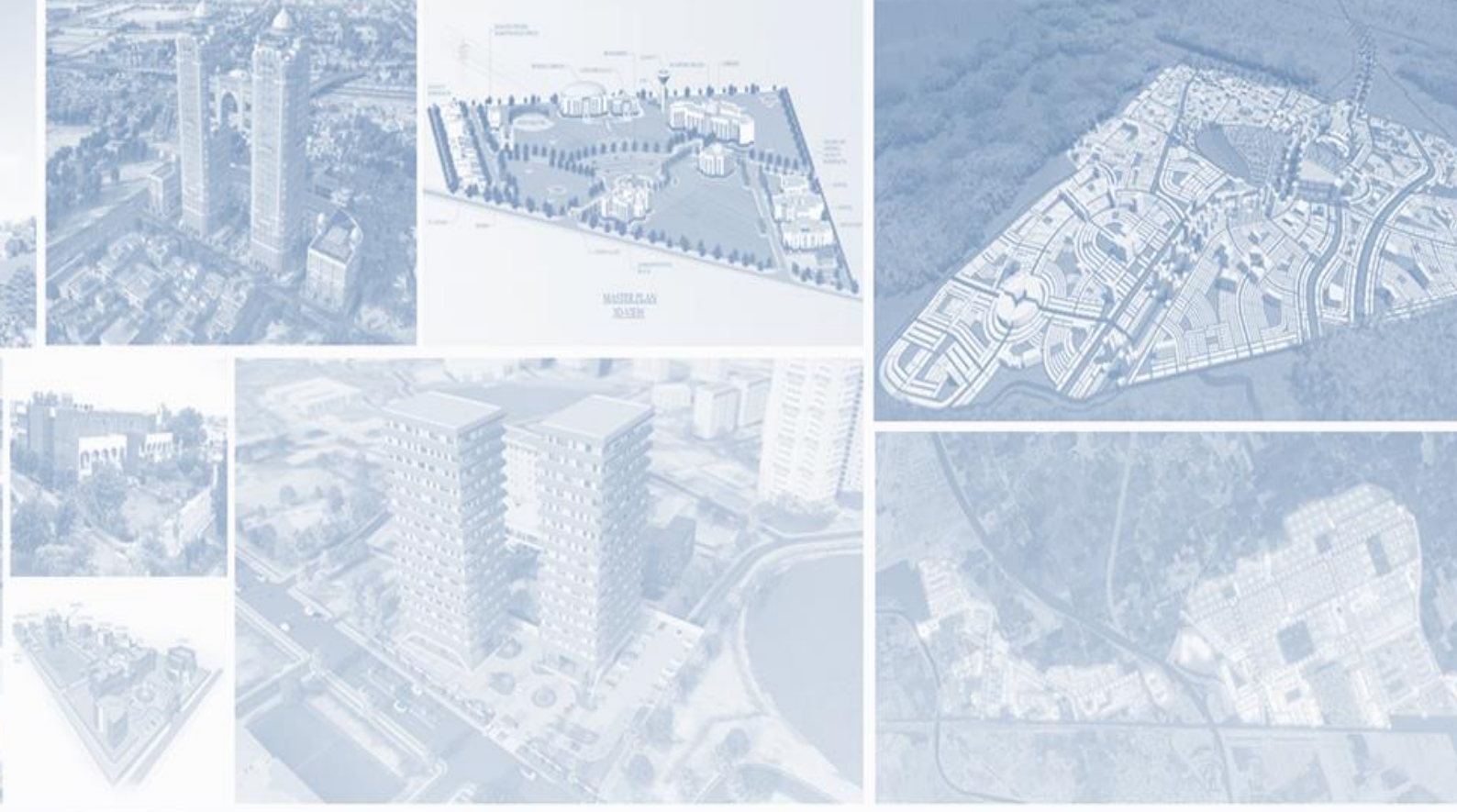

Punjab Industrial Estates
Development and Management Company (PIEDMC)

"Quaid-E-Azam Business Park (QABP), Sheikhupura
Combined Effluent Treatment Plant (CETP)"

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

December-2023

ART Çevre Teknolojileri

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ACS REGISTRARS Quality Assurance ISO 9001

Quality Control Sheet

Quality Control Sheet				
DOCUMENT	**Environmental Impact Assessment (EIA)**			
PROJECT	**"Quaid-E-Azam Business Park (QABP), Sheikhupura Combined Effluent Treatment Plant (CETP)"**			
CODE	**9200165**			
REVISION NO.	**Rv.001** ☑	Rv.002	Rv.003	Rv.004
AUTHOR	AR			
	25/10/2023			
VERIFIED	NA			
	25/10/2023			
TO [*Client*]	**Punjab Industrial Estates Development and Management Company (PIEDMC)**			
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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

ES-1. Title and Location of Project

Quaid-e-Azam Business Park (QABP) intents to the installation of Combined Effluent Treamtmnet Plant (CETP), geographically located at 31° 44' 04'' N and 74° 05' 04'' E accessible through 6 km North-East of Sheikhupura City and is adjacent to the Lahore-Islamabad Motorway (M2), at a distance of about 3.5 km from Sheikhupura Interchange.

Presently, different infrastructure facilities including roads, water supply works and sewerage and drainage works are being constructed at QABP. Industrial plots, with more than half of the total industrial plot area, have already been allotted to the applicant industries. PIEDMC has decided to undertake, parallel to the other infrastructure facilities, the construction of a Combined Effluent Treatment Plant (CETP), for the Estate, at an already allocated site, located along the western boundary of the Estate.

ES-2. Name of proponent

Mr. Ali Muazzam Syed the proponent of project intends to get Environmental approval for the establishment of said unit by submitting the Environmental Impact Assessment Report for the compliance of section 12, PEPA, 1997 (Amended 2012).

Table 0-1, Details of Project Proponent

Name	Ali Muazzam Syed
CNIC	35202-8279686-3

ES-3. Name of organization preparing report

ASIAN Consulting Engineers Private Limited (ACEs) is providing their services to conduct environmental assessment for the project. ACEs is a leading consulting company executing complex planning, architectural and engineering projects that require overall design and construction management services. ACEs is an independent consulting company working in the field of environment. Asian provides consulting services and sustainable solutions for infrastructure projects, industrial projects and social development projects.

The team of experts are given as under-:

Sr. No.	Team Member	Position Held	Qualifications
1	Aleem Butt	Chief Environmentalist Team Leader- EIA	M.Phil. Environmental Sciences, Government College University (GCU), Lahore M.Sc. Environmental Sciences, Punjab University (PU), Lahore NEBOSH, Lead Auditor

Sr. No.	Team Member	Position Held	Qualifications
2	Noman Ashraf	Environmental Specialist	M.Phil. Environmental Sciences, Government College University (GCU), Lahore PGD, Environmental Law University of the Punjab, Lahore
3	Ayesha Rasheed	Environmentalist	M.Phil Environmental Sciences, Government College University (GCU), Lahore
4	Asma Butt	Sociologist	M.Sc. Sociology, University of the Punjab, Lahore

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

ES-4. Project Description

The proposed project is the installation of Combined Effluent Treatment Plant (CETP), with an area of about 6.7 hectares (20 acres) which is located in the western end of the Estate, on a road (25 meter wide). CETP Site is almost flat, with its natural surface levels (NSL), varying from about 207.500 to 208.000 meters. The location map and layout plan of CETP site are shown in Chapter-01 (Introduction) of this report.

Untreated wastewater, into the CETP, shall be carried through two partially-combined (with provision for stormwater allowance) gravity sewers. Raw wastewater pumping station, at the CETP, has already been designed and is presently under construction.

An existing surface water drain, called Sheikhupura Drain, which ultimately discharges to the Qadirabad-Balloki Link Canal, passes by the western boundary of the proposed CETP Site. This section of the Drain is concrete-lined. The treated effluents from the CETP shall be discharged to this Drain. Qadirabad-Balloki Link Canal ultimately drains to River Ravi, upstream of the Balloki Bar.

A detailed design of the plant is given in Chapter-04 of this report.

ES-5. Major Impacts and Their Mitigation

The EIA process has identified the major impacts and recommended mitigation measures during design, construction and operation phase as shown below in mitigation matrix:

Table 0-2, Mitigation Matrix

Sr. No.	Affected areas	Possible Mitigation Measures
Construction phase		
1.	Soil contamination and erosion	• The project should be scheduled to avoid or minimize work during heavy rainfall periods (i.e., during the dry season) or windy days to the extent practical. • After construction activities, the site which is cleared temporarily should be re-vegetating promptly. • Off-site sediment transport should be reduced or prevented by the use of settlement ponds, silt fences, water treatment, as well as modifying or suspending activities during extreme rainfall and high winds to the extent practical. • The environmental impact of soil erosion can best be mitigated by removing vegetative cover only from the specific site on which construction is to take place and by disturbing the vegetation in adjacent areas as little as possible.
2.	Construction Waste	• EMP should be implemented to control the impacts of waste generation. • The construction waste which will be sent for recycling like damage pipes left over steel, wooden and plastic pieces. • The construction material will be kept in a cover place, especially during the precipitationseason. • Various waste containers for different types of waste will be deployed onsite. The waste bins will be properly marked for each type of waste produced during the constructional activities. • The project area will contain the sewage and litter facility to overcome the problem of unchecked dumping of waste.
3.	Ambient Air Quality	• For control of air pollution during construction work, following measures are recommended: • Minimizing dust from open area sources 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. • PPEs, such as dusk masks, should be used where dust levels are excessive. • Avoiding open burning of solid. • Sprinkling of water and fine spray from nozzles to

Sr. No.	Affected areas	Possible Mitigation Measures
		suppress the dust. • On-Road- Inspection should be done for black smoke generating machinery. • Use of cleaner fuel should be done. • Vehicles having pollution under control certificate may be allowed to supply the construction material to the project site. • Use of covering sheets should be done for trucks to prevent from dust dispersion caused through the trucks.
4.	Wastewater Generation	• Careful management of construction work is necessary to ensure water is not wasted. • Where possible, the construction wastewater should be reused after initial treatment (if required such as sedimentation). • Washing of vehicles and construction machinery should be avoided if possible or be done in a designated area. • Wastewater generation will be minimized by controlling the pollutant at the source. • Regular monitoring of the wastewater generation will be taken into consideration. • Adequate Potable or permanent sanitation facilities serving all workers should be provided at all construction sites.
5.	Noise & Vibration	• The activities associated with greatest potential to generate noise should be planned during the day period that will result in least disturbance to the nearby residents. • Noise control devices should be used such as temporary noise barriers and deflectors for impact activities.
6.	Occupational Health and Safety Issues of construction work	• Workers should be trained with lifting and materials handling techniques before the construction of the project, including the placement of weight limits above which mechanical assists or two person lifts are necessary. • Work site layout should be planned to minimize the need for manual transfer of heavy loads. • Tools should be selected and work stations would be designed to reduce force requirements and holding times, which promote improved postures, including, where applicable, user adjustable work stations • Administrative controls, such as job rotations and rest or stretch breaks should be implemented into the work processes.

