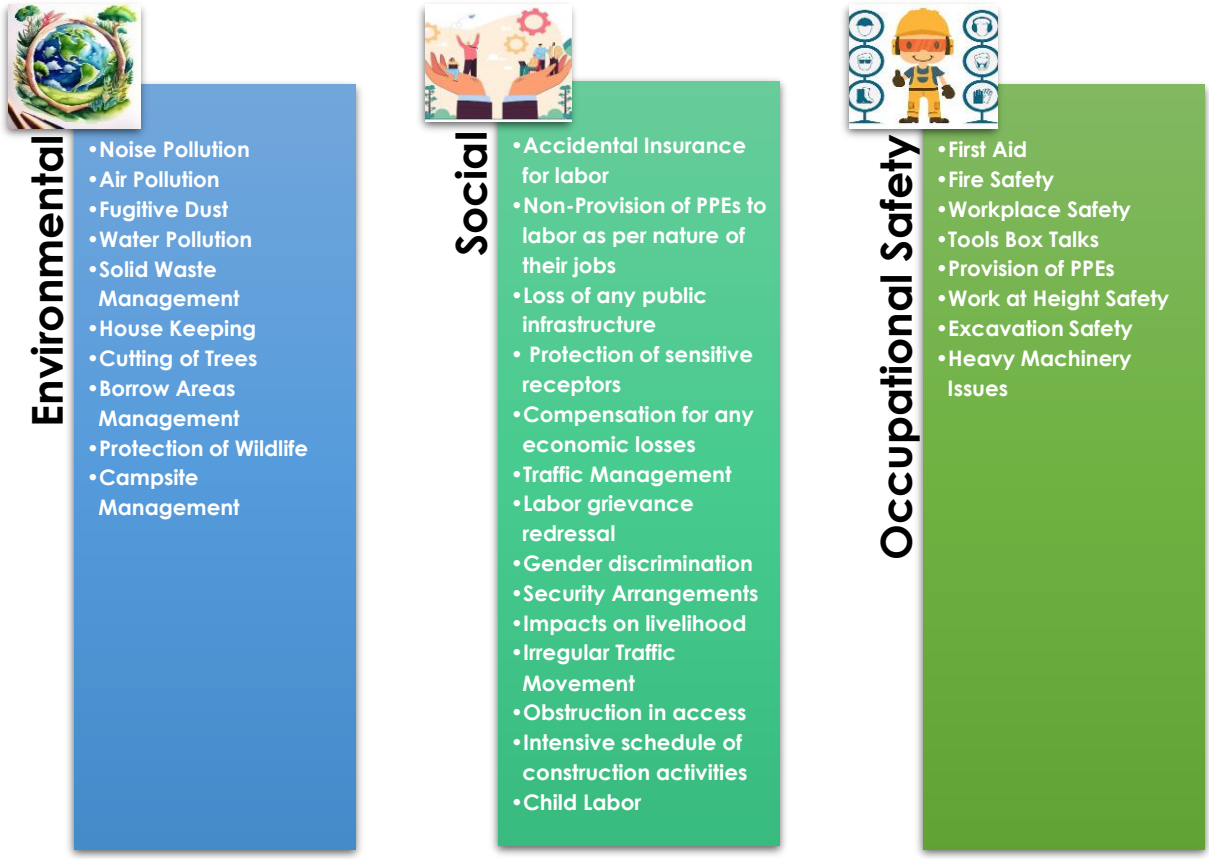


Figure 3-1, Types of Grievances

i. Procedures

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

- Tracking complainant(s) from 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

MC level will review and identify actions to be taken to address the complaints at its weekly meetings.

If not satisfactorily resolved by the MC and regional level, then the grievance will be referred for consideration by GRC at the PMDFC/LG&CDD 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 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)*.

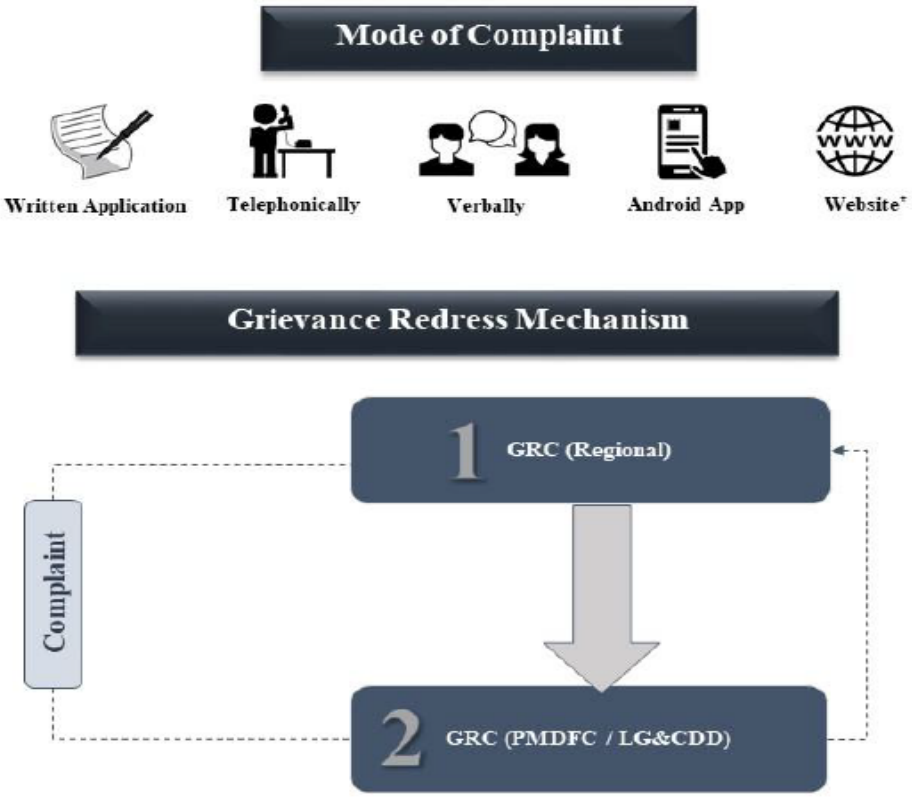


Figure 3-2, GRM

4. CONCLUSION AND RECOMMENDATIONS

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

a. Conclusion

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

b. Recommendations

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 project area is recommended.
- The management 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 project, it is concluded that project will not have significant adverse impacts on the nearby community

and on environment. Overall, the project will have positive impacts on the local population and country as a whole. Therefore, it is requested for the environmental approval for the subject project.

No private land will be acquired during this project and no resettlement will be required. Project will be executed on government owned land. As wastewater treatment plant will be constructed on govt. owned land, treated wastewater will be discharged in nearby seepage drain which is said to be under jurisdiction of Irrigation department, force main will pass along / RoW of railway track and roads (Railway department and Highway department) and existing disposal stations will be rehabilitated. So, NOCs / Consent Letters from concerned departments should be obtained before execution of the project.

ANNEXURES

ANNEXURE - 1: REFERENCES

- https://www.epa.gov/sites/production/files/2015-10/documents/njmc-wpp-2.pdf
- Schedule I of Punjab Environmental Protection Act 1997 (Amended 2012)
- section 12 of Punjab Environmental Protection Act 1997 (Amended 2012)
- Pakistan Environmental protection act 1997
- Punjab Environmental Protection Act 1997 (Amended 2012)
- Guideline for the Environmental Assessment
- Regulations of Environmental Assessment, Regulations 2000
- National Conservation Strategy- Pakistan
- Guideline for the public consultation
- National Resettlement Policy and Ordinance
- National Environmental Quality Standards (Self-monitoring and reporting by the industry)
- Labor laws
- Canal and Drainage Act, 1873
- National Environmental Policy 2005.
- The Land Acquisition act, 1894
- The Punjab local Governmental ordinance, 2001.
- Meteorological data from meteorological department and website
- Pakistan Biosafety rules 2005
- Pakistan Environmental agency (review of IEE/EIA) regulation 2000.
- Punjab Portal (http://www.punjab.gov.pk/attock)
- Attock Chamber of Commerce Industries (http://www.acci.org.pk/Attock.html)
- Sectorial Guideline for environmental reports, industrial states
- Pakistan Environmental Protection ordinance (PEPO), 1983
- OSHAS 1800 for health and safety
- Census 2017

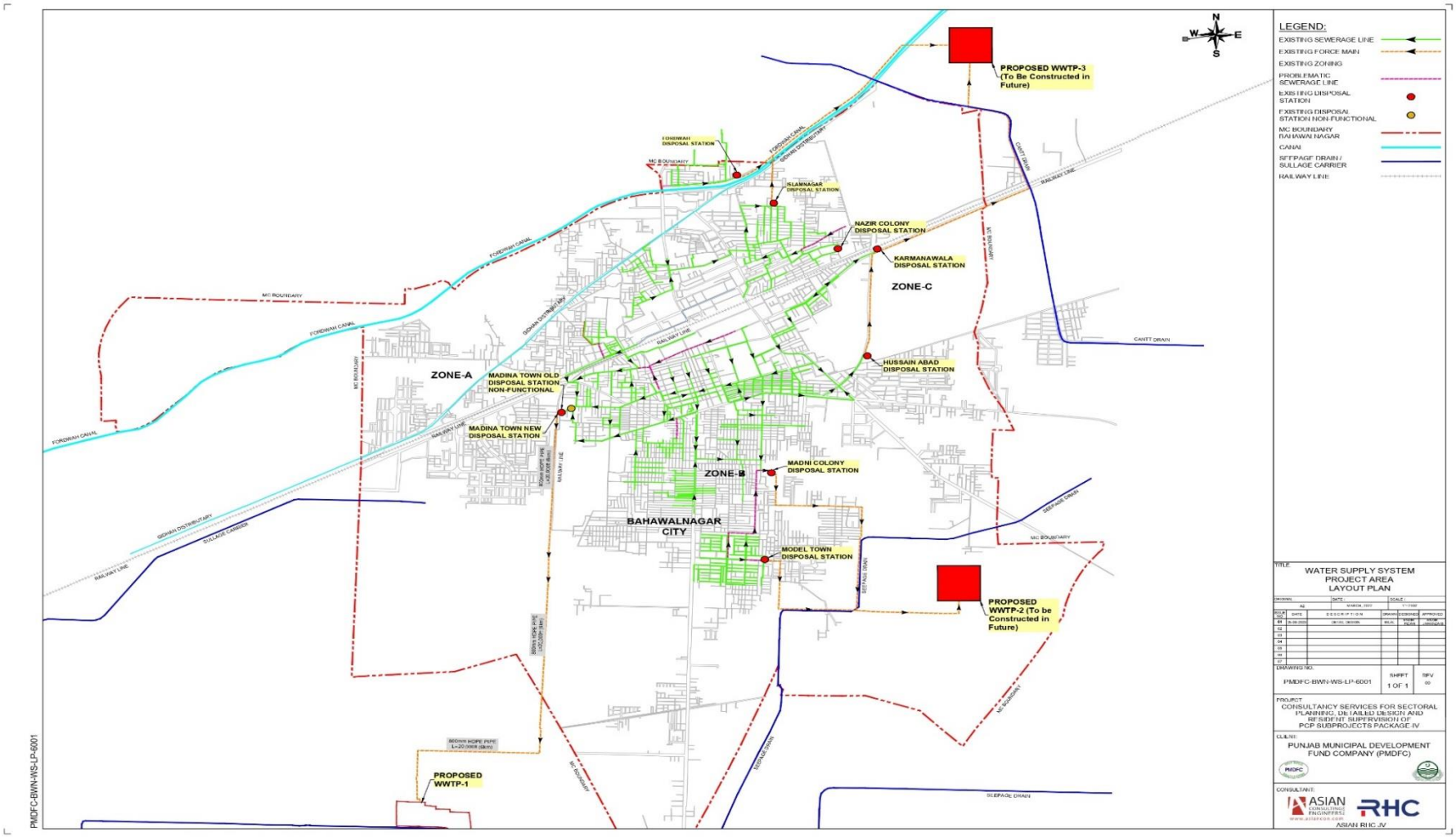
ANNEXURE - 2: GLOSSARY

Words	Dictionary
Mitigation	The action of lessening in severity or intensity
Legislation	law enacted by a legislative body
Compliance	Acting according to certain accepted standards
Flora	All the plant life in a particular region or period
Fauna	All the animal life in a particular region or period
Demarcated	Separate clearly, as if by boundaries
Screening	The display of a motion picture
Substitutions	An event in which one thing is substituted for another
Regulations	An authoritative rule
Stakeholders	A person or organization with an interest or concern in something
Vulnerable	Susceptible to attack