Sr. No.	Affected areas	Possible Mitigation Measures
7.	Impact on Flora	• The designated green area will be vegetated and native vegetation present on-site will be preserved • Biodiversity at the site will be maintained by transplanting or culturing endangered or threatened plants such as Sheesham which is under-attack in Asia will be planted at site.
Operational phase		
8.	Solid Waste (Sludge Production)	• Reducing the volume of sludge through sludge thickener and sludge dewatering systemswhich will be designed for sludge treatment system. • Storing the dried sludge cake in a separate designated place onsite for end disposal.
9.	Wastewater Generation	• Leaching of the sludge into the ground should be controlled through efficient handling. • In order to overcome the problem of groundwater contamination, sludge should be dried in a leak-proof facility. • Sludge handling should be monitored along with the effluent monitoring. • Do not store sludge for prolonged periods. • Ensure prompt sludge dewatering to avoid nuisance due to odors and flies • In case the sludge is to be kept for some period; ensure it is properly covered and confined • Adopt containment procedures to avoid spillage of sludge.
10.	Odor	• Careful selection of lining material used for interior lining of sedimentation, aeration tanks and other plant equipment and facilities. • Regular inspection of tanks and basins for structure breakage • The system for the treatment of the wastewater and effluent production should ensure minimization of leakages of wastewater to groundwater (connections between pipes and tanks should be water-tight) • Refueling of vehicles and equipment on the site shall be strictly controlled • Washing of vehicles and equipment on the site shall be restricted.
13.	Chemical Hazard	• Proper signage including Material Safety Data Sheet (MSDS) should be displayed at the storage area to communicate the hazard. • PPE should be made mandatory for personnel dealing with these chemicals. • Adequate First Aid should be available onsite to

Sr. No.	Affected areas	Possible Mitigation Measures
		immediate remedy the affected person. • Trainings should be imparted to the staff on safe use and handling of these chemicals.
14.	Impact on Flora & Fauna	• Tree planting will enhance biodiversity at the site. • Trees will attract many bird species and other animal species. • The designated green area will be vegetated and native vegetation present on-site will be preserved.
15.	Socio-economic Impacts	• Good relations with the local communities will be promoted by encouraging Contractor to provide opportunities for skilled and un-skilled employment to the locals as well as on-job training • In the case of not hiring the locals, Contractor will restrict his permanent staff to mix with the locals to avoid any social problems • The contractor will keep the copy of National Identity Card (CNIC) of his employees and will warn the workers not to involve in any anti-social activities otherwise they may face dire consequences • At the time of hiring the Contractor has to ensure that the workers should be of good repute • First aid kits having all the necessary first aid stuff will be available at the site • Routine medical check-ups of all the field staff including unskilled labor needs to be conducted by qualified physician and surgeon • Training of workers should be carried out for operating various constructional machinery, safety procedures should be adopted, environmental awareness should be carried out, equip all workers with safety boots, helmets, gloves, protective masks and monitoring of their proper and sustained usage will be carried out. In case of accidents, contractor will provide free medical treatment to the community • The Contractor will be responsible for the sensitivity towards the local customs and traditions

ES-6. Proposed Monitoring

The proposed environmental monitoring plan is given below:

Monitoring Areas	Location of monitoring	Parameters and Techniques to monitor	Monitoring Frequency
During Construction			
Noise	Generators	• Noise levels in dB(A) Vibration meter (mils/sec)	Quarterly
Air Emissions	Exhausts of generators and vehicles	• Composition of exhaust flue gases • CO, NOx, SOx, Particulate matter (mg/Nm^3) • Noise, smoke and CO for vehicles	Quarterly
Wastewaterdisposal	Discharge pump	• As per PEQS effluent standards	Quarterly
Ambient Air quality	CETP premises	• Parameters as per PEQS	Quarterly
Occupation Hazard	CETP premises	• Working practicesUse of PPE • Safety of work place • Identification of hazard and hazard control measures	Daily during operations
During Operation			
Noise	Standby Generators (when operational)	• Noise levels in dB(A) Vibration meter (mils/sec)	Quarterly
Ambient Air quality	CETP premises	• All parameters as per PEQS	Quarterly
Treated effluent	Final outfall of plant	• All 32 parameters as per PEQS	Monthly
Untreated influent	Inlet of CETP	• All 32 parameters as per PEQS	As required
Occupation Hazard	CETP premises	• Working practicesUse of PPE Safety	Periodically during

Monitoring Areas	Location of monitoring	Parameters and Techniques to monitor	Monitoring Frequency
		of work place • Identification of hazard and hazard control measures	operations
Sludge storage and disposal	CETP premises	• Visual inspection, maintenance of disposal records	Periodically during operations

CHAPTER – 1: INTRODUCTION

SECTION - 1: INTRODUCTION

Municipal and industrial wastewater is produced in large quantities worldwide in both industrial countries such as the United States (79.6 km^3) and less developed countries such as Egypt (8.5 km^3) making wastewater treatment an important global issue[1]. Wastewater treatment is an economical issue as well, as wastewater treatment can often be a significant portion of an industries or municipality's budget. Therefore, there is a need to develop low cost-effective wastewater treatment alternatives.

Industries are a huge source of water pollution; it produces pollutants that are extremely harmful to people and the environment. Approximately 90% of sewage in developing countries is discharged untreated directly into water bodies. Every day 02 million tons of sewage and other effluents drain out[2]. Industry discharges an estimated 300-400 megatons of waste into water bodies every year.

Keeping in view of water quality deterioration, various water treatment methods/facilities have been introduced, both on industrial as well as domestic level.

The current project is the installation of a combined effluent treatment plant (CETP), owned by Quaid-e-Azam Business Park (QABP). The CETP collects sewage from surrounding localities and treat it with industrial wastewaters.

Quaid-e-Azam Business Park (QABP) is a project of the Punjab Industrial Estates Development and Management Company (PIEDMC). Presently, different infrastructure facilities including roads, water supply works and sewerage and drainage works are being constructed at QABP. Industrial plots, with more than half of the total industrial plot area, have already been allotted to the applicant industries. PIEDMC has decided to undertake, parallel to the other infrastructure facilities, the construction of a Combined Effluent Treatment Plant (CETP), for the Estate, at an already allocated site, located along the western boundary of the Estate. PIEDMC has engaged Asian Consulting Engineers (ACEs) Pvt. Ltd. for preparation of Environmental Impact Assessment (EIA) to meet the requirements of Pakistan Environmental Protection Act, 1997.

1.1 Purpose of Report

The purpose of this EIA study is to identify the possible beneficial and adverse environmental impacts of the project comprises of installation of CETP at an already allocated site QABP to treat effluents being discharged by industrial units. The report also proposes the applicable mitigation measures to be implemented during the installation and operation of the plant in order to minimize the negative impacts and preparation of Environmental

1 Sato, T., Qadir, M., Yamamoto, S., Endo, T., & Zahoor, A. 2013. Global, regional, and country level need for data on wastewater generation, treatment, and use. Ag. Water Manag. 130, 1-13.
2 Loehman, E., Orlando, J., Tschirhart, J., & Whinston, A. 1979. Cost allocation for a regional wastewater treatment system. Water Resour. Res. 15(2), 193-202.

Management Plan (EMP).

This EIA report has been prepared keeping in view the following regulations and guidelines:

a) Punjab Environmental Protection Act, 1997 (Amended 2012)

b) Punjab Environmental Protection Agency Regulations, 2022 for review of IEE and EIA.

c) Pakistan Environmental Impact Assessment procedures, 2000.

d) Punjab Environmental Quality Standards, PEQS

1.2 Identification of Project and Poponent

Details of Proponent	
Name of proponent	Ali Muazzam Syed
CNIC of Proponent	35202-8279686-3
Project Details	
Name of project	Construction of Combined Effluent Treatment Plant (CETP) for Quaid-E-Azam Business Park (QABP), Sheikhupura.
Location/ Address of the site	About 6 km North-East of Sheikhupura City and is adjacent to the Lahore-Islamabad Motorway (M2), at a distance of about 3.5 km from Sheikhupura Interchange.
Nature/ Feature of the project	THE current project is the installation of CETP. Features of the project are given below: • Wastewater Screening and Pumping Station • Flow Distribution Chamber (FDC) • Primary Settling Tanks (PST) • Aeration Tanks (AT) • Air Blowers Rooms (ABR) • Secondary Settling Tanks (SST) • Primary Sludge Pumping Rooms (PSPR) • Secondary Sludge Pumping Rooms (SSPR) • Sludge Thickeners (ST) • Sludge Dewatering Stations (SDS)
Estimated cost of project	2190.46 million PKR.
Plot area of the project	A total of 40 cusec of plant capacity, on approximately 6.7 hectares (20 acres) of land.
Project start	1 month after getting NOC from Environmental Protection Department
Project completion duration	1 year

1.3 Details of Consultant

ASIAN Consulting Engineers Private Limited (AsCE) is providing their services to conduct environmental assessment for the project. AsCE is a leading consulting company executing complex planning, architectural and engineering projects that require overall design and construction management services. AsCE is an independent consulting company working in the field of environment. Asian provides consulting services and sustainable solutions for infrastructure projects, industrial projects and social development projects.

The team of experts are given as under-:

Sr. No.	Team Member	Position Held	Qualifications
1	Aleem Butt	Chief Environmentalist Team Leader- EIA	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	Ayesha Rasheed	Environmentalist	M.Phil Environmental Sciences, Government College University (GCU), Lahore
4	Asma Butt	Sociologist	M.Sc. Sociology, University of the Punjab, Lahore

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.

1.4 Nature, Size and Location of Project

Nature: Non-linear project

Size: A total of 40 cusec of plant capacity, on approximately 6.7 hectares (20 acres) of land.

Location: About 6 km North-East of Sheikhupura City and is adjacent to the Lahore-Islamabad Motorway (M2), at a distance of about 3.5 km from Sheikhupura Interchange.