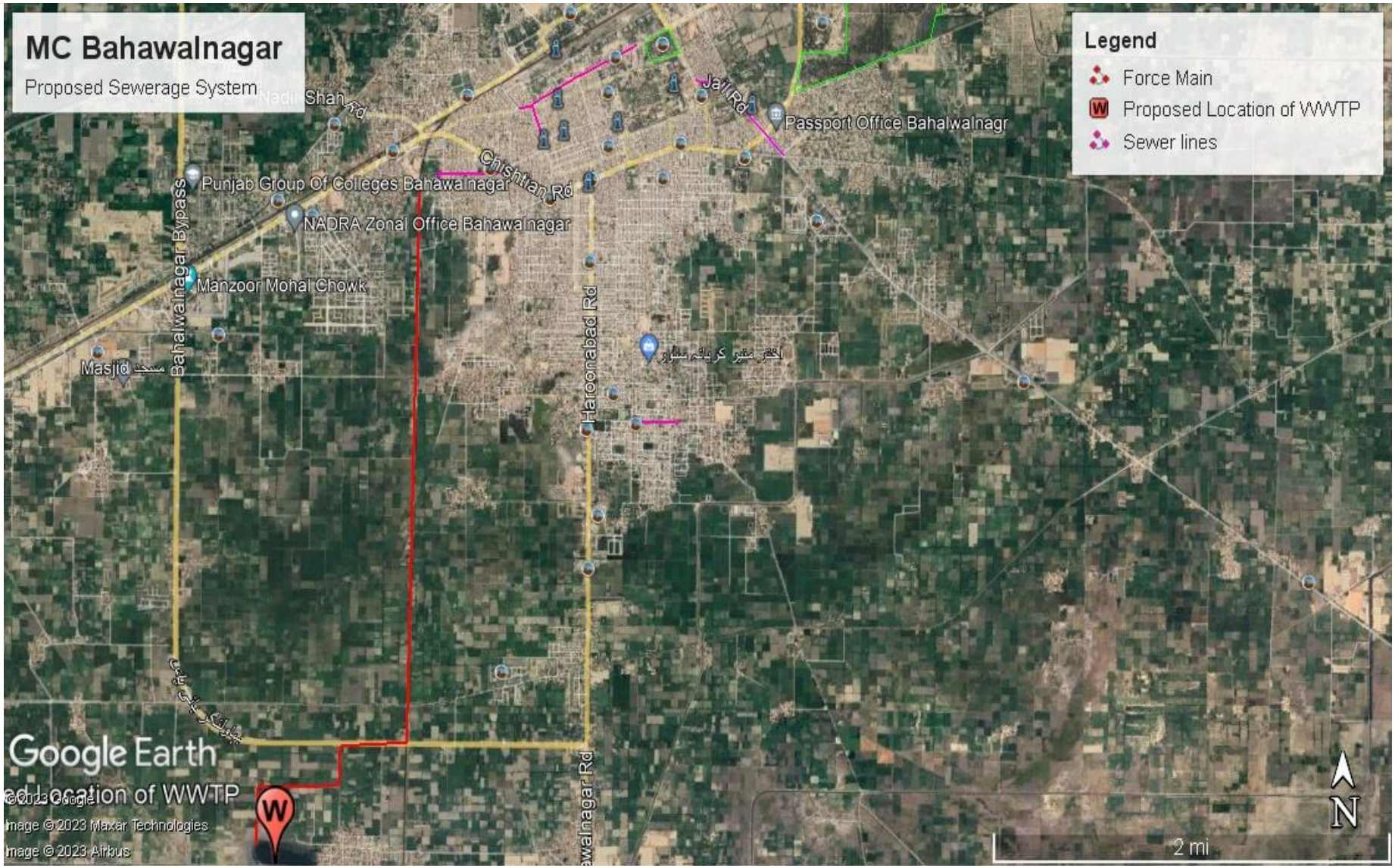
ANNEXURE - 3: LIST OF ABBREVIATION

PEPA	Punjab Environmental Protection Act
NEQS	National Environmental Quality Standards
PEQS	Punjab Environmental Quality Standards
WAPDA	Water and Power Development Authority
EMP	Environmental Management plan
ESMMP	Environmental and Social Management & Monitoring Plan
WWTP	Waste Water Treatment Plant
EPA	Environmental Protection Agency
W.H.O	World Health Organization
SWM	Solid Waste Management
CSR	Corporate Social Responsibility
MSWs	Municipal Solid Wastes
TMA	Town Municipal Authority
MC	Municipal Corporation
PPEs	Personal protective equipment's
PM	Particulate Matter
ESIA	Environmental and Social Impact Assessment
ESFPs	Environment and Social Focal Persons
DPO-ESM	Deputy Program Officer- Environment and Social Management
DPO ID	Deputy Program Officer Infrastructure Development
DPO IS	Deputy Program Officer – Infrastructure Strengthening
PD	Project Director
GRC	Grievance Redress Committee
LG and CDD	Local Government and Community Development Department
SDO	Sub Divisional Officer
PMDFC	Punjab Municipal Development Fund Company
PCP	Punjab Cities Program
AsCE	Asian Consulting Engineers Private Limited

ANNEXURE - 4: LAYOUT AND GOOGLE MAP OF PROJECT SITE



Project Layout Map



Project Google Map

ANNEXURE - 5: ESIA TEAM

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.	M. Umair Iqbal	Environmentalist	BS Environmental Science, Government College University, Faisalabad
4.	Waqar Saleem	Sociologist and Resettlement Specialist	M.Phil. Sociology, University of Sargodha
5.	Asma Butt	Sociologist	M.Phil. Sociology, University of Punjab
6.	Muhammad Ibrar	Ecologist	M.Phil. Zoology, University of Punjab
7.	Sajjad Hussain	Chief Chemist	M.Phil. Chemistry, Govt. College University, Lahore

ANNEXURE - 6: LAB REPORTS OF ENVIRONMENTAL MONITORING

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BASELINE ENVIRONMENTAL MONITORING & ANALYSIS REPORT

IMPROVEMENT & EXTENSION OF SEWERAGE SYSTEM IN BAHAWALNAGAR CITY

- Ambient Air Monitoring
- Noise Monitoring
- Ground Water Analysis

Reference No.: AES-ENV-PM-94/2023 | Dated: 18 October, 2023

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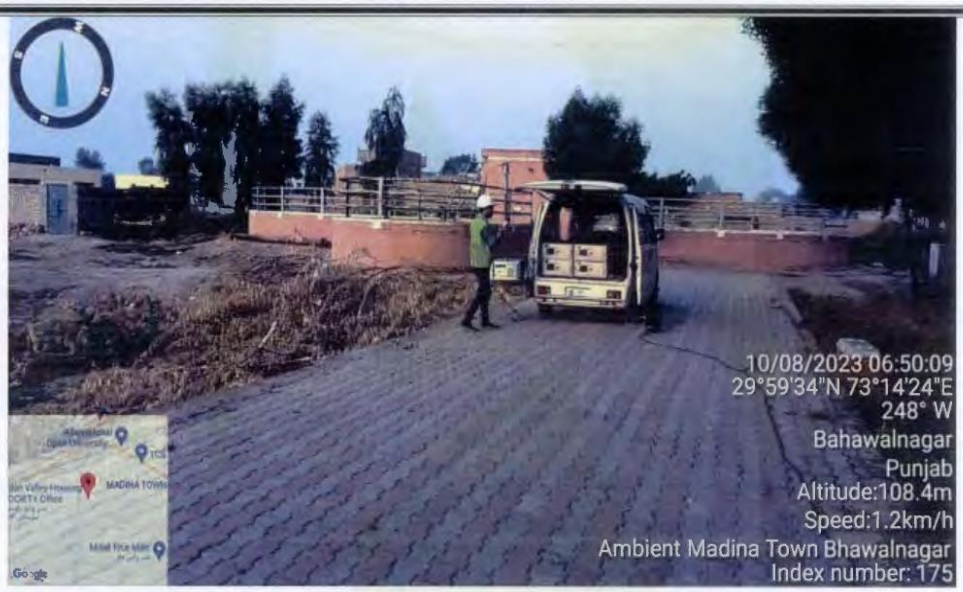
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Location for Ambient Air Monitoring-01

MADINA TOWN

Bahawalnagar



Document No. AES/LMS/FRM-115, Date of Issue 07 July, 2022, Revision No. 00

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Ambient Air Monitoring Report

Monitoring Details

Reference Number	AES-ENV-PM-094/2023-AA-C1	Monitoring Point	Madina Town, Bahawalnagar
Date of Monitoring	08-10-2023 to 09-10-2023	Monitoring Coordinates	29°59'34" N 73°14'24" E
Validation Officer	Miss. Saiqa (Research officer-Punjab EPA)		

Sr. No.	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)
1	07:00	1.97	15.72	38.80	54.45	29.83
2	08:00	1.98	17.61	38.29	55.83	30.36
3	09:00	1.99	13.81	38.21	51.95	31.82
4	10:00	2.00	12.03	37.83	49.79	33.10
5	11:00	2.03	14.13	37.29	51.36	34.62
6	12:00	2.00	15.76	36.22	51.91	34.83
7	13:00	1.96	15.53	35.27	50.73	36.16
8	14:00	1.93	15.22	34.52	49.68	37.28
9	15:00	1.85	15.13	34.35	49.41	38.74
10	16:00	1.76	14.94	33.51	48.38	39.22
11	17:00	1.65	15.09	32.44	47.46	39.94
12	18:00	1.66	15.24	30.43	45.61	40.15
13	19:00	1.44	15.76	30.39	46.09	40.15
14	20:00	1.56	13.94	30.29	44.18	40.55
15	21:00	1.62	15.22	30.10	45.27	41.40
16	22:00	1.63	14.46	29.87	44.27	42.47
17	23:00	1.70	17.06	28.61	45.61	42.81
18	0:00	1.77	16.10	28.42	44.46	41.08
19	01:00	1.75	15.34	28.57	43.85	40.15
20	02:00	1.73	15.22	28.57	43.74	38.42
21	03:00	1.71	14.42	30.49	44.85	37.31
22	04:00	1.79	14.23	31.79	45.95	35.98
23	05:00	1.89	13.31	32.68	45.94	34.62
24	06:00	1.90	13.18	34.41	47.52	34.49
Average Concentration		**1.80**	**14.94**	**32.97**	**47.85**	**37.31**

Monitored By

Reviewed By (TM)

Approved By (QM/Chief Chemist)

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Ambient Air Monitoring Report

Monitoring Details

Reference Number	AES-ENV-PM-094/2023-AA-01	**Monitoring Point**	Madina Town, Bahawalnagar
Date of Monitoring	08-10-2023 to 09-10-2023	**Monitoring Coordinates**	29°59'34" **N** 73°14'24" **E**
Validation Officer	Miss. Saiqa (Research officer-Punjab EPA)		

Parameters	Units	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO_2) *	µg/m³	24Hours	1.00	32.97	80.0	Optimal
Nitrogen Oxide (NO)*	µg/m³	24Hours	1.00	14.94	40.0	Optimal
NO_x*	µg/m³	24Hours	1.00	47.85	120.0	Optimal
Sulphur Dioxide (SO_2) *	µg/m³	24Hours	1.00	37.31	120.0	Optimal
Carbon Monoxide (CO) *	mg/m³	24Hours	0.01	1.80	05.0	Optimal
Particulate Matter (PM_{10}) *	µg/m³	24Hours	1.00	100.31	150	Optimal
Particulate Matter ($PM_{2.5}$) *	µg/m³	24Hours	1.00	20.56	35	Optimal
Total Particulate Matter (TSP)	µg/m³	24Hours	1.00	138.04	500	Optimal

*Parameters are approved from Punjab Environment Protection Agency.