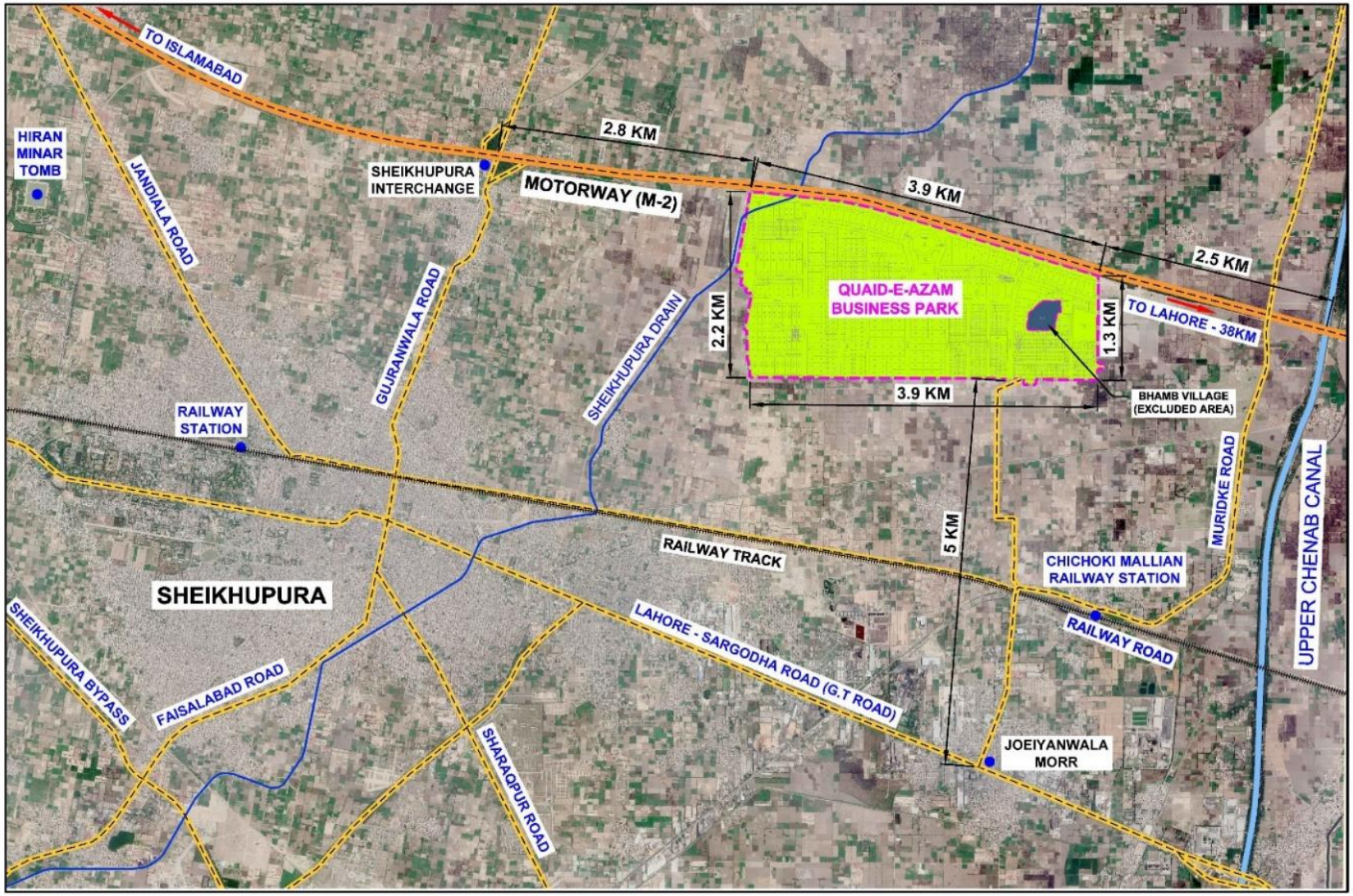


Figure 1-1, Location Map of Project Site

SECTION - 2: SCREENING AND SCOPING

2.1 Screening

The Proposed Project is located in Punjab Province, therefore, the Punjab Environmental Protection Act, 1997 (Amended 2012 & 2017) is the core environmental law for the proposed Project. Under Section 12 (1) of Punjab Environmental Protection Act (PEPA), EIA is mandatory for the subject project, which states that:

"No proponent of a project of public and private sector shall commence construction or operation unless he has filed an Initial Environmental Examination / Environmental Impact Assessment with the Punjab Environmental Protection Agency, as the case may be, or, where the project is likely to cause adverse environmental effects; and has obtained approval from the Provincial Agency in respect thereof".

According to the Pakistan Environmental Protection Agency (Review of EIA and EIA) Regulations 2022, the proposed project falls under Category 'F' of "***Water supply and Treatment***" of the Schedule-II. This category requires an EIA study to be conducted for construction of treatment plants related projects to initiate the process of environmental approval.

2.2 Scooping

Table 2-1, Spatial and Temporal Boundaries of Environmental Assessment

Spatial Boundaries	Temporal Boundaries
REGIONAL: Impact could extend to the region surrounding the proposed project on with certain conditions.	**YEAR ROUND:** Non-Significant throughout the year
LOCAL: Impact limited to the boundaries of industries. No impact will be on local people.	**SEASONAL:** No Significant impact will be occurred on a seasonal basis.

2.3 Important Issues and Concerns Raised During Consultation

The issues and concerns raised during installation and operational phases could be both; positive and negative based on the nature and location of the project. The EIA process requires all possible environmental and socio-economical aspects which provides the basis of categorization and evaluation of impacts and their likelihood to occur due to project activities.

A preliminary survey of the project was organized by the consultant including primary and secondary stakeholders and public. The purpose of the consultation was to inform the targeted audience regarding;

- To inform about the project
- To gather feedback

- To identify relevant protentional impacts and corresponding mitigation measures
- To identify sensitive receptors of the area

As the project is non-linear and already exists on an industrial area, no major issues and concerns raised during consultation.

2.4 Significant Impacts and Factors to be Determined

No significant impacts on local as well as regional boundaries. But while certain conditions, the impacts could be significant if treatment plant is non-operational/is not fulfilling the criteria of desired parameters.

There is a need to set initial baseline condition of the following environmental parameters.

- Ambient air quality
- Ambient Noise level Measurement
- Surface water testing
- Ground water testing
- Ecological survey

Also, the implementation of the proposed EMP is recommended.

CHAPTER – 3: ANALYSIS OF PROJECT ALTERNATIVE

SECTION - 3: ANALYSIS OF PROJECT ALTERNATIVES

3.1 General

The EIA guidelines define alternatives as: "different means of meeting the general purpose and requirements of the activity, which may include alternatives to the: Site (location of property), Type of Activity to be undertaken; Design or Layout; Technology to be used".

It is a specific requirement of EIA process that includes the identification and consideration of feasible alternatives in the early stage or during scoping stage of environmental assessment. The value of this requirement is that alternatives are a form of mitigation, in that certain options may avoid or reduce the nature, extent or duration of one or more impacts, on one or more aspects of the receiving environment. The following section presents an outline of the alternatives which were considered for the project.

3.2 Site Alternatives

A suitable site was selected for the installation of CETP based on following evaluating factors such as;

- land availability
- environmental impact
- accessibility
- Proximity to the wastewater collection system

The site is large enough to accommodate the necessary treatment units and potential future expansion.

3.3 Design/Technology Alternative

The qualitative comparison of the alternate biological treatment processes, with respect to certain key parameters is given below:

Table 3-1, A Qualitative Comparison of Alternate Biological Treatment Processes

Parameter	Activated Sludge	Trickling Filters	Aerated Lagoons	Oxidation Ponds
Plant Area Requirement	Minimum: of the Same Order		High	Very High
Operation and Maintenance Cost	High	Moderate	Very High	Minimum
Process Energy Requirement	High	Moderate	Very High	Nil
Operational Supervision & Control	High	High	Moderate	Minimum
Construction Cost	High: of the Same Order		Very High	Moderate
Capital Cost	High: of the Same Order		Very High	High [1]
Process Mechanical Equipment	Yes	Yes	Yes	No
Quantities of Sludge Produced	High	High	High	Minimum
Daily Waste Sludge Disposal	Yes	Yes	Yes	No
[1] Largely depends upon the cost of land				

The above discussion reflects that activated sludge process is, both technically and economically, the most suitable aerobic treatment process for the CETP and the same has been adopted for the Project.

3.4 Environmental Alternative

3.4.1 Water Alternative

Due to the absence of nearby surface water, groundwater is the primary alternative for both domestic and construction needs in the Project Area. To facilitate this, a turbine will be set up at the labor camp. Additionally, water supply from WASA serves as an additional option. It has been determined that during the project's construction phase, groundwater is the most suitable choice; however, if there are any fluctuations in tube well water supply, arrangements will be made to supplement it with tankers from WASA.

3.4.2 Electricity Alternatives

Two potential sources are evaluated for the electricity source in the Project Area: utilizing the existing power supply from LESCO, or connecting solar energy. Using solar panels as an alternative energy source appeared appropriate due to the sun's abundance (renewable energy resource). For emergency purposes, generators will be installed.

3.5 Economic Alternative

The installation of a combined effluent treatment plant has seen significant advancements in order to facilitate the treatment of effluents from various industries at a centralized facility. This innovative approach enables larger-scale operations and cost-effectiveness when it comes to effectively treating these diverse effluents.

CHAPTER – 4: PROJECT DESCRIPTION

SECTION - 4: PROJECT DESCRIPTION

This chapter provides an overview of project including its silent features, location, components and various phases.

4.1 Objective of Project

The advantages of CETP includes;

- Saving in Capital and Operating cost of treatment plant. The CETP is always cheaper than small scattered treatment units.
- Availability of land which is difficult to be ensured by all individual units in the event they go for individual treatment plants.
- Contribution of nutrient and diluting potential, making the complex industrial waste more amenable to degradation.
- The neutralization and equalization of heterogeneous waste makes its treatment techno-economically viable.
- Professional and trained staff can be made available for operation of CETP which is not possible in case of individual plants.
- Disposal of treated wastewater & sludge becomes more organized.
- Reduced burden of various regulatory authorities in ensuring pollution control requirement.

4.2 Location, Site Layout and Road Access of Project

The QABP where CETP is going to be installed is located at about 6 km North-East of Sheikhupura City and is adjacent to the Lahore-Islamabad Motorway (M2), at a distance of about 3.5 km from Sheikhupura Interchange.

Figure 4-1 shows the Location of the project site.