Abbreviations:
LDL= Lower Detection Limit PEQS= Punjab Environmental Quality Standards µg/m³= Micro Gram per Meter Cube

Remarks:
Optimal = Compliance with Permissible Range Marginal = Close to Extreme Edge High = Exceeds from Permissible Range
Low = Less Than Permissible Range

Monitored By

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(TM)

Approved By
(QM/Chief Chemist)

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Ambient Air Monitoring Report

Monitoring Details

Reference Number	AES-ENV-PM-094/2023-AA-01	**Monitoring Point**	Madina Town, Bahawalnagar
Date of Monitoring	08-10-2023 to 09-10-2023	**Monitoring Coordinates**	29°59'34" N 73°14'24" E
Validation Officer	Miss. Saiqa (Research officer-Punjab EPA)		

Sr. No.	Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
1	07:00	30	NE	0.9	51	757.40
2	08:00	31	NE	0.9	51	757.10
3	09:00	31	NE	0.9	51	757.40
4	10:00	32	NE	1.02	52	757.90
5	11:00	32	E	1.03	53	758.10
6	12:00	33	E	1.04	53	758.40
7	13:00	33	E	1.09	54	758.90
8	14:00	34	E	1.1	55	757.80
9	15:00	33	E	1.12	55	757.10
10	16:00	33	E	1.04	56	759.40
11	17:00	32	SE	0.9	56	755.60
12	18:00	32	SE	9.8	57	754.90
13	19:00	32	SE	0.8	57	754.50
14	20:00	31	SE	0.8	57	754.20
15	21:00	31	SE	0.7	56	754.10
16	22:00	30	SE	0.7	56	753.90
17	23:00	29	E	0.7	56	753.40
18	0:00	29	E	0.9	55	753.10
19	01:00	28	E	0.9	55	752.10
20	02:00	28	E	1.02	55	752.00
21	03:00	28	E	1.04	54	751.90
22	04:00	27	E	1.09	54	752.60
23	05:00	27	NE	1.12	53	753.20
24	06:00	26	NE	1.14	52	754.40

Monitored By

Reviewed By (TM)

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Noise Monitoring Report

Monitoring Details			
Reference Number	AES-ENV-PM-094/2023-AA-01	Monitoring Point	Madina Town, Bahawalnagar
Date of Monitoring	08-10-2023 to 09-10-2023	Monitoring Coordinates	29°59'34" N 73°14'24" E
Validation Officer	Miss. Saiqa (Research officer-Punjab EPA)		

Sr. No.	Time	Noise dB(A)		PEQS
1	07:00	40		
2	08:00	41		
3	09:00	42		
4	10:00	42		
5	11:00	43		
6	12:00	44		
7	13:00	45		
8	14:00	45	Day Time	55
9	15:00	45		
10	16:00	44		
11	17:00	43		
12	18:00	42		
13	19:00	42		
14	20:00	43		
15	21:00	43		
16	22:00	42		
17	23:00	42		
18	00:00	41		
19	01:00	41		
20	02:00	40	Night Time	45
21	03:00	40		
22	04:00	39		
23	05:00	38		
24	06:00	38		

Note: The values exceeding PEQs are in bold

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Location for Ambient Air Monitoring-02

HAFIZWALA

Bahawalnagar



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Ambient Air Monitoring Report

Monitoring Details

Reference Number	AES-ENV-PM-094/2023-AA-02	Monitoring Point	Hafiz Wala Bahawalnagar
Date of Monitoring	09-10-2023 to 10-10-2023	Monitoring Coordinates	31°34'32" N 72°34'51" E
Validation Officer	Miss. Saiqa (Research officer-Punjab EPA)		

Sr. No.	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)
1	07:30	1.13	15.72	34.35	50.00	29.32
2	08:30	1.19	15.53	35.97	51.44	31.82
3	09:30	1.65	15.47	38.14	53.54	33.05
4	10:30	1.62	15.22	38.67	53.82	34.49
5	11:30	1.49	14.65	39.03	53.61	34.83
6	12:30	1.42	13.43	39.38	52.74	36.43
7	13:30	1.50	13.18	39.80	52.91	38.58
8	14:30	1.56	13.56	41.48	54.97	38.96
9	15:30	1.58	15.22	40.62	55.77	37.49
10	16:30	1.62	15.34	41.77	57.03	35.50
11	17:30	1.63	16.37	42.00	58.29	34.80
12	18:30	1.73	16.14	42.11	58.18	34.70
13	19:30	19.94	16.10	39.24	55.28	34.70
14	20:30	19.81	15.99	38.42	54.34	34.49
15	21:30	19.62	15.87	38.10	53.90	34.17
16	22:30	19.31	15.47	37.70	53.10	33.90
17	23:30	19.02	15.22	36.51	51.67	33.58
18	00:30	18.78	14.65	36.11	50.69	31.82
19	01:30	18.32	14.27	35.61	49.51	30.71
20	02:30	18.09	14.71	35.21	49.65	30.36
21	03:30	17.52	15.26	34.44	49.64	29.38
22	04:30	17.31	17.04	34.25	51.23	28.98
23	05:30	17.01	17.14	33.55	50.62	27.78
24	06:30	16.95	17.38	32.68	50.00	27.70
Average Concentration		9.99	15.37	37.71	53.02	33.23

Monitored By

Reviewed By (TM)

Approved By (QM/Chief Chemist)

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Monitoring Details

Reference Number	AES-ENV-PM-094/2023-AA-02	**Monitoring Point**	Hafiz Wala Bahawalnagar
Date of Monitoring	09-10-2023 to 10-10-2023	**Monitoring Coordinates**	31°34'32" **N** 72°34'51" **E**
Validation Officer	Miss. Saiqa (Research officer-Punjab EPA)		

Parameters	Units	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO_2) *	µg/m³	24Hours	1.00	37.71	80.0	Optimal
Nitrogen Oxide (NO)*	µg/m³	24Hours	1.00	15.37	40.0	Optimal
NO_x*	µg/m³	24Hours	1.00	53.02	120.0	Optimal
Sulphur Dioxide (SO_2) *	µg/m³	24Hours	1.00	33.23	120.0	Optimal
Carbon Monoxide (CO) *	mg/m³	24Hours	0.01	9.99	05.0	Optimal
Particulate Matter (PM_{10}) *	µg/m³	24Hours	1.00	101.49	150	Optimal
Particulate Matter ($PM_{2.5}$) *	µg/m³	24Hours	1.00	22.11	35	Optimal
Total Particulate Matter (TSP)	µg/m³	24Hours	1.00	137.99	500	Optimal

*Parameters are approved from Punjab Environment Protection Agency.

Abbreviations:
LDL= Lower Detection Limit PEQS= Punjab Environmental Quality Standards µg/m³ = Micro Gram per Meter Cube

Remarks:
Optimal = Compliance with Permissible Range Marginal = Close to Extreme Edge High = Exceeds from Permissible Range
Low = Less Than Permissible Range

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Ambient Air Monitoring Report

Monitoring Details

Reference Number	AES-ENV-PM-094/2023-AA-02	Monitoring Point	Hafiz Wala Bahawalnagar
Date of Monitoring	09-10-2023 to 10-10-2023	Monitoring Coordinates	31°34'32" N 72°34'51" E
Validation Officer	Miss. Saiqa (Research officer-Punjab EPA)		

Sr. No.	Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
1	07:30	34	SE	0.9	48	757.10
2	08:30	34	SE	0.8	48	757.20
3	09:30	35	SE	0.7	47	757.40
4	10:30	35	SE	0.9	46	757.90
5	11:30	35	E	1.02	47	758.20
6	12:30	36	E	1.06	48	758.40
7	13:30	37	E	1.09	49	758.40
8	14:30	38	E	1.1	50	758.60
9	15:30	38	NE	1.2	51	758.10
10	16:30	39	NE	1.3	51	757.20
11	17:30	37	NE	1.1	52	756.40
12	18:30	36	NE	0.9	51	755.90
13	19:30	35	NE	0.8	50	755.50
14	20:30	35	E	0.9	50	755.10
15	21:30	34	E	1.02	49	754.90
16	22:30	33	E	1.06	49	754.70
17	23:30	32	E	1.11	49	754.10
18	00:30	32	E	1.12	48	753.20
19	01:30	31	NE	1.16	48	753.10
20	02:30	31	NE	1.19	48	752.10
21	03:30	31	NE	1.21	47	751.90
22	04:30	32	NE	1.29	48	751.10
23	05:30	33	E	1.21	49	750.70
24	06:30	33	SE	1.19	48	549.90

Monitored By

Reviewed By (TM)

Approved By (QM/Chief Chemist)

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Noise Monitoring Report

Monitoring Details			
Reference Number	AES-ENV-PM-094/2023-AA-02	Monitoring Point	Hafiz Wala Bahawalnagar
Date of Monitoring	09-10-2023 to 10-10-2023	Monitoring Coordinates	31°34'32" N 72°34'51" E
Validation Officer	Miss. Saiqa (Research officer-Punjab EPA)		

Sr. No.	Time	Noise dB(A)		PEQS
1	07:30	39		
2	08:30	39		
3	09:30	40		
4	10:30	41		
5	11:30	41		
6	12:30	41		
7	13:30	42		
8	14:30	43	Day Time	55
9	15:30	44		
10	16:30	45		
11	17:30	44		
12	18:30	46		
13	19:30	43		
14	20:30	43		
15	21:30	42		
16	22:30	41		
17	23:30	40		
18	00:30	40		
19	01:30	39		
20	02:30	38	Night Time	45
21	03:30	38		
22	04:30	39		
23	05:30	40		
24	06:30	40		

Note: The values exceeding PEQs are in bold

Monitored By

Reviewed By (TM)

Approved By (QM/Chief Chemist)

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GROUND WATER ANALYSIS REPORT

Sample Detail

Reference No.	AES-ENV-PM-094/2023-GW-63	**Reporting Date**	18-10-2023
Nature of Sample	Ground Water	**Sampling Method Reference**	AES/LMS/QSP-014
Grab/Composite	Grab	**Sample Collected by**	AES
Sampling Date	10-10-2023	**Sample Receiving Date**	11-10-2023
Analysis Completion Date	16-10-2023	**Lab Temp & Humidity**	26.6C & 52%
Ambient Temperature & Humidity at the Time of Sampling			33°C & 49%
Sample ID	AES-ENV-GW-63/2023	**Sampling Location**	Madina Town
Clint Details	Improvement & Extension of Sewerage System in Bahawalnagar City.	**Validation Officer**	Miss Saiqa (Research Officer Punjab EPA)



Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Lab Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	< 5 NTU	**31**	N.A.	High
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	**652**	± 5.14	High
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	**1328**	± 8.02	High
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.13	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	<0.005	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	<0.005	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	<0.0035	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	<0.02	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	<0.006	N.A.	Optimal
Chloride (Cl^-) **	SMWW 4500 Cl^- B	< 250 mg/L	128	± 1.73	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	<0.004	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.164	N.A.	Optimal
Cyanide (CN^-)*	SMWW 4500 CN^- F	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F^-)**	SMWW 4500 F^- C	≤ 1.5 mg/L	0.30	± 0.103	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	<0.005	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	<0.015	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	<0.02	N.A.	Optimal
Nitrate (NO_3^-) *	SMWW 4500 NO_3^- D	≤ 50 mg/L	1.72	± 1.20	Optimal
Nitrite (NO_2^-) *	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	<0.01	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500 Cl^- B	0.5 mg/L	0	N.A.	Optimal

18-10-2023

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GROUND WATER ANALYSIS REPORT

Sample Detail

Reference No.	AES-ENV-PM-094/2023-GW-63	**Reporting Date**	18-10-2023
Nature of Sample	Ground Water	**Sampling Method Reference**	AES/LMS/QSP-014
Grab/Composite	Grab	**Sample Collected by**	AES
Sampling Date	10-10-2023	**Sample Receiving Date**	11-10-2023
Analysis Completion Date	16-10-2023	**Lab Temp & Humidity**	26.6C & 52%
Ambient Temperature & Humidity at the Time of Sampling			33°C & 49%
Sample ID	AES-ENV-GW-63/2023	**Sampling Location**	Madina Town
Clint Details	Improvement & Extension of Sewerage System in Bahawalnagar City.	**Validation Officer**	Miss Saiqa (Research Officer Punjab EPA)



Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS	0	N.A.	-
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.049	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU/100 mL	0	N.A.	Optimal
Fecal Coliforms *	SMWW 9222 D	0 CFU/100 mL	0	N.A.	Optimal

*Parameters are approved from Punjab Environment Protection Agency.
**Parameters are accredited from Pakistan National Accreditation Council.
The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

Abbreviations:

PEQS = Punjab Environment Quality Standards | **SMWW** = Standard Methods for the examination of Water and Wastewater
TCU = True Color Unit | **N.A.** = Not Available | **CFU** = Colony forming Unit
NTU = Nephelometric Turbidity Unit | **MU** = Measurement Uncertainty | **NGVS** = No Guideline Value Set

Remarks:

Optimal = Compliance with Permissible Range | **Marginal** = Close to Extreme Edge | **High** = Exceeds from Permissible Range
Low = Less Than Permissible Range

Report Disclaimer

- The remaining portion of the sample (s) will be disposed off after 15 days after the issuance date of report from the laboratory unless otherwise instructed (Condition Apply).
- This report shall not be reproduced in part/parties.
- The provided results relate only to the sample provided/collected.
- Values reflect the testing results; decision for usage of report totally depends on client.