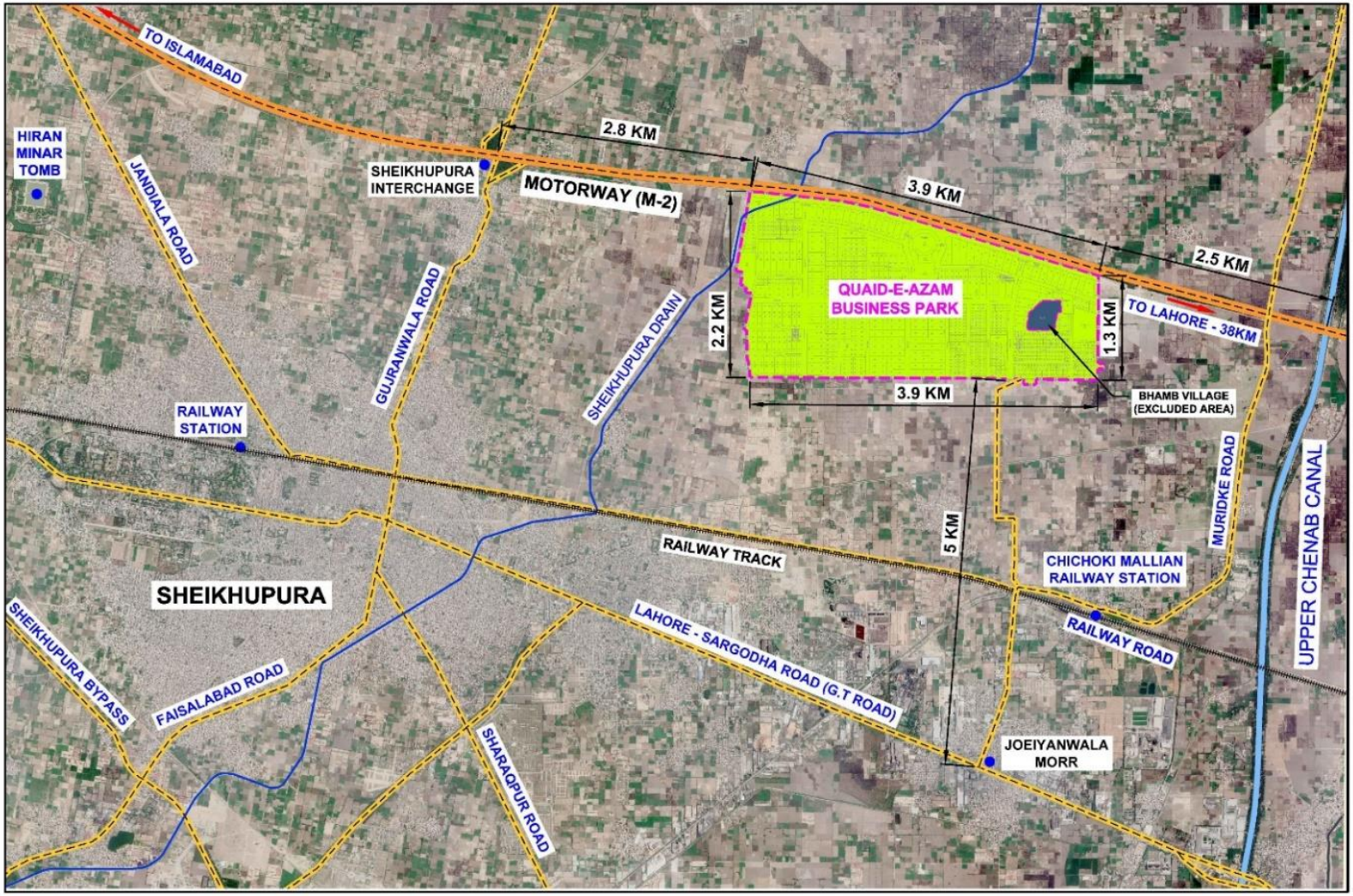


Figure 4-1, Location Map

4.3 Land Use

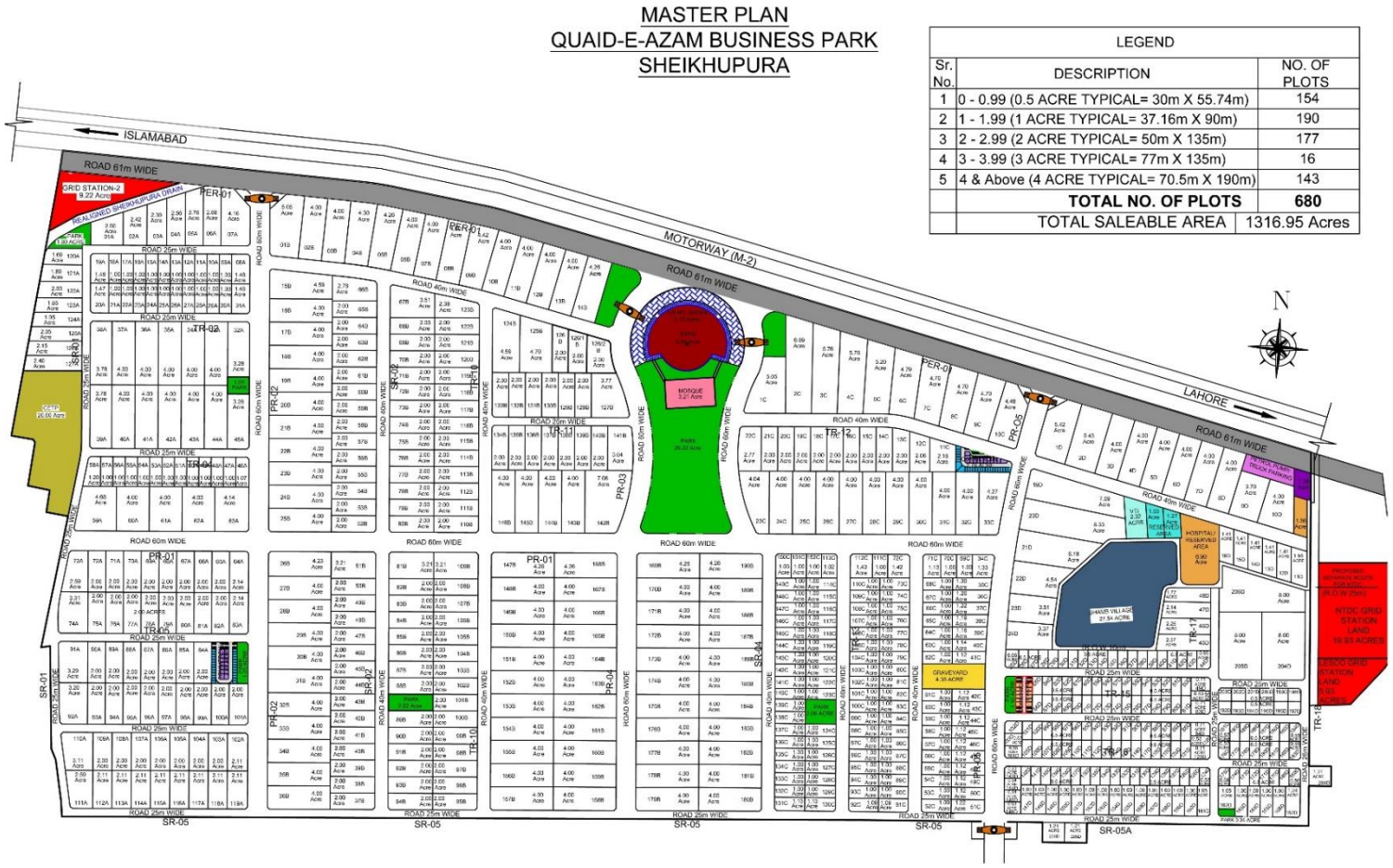
The land falls in industrial area as per TMA. The broad landuse distribution of QABP, based upon its approved masterplan is shown in table **Table** 4-1. A village, named Bamban Kalan, is also located within the QABP Site and its wastewater will also be taken into the sewerage system of QABP.

Table 4-1, QABP: Landuse Distribution by Major Landuses

Landuse Category	Area		
	(acre)	(ha)	(%)
Industrial Plots (0.5 – 4.0 acres)	1319.50	441.27	69.59
Commercial and Institutional Plots	81.52	27.26	4.30
Village Bamban Kalan	27.52	9.20	1.45
Parks and Open Area	46.82	15.66	2.47
Roads	420.64	140.67	22.19
Total	**1,896.00**	**634.06**	**100.00**

1 Acre = 36,000 SFT

The mentioned site is already a declared industrial area with designated treatment plant area of 20.00 acres. The specific nature of individual industries which have been allotted plots in QABP, and information on their production is not known. The available pertinent data, which can be used for establishing design wastewater flows and characteristics for CETP, at this stage, is the plot-area based composition of the Estate, with respect to different broad categories of industries.



LEGEND		
Sr. No.	DESCRIPTION	NO. OF PLOTS
1	0 - 0.99 (0.5 ACRE TYPICAL= 30m X 55.74m)	154
2	1 - 1.99 (1 ACRE TYPICAL= 37.16m X 90m)	190
3	2 - 2.99 (2 ACRE TYPICAL= 50m X 135m)	177
4	3 - 3.99 (3 ACRE TYPICAL= 77m X 135m)	16
5	4 & Above (4 ACRE TYPICAL= 70.5m X 190m)	143
	TOTAL NO. OF PLOTS	**680**
	TOTAL SALEABLE AREA	1316.95 Acres

Figure 4-2, QABP Layout Plan

4.4 Vegetation Features of the site

The project site is already an industrial area. The Land is free from any type of vegetation. There is no need to clear any vegetation because they are out of vicinity of the project.

4.5 Cost & Magnitude of the Project

The total capital cost of the project is estimated as 2190.46 million PKR.

4.6 Schedule of Implementation

The total project completion time is estimated as 12 months.

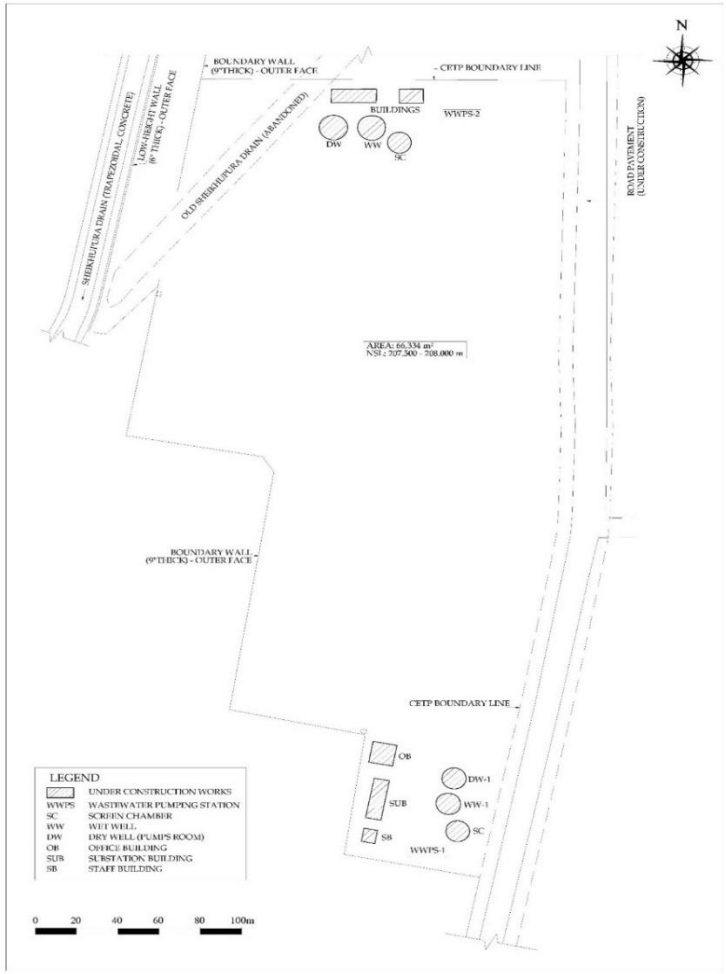
4.7 Description the of project

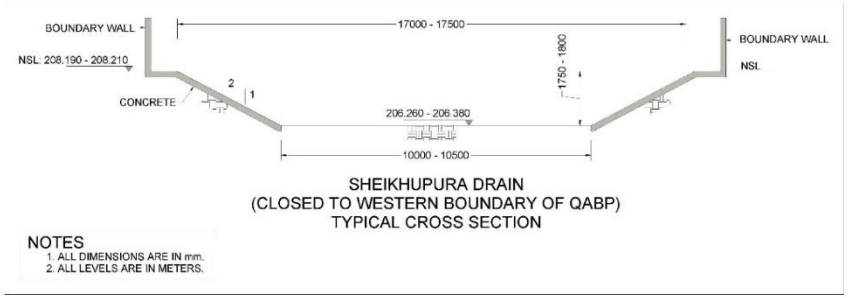
4.7.1 CETP Site

The proposed project is the installation of Combined Effluent Treatment Plant (CETP), with an area of about 6.7 hectares (20 acres) which is located in the western end of the Estate, on a road (25 meter wide). CETP Site is almost flat, with its natural surface levels (NSL), varying from about 207.500 to 208.000 meters. The location map and layout plan of CETP site are shown in Figu

Untreated wastewater, into the CETP, shall be carried through two partially-combined (with provision for stormwater allowance) gravity sewers. Raw wastewater pumping station, at the CETP, has already been designed and is presently under construction.

An existing surface water drain, called Sheikhupura Drain, which ultimately discharges to the Qadirabad-Balloki Link Canal, passes by the western boundary of the proposed CETP Site. This section of the Drain is concrete-lined. The treated effluents from the CETP shall be discharged to this Drain. Qadirabad-Balloki Link Canal ultimately drains to River Ravi, upstream of the Balloki Bar.





(Typical Cross-Sectional Review)

Figure 4-3, Layout Plan

4.8 Treatment Process scheme

4.8.1 Preliminary Design of Treatment Facilities

This section presents the preliminary design of all the key component facilities for the CETP. Preliminary Facilities Process Flow and Layout Plan for the proposed CETP is given below in **Figure** 4-4 & **Figure** 4-5.

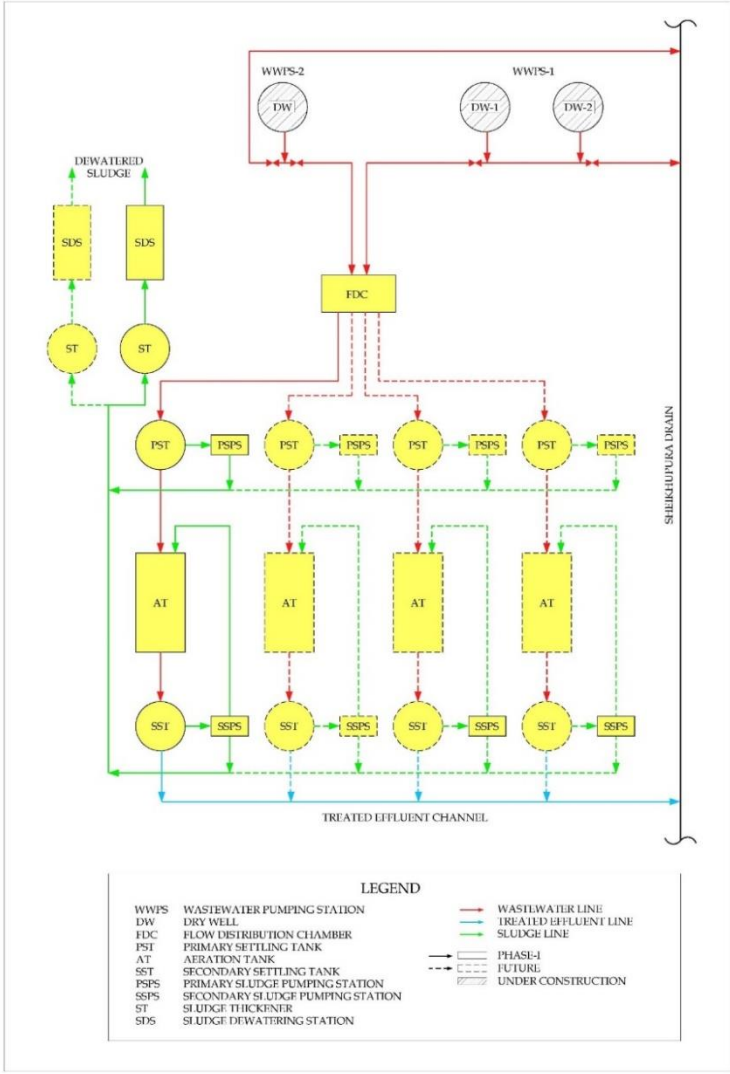


Figure 4-4, Preliminary Process Flow Diagram (PFD)

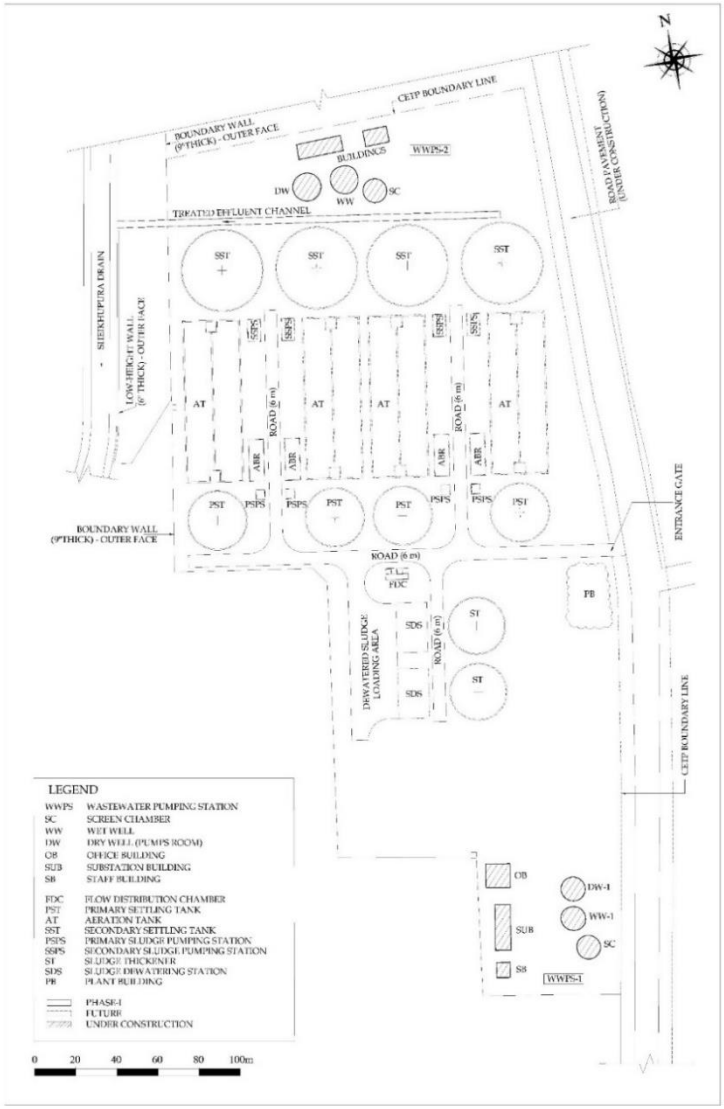


Figure 4-5, Preliminary Facilities layout Plan

4.9 General Design Basis

4.9.1 Wastewater Screening and Pumping Station

Wastewater Pumping Stations (WWPS-1 and WWPS-2) are currently under-construction.

4.9.2 Flow Distribution Chamber (FDC)

a) Ultimate provision is of 1 Flow Distribution Chamber (FDC), to be constructed in Phase-1.

b) The FDC shall receive wastewater from the Wastewater Pumping Stations (WWPS-1 and WWPS-2), through 2 separate delivery pipes and divide it into 4 equal-flow streams, each to be carried by a separate pipeline and fed under gravity to the respective Primary Settling Tanks (PST), of the 4 Core Treatment Modules (CTM), provided in parallel.

c) The division of flow shall be carried out by providing 4 separate sharp-crested, rectangular, weirs, in the structure, with their sill-levels being same.

d) The FDC shall need to be raised from the ground level, in order to afford gravity flows to the Core Treatment Modules (CTM), and gravity-discharge, of the treated effluents, from Secondary Settling Tanks (SST), to the Sheikhupura Drain.

e) Following are the key components of the Flow Distribution Chamber:

1. Wastewater Inlet Pipes (3, HDPE/CI), from Wastewater Pumping Stations (WWPS-1 and WWPS-2) to the Inflow Box of the FDC
2. Four numbers sharp-crested rectangular weirs (MS, Epoxy-Coated), installed on wall of Inflow Box, each discharging equally split wastewater streams, to 4 separate Outflow Boxes
3. Four separate Outflow Boxes (RCC)
4. Four Outlet Pipes (CI) with sluice valves (CI), each carrying wastewater from the Outflow Boxes to the respective Primary Settling Tanks (PST), of the 4 Core Treatment Modules (CTM)
5. Chamber supporting structure comprising RCC columns and footings
6. Accessways
7. Spiral Stair (MS) to the top of chamber

A) Design

Design calculations and design summary are presented in **Table** 4-2.

Table 4-2, Design Summary: Flow Distribution Chamber (FDC)

Parameter	Unit	Value
Inflow Box		
Internal Dimension across Flow Direction	(m)	10.600
Internal Dimension along Flow Direction	(m)	2.500
Rectangular Weirs		
Numbers		4
Length of Weirs	(m)	1.500
Out Flow Boxes		
Numbers		4
Internal Dimension across Flow Direction	(m)	2.500
Internal Dimension along Flow Direction	(m)	2.500
Chamber Depths		
Depth of Weir-Sill from Top of Chamber	(m)	1.000
Depth of Chamber below Weir-Sill	(m)	2.500
Total Depth of Chamber	(m)	3.500
Pressure Pipelines (CI)		
Pipelines from WW Pumping Station WWPS-1		
Numbers in Parallel (1 in Phase-1 + 1 in Future)		2
Nominal Diameter (DN)	(mm)	**700**
Pipeline from WW Pumping Station WWPS-2		
Numbers		1
Nominal Diameter (DN)	(mm)	**500**
Gravity-Flow Pipelines to Primary Settling Tanks (PST)		
Numbers		4
Nominal Diameter (DN)	(mm)	**700**

4.9.3 Primary Settling Tanks (PST)

a) Ultimate provision is 4 Primary Settling Tanks (PST), of equal sizes, each as first component of the 4 Core Treatment Modules (CTM), with 1 to be constructed in Phase-1 and others, in the future phases.

b) PSTs shall receive wastewater from the respective Out Flow Boxes of the Flow Distribution Chamber (FDC), for settling of readily-settleable suspended solids, as primary sludge.

c) The proposed PSTs shall be of RCC and circular in plan. It shall be centre-feed type, equipped with peripheral multiple-notch triangular effluent weir. Inflow pipe to PST shall discharge wastewater into inlet drum, provided for this purpose.

d) Following are the key components of the PSTs:

1. Vertical Inlet Pipe (CI), carrying wastewater from the Flow Distribution Chamber (FDC), encased within the RCC Central Column
2. Inlet Assembly (MS, Epoxy-Coated), fitted at the top of Vertical Inlet Pipe, designed to divert wastewater from Inlet Pipe, to the Inlet Drum, through four horizontal ports, placed radially at right angles, with uniform heights and radially expanding widths
3. Central Column (RCC), for housing Vertical Inlet Pipe and supporting the Sludge Scraper assembly at the center
4. Inlet Drum (MS, Epoxy-Coated), supported by the bridge structure of Sludge Scraper, for minimizing turbulence and hydraulic short-circuiting and for ensuring quiescent entry of wastewater into the settling zone of tank
5. Central Sludge Collection Pit in the bottom of the tank, all around the Central Column, with sloping sides and with base slab of the tank sloping radially towards it
6. Sludge Scraper (End-Driven Rotating Half-Bridge Type), with its center supported on Central Column and its wheels moving on the tank wall, for continuously scraping and directing sludge, settled at the tank bottoms, towards the Central Sludge Collection Pit
7. Scum Skimmer (MS, Epoxy-Coated), attached with the bridge structure of Sludge Scraper, for automatically directing the scum to the Scum Collection Box (MS, Epoxy-Coated), attached to the tank wall
8. Effluent Channel, provided circumferentially inside the side wall of tank, in order to support the wheels of the Scraper on the side wall
9. Effluent Weir (multiple V-notch type, MS, Epoxy-Coated), attached to the inner wall of Effluent Channel, to ensure uniform radial distribution of flow across the settling tank
10. Effluent Pipe (CI), from Effluent Channel of PST to Inlet Chamber of Aeration Tank (AT)
11. Sludge Pipe (CI) from the Central Sludge Collection Pit to the suction side of the Primary Sludge Pumps

e) Settled wastewater, collected in the Effluent Channels of the PSTs, shall be fed to the respective Aeration Tanks (AT), through gravity pipelines.

f) Scum, collected in the scum box, shall be discharged, through a pipe (provided with valve), to a scum trolley, provided for this purpose. Thereupon, the scum shall be carried to the dewatered sludge yard, for their ultimate disposal along-with the dried sludge.

A) Design

Design calculations and design summary are presented in **Table** 4-3.