Analyzed By 18/10/23

Reviewed By (TM) 18-10-2023

Approved By (QM/ Chief Chemist) 18/10/2023

----------End of Report----------

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GROUND WATER ANALYSIS REPORT

Sample Detail

Reference No.	AES-ENV-PM-094/2023-GW-64	**Reporting Date**	18-10-2023
Nature of Sample	Ground Water	**Sampling Method Reference**	AES/LMS/QSP-014
Grab/Composite	Grab	**Sample Collected by**	AES
Sampling Date	10-10-2023	**Sample Receiving Date**	11-10-2023
Analysis Completion Date	16-10-2023	**Lab Temp & Humidity**	26.6C & 52%
Ambient Temperature & Humidity at the Time of Sampling			33°C & 49%
Sample ID	AES-ENV-GW-64/2023	**Sampling Location**	Hafiz Wala
Clint Details	Improvement & Extension of Sewerage System in Bahawalnagar City.	**Validation Officer**	Miss Saiqa (Research Officer Punjab EPA)



Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Lab Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	< 5 NTU	0	N.A.	Optimal
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	**884**	± 5.14	High
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	**1952**	± 11.40	High
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.28	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	<0.005	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	<0.005	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	<0.005	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	<0.0035	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	<0.02	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	<0.006	N.A.	Optimal
Chloride (Cl^-) **	SMWW 4500 Cl^- B	< 250 mg/L	**271**	± 2.87	High
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	<0.004	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.164	N.A.	Optimal
Cyanide (CN^-)*	SMWW 4500 CN^- F	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F^-)**	SMWW 4500 F^- C	≤ 1.5 mg/L	0.67	± 0.103	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	<0.005	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	<0.015	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	<0.001	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	<0.02	N.A.	Optimal
Nitrate (NO_3^-) *	SMWW 4500 NO_3^- D	≤ 50 mg/L	1.65	± 1.20	Optimal
Nitrite (NO_2^-) *	SMWW 4500 NO_2^- B	≤ 3.0 mg/L	0.22	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	<0.01	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500 Cl^- B	0.5 mg/L	0	N.A.	Optimal

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Clint Details	Improvement & Extension of Sewerage System in Bahawalnagar City.	Validation Officer	Miss Saiqa (Research Officer Punjab EPA)



Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS	0	N.A.	-
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.048	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU/100 mL	0	N.A.	Optimal
Fecal Coliforms *	SMWW 9222 D	0 CFU/100 mL	0	N.A.	Optimal

*Parameters are approved from Punjab Environment Protection Agency.
**Parameters are accredited from Pakistan National Accreditation Council.
The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

Abbreviations:

PEQS = Punjab Environment Quality Standards
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Remarks:

Optimal = Compliance with Permissible Range
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Analyzed By 18/10/23

Reviewed By (TM) 18-10-2023

Approved By (QM/ Chief Chemist)

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ANNEXURE - 7: TORS

Terms of References

These terms of references are being submitted for the subject ESIA study under Clause 5 (f) of policy and procedure for the filing, review and approval of environmental assessment. These TORs of ESIA have been prepared by the environmental consultants, in consultation with the sub-project proponent. Proposal and TORs for the ESIA accepted by Punjab Municipal Development Fund Company (PMDFC).

Introduction of Project

The project aims at improvement of infrastructure of municipal services such as improvement and extension of sewerage system of the Bahawalnagar city.

The project comprises of construction of wastewater treatment plant, force mains, laying of sewer lines, rehabilitation of disposal stations and other allied works.

Cost of Project:

The capital cost of the project will be about 1293.1 Million PKR.

Name of Proponent

Chief Executive Officer of MC Bahawalnagaris the project proponent.

Environmental Consultant & Client

MC Bahawalnagar has appointed the Asian Consulting Engineers Private Limited, as the Consultant for the subject project to conduct the ESIA. Asian Consulting Engineers Private Limited will be called as "Consultant" and MC Bahawalnagar as the "Client".

Objective of the ESIA Study

The Objective of study includes Compliance of section 12 of PEPA 1997 (Amended 2012), PEQS and fulfilment of HSE conditions.

Purpose of the ESIA

The key objectives of the ESIA are to:

- Document the ecological and socioeconomic baseline conditions of the study area and the affected communities
- Inform and obtain input from stakeholders, (e.g., governmental authorities, the public, and indigenous communities) and capture their relevant issues and concerns
- Assess in detail the environmental, social, and health impacts that would result from the project
- Suggestion of environmental and social mitigation measures to identified environmental Impacts
- Develop the EMPs as discussed above, based on the mitigation measures developed in the ESIA.

- Meet the requirements or recommendations of the applicable National Environmental Laws and Guidelines

Scope of Services

ESIA for the subject project is construction and / or rehabilitation of WWTP, force main, sewer lines and disposal stations in MC Bahawalnagar

Accordance with:

1. The Punjab Environmental Protection Act, 1997 (amended 2012) and the
    - Various guidelines developed by the Punjab Environmental Protection Agency
    - Pakistan Environment Protection Agency Guidelines
    - Guidelines of Labor & Human Resource Department
    - Punjab Local Government Guidelines
    - Punjab Food Authority Guidelines
2. Methodology for carrying out this study
    - Project Description
    - Site Selection
    - Project Alternatives
3. Process Description
    - Detailed review of the processes
    - Design Parameters
    - Process flow chart
    - Details related top Plant and Equipment
4. Environmental profile of the environmental study area
    - Climatology
    - Geographical features
    - Geological and Hydrological features
    - Historical review
    - Land Use
    - Ecology, i.e., Flora and Fauna etc.
5. Analysis of EPA required environmental parameters
    - Sampling for Air, Water, and Noise Level

- Ambient Air Quality will be monitored at the existing sub-project site by using certified instruments/methods to check the concentration of pollutants in ambient air before construction.
- Groundwater quality of the area will be checked through analysing EPA Smart Parameters. 2-3 representative samples will be collected to check the groundwater quality by using certified sampling techniques and analysis procedures.
- Noise Level will be monitored at 5 to 6 localities at existing project site

6. Investigate Socio-Economic and Socio-Environmental aspects and cultural values within and around the operating facility
    - Administrative Set up
    - Cultural and Social Values
    - Social Cohesion
    - Interviews from different groups
7. Development activities and Waste Management
8. Identify and evaluate major environmental impacts
9. Identify mitigation measures and develop Environmental Management and Monitoring plan
10. Conclusions based on the study conducted for this ESIA.

ESIA Proceedings

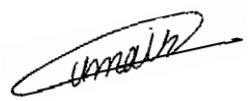
1. All other requirements, as set forth by
    - The Punjab Environmental Protection Act, 1997 (Amended 2012) and the
    - Various guidelines developed by PEPA
    - Any other legal requirements existing within Pakistan
2. 1-2 Site Visits for data acquisition
3. Environmental Monitoring
4. Preparation of Lab Analysis Report
5. Preparation of Environmental and social Impact Assessment (ESIA)
6. Submission of all ESIA report in office of DG EPA Punjab
7. Conduction of Public Hearing of ESIA
8. Briefing & Presentation at the site to District Officer/Inspector for Environmental Management.
9. Reply to technical Environmental Objections/Review

10. Presentation in the office of DG EPA, Punjab
11. Issuance of NOC

Client's Responsibility

We expect the following inputs from the clients:

- As soon as the Proposal is accepted, the Consultants will request for the nomination of senior officer to be nominated as Coordinator who will be responsible for all coordination activities as required by the Consultants and to whom the Consultants will refer for information and assistance. All correspondence between the Consultants and the CLIENT will be routed through the coordinator.
- Asian will require free access to all relevant information available with the Client.
- Assess and identify major potential issues and impacts particularly those which may have influence on design, construction and operation at any stage.
- The report developed for the CLIENT shall be the property of the CLIENT and the Consultants shall adhere to confidentiality morally as well as legally.
- Client will provide relevant documents as:
    1. Signed application on company letter head (pattern will be provided)
    2. Undertaking on Rs. 100/- Stamp Paper (pattern will be provided)
    3. Affidavit on Rs. 100/- Stamp Paper (pattern will be provided)
    4. Copy of CNIC of proponent
    5. Signature on Schedule IV (pattern will be provided)
    6. Layout Map of the project
    7. Other NOCs / Certificates form other concerned departments (if any)
- Project proponent will provide the Bank Drafts of amount of Rs. 30,000/- in favor of D.G. EPA Punjab which is review fee for EIA.
- If any legal litigation arises from stakeholders during the preceding of EIA, the consultant will not be responsible for the delay in the approval process due to legal litigation.

Signature: 	Signature: _____
Name: Muhammad Umair Iqbal	Name _____
Designation: Environmentalist	Designation _____
Date: _____	Date: _____

ANNEXURE - 8: IFC'S EHS GUIDELINES FOR CONSTRUCTION AND DECOMMISSIONING

General EHS Guidelines [Complete version] at: **www.ifc.org/ehsguidelines**

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

WORLD BANK GROUP

4.0 Construction and Decommissioning

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

Applicability and Approach

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

4.1 Environment{ TC "4.1 Environment" \f C \l "2" }

Noise and Vibration

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

- Planning activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance
- Using noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, and exhaust muffling devices for combustion engines.
- Avoiding or minimizing project transportation through community areas

Soil Erosion

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

Sediment mobilization and transport

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

Clean runoff management

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

Road design

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

Disturbance to water bodies

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

Structural (slope) stability

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

Air Quality

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

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

Solid Waste

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

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

Hazardous Materials

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

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

Wastewater Discharges

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

Contaminated Land

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

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

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

4.2 Occupational Health and Safety{ TC "4.2 Occupational Health and Safety" \f C \l "2" }

Over-exertion

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

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

Slips and Falls

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

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

Work in Heights

Falls from elevation associated with working with ladders, scaffolding, and partially built or demolished structures are among the most common cause of fatal or permanent disabling injury at construction or decommissioning sites. If fall hazards exist, a fall protection plan should be in place which includes one or more of the following aspects, depending on the nature of the fall hazard[95]:

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

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

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

Struck By Objects

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

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

Moving Machinery

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

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

Dust

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

Confined Spaces and Excavations

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

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

Other Site Hazards

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

- Use of specially trained personnel to identify and remove waste materials from tanks, vessels, processing equipment or contaminated land as a first step in decommissioning activities to allow for safe excavation, construction, dismantling or demolition
- Use of specially trained personnel to identify and selectively remove potentially hazardous materials in building elements prior to dismantling or demolition including, for example, insulation or structural elements containing asbestos and Polychlorinated Biphenyls (PCBs), electrical components containing mercury[96]
- Use of waste-specific PPE based on the results of an occupational health and safety assessment, including respirators, clothing/protective suits, gloves and eye protection

[96] Additional information on the management and removal of asbestos containing building materials can be found in ASTM Standard E2356 and E1368

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

General Site Hazards

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

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

Disease Prevention

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

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

Traffic Safety

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

ANNEXURE - 9: COVID-19 PANDEMIC AND HEALTH SAFETY MEASURES

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

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

Activities	Adaptive Measures
Pre- Execution Phase	
A. Profile preparation	• Detail profile of sub-project workforce • Enlist the names, addresses and contact nos. • Breakdown of the workforce (workers from local communities and those who have on site accommodation) • Assigning the task against each person • Schedule the key activities and their duration at site
B. Initial Screening	• All enlisted workforce should go through initial screening process • Ensuring the availability of Thermogun on site • Record keeping against initial screening • Identifying all workers who are initially at more risk of contracting Covid-19
During Execution Phase	
A. Preliminary Screening	**Regular Screening:** • Regular screening by using Thermogun on daily basis before starting civil work at site • Checking and recording temperatures of workers and other people entering the site or requiring self-reporting prior to or on entering the site • If a worker has symptoms of COVID-19 (e.g., fever, dry cough, fatigue) the worker should be removed immediately from work activities and isolated on designated site. • Co-workers (i.e., workers with whom the sick worker was in close contact) should be required to stop work, and to quarantine themselves for 14 days, even if they have no symptoms. **Sequential Screening:**

	Concerned THQ medical staff is requested for screening at regular intervals. List should also be shared with THQ for avoiding future inconvenience or hire health safety officer on weekly basis.
B. Special Arrangements regarding PPEs	• Ensuring availability of handwashing facilities (sanitizers/soaps) on site • Presence of closed waste bins at key places throughout site, including at entrances/exits to work areas (toilet, canteen or food distribution, or provision of drinking water; in worker accommodation; at waste stations; at stores; and in common spaces). • Special arrangements regarding PEPEs and sanitation at site • Record keeping of stock availability on daily basis
C. Restricted Movement/ Demobilization of staff	• Encourage employees to wash their hands at least for 20 seconds with soap and stay at least one meter away from people who are coughing or sneezing • Breakdown of workers who reside at home (i.e., workers from the communities), workers who lodge within the local communities and workers in on-site accommodation. Workers accommodated on site should be required to minimize contact with people near the site, and in certain cases be prohibited from leaving the site for the duration of their contract, so that contact with local communities is avoided. • Workers from local communities, who return home daily, weekly or monthly, will be more difficult to manage. They should be subject to health checks at entry to the site (as set out above) and at some point, circumstances may make it necessary to require them to either use accommodation on site or not to come to work. • All workers should be provided separate accommodation.
D. Training sessions	• Health and safety training for Contractor's Personnel (which include sub-project workers and all personnel that the Contractor uses on site, including staff and other employees of the Contractor and Subcontractors and any other personnel assisting the Contractor in carrying out sub-project activities.