Table 4-3, Design Summary: Primary Settling Tanks (PST)

Parameter	Unit	Range [Ref 1]	Adopted
Governing Parameters			
Overflow Rate @ Average Flow	(m/h)	1.2 – 1.65 – 2.1	1.99
Overflow Rate @ Peak Flow	(m/h)	3.3 – 4.2 – 5.0	2.90
Internal Diameter of Tank	(m)	3 – 60	**28.000**
Width of Effluent Channel	(m)		0.600
Depths			
Side Liquid Depth (No-flow Conditions)	(m)	3 – 4.3 – 4.9	4.500
Free Board @ Minimum Side Liquid Depth	(m)		0.500
Height of Side Wall	(m)		**5.000**
Bottom Slope: Circular Tanks – Approximate		1/16 – 1/12 – 1/6	**1/12**
Checking of Secondary Design Parameters			
Hydraulic Detention Time	(h)	1.5 – 2.0 – 2.5	2.00
Weir Loading @ Peak Flow	(m^2/h)	5 – 10 – 21	19.22
PST Removal Efficiencies			
Total Suspended Solids (TSS)	(%)	50 – 70	60
Biochemical Oxygen Demand (BOD)	(%)	25 – 40	20
Inlet and Outlet Pipes (CI): Nominal Diameter (DN)	(mm)		**700**
Inlet Assembly			
Inlet Port Velocity @ Peak Hour Flow	(m/s)	$\leq$ 0.75	0.48
Inlet Port Depth below HGL	(m)	0.5 – 0.7	0.550
Inlet Drum			
Ration of Drum Diameter to Tank Diameter		0.25 – 0.35	0.26
Depth			
Below WL	(m)	1 – 2.5	2.000
Below Inlet Ports	(m)	1	1.000
Sludge Pipe (CI): Nominal Diameter (DN)	(mm)		**200**
Scraper Speed	(RPM)	1/50–1/30–1/20	1/30

4.9.4 Aeration Tanks (AT)

a) Ultimate provision is 4 Aeration Tanks (AT), of equal sizes, each as a component of the 4 Core Treatment Modules (CTM), with 1 to be constructed in Phase-1 and others, in the future phases.

b) Each Aeration Tank shall receive settled wastewater from the corresponding Primary Settling Tank (PST), through a gravity pipeline.

c) As laid down in Section 4.3.4, surface/mechanical aeration system is adopted, for the aeration of wastewater in ATs.

d) The proposed geometry of Aeration Tank, in plan, is rectangular.

e) Following are the key components of the Aeration Tanks:

1. Wastewater Inlet Pipe (CI), from the respective Primary Settling Tank (PST) to the Inlet Chamber
2. Secondary Sludge Recycling Pipe (CI/HDPE) from the respective Secondary Sludge Pumping Station (SSPS) to the Inlet Chamber
3. Inlet Chamber (RCC), with sharp-crested rectangular weirs (2#)
4. Selector Tanks (SET), 2 numbers, in parallel, preceding each Compartment of the Aeration Tank
5. Aeration Tank (RCC), with 2 Compartments in parallel
6. Effluent Weir & Channel (RCC), along the outlet wall
7. Outlet Pipe (CI), from Effluent Channel to the respective Secondary Settling Tank (SST)
8. Surface/Mechanical Aerators Platforms (RCC), supported on RCC columns
9. Surface/Mechanical Aerators
10. Access Stair (RCC), Walkways (RCC) and Ladders (MS, Epoxy-Coated)

A) Design of Aeration Tank

Design calculations and design summary are presented in **Table** 4-4.

Table 4-4, Design Summary: Aeration Tanks (AT)

Parameter	Unit	Range [Ref 1]	Adopted
Influent (to AT) Wastewater Characteristics			
VSS/TSS Ratio			0.50
nbVSS/VSS Ratio		0.333	0.333
Biological Process Parameters			
Biomass Yield Coefficient	(VSS/BOD)	0.4 – 0.6 – 0.8	0.60
Biomass Decay Coefficient @ 20 ^{0}C	(1/d)	0.06 – 0.1 – 0.15	0.1
Biomass VSS/SS Ratio		0.8 – 0.85 – 0.9	0.85
Biomass Cell Debris Fraction	(VSS/VSS)	0.10 – 0.15	0.15
Principal Design Parameters			
Design WW Temperature – Minimum (Winter)	(^{0}C)		10
Solids Retention Time (SRT)			
For BOD Removal, Temperate: 10 ^{0}C	(d)	5 – 6	5
Mixed Liquor Suspended Solids (MLSS)	(mg/l)	1500 – 4000	3,500
Volume and Dimensions of Aeration Tank			
Numbers of Parallel Compartments in AT			2
Dimensions			

Parameter	Unit	Range [Ref 1]	Adopted
Depths			
Liquid Depth	(m)		5.000
Free Board @ No-flow Conditions	(m)	1 – 1.5	1.000
Length	(m)		63.000
Width – Each Compartment	(m)		16.500
Effective Volume of Tank (Provided)	(m^3)		10,395
Checking of Secondary Design Parameters			
Hydraulic Retention Time	(h)	3 – 6	9.45
Food-Microorganism (F:M) Ratio	(1/d)	0.2 – 0.6	0.39
BOD Loading	(kg/m^3-d)	0.3 – 1.6	0.91
Selector Tanks (SET)			
Principal Design Parameters: Contact Time	(h)	0.5 – 1.0	0.50
Effective Volume	(m^3)		993
Pressure Pipelines (CI)			
Wastewater Inlet: Nominal Diameter (DN)	(mm)		**700**
Sludge Inlet: Nominal Diameter (DN)	(mm)		**600**
Mixed Liquor Outlet: Nominal Diameter (DN)	(mm)		**900**

4.9.5 Secondary Settling Tanks (SST)

Ultimate provision is 4 Secondary Settling Tanks (SST), of equal sizes, each as a component of the 4 Core Treatment Modules (CTM), with 1 to be constructed in Phase-1 and others, in the future phases.

b) SSTs shall receive mixed liquor from the Outlet Chambers of the respective Aeration Tanks (AT), for settling of secondary sludge.

c) The proposed SSTs shall be of RCC and circular in plan. It shall be center-feed type, equipped with peripheral multiple-notch triangular effluent weir. Inflow pipe to SST shall discharge mixed liquor into inlet drum, provided for this purpose.

d) Following are the key components of the SSTs:

1. Vertical Inlet Pipe (CI), carrying wastewater from Aeration Tank (AT), encased within the RCC Central Column
2. Inlet Assembly (MS, Epoxy-Coated), fitted at the top of Vertical Inlet Pipe, designed to divert wastewater from Inlet Pipe, to the Inlet Drum, through four horizontal ports, placed radially at right angles, with uniform heights and radially expanding widths
3. Central Column (RCC), for housing Vertical Inlet Pipe and supporting the Sludge Scraper assembly at the center
4. Inlet Drum (MS, Epoxy-Coated), supported by the bridge structure of Sludge Scraper, for minimizing turbulence and

hydraulic short-circuiting and for ensuring quiescent entry of wastewater into the settling zone of tank

5. Central Sludge Collection Pit in the bottom of the tank, all around the Central Column, with sloping sides and with base slab of the tank sloping radially towards it
6. Sludge Scraper (End-Driven Rotating Half-Bridge Type), with its center supported on Central Column and its wheels moving on the tank wall, for continuously scraping and directing sludge, settled at the tank bottoms, towards the Central Sludge Collection Pit
7. Scum Skimmer (MS, Epoxy-Coated), attached with the bridge structure of Sludge Scraper, for automatically directing the scum to the Scum Collection Box (MS, Epoxy-Coated), attached to the tank wall
8. Effluent Channel, provided circumferentially inside the side wall of tank, in order to support the wheels of the Scraper on the side wall
9. Effluent Weir (multiple V-notch type, MS, Epoxy-Coated), attached to the inner wall of Effluent Channel, to ensure uniform radial distribution of flow across the settling tank
10. Effluent Pipe (CI), from Effluent Channel of SST to Treated Effluent Channel of CETP
11. Sludge Pipe (CI) from the Central Sludge Collection Pit to the suction side of the Secondary Sludge Recycling and Wastage Pumps

e) Treated effluent, collected in the Effluent Channels of the SSTs, shall be discharged to the Treated Effluent Channel of CETP, through gravity pipelines.

f) Scum, collected in the scum box, shall be discharged, through a pipe (provided with valve), to a scum trolley, provided for this purpose. Thereupon, the scum shall be carried to the dewatered sludge yard, for their ultimate disposal along-with the dried sludge and adopted values of liquid depth and other key parameters.

A) Design

Design calculations and design summary are presented in **Table** 4-5.

Table 4-5, Design Summary: Secondary Settling Tanks (SST)

Parameter	Unit	Range [Ref 1]	Adopted
Governing Parameter			
SS Loading Rate (Average)	(kg/m^2-h)	4 – 6	5.79
SS Loading Rate (Peak)	(kg/m^2-h)	< 10	8.12
Internal Diameter of Tank	(m)	3 – 60	**40.000**

Parameter	Unit	Range [Ref 1]	Adopted
Width of Effluent Channel	(m)		0.600
Depths			
Side Liquid Depth (No-flow Conditions)	(m)	4.0 – 5.5	4.000
Free Board @ Minimum Side Liquid Depth	(m)		0.500
Height of Side Wall	(m)		**4.500**
Bottom Slope: Circular Tanks		1/16 – 1/12 – 1/6	1/12
Checking of Secondary Design Parameters			
Overflow Rate			
@ Average Flow	(m/h)	0.65 – 1.15	0.94
@ Peak Flow	(m/h)	1.5 – 2.3	1.37
Weir Loading @ Peak Flow	(m^2/h)	< 16	13.23
Inlet Pipe (CI): Nominal Diameter (DN)	(mm)		**900**
Inlet Assembly			
Inlet Port Velocity @ Peak Hour Flow	(m/s)	≤ 0.75	0.71
Inlet Port Depth below HGL	(m)	0.5 – 0.7	0.550
Inlet Drum			
Ration of Drum Diameter to Tank Diameter		0.25 – 0.35	0.20
Depth			
Below WL	(m)	1 – 2.5	2.000
Below Inlet Ports	(m)	1	1.000
Outlet Pipe (CI): Nominal Diameter (DN)	(mm)		**600**
Sludge Pipe (CI): Nominal Diameter (DN)	(mm)		**600**
Scraper Speed	(RPM)	1/50–1/30–1/20	1/30

4.9.6 Primary Sludge Pumping Rooms (PSPR)

a) Each Primary Settling Tank (PST) shall have its own respective Primary Sludge Pumping Room (PSPR). Consequently, with the ultimate provision of 4 PSPR, 1 shall be constructed in Phase-1, and others, in the future phases. The purpose of PSPRs, to be located close to the respective PSTs, shall be to house Primary Sludge Wastage Pumps.

b) The pumps, with their suction side, connected to the central collection pit, of the respective PST, shall be operated, at certain intervals, for required periods of times, for wasting primary sludge from the PST. The sludge shall be pumped to the primary/secondary sludge-conveyance pipe, which shall carry it to the Sludge Thickeners (ST).

c) The pumps shall be non-clogging, single-stage, horizontal, centrifugal type.

A) Design

Design calculations and design summary are presented in **Table** 4-6.

Table 4-6, Design Summary: Primary Sludge Pumping Rooms (PSPR)

Parameter	Unit	Value
Primary Sludge Pumps		
Number of Pumps per PSPR		
Duty		1
Standby		1
Total		2
Pumps		
Capacity, Each Pump	(m^3/h)	**100**
Daily Pumping Duration – Required	(h)	1.9
PSPR: Dimensions		
Dimension of Room across the Pumps	(m)	**4.500**
Dimension of Room along the Pumps	(m)	**4.000**

4.9.7 Secondary Sludge Pumping Rooms (SSPR)

a) Each Secondary Settling Tank (SST) shall have its own respective Secondary Sludge Pumping Room (SSPR). Consequently, with the ultimate provision of 04 SSPR, 1 shall be constructed in Phase-1, and others, in the future phases. The purpose of SSPRs, to be located close to the respective SSTs, shall be to house the following pumps:

1. Secondary Sludge Recycling Pumps
2. Secondary Sludge Wastage Pumps

b) The pumps shall be non-clogging, single-stage, horizontal, centrifugal type.

A) Design

Preliminary design calculations and design summary are presented in **Table** 4-7.

Table 4-7, Preliminary Design: Secondary Sludge Pumping Rooms (SSPR)

Parameter	Unit	Value
Secondary Sludge Recycling Pumps		
Number of Pumps per SSPR		
Duty		02
Standby		01
Total		03
Recycling Pumps		
Toral Operating Capacity	(m^3/h)	1,100
Capacity, Each Pump	(m^3/h)	550

Parameter	Unit	Value
Secondary Sludge Wastage Pumps		
Number of Pumps per PSPR		
Duty		01
Standby		01
Total		02
Wastage Pumps		
Capacity, Each Pump	(m^3/h)	200
Daily Pumping Duration – Required	(h)	3.6
SSPR: Dimensions		
Dimension of Room across the Pumps = [1.75 + 1.75 (4) + 1.75]	(m)	10.500
Dimension of Room along the Pumps	(m)	6.000

4.9.8 Sludge Thickeners (ST)

a) The waste sludge shall need to be thickened, in Sludge Thickeners (ST), prior to its mechanical dewatering.

b) Ultimate provision is of 2 Sludge Thickeners (ST), of equal sizes, with 1 to be constructed in Phase-1 and other, in the future.

c) The STs shall receive primary and secondary sludge, through the common primary/secondary sludge-conveyance pipe.

d) The proposed STs shall be of RCC and circular in plan. It shall be center-feed type, equipped with peripheral multiple-notch triangular effluent weir. Inflow pipe to ST shall discharge sludge into inlet drum, provided for this purpose.

e) Following are the key components of the STs:

1. Vertical Inlet Pipe (CI), carrying primary and secondary sludge, encased within the RCC Central Column
2. Inlet Assembly (MS, Epoxy-Coated), fitted at the top of Vertical Inlet Pipe, designed to divert sludge from Inlet Pipe, to the Inlet Drum, through four horizontal ports, placed radially at right angles, with uniform heights and radially expanding widths
3. Central Column (RCC), for housing Vertical Inlet Pipe and supporting the Sludge Scraper assembly at the center
4. Inlet Drum (MS, Epoxy-Coated), supported by the bridge structure of Sludge Scraper, for minimizing turbulence and hydraulic short-circuiting and for ensuring quiescent entry of sludge into the thickening zone of tank
5. Central Thickened Sludge Collection Pit in the bottom of the tank, all around the Central Column, with sloping sides and with base slab of the tank sloping radially towards it

6. Sludge Scraper (End-Driven Rotating Half-Bridge Type), equipped with vertical pickets, with its center supported on Central Column and its wheels moving on the tank wall, for continuously scraping and directing thickened sludge, settled at the tank bottoms, towards the Central Sludge Collection Pit
7. Supernatant Channel, provided circumferentially inside the side wall of tank, in order to support the wheels of the Scraper on the side wall
8. Supernatant Weir (multiple V-notch type), attached to the inner wall of Supernatant Channel, to ensure uniform radial distribution of flow across the thickening tank
9. Supernatant Pipe (CI), from Supernatant Channel of ST, to Sludge-Water Pipeline (RCC) of CETP
10. Thickened Sludge Pipe (CI) from the Central Sludge Collection Pit to the suction side of the Thickened Sludge Pumps, for feeding the Sludge Dewatering Equipment

f) Thickened sludge pipes, from the central collection pit of the STs, shall be connected to the suction sides of the sludge pumps, provided for feeding the sludge to the respective sludge dewatering equipment.

g) Supernatant from STs is highly polluted stream and shall be carried back, under gravity, through Sludge-Water Pipeline, to the Wastewater Pumping Station (WWPS-1 or WWPS-2) for re-treatment.

A) Design

Design calculations and design summary are presented in **Table** 4-8.

Table 4-8, Design Summary: Sludge Thickeners (ST)

Parameter	Unit	Range [Ref 1]	Adopted
Governing Parameter			
SS Loading Rate (Primary + Activated Sludge)	(kg/m^2-d)	25 – 70	45.9
Internal Diameter of Tank	(m)		**27.000**
Bottom Slope: Circular Tanks		1/16 – 1/12 – 1/6	**1/12**
Width of Supernatant Channel	(m)		0.450
Depths			
Side Liquid Depth (No-flow Conditions)	(m)	4.0 – 5.5	4.500
Free Board @ Minimum Side Liquid Depth	(m)		0.500
Height of Side Wall	(m)		**5.000**
Bottom Slope: Circular Tanks		1/16 – 1/12 – 1/6	1/12
Sludge Inlet Pipe (from Sludge Wastage Pumps)			
CI: Nominal Diameter (DN)	(mm)		**350**
Inlet Assembly			

Parameter	Unit	Range [Ref 1]	Adopted
Inlet Port Velocity @ Peak Flow	(m/s)	≤ 0.75	0.18
Inlet Port Depth below HGL	(m)	0.5 – 0.7	0.55
Inlet Drum			
Ration of Drum Diameter to Tank Diameter		0.25 – 0.35	0.25
Depth			
Below WL	(m)	1 – 2.5	2.000
Below Inlet Ports	(m)	1	1.150
Supernatant Pipe (to Sludge Water Pipeline)			
CI: Nominal Diameter (DN)	(mm)		**350**
Sludge Pipe (to Sludge Dewatering Station)			
CI: Nominal Diameter (DN)	(mm)		**200**
Scraper Speed	(RPM)	1/50–1/30–1/20	1/30

4.9.9 Sludge Dewatering Stations (SDS)

a) Two Sludge Dewatering Stations (SDS) shall be provided, one each for two Sludge Thickeners (ST), with 1 to be constructed in Phase-1 and other, in the future.

b) The Sludge Dewatering Stations shall house the following key facilities, besides certain ancillary equipment:

1. Thickened Sludge Feed Pumps: Two thickened sludge feed pumps (1 Duty and 1 Standby) shall be provided for each Sludge Dewatering Equipment. These pumps shall be installed on the common suction line, coming from the sludge collection pit of the Sludge Thickener.
2. Sludge Dewatering-Aid Chemical Dosing System: For more efficient mechanical dewatering of sludge, some dewatering-aid chemicals (organic polymers) would need to be added to the thickened sludge, before feeding it to the sludge centrifuge. For this purpose, chemical dosing system shall be provided. The chemical dosing system shall comprise the following key components:
   - Chemical Solution Dosing Vessel with Mixer
   - Dosing Pump
   - Piping

   The chemical dosing pumps shall be interlocked with the respective sludge feed pumps, for concurrent operation. For each sludge centrifuge, separate chemical dosing system, shall be provided.
3. Sludge Dewatering Equipment (Centrifuge Type)

c) SDSs shall be single-story, shed-type, RCC column-slab structure, with no side walls.

d) The dewatered sludge shall be transported, by tractor-trolleys, of some other transport vehicles, to the site for disposal or land application, as the case may be.

e) For the purpose of receiving, and loading dewatered sludge on the transport vehicles, duly paved sludge-loading area shall be developed, in front of the SDSs.

f) Sludge water, extracted from sludge, by dewatering equipment, is highly polluted stream and shall be carried back to the wastewater pumping station for re-treatment.

A) Design

Preliminary design calculations and design summary are presented in **Table** 4-9.

a) The required design capacities and numbers of the sludge centrifuges are determined, keeping in view the capacities of the commercially available equipment, their relative costs and project phasing requirements.

b) No standby sludge centrifuge is provided, because in case one centrifuge goes out of operation, the remaining can be operated for longer durations to fulfill the daily dewatering requirements.

Table 4-9, Preliminary Design: Sludge Dewatering Stations (SDS)

Parameter	Unit	Range [Ref 1]	Adopted
Capacities and Numbers of Sludge Centrifuges			
SS Concentration in Thickened Sludge from ST	(mg/l)	20,000 – 30,000	30,000
Dewatering Capacity of Sludge Centrifuge	(m^3/h)		25
Net Daily Operation Period (1 Shift)	(h)		08
Number of Centrifuges Required			
Ultimate/Total			08
Phase-1			02
Sludge Dewatering Stations (SDS)			
Number of SDSs			
Ultimate/Total			02
Phase-1			01
Number of Sludge Centrifuges in SDS (Phase-1)			
Phase-1			02
Future			02
Total			04
Dimension of Shed across the Centrifuges	(m)		**24.00**
Dimension of Shed along the Centrifuges	(m)		**15.00**
Dewatered Sludge Quantities			
SS Concentration in Dewatered Sludge			
Primary + Activated Sludge	(mg/l)	220,000 – 350,000	200,000

Parameter	Unit	Range [Ref 1]	Adopted
Max Daily Volume of Dewatered Sludge			
Ultimate/Total	(m^3/d)		240
Phase-1	(m^3/d)		60

4.10 Process Piping

The piping required for the transmission of wastewater and sludges is as follows:

a) All the process piping, under pressure-flow, for wastewater and sludge, shall, in general, be of HDPE.

b) All the valves and penstocks shall be of cast iron (CI).

c) The pipe, carrying supernatant from Sludge Thickeners and sludge-water, from Sludge Centrifuges, under gravity-flow, shall be of RCC.

4.11 Process Control and Monitoring Facilities

a) Following continuous monitoring instruments, with 2 LCD display units (1 on-site + 1 located in Plant Control Room of Plant Building) shall be installed:

1. Two Wastewater Flow Meters (Electromagnetic type), 1 each on raw wastewater delivery pipelines, from Wastewater Pumping Stations WWPS-1 and WWPS-2
2. One Wastewater pH Meter in Flow Distribution Chamber (FDC)
3. Dissolved Oxygen (DO) Meters, in two compartments of each Aeration Tank (AT)

b) In order to facilitate the monitoring of the CETP, on/off displays, for all the mechanical equipment, shall be provided in the Plant Operation Room of the Plant Building.

c) A duly-equipped laboratory, for the routine testing of wastewater and sludge samples, for pH, settleable solids, total suspended solids (TSS) and chemical oxygen demand (COD), shall be provided in the Plant Building.

4.12 Plant Building

a) The Plant Building shall be located close to the front boundary of CETP.

b) The proposed Building, partly single-story and partly double-story, shall be designed to accommodate ultimate staff requirements of the CETP.

c) Following facilities shall be provided in the Plant Building:

- Reception
- Plant Manager Room

- Technical Staff Area
- Spare Office Area
- Common Room
- Admin/Accounts Staff Area
- Plant Operation Room
- Laboratory
- Office Store & Record Room
- Kitchen
- Gents Toilet
- Ladies Toilet
- Equipment Store
- Chemicals Store
- Workshop
- Workers Sitting and Dining Room
- Worker's Kitchen
- Worker's Gents Toilet

d) Estimated covered area of the building is about 750 m^2.

4.13 Miscellaneous Works

In addition to the component treatment facilities and buildings, as mentioned in the preceding sections of this chapter, following miscellaneous works shall be required in the CETP:

a) Entrance Gates
b) Boundary Wall
c) Car Parking Area near Plant Building
d) Sludge Loading and Tractor-Trolleys Parking Area
e) Roads and Walkways
f) Stormwater Drainage
g) Water Supply
h) Sewerage

4.14 Restoration and Rehabilitation Plans

There will be no matter of rehabilitation as the site is already owned by the project proponent and within the boundaries of industry. 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.