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

ANNEXURE - 10: ENVIRONMENTAL & SOCIAL SCREENING AND INVOLUNTARY RESETTLEMENT SCREENING CHECKLISTS

Environmental & Social Screening Checklist

Instructions:

Environmental and Social Focal Persons (ESFPs)[11] nominated by the MCs for PCP environmental and social management, will use this checklist in field for environmental and social screening and categorization of each and every sub-project proposed to be executed under the Program.

Deputy Program Officers-Environmental and Social Management (DPO-ESM) deputed by PMDFC in regional offices will technically assist and support the ESFPs/MCs in filling in of this Checklist.

It is to be attached with the main document[12] of sub-projects at planning stage and will be duly signed by the relevant ESFP and endorsed by the respective DPO-ESM.

This checklist focuses on environmental and social impacts. To ensure that social dimensions are adequately considered, Involuntary Resettlement Screening Checklist will also be used.

(iii) The purpose of this E&S Screening Checklists is to identify potential "Negative" impacts of environmental and social attributes or to enhance the existing environmental & social benefits. Use the "remarks" section to discuss any anticipated mitigation measures.

Name of ESFP: Abdul Razzaq

Name of MC: Bahawalnagar

Sub-Project Sector: Sewerage System

Sub-Project Title: Improvement and Extension of Sewerage System in Bahawalnagar City

Sub- Project Categorization:	**E-1** ✓	**S-1**
	E-2	**S-2** ✓
	E-3	**S-3**

Date of Screening: 08th March, 22nd September & 6th October, 2023

Anticipated Project Activities:

The project includes the improvement and / or construction of disposal stations, force main and Waste Stabilization Pond in MC Bahawalnagar. Project activities include

- Rehabilitation of disposal stations including pumping machineries, plaster of wall, painting etc.,
- Laying of force main including excavation, backfilling and restoration of roads
- Construction of Wastewater Treatment Plant / Waste Stabilization Pond which involves excavation of ponds, construction of inlet channel and effluent channels and construction of office building and office.

[11] *In all MCs, ESFPs are notified by Local government; MO (I&S) are focal persons for environmental sector and MO(P) are focal persons for social sectors.*

[12] *It is meant as PC-I and/or engineering estimates of sub-project*

Estimated Cost of Subproject: PKR 1293.1 M

Completion Time/Duration: 18 Months

Estimated Labor for Subproject: Approx. 30

Screening Questions	Yes	No	Remarks
A. Project Siting Is the Sub-Project area adjacent to or within any of the following:			
Environmentally sensitive areas?			
Legally protected Area		✓	No legally protected area has been reported within the project area.
Any surface water body (river, canal, stream, lake, wetland) within 250 meter of the proposed sub project[13]		✓	No surface water body (river, canal, stream, lake, wetland) found within 250 meter of the proposed sub-project.
Estuarine		✓	No estuarine has been reported within the project area.
Special area for protecting biodiversity		✓	No special area for protecting biodiversity has been reported within the project area.
Buffer zone of protected area		✓	No buffer zone of protected area has been reported within the project area.
Mangroves Forest		✓	No mangroves forest has been reported within the project area.
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	No man-made forest / game reserve, orchid / crops or any other area of environmental importance has been reported within the project area.
Socially sensitive /important areas/communities/ people?			
PCRs and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, *Gordwarah*, Temple, Fort, archeological/historical site) within 100 m of the proposed subproject[14]	✓		Sites of religious importance like mosques and graveyard have been found within 100 m of the proposed subproject. Around 10 no. of mosques and 01 no. of graveyard found within 100 m 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 impact near sensitive receptors.

Screening Questions	Yes	No	Remarks
Sensitive receptors (Schools, colleges, hospitals and clinics) within 100 meter of the proposed sub project[15]	✓		Sensitive receptors like schools, university, hospitals and clinics have been found. Around 11 no. of schools, 01 no. of university, 05 no. of hospitals and 01 no. of clinic 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 impact near sensitive receptors.
Any graveyard of local community (Muslims or Christians)	✓		01 graveyard has been reported within 100 m of the proposed subproject.
Any demographic or socio-economic aspects of the sub-project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities, people in old age, socially isolated segments[16] of the society and women or children)?		✓	No demographic or socio-economic aspects of the sub-project area that are already vulnerable found.
Already existing infrastructure [17](including public amenities) which may be required to dismantle or may be affected temporarily by any means?	✓		Already existing infrastructure like road may be required to dismantle or may be affected temporarily by any means. The contractor will be bound to restore / rehabilitate the existing infrastructure to its original state after the completion of subproject. Contractor will be liable to nullify any damage to already existing infrastructure.
B. Potential Environmental Impacts Will the Sub-Project cause…			

[13] *Ibid.*

[14] *According to Environmental Assessment Guidelines adopted by Punjab EPA*

[15] *Ibid.*

[16] *due to caste, creed, religion or gender e.g., transgender*

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

Screening Questions	Yes	No	Remarks
1. Disturbance to habitats / biodiversity of environmentally sensitive or protected areas?		✓	There will be no disturbance to habitats / biodiversity or protected areas.
2. Cutting of trees?		✓	No cutting of trees is anticipated during sub-project activities.
3. Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	There will not be any disruption to habitats / biodiversity of surrounding ecosystem/environment.
4. Generation of wastewater during construction or operation?	✓		The wastewater will be generated from the contractor camp site during construction phase which will be treated through wastewater treatment plant or septic tank before final disposal to the nearest drain. However, no wastewater generation is anticipated during project operation.
5. Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of waste water?		✓	The wastewater discharge from construction camps will be properly treated before the final disposal. No ground water contamination is anticipated, the septic tank develop will be properly lined in order to avoid percolation and contamination of ground water.
6. Alteration of surface water hydrology of waterways resulting in increased sediment in streams/rivers or due to increased soil erosion at construction site?		✓	Not reported as there is no surface water body present near subproject site.
7. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		✓	No surface water body is present near the subproject site. Mitigation measures will be adopted like; Storing all material and chemicals required for construction in well secured and managed sites, installing silt traps near all water bodies prior to construction activities, disposing all waste soil and other debris to approved locations, locating labor camps at approved locations, providing proper sanitary

Screening Questions	Yes	No	Remarks
			facilities and solid waste management practices to worker camps and creating awareness on sanitation for workers will mitigate these impacts.
8. Over pumping of ground water, leading to salinization and ground subsidence?		✓	No over pumping will be done. The turbine installed for the extraction will be operated within its capacity.
9. Serious contamination of soil due to construction works?	✓		Soil may be contaminated due to the spillage of chemicals, fuels, solvents, oils, paints, concrete, solid waste generated at campsites etc. This normally happens when these materials are transported in open or loosely capped containers. The contractor is required to adopt the proper mitigation that include good housekeeping, training of his staff, disposal of waste on approved landfill and implementation of waste management plans.
10. Aggravation of solid waste problems in the area?		✓	The solid waste problem during construction activities will be mitigated by adopting the proper solid waste management plan.
11. Generation of hazardous waste?	✓		Oil, fuel, batteries and other hazardous chemicals that will be used during construction activities will be stored at the site, if required, in well closed containers at designated locations. The hazardous waste will be disposed of through EPA approved contractor.
12. Increased air pollution due to sub-project construction and operation?	✓		Adaptation of speed limits for construction vehicles and timely servicing and maintaining them up to the given standards will reduce the volume of air

Screening Questions	Yes	No	Remarks
			emissions to the surrounding. Frequent monitoring of air quality will support to review the effectiveness of the mitigation measures. The scrubber will be installed on asphalt and batching plant in order to limit the air emissions within PEQS limits.
13. Noise and vibration due to sub-project construction or operation?	✓		Blasting is not involved which is the major source of vibration. However, vibration produced from construction machinery will be limited and site specific. Ambient noise level is expected to increase in the range of 80-90 dB(A) due to various construction activities, maintenance workshops, and earthmoving equipment to be used for civil works. All stationary noise making equipment will be installed with acoustic enclosures. Timings of noise construction activities will be regulated near sensitive receptors. Plantation will be proposed along the road which acts as a barrier to reduce the noise level. Further regular monitoring of noise levels will be adopted based on baseline data gathered during the pre-construction stage and continuous monitoring is proposed during construction stage as a mitigatory measure.
14. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?	✓		Temporary excavated areas and used tyres in the warehouse/yards during the construction phase may provide breeding grounds for mosquitoes including dengue.

Screening Questions	Yes	No	Remarks
			Mitigation will be proposed like filled top-soil which will naturally restrict mosquito breeding. The tyres should remain dry in order to avoid the mosquito breeding.
15. Use of chemicals during construction?	✓		All chemicals will be stored in proper containers in order to avoid the leakages. The storage facility of chemicals should be properly ventilated and have emergency measures of firefighting and emergency exists. The workers using the chemicals should have training and should wear the PPEs.
C: Potential Social Impacts Will the Sub-Project cause…			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?		✓	There will be no impairment of historical/cultural areas and there will be no disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs).
2. Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	There is no physical and economic displacement or involuntary resettlement of the people. Proposed land for WWTP is said to be govt. land as per consultation conducted with MC and patwari. Currently, that land is free of any occupation, there are no encroachments / structures / crops.
3. Disproportionate impacts on the poor, women and children and or other vulnerable groups [18](mentioned above)?		✓	There is no impact on the poor, women and children or other vulnerable group.
4. Temporary impediments in movements of people/transport and animals?	✓		The movement will be restricted for few hours only which the resident/people will be informed prior to the construction activities.

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

Screening Questions	Yes	No	Remarks
5. Large population influx during sub-project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	There will be no large population influx on the locals. However, during construction activities, separate sanitary facilities and water will be adequately supplied to the labor force by the contractor to avoid and conflict with the local community on the use of their water resources.
6. Social conflicts if workers from other areas are hired?		✓	Contractor will be bound to hire the locals for unskilled work during construction and hence such conflict is not anticipated, however, awareness programs will be conducted for both labor force and local community in order to minimize possible conflicts.
7. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		Workers may get exposed to dust and noise during construction activities. However, the exposure levels are likely for short time. Workers will be provided requisite PPEs to minimize such exposure and associated harmful occupational health effects. Also, it is proposed to prepare a separate health and safety plan to be implemented during construction and operation phases, and a regular monitoring schedule to be proposed under close supervision and coordination of a professional Occupational Health & Safety Officer of the Project Implementation Consultant.
8. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	✓		EHS SOPs will be followed to mitigate any impacts related to EHS. The regular monitoring schedule to be proposed under close supervision of the consultant.

Screening Questions	Yes	No	Remarks
9. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	✓		EHS SOPs will be followed to mitigate any impacts related to EHS and a regular monitoring schedule to be proposed under close management of a professional Occupational Health & Safety officer.
10. Any impact on sensitive receptors (mentioned above)	✓		Sensitive receptors like schools, university, hospitals and clinics have been found. Around 11 no. of schools, 01 no. of university, 05 no. of hospitals and 01 no. of clinic 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 impact near sensitive receptors.
11. Any impact of negative nature on already existing infrastructure including public amenities?	✓		Already existing infrastructure like road will be disturbed. Contractor will be bound to restore and rehabilitate the site area to its original state after the completion of construction works.

Prepared by;	**Endorsed by;**	**Reviewed by;**
Name: Aleem Butt	**Name:**	**Name:**
Designation: Environmental Specialist	**Designation:**	**Designation:**
Signature:	**Signature:**	**Signature:**
Date:	**Date:**	**Date:**

Appendix A-Environmental and Social Categorization of Sub-Projects

Using the Environmental and Social Screening Checklist, E & S Categorization of sub-projects of PCP is and will be carried out as following:

For Environmental Category:

E-1 = All those sub-projects having adverse environmental impacts and or those sub-projects that come under Schedule I and II of Pakistan Environment Protection Agency Review of IEE and EIA Regulations 2000 will need to submit **Initial Environmental Examination (IEE)** or **Environmental Impact Assessment (EIA)**[19] report

E-2 = All those sub-projects which will have moderate negative environmental impacts will need to submit **Environmental and Social Management Plans (ESMP)**[20]

E-3 = All those sub-projects which will have no negative environmental impacts will be categorized as E3 and for those, no further process will be required[21] after E &S Screening

For Social Category:

S-1= All those sub-projects having negative social impacts of significant nature on > 40 households and or it require displacement/resettlement of > 40 households for land acquisition, will need to submit Social Assessment (SAR), Social Management Plan (SMP) and Resettlement Action Plan (RAP)

S-2= All those sub-projects having negative social impacts of significant nature on 1 – 40 households and or it require displacement/resettlement of 1- 40 households for land acquisition, will need to submit Social Assessment (SAR), Social Management Plan (SMP) and Abbreviated Resettlement Action Plan (ARAP)

S-3= All those sub-projects having no negative social impacts and or they are not involved in displacement/resettlement of any nature, will be categorized as S3 and No further process will be required after E &S Screening

Appendix B-Important Definitions

1. Environmentally sensitive areas [22]

   Environmentally sensitive areas are landscape elements or places which are vital to the long-term maintenance of biological diversity, soil, water or other natural resources both on the site and in a regional context.
2. Cultural heritage[23]
   - Tangible cultural heritage:
     - movable cultural heritage (paintings, sculptures, coins, manuscripts)
     - immovable cultural heritage (monuments, archaeological sites, and so on)
     - underwater cultural heritage (shipwrecks, underwater ruins and cities)

[19] *.All the social impacts (except those that come under S1 and S2 Category of land acquisition) of E1 Category sub-projects will be covered in IEE/EIA report*
[20] *.All the social impacts (except those that come under S1 and S2 Category of land acquisition) of E2 Category sub-projects will be covered in the ESMP*
[21] *.For all those sub-projects which will have no negative environmental impacts and are categorized as E3 but they require construction labor/workers for the execution ,will follow the Environment, Health and Safety SOPs prepared for PCP and they will follow the instructions given by ESM team of PCP*
[22] *https://www.sciencedirect.com/science/article/abs/pii/0169204694020169*
[23] *http://www.unesco.org/new/en/culture/themes/illicit-trafficking-of-cultural-property/unesco-database-of-national-cultural-heritage-laws/frequently-asked-questions/definition-of-the-cultural-heritage/*

- Intangible cultural heritage: oral traditions, performing arts, rituals

3. Wetlands

- Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season.[24]
- areas of marsh, fen, petal and or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters".[25]

4. Buffer zone of protected area

Areas peripheral to a specific protected area, where restrictions on resource use and special development measures are undertaken in order to enhance the conservation value of the protected area.[26]

5. Special area for protecting biodiversity/ Key Biodiversity Areas (KBA)

Sites that contribute significantly to the global persistence of biodiversity, in terrestrial, freshwater and marine ecosystems [27]

6. Estuarine

Area of the mouth of a river where it broadens into the sea, and where fresh and seawater intermingle to produce brackish water. The estuarine environment is very rich in wildlife, particularly aquatic, but it is very vulnerable to damage as a result of human activities.[28]

7. Hazardous substance means-

(a) A substance or mixture of substance, other than a pesticide as defined in the Agricultural Pesticide Ordinance, 1971 (II of 1971), which, by reason of its chemical activity is toxic, explosive, flammable, corrosive, radioactive or other characteristics causes, or is likely to cause, directly or in combination with other matters, an adverse environmental effect; and

(b) Any substance which may be prescribed as a hazardous substance;

Hazardous waste means waste which is or which contains a hazardous substance or which may be prescribed as hazardous waste, and includes hospital waste and nuclear waste; [29]

8. Waste

Waste means any substance or object which has been, is being or is intended to be, discarded or disposed of, and includes liquid waste, solid waste, waste gases, suspended waste, industrial waste, agricultural waste, nuclear waste, municipal waste, hospital waste, used polyethylene bags and residues from the incineration of all types of waste. [30]

Pictures of Project Siting

[24] *https://www.epa.gov/wetlands/what-wetland*
[25] *https://www.ramsar.org/sites/default/files/documents/library/info2007-01-e.pdf*
[26] *https://www.biodiversitya-z.org/content/buffer-zones.pdf*
[27] *https://biodiversitya-z.org/content/key-biodiversity-areas-kba*
[28] *https://biodiversitya-z.org/content/estuary*
[29] *Punjab Environmental Protection Act 2012*
[30] *ibid*


GPS Map Camera
Hafizwala, Punjab, Pakistan
W6WM+W5H, Hafizwala, Bahawalnagar, Punjab, Pakistan
Lat 29.945338°
Long 73.231192°
22/09/23 11:00 AM GMT +05:00
Google


GPS Map Camera
Bahawalnagar, Punjab, Pakistan
Bahawalnagar Bypass, Bahawalnagar, Punjab, Pakistan
Lat 29.955288°
Long 73.232407°
22/09/23 11:15 AM GMT +05:00
Google


GPS Map Camera
Bahāwalnagar, Punjab, Pakistan
2759+HHH, Manchinabad Road, Bahāwalnagar, Bahawalnagar, Punjab, Pakistan
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08/03/23 02:28 PM
Google


GPS Map Camera
Bahāwalnagar, Punjab, Pakistan
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Lat 29.976658°
Long 73.261046°
08/03/23 03:31 PM
Google

INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of ESFP: Abdul Razzaq

Name of MC: Bahawalnagar

Sub-Project Sector: Sewerage System

Sub-Project Title: Improvement and Extension of Sewerage System in Bahawalnagar City

Sub- Project Categorization: **S-1**

S-2 ✓

S-3

Date of Screening: 08th March, 22nd September & 6th October, 2023

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		Project does not require land acquisition. Proposed land for WWTP is govt. owned land as per consultation conducted with MC and patwari.
If yes, then describe the type of land being acquired from the categories below:		✓		
Land (Quantify and describe types of land being acquired in "remarks column".				
Government and LG owned land free of occupation (agriculture or settlement)	✓			Proposed land for WWTP is free of occupation, there are no encroachments / structures / crops.
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)				
Private land		✓		

Residential		✓		
Commercial		✓		
Agricultural		✓		
Communal		✓		
Others (specify in "remarks").				
Name of owner/owners and type of ownership document if available.				
If land is being acquired, describe any structures constructed on it		✓		
Land-based assets:		✓		
Residential structures		✓		
Commercial structures (specify in "remarks")		✓		
Community structures (specify in "remarks")		✓		
Agriculture structures (specify in "remarks")		✓		
Public utilities (specify in "remarks")		✓		
Others (specify in "remarks")		✓		
If agricultural land is being acquired, specify the following:				
Agriculture related impacts		✓		
Crops and vegetables (specify types and cropping area in "remarks).		✓		
Trees (specify number and types in "remarks").				
Others (specify in "remarks").				
Affected Persons (APs)				
Will any people be displaced from the land when acquired? Yes/No		✓		Land acquisition is not required as the proposed land is govt. owned land, as per consultation conducted with MC and patwari.

Number of APs				
Males				
Females				
Titled land owners				
Tenants and sharecroppers				
Leaseholders				
Agriculture wage laborers				
Encroachers and squatters (specify in remarks column)		✓		
Vulnerable APs (e.g. women headed households, minors and aged, orphans, disabled persons and those below the poverty line). Specify the number and vulnerability in "remarks".		✓		
Others (specify in "remarks")				
How will people be affected?				

Prepared By:

Name: Aleem Butt (Environmental Specialist)

Signature:

Date:

Endorsed By:

Name:

Signature:

Date:

Reviewed By:

Name:

Signature:

Date:

ANNEXURE - 11: IMPACT MATRIX

Environmental Parameters / Project Activities	Physical, Ecological and Social Environment																												
	Land Acquisition	Downstream Water Users	Air Quality	Noise	Soil Contamination	Aesthetic	Liquid and Solid Waste	Borrow Pits	Surface Water	Irrigation Water	Wastewater	Soil	Flora	Fauna	Livestock Grazing	Fishery	Mobility of Locals	Cultural Issues	Water Ponds	Gender Issues	Health& Safety of Workers	Archeological, Historical and Religious Sites	Security Situation	Human Health	Ground Water	Agriculture	Drinking Water	Livelihood	Income
A. Planning & Design Phase																													
Site Selection	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	-1	-1
Topographic Survey	0	0	-1	0	-1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0
Geotechnical Investigation	0	0	-1	0	-1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0
Seismic Investigation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land Acquisition	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	-1	0	-1	-1
B. Construction Phase																													
Clearing of Land ,Digging and Excavation	0	0	-1	-2	-1	-3	-1	-3	0	0	0	-1	-1	-1	-2	0	-2	0	0	0	-1	0	0	0	0	0	0	1	2
Storage of Material	0	0	0	0	-1	0	-1	0	0	0	0	-1	-1	0	0	0	-1	0	0	0	-1	0	0	0	0	0	0	0	0
Loading and Hauling	0	0	-1	-1	-1	-1	-1	0	0	0	0	0	0	0	0	0	0	-2	0	0	-1	0	0	0	0	0	0	0	0
Construction of Access Road	0	0	-2	-2	-2	-1	-1	0	0	0	0	-2	-1	-1	-1	0	-1	-1	0	-1	-1	0	0	0	0	0	0	1	1
Construction Camps	0	0	0	-1	-1	-2	-2	-1	0	0	-1	-1	-1	-1	-1	0	-1	-1	0	-1	-1	0	0	0	0	0	0	0	0
Crushing	0	0	0	-2	-1	-2	-2	0	0	0	0	0	-1	-1	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0
Use of Heavy Machinery	0	0	-1	-2	-1	0	0	0	0	0	0	0	-1	-1	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0
Wastewater Disposal	0	0	0	0	-1	0	1	-1	0	0	1	-2	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	-2	0	0
Solid Waste Disposal	0	0	0	0	-1	-2	-2	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	-1	0	0
Leakage & Spillage of Oil	0	0	0	0	-2	0	-2	0	0	0	-2	0	-1	-1	0	0	0	0	0	0	-1	0	0	0	-1	0	-1	0	0
C. Operational Phase																													
Industrial Operations	0	0	-1	-1	-1	1	-1	0	-1	0	-1	1	2	2	0	0	0	0	0	-1	-1	0	1	-1	0	0	0	2	2
International			-1	-1	0	0														-1								2	2
Investments																													
Economy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3	3

Beneficial		Adverse
1	Low	-1
2	Medium	-2
3	High	-3

0	Insignificant or No Impact

ANNEXURE - 12: SCREENING CHECKLIST

Adverse Impact -, Significant Adverse --, Beneficial Impact +, Highly Beneficial ++, No Impact 0

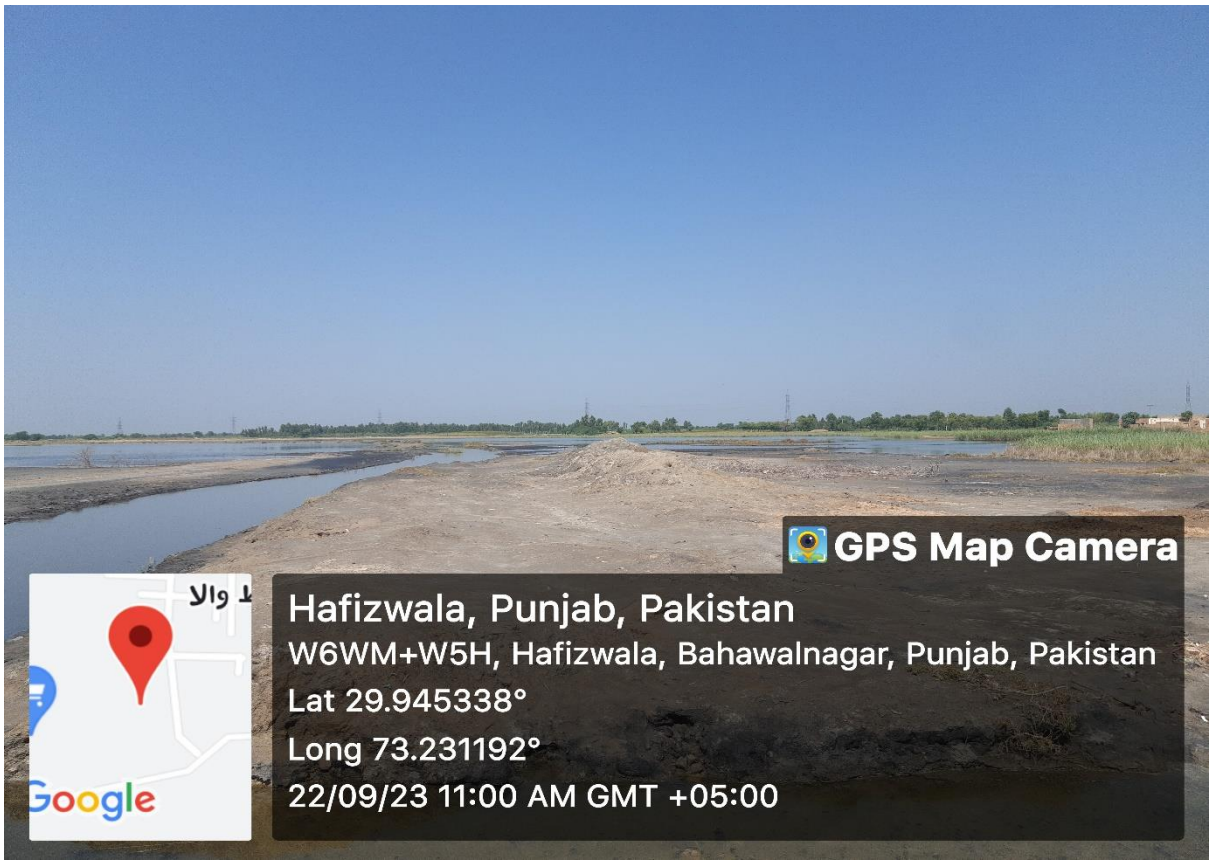
Sr. No.	Main Environmental Parameters	Baseline Conditions	With Project			
			During Construction without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
1	**Atmosphere**					
a	Ambient Air	0	--	0	-	0
b	Primary Pollutants	0	--	0	-	0
c	Secondary Pollutants	0	-	0	0	0
d	Noise	0	--	0	-	0
e	Vibration	0	-	0	-	0
2	**Climate**					
a	Temperature	0	0	-	0	-
b	Precipitation	0	0	0	0	0
c	Relative Humidity	0	0	0	0	0
e	Evaporation	0	0	0	0	0
3	**Water Resources**					
a	Surface Water	0	0	0	0	0
	Rivers	0	0	0	0	0
	Streams	0	0	0	0	0
	Springs	0	0	0	0	0
	Wetland	0	0	0	0	0
	Flow	0	0	0	0	0
	Quality	0	0	0	0	0
	Usage	0	0	0	0	0
	Sediments	0	0	0	0	0
	Chemicals	0	0	0	0	0
	Pollution	0	0	0	0	0
	Erosion	0	0	0	0	0
b	Ground Water					
	Sources	0	0	++	+	++
	Depth	0	0	++	+	++
	Quantity	0	0	++	+	++
	Potential Extraction	0	0	++	+	++

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Project			
			During Construction without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
	Usage	0	0	++	+	++
	Domestic Supply	0	0	0	0	0
	Industrial Water Supply	0	0	+	0	+
	Irrigation	0	0	0	0	0
	Hydropower Generation	0	0	0	0	0
	Quality	0	-	+	0	+
4	**Land Resources**					
a	Topography	0	0	0	0	0
b	Soil	0	-	0	0	0
c	Major Land use	0	0	0	0	0
5	**Ecological Environment**					
a	Terrestrial Ecology					
	Flora	0	-	0	0	+
	Fauna	0	0	0	0	0
b	Aquatic Ecology					
	Aquatic Flora	0	-	0	0	0
	Aquatic Fauna	0	0	0	0	0
	Fisheries	0	0	0	0	0
c	Wildlife	0	0	0	0	0
d	Forestry	0	0	0	0	0
e	Beneficial Plants and Animals	0	0	0	0	+
f	Endangered Species	0	0	0	0	0
6	**Socio-economic Environment**					
a	Institutional and Administrative Setup	0	0	0	0	+
b	Demography	0	0	0	0	0
c	Gender issues	0	0	0	0	0
d	Social Equity	0	0	0	0	0
e	Settlement Patterns	0	0	0	0	0

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Project			
			During Construction without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
f	Land Holdings & Titling	0	0	0	0	0
g	Common Resource Rights	0	0	0	0	0
h	Fish	0	0	0	0	0
i	Wood	0	0	0	0	0
j	Grazing	0	0	0	0	0
k	Fodder	0	0	0	0	0
l	Domestic Energy and Fuel	0	0	0	0	0
m	Domestic Water Supply	0	0	0	0	0
n	Sanitation	0	0	0	0	0
o	Health	0	-	0	0	0
p	Waterborne Disease	0	-	-	0	+
q	Common Diseases	0	0	0	0	0
r	Mental Health	0	0	0	0	0
s	Human Nutrition	0	0	0	0	0
t	Education & Literacy	0	0	0	0	0
u	Cultural & Historical Sites	0	0	0	0	0
v	Religious Sites	0	0	0	0	0
w	Aesthetics	0	0	0	0	0
x	Landscape	0	0	0	0	0
y	Livelihood	0	0	0	0	0
z	Agriculture	0	-	0	-	0
	Livestock	0	0	0	0	0
	Forestry	0	0	0	0	0
	Fisheries	0	0	0	0	0
	Industry	0	0	0	++	++
	Other Cash Income	0	+	+	+	++
7	**Transport, Infrastructure & Communication**					

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Project			
			During Construction without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
a	Roads	0	-	0	0	0
b	Tracks	0	-	0	0	0
c	Bridges	0	0	0	0	0
d	Pedestrian Tracks	0	-	0	0	0
e	Navigation	0	0	0	0	0
f	Energy and Power	0	-	0	0	0
g	Telecommunication	0	0	0	0	0
8	**Natural Risks and Hazards**					
a	Earthquake	0	0	0	0	0
b	Landslides	0	0	0	0	0
c	Storms	0	0	0	0	0
d	Floods	0	0	0	0	0
e	Erosion	0	0	0	0	0
f	Drought	0	0	0	0	0
g	Human Disease	0	0	0	0	0
h	Pollution	0	--	0	-	0
i	Social Instability	0	0	0	0	+
j	Economic Instability	0	+	+	0	++
k	Political Instability	0	0	0	0	0
9	**External Constraints**					
a	Upstream Constraints	0	0	0	0	0
b	Upstream Impacts	0	0	0	0	0
c	Downstream Constraints	0	0	0	0	0
d	Downstream Impacts	0	0	0	0	0

ANNEXURE - 13: SITE PICTURES






GPS Map Camera
Bahāwalnagar, Punjab, Pakistan
Unnamed Road, Bahāwalnagar, Bahawalnagar, Punjab, Pakistan
Lat 30.010833°
Long 73.268077°
08/03/23 02:30 PM
Google


GPS Map Camera
Bahāwalnagar, Punjab, Pakistan
Unnamed Road, Bahāwalnagar, Bahawalnagar, Punjab, Pakistan
Lat 30.010774°
Long 73.268203°
08/03/23 02:30 PM
Google

ANNEXURE - 14: LABOR'S SOPS

PUNJAB CITIES PROGRAM

ENVIRONMENT, HEALTH AND SAFETY SOPs FOR LABOR/WORKERS

Labor /workers play key role in the infrastructure development and construction activities. The objective of preparation of the EHS SOPs for Labor/Workers is to address environment, health and safety issues related to the proposed sub-project implementation. These SOPs will provide guidelines to be followed by the contractors for effective management of EHS issues related to labor/workers/daily wagers (including women). These SOPs will be annexed in the general conditions of all the contracts carried out under the PCP. These SOPs are designed for Punjab Cities Program and will be applicable to all types of labor/workers/daily wagers (including women), hired for the construction activities under PCP. Following are the anticipated Environment, Health and Safety issues and their recommended mitigation measures.

Table 1: Construction Camp Management

Activity/ Impact Source	EHS Concerns/issues	Mitigation Measures/ Management Guidelines
Siting and Location of construction camps	Camp sites for construction workers are the important locations that have significant impacts such as health and safety hazards on labor/workers Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	The Contractor shall: Locate the construction camps at areas which are acceptable from environmental, cultural or social point of view. Consider the location of construction camps away from communities in order to avoid social conflict with the surrounding communities. 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 surveillance over public health, social and security matters
Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will generate social issues and impacts on health and environment.	Contractor shall provide the following facilities in the campsites: Adequate ventilation facilities Safe and reliable drinking water supply for personal hygiene (washing or bathing) Adequate housing for all workers Safe and reliable drinking water supply. Water supply from tube wells that meets the Punjab Environment Quality Standards Hygienic sanitary facilities, hand washing facilities and sewerage system. The toilets and domestic waste water will be collected

Activity/ Impact Source	EHS Concerns/issues	Mitigation Measures/ Management Guidelines
		through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. Female toilets should be clearly marked in language or signage clearly understood by the persons using them to avoid miscommunication. The minimum number of toilet facilities required is one toilet for every ten persons. Storm water drainage facilities. Both sides of roads are to be provided with shallow v drains to drain off storm water to a silt retention pond which shall be sized to provide a minimum of 20 minutes retention of storm water flow from the whole site. Channel all discharge from the silt retention pond to natural drainage via a grassed swale at least 20 meters in length with suitable longitudinal gradient. Paved internal roads. Ensure with grass/vegetation coverage to be made of the use of top soil that there is no dust generation from the loose/exposed sandy surface. Pave the internal roads of at least haring-bond bricks to suppress dusts and to work against possible muddy surface during monsoon. Provide child crèches for women working on the construction site. The crèche should have facilities for dormitory, kitchen, indoor/outdoor play area. Schools should be attached to these crèches so that children are not deprived of education whose mothers are construction workers Provide in-house community/common entertainment facilities. Dependence of local entertainment outlets by construction camps to be discouraged/prohibited to the extent possible.
Disposal of Labor Camp waste	Management of wastes is crucial to minimize impacts on the environment as well as on the health of the workers/labor	The Contractor shall: Ensure proper collection and disposal of solid wastes within the construction camps Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at household level. Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems at their own. Dispose organic wastes in a designated safe place on daily basis. At the end of the day cover the organic wastes with a thin layer of sand so that flies, mosquitoes, dogs, cats, rats, are not attracted. One may dig a large hole to put organic wastes in it; take care to protect groundwater from contamination by leachate formed due to decomposition. Cover the bed of the pit with impervious layer of materials (clayey, thin concrete) to protect groundwater from

Activity/ Impact Source	EHS Concerns/issues	Mitigation Measures/ Management Guidelines
		contamination. Locate the garbage pit/waste disposal site min 500 m away from the residence so that peoples are not disturbed with the odor likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place by fencing and tree plantation to prevent children to enter and play with. All solid waste will be collected and removed from the work camps and disposed in approval waste disposal sites.
Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	The Contractor shall: Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or other biomass. Make available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them using biomass for cooking. Conduct awareness campaigns to educate workers on preserving the protecting of biodiversity in the project area, and relevant government regulations and punishments on wildlife protection.
Health and Hygiene	There will be a potential for diseases to be transmitted including COVID-19, malaria, exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS.	The Contractor shall: Provide adequate health care facilities within construction sites. Provide first aid box facility at the construction site round the clock. Maintain stock of medicines in the first aid facility in camp sites facility and appoint fulltime designated first aider or nurse. Provide ambulance facility for the laborers during emergency to be transported to nearest hospitals and telephone/mobile facility to call for Emergency Services 1122. Initial health screening of the laborers coming from outside areas Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication for all workers on regular basis Provide adequate drainage facilities throughout camps to ensure that disease vectors habitats (stagnant water bodies, puddles) do not form. Regular mosquito repellant sprays in monsoon. Carryout short training sessions on best hygiene practices to

Activity/ Impact Source	EHS Concerns/issues	Mitigation Measures/ Management Guidelines
		be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices Place display boards of contact information of nearest dispensary/health clinic/hospital
Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	The Contractor shall: Provide appropriate security personnel (police / home guard or private security guards) and enclosures to prevent unauthorized entry in to the camp area. Maintain register to keep track on a head count of persons present in the camp at any given time. Encourage use of flame proof material for the construction of labor housing/site office. Ensure that these houses/rooms are of sound construction and capable of withstanding storms/cyclones. Provide appropriate type of firefighting equipment suitable for the construction camps Display emergency contact numbers clearly and prominently at strategic places in camps. Communicate the roles and responsibilities of laborers in case of emergency in the monthly meetings with contractor.
Food Safety	There is potential for exposure to poisonous substances by ingestion	Suitable arrangements are to be made for provision of clean eating areas where workers are not exposed to the hazardous or noxious substances
Site Restoration	Restoration of the construction camps to original condition requires demolition of construction camps.	The Contractor shall: Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates at the completion of the construction work. Dismantle camps in phases as the work decreases (do not wait for completion of the entire work. Give prior notice to the laborers before demolishing their camps/units Maintain the noise levels within the national standards during demolition activities Different contractors should be hired to demolish different structures to promote recycling or reuse of demolished material. Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site by MCs/ESFPs. Handover the construction camps with all built facilities as it is if agreement between both parties (contactor and land-owner) has been made so.

Activity/ Impact Source	EHS Concerns/issues	Mitigation Measures/ Management Guidelines
		Restore the site to its original condition or to an agreed condition with the landowner defined prior to the commencement of the works (in writing). Not make false promises to the laborers for future employment in O&M of the project.

Table 2: Cultural and Religious Issues

Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities	Disturbance in performance of religious activities	The Contractor shall: Provide separate prayer facilities (men and women) to the construction workers. Show appropriate and non-biased behavior with all construction workers irrespective of their religious or cultural affinities Allow the workers to participate in praying during construction time Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works so as to maintain effective surveillance over public health, social and security matters In case of working during COVID-19 pandemic, SOPs for prayers in Mosque issued by the Government of Punjab, will be applicable and it will be responsibility of contractor to sensitize the labor/workers about it

Table 3: Workers/Labor Health and Safety at Construction Site

Activity/ Impact Source	Impacts	Mitigation Measures/ Management Guidelines
Construction Activities	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise,	The Contractor shall: Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international standards (e.g. International Labor Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national acts and rules of the Government of Pakistan Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of

Activity/ Impact Source	Impacts	Mitigation Measures/ Management Guidelines
	dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases etc), (ii) risk factors resulting from human behavior (e.g. STD, HIV etc) and (iii) road accidents from construction traffic.	hazards in the work areas, Provide Personal Protection Equipment (PPEs)1 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 damaged ones. Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job Appoint an environment, health and safety manager to look after the health and safety of the workers Inform the local authorities responsible for health, religious and security before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters
	Child and pregnant labor	The Contractor shall: not hire 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 Employment of Children Act (2015)2 and Pakistani Labor Laws and policies respectively .

1 Table 4 presents general examples of occupational hazards and types of PPE available for different purposes.

2 The ECA 2015 defines a child as a person who has not completed his/her 14th year of age. The ECA states that no child shall be employed or permitted to work in any of the occupations set forth in the ECA (such as transport sector, railways, construction, and ports) or in any workshop wherein any of the processes defined in the Act is carried out

Activity/ Impact Source	Impacts	Mitigation Measures/ Management Guidelines
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	Provide health care facilities and first aid facilities are readily available. Appropriately equipped first-aid stations should be easily accessible throughout the place of work Document and report occupational accidents, diseases, and incidents. Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. Provide awareness to the construction drivers to strictly follow the driving rules Provide adequate lighting in the construction area and along the roads
Water and sanitation facilities at the construction sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	The contractor shall provide separate portable toilets and hand washing facilities at the construction sites, if about 25 people are working the whole day for a month. Location of portable facilities should be at least six m away from storm drain system and surface waters. These portable toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common septic tank for further treatment. Contractor should provide bottled drinking water facilities to the construction workers at all the construction sites.
Other issues	Potential risks on health and hygiene of construction workers and general public	The Contractor shall follow the following management measures to reduce health risks to the construction workers and nearby community: Drainage Management Air Quality Management Noise and Vibration Management Road Transport and Road Traffic Management
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	The Contractor shall: Train all construction workers in basic sanitation and health care issues (e.g., how to avoid COVID-193, malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. Train all construction workers in general health and safety matters, and on the specific hazards of their work Training should consist of basic hazard awareness, site specific

3 .SOPs issued by the GoPunjab during COVID-19 Pandemic will be implemented

Activity/ Impact Source	Impacts	Mitigation Measures/ Management Guidelines
		hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. Commence the COVID-19, malaria, HIV/AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to condoms in the area as well as to voluntary counseling and testing. Implement COVID-19, malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on ongoing and regular basis. This should be complemented by easy access to condoms at the workplace as well as to voluntary counseling and testing.

Table 4: Summary of Recommended Personal Protective Equipment According to Hazard[4]

Objective	Workplace Hazards	Suggested PPE
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation.	Safety Glasses with side-shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and overhead power cords.	Plastic Helmets with top and side impact protection.
Hearing protection	Noise, ultra-sound.	Hearing protectors (ear plugs or ear muffs).
Foot protection	Falling or rolling objects, pointed objects. Corrosive or hot liquids.	Safety shoes and boots for protection against moving & falling objects, liquids and chemicals.
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures.	Gloves made of rubber or synthetic materials (Neoprene), leather, steel, insulating materials, etc.
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors.	Facemasks with appropriate filters for dust removal and air purification (chemicals, mists, vapors and gases). Single or multi-gas personal monitors, if available.
	Oxygen deficiency	Portable or supplied air (fixed lines). On-site rescue equipment.
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration.	Insulating clothing, body suits, aprons etc. of appropriate materials.

4 Source: IFC Environmental, Health, and Safety (EHS) Guidelines

ANNEXURE - 15: TORS FOR ENVIRONMENT AND HSE SPECIALISTS

A qualified Environment Specialist, HSE Specialist, and environmental inspectors will be hired by the contractor to implement ESIA during the construction activities. The contractor will be responsible for implementing the impact mitigation measures of the ESIA during the construction phase of the project. The key responsibilities with qualifications for safeguard staff of contract are given as under;

Environment Specialist (ES)

The main responsibilities of the C-ES include, but are not necessarily limited to the following;

- Responsible for all Environment Safeguard related matters at the site.
- Screen all construction activities for construction environment impacts and implement its mitigations.
- Prepare the Site-Specific Environmental Management Plan (SSEMP) and ensure its effective implementation.
- Ensure that all facilities (establishment of camp, asphalt and batching plants, borrow areas) will be selected in light of the EMP requirements.
- Maintain close liaison with Environment Specialist – Supervisory Consultant with respect to the implementation of ESMMP requirements and compliance to Punjab Environmental Protection Agency (PEPA) Environmental Approval;
- Monitor all the construction work and ensure that work has been undertaken in accordance with the ESMMP.
- Carry out site visits of construction camp, construction site(s), quarries, and borrow pits to review environmental status and rectify the non-compliances.
- Ensure that all waste generated from the construction site, camps, asphalt plants, etc. has been properly disposed of.
- Prepare the corrective action plan for the major non-compliances
- Supervise the environmental monitoring is being carried out as pre-defined frequencies mentioned in EMP.
- Implementation of the mitigation measures at the construction site;
- Responsible for the compliance of EMP recommendations and will also be responsible for effective liaison with local people
- Provision of proper Personal Protective Equipment (PPEs) to the workers and train them for their proper use;

Qualification Requirement

- Post Graduate degree in environmental engineering, environmental management, environmental sciences, Civil Engineering, or relevant areas
- 05 years of professional experience in implementing environment safeguard preferably on donor-funded projects or large-scale development projects
- Excellent written and spoken communication skills in English;

HSE Specialist

The main responsibilities of the HSE specialist include, but are not necessarily limited to the following-:

- Responsible for all HSE related matters at the site.
- Prepare the Health, Safety and Environment (HSE) Management Plan; Emergency Preparedness and Response Plan; Restoration and Rehabilitation Plan; Waste Management Plan; Disaster Management Plan; Drinking Water Supply and Sanitation Plan, Traffic Management Plan, Dust Control / Water Sprinkling Plan etc.
- Responsible for the Implementation of the HSE Plan, waste management plan, emergency response plan, disaster management plan etc.
- Screen all construction activities for construction HSE impacts and implement its mitigations
- Responsible for performing regular risk assessments during the construction activities and enforcing preventive measures.
- Perform the accident investigation, data analysis, and recurrence prevention programs and procedures
- Responsible for appropriateness of all safety equipment used at the site
- Perform periodic HSE-related and risk assessments at site and implement its mitigations.
- Impart training programs and workshops for the contractor's staff;
- Strong coordination with the Supervision Consultant.

Qualification Requirement

- Post Graduate degree in Health and Safety, Environmental Science / Management, Environmental Engineering, Civil Engineering, or other relevant discipline.
- 05 years of professional experience in managing health & safety on major roads & infrastructure projects.

- Must have NEBOSH International General Certificate in Occupational Health & Safety and certification in ISO 45001:2018 Occupational health and safety management systems.

ANNEXURE - 16: WASTE MANAGEMENT PLAN

As the project will generate significant volume of wastes of various types, the contractor will therefore implement its Waste Management Plan.

The following objectives form the basis for the waste management plan of the Campsite:

- Progressive reduction of wastes with the target to minimize overall emissions / discharges, which have adverse impact on the environment,
- Establishment, Implementation and maintenance of waste segregation aimed at enhancing recycling,
- Ensure effective waste handling and disposal processes.

Type of Waste

The major categories of wastes envisaged from the sub-project are outlined as follows:

- Solid wastes: These include felled vegetation, woods from crates, metals, papers and other scraps which are due to be removed during site clean-up, domestic waste (waste generated from camp kitchens, packing materials, boxes and plastics).
- Liquid wastes: These include non-hazardous operational waste generated from work construction sites e.g., sanitary water etc.
- Gaseous wastes: These include combustion products from construction engines, natural gas leaks etc.

Waste Minimization / Reduction

Waste minimization implies reduction to the greatest extent possible of the volume or toxicity of waste materials. The four principles of waste minimization (reduce, reuse, recycle and recover) shall be adopted as applicable.

Waste Segregation

Waste segregation and characterization shall be carried out on wastes that are similar and shall be combined to simplify storage, treatment, recycling and effective implementation of appropriate waste disposal methods. Wastes shall be segregated at source into clearly designated bins at strategic locations. Particular attention shall be given to the work area where a variety of wastes shall be generated.

Waste Disposal

All debris, spoilt materials, and other wastes shall be cleared regularly from the site and disposed at approved dump sites operated by designated waste disposal authorities. Instructions on material safety handling sheet shall be strictly adhered to and shall form the basis for the disposal of wastes related

to such products. Wastes in transits shall be accompanied and tracked by waste disposal notes. The note shall contain such information as date of dispatch, description of wastes, waste quantity, container type, designated disposal site and method, consignee name, means of transport and confirmation of actual disposal time and date. Special attention will be accorded to wastes removed from the sites and also drums of waste oil that might contain dangerous substances; these are to be transported to a site designated by MC for safe storage and subsequent testing prior to disposal.

Waste management audit of facilities shall be carried out in consultation with the key stakeholders, and findings shall be properly documented and followed up. Accommodation, catering services areas and work site shall maintain acceptable standard of hygiene and good house-keeping.

Contractor should be committed to effectively manage all their activities, including:

- Approved storage and use of raw materials and substances.
- Waste Management Plan - Waste minimization (promoting reduce, reuse, recycling, recovery including energy recovery and safe disposal).
- Monitoring and review of environmental performance.

Waste Management

The construction waste from the project site consists of asphalt waste, batteries, containers / drums, excavated natural material, oil filters, motor oil, scrap material and concrete waste. The waste from labour camp consists of the municipal waste of both solid and liquid effluent.

The liquid waste from campsite will be disposed of by using the septic tank.

Each type of solid waste has been managed separately and is discussed in the following table:**Error! Reference source not found.**

Sr. No	Type of Waste	Mode of Disposal / Use
1.	Asphalt Waste	Reuse in applications such as base, and sub-base and some will be blended for use in new asphalt
2.	Batteries	Sell to the scrap metal recyclers
3.	Empty containers / drums	Sell to the scrap metal recyclers
4.	Excavated natural material	Reuse offsites
5.	Oil filters	Sell to recyclers
6.	Motor Oil	Sell to oil recycler for reprocessing and recovery
7.	Scrap material	Sell to the scrap metal recyclers

Sr. No	Type of Waste	Mode of Disposal / Use
8.	Concreate Waste	Reuse in pavement base and sub-base
9.	Municipal Solid Waste	Dispose in landfill site