CHAPTER – 5: DESCRIPTION OF BASELINE ENVIRONMENT

SECTION - 5: DESCRIPTION OF BASELINE ENVIRONMENT

Baseline conditions refer to the existing physical, environmental and socio-economic status of the project and study area. On the basis of baseline information, the project interventions are assessed and mitigation measures are proposed. The baseline information also helps to indicate the specific issues to be monitored during construction and operational phases. The baseline data (physical, biological and socio-economic parameters) related to the project and study area is described below. Information provided is based on primary and secondary data collected by site visits, desk studies and consultation with locals respectively. This section gives the overview of the topology, geology, seismology and meteorological conditions of whole city whereas, it gives detailed information about the surface water, ground water and air quality of the project area. The detail of each parameter is discussed in sub-sections below:

The physical environment consists of existing land form and land use at the project site including geology, pedology, hydrology, meteorology and climatology. The pre-project condition (i.e., baseline) of these components of the physical environment is described in detail. To identify the potential impacts on the physical, biological and socio-economic environment that is likely to arise from the project activities.

5.1 Baseline Physical Environment

5.1.1 Topography

Topography of Sheikhupura City is flat. The area is a part of Rachna Doab and consists of sub-recent sediments brought by spill channel from the river Chenab. There are some old channel levees remnants and old basins filled up with clay materials. The material is probably of Late Pleistocene Age derived from mixed calcareous sedimentary and metamorphic rocks of Lower Himalayas. The area of the Sheikhupura District is comprised of the fluvial deposits of Ravi River.

5.1.2 Geography& Geology

Sheikhupura lays 31°42'51.16"North latitude and 73°59'3.49"Easr longitude. The city is well connected with its surrounding big urban centers like Lahore (35 km) Faisalabad (94 km), Sargodha (143 km) and Gujranwala (54 km). Sheikhupura is also a railway junction. The area is a part of Rachna Doab, and consists of some recent sediment brought by spill channel from River Chenab. There are some old channel levee remnants and old basins filled up with clay materials. It is probably of Late Pleistocene Age derived from mixed calcareous, sedimentary and metamorphic rocks of the lower Himalayas. District Sheikhupura is spread over an area of 3,241km^2 and comprises 5 tehsils such as; Sheikhupura, Ferozewala, Sharaqpur Sharif, Muridke and Safdarabad. The map showing the area of district Sheikhupura is given below:

Figure 5-1, Map Showing the Area of District Sheikhupura

5.1.3 Seismology

According to Seismic Zoning of Pakistan (2021), the project area lies in Zone 2A and represents minor to moderate damage due to earthquakes.

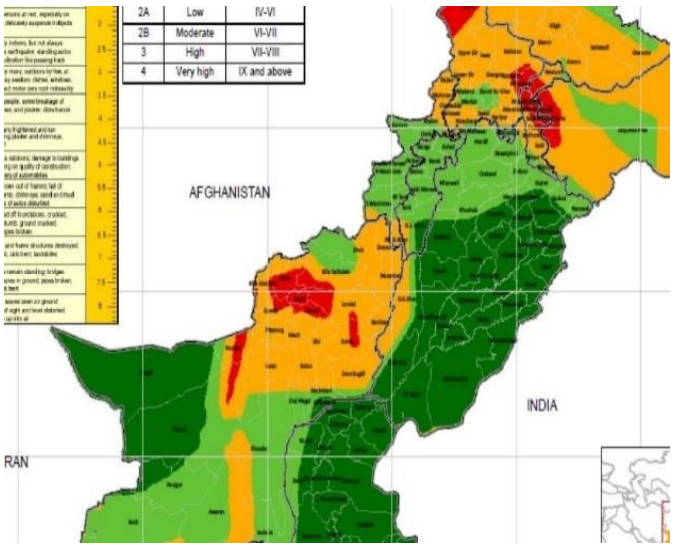


Figure 5-2, Seismic Zone of Pakistan

5.1.4 Soil

The soil in the project area is cohesion less and is of alluvial type deposited by Ravi River. The types of soil layers that are present below the ground level includes: silt, silty clay, silty sand, poorly graded sand with silt and lean clay.

5.1.5 Climate

The District Sheikhupura has extreme climate conditions and summer season starts from April and continues till October. During the summer season,

temperature ranges from 30°C to 48°C. The winter season starts from November and continues till March. December and January are the coldest months with a mean minimum temperature of about 3-5°C. The dust storms occur occasionally during the hot season, June, July and August.

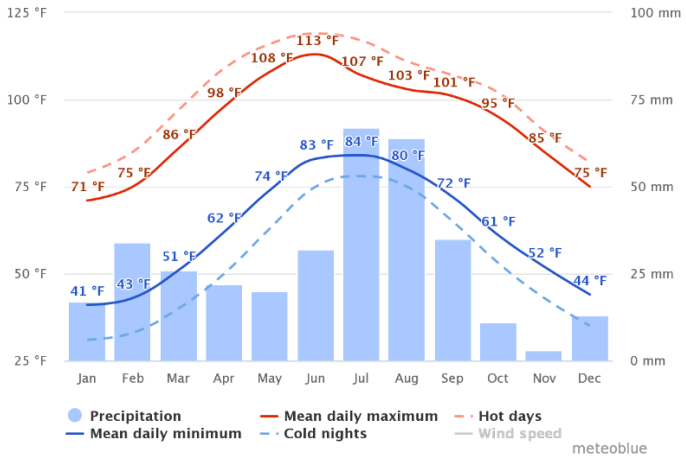


Figure 5-3, Average temperatures and precipitation (Meteoblue)

Rainy weather alternates with oppressive weather. The rainfall is 500 mm per annum. In the recent year, the maximum average precipitation occurred in September and it was around 50-100mm.

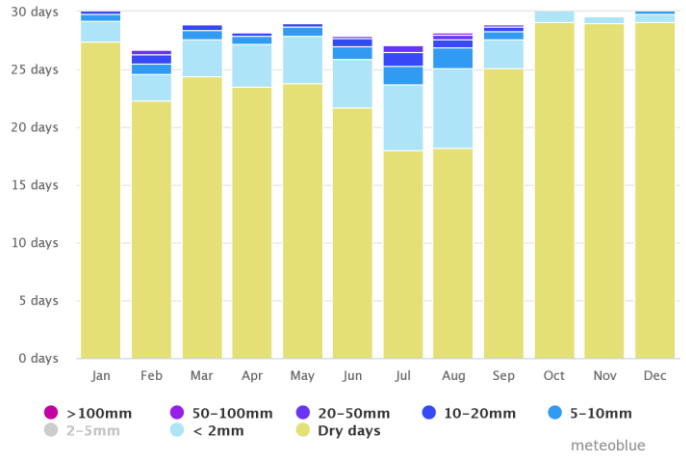


Figure 5-4, Mean Precipitation (Meteoblue)

The average daily wind speed was highest in July which was 38 km/h. In recent years, the maximum sustained wind speed has reached 38 km/h.1 The diagram shows how many days within one month can be expected to reach certain wind speeds. Monsoons create steady strong winds on the Tibetan Plateau from December to April, but calm winds from June to October. The wind speed directly affects the dispersion and transport of plume. So, the greater is the wind speed, the greater will be the dispersion and the distance at which plume strikes the ground and the lesser will be the pollution concentration.

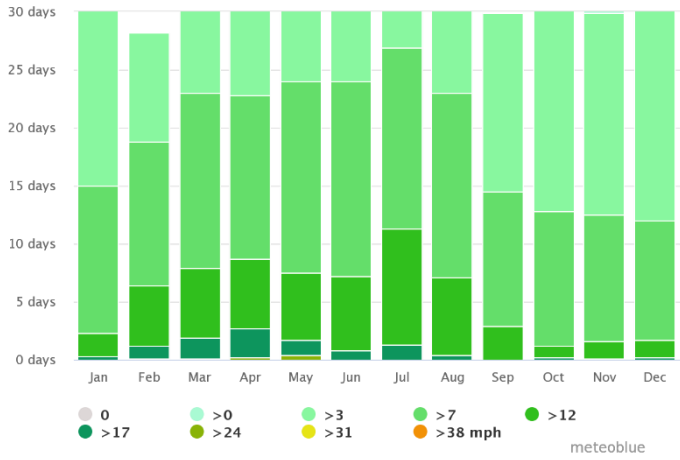


Figure 5-5, Average Wind Speed (Meteoblue)

Wind Rose

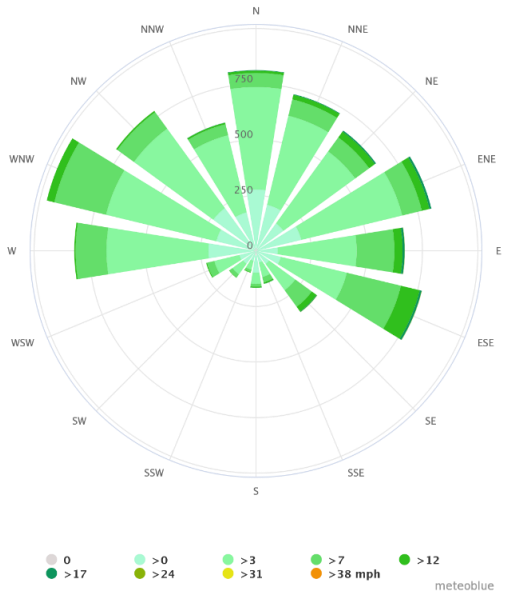


Figure 5-6, Wind Rose

5.1.6 Water resources

A distributary of Chenab River is located at a distance of 8.44 km from project area. The main source of the water consumption is the ground water. It is being used in the study area for industrial and domestic purposes.

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

collected and analyzed. The ground water will be extracted through boring. The detail of the water quality of the project area is given below:

Table 5-1, Ground Water Analysis Results

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	9.61	N.A.	High
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	300	± 1.79	Optimal
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	768	± 8.02	Optimal
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.67	± 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	37	± 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	0.41	± 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	5.88	± 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	0.041	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

5.1.7 Ambient Air Quality

The primary source of air pollution at the project sites is the vehicular emissions, industries and the key pollutants likely to be found at 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, Laboratory had the requisite air sampling device and expertise for collection of samples. The monitored parameters included Carbon mono-oxide (CO), Nitrogen oxides (NOx), Sulphur oxides (SOx), Particulate Matter (PM_{10}). The monitoring was carried out for a period of 24 hours and results are presented in **Table** 5-2, and reports are attached as **Annexure-07.**

Table 5-2, Ambient Air Quality Results

Parameters	Units	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO_2)*	µg/m³	24Hours	1.00	43.49	80.0	Optimal
Nitrogen Oxide (NO)*	µg/m³	24Hours	1.00	19.71	40.0	Optimal
NO_x*	µg/m³	24Hours	1.00	63.11	120.0	Optimal
Sulphur Dioxide (SO_2)*	µg/m³	24Hours	1.00	39.81	120.0	Optimal
Carbon Monoxide (CO)*	mg/m³	24Hours	0.01	1.82	05.0	Optimal
Particulate Matter (PM_{10})*	µg/m³	24Hours	1.00	94.01	150	Optimal
Particulate Matter ($PM_{2.5}$)*	µg/m³	24Hours	1.00	22.64	35	Optimal
Total Particulate Matter (TSP)	µg/m³	24Hours	1.00	140.03	500	Optimal

5.1.8 Noise

Noise level of the project area was monitored at project site using digital sound meter. The results showed a high noise level at each point during night time. For the management of noise level, a management plan is attached in Annexure-08. The results are presented in Table 5-3 and reports are attached as **Annexure-07.**

Table 5-3, Noise Levels at Project Site

Sr. No.	Time	Noise dB(A)		PEQS
1	13:30	67	Day Time	75
2	14:30	67		
3	15:30	67		
4	16:30	68		
5	17:30	68		

Sr. No.	Time	Noise dB(A)		PEQS
6	18:30	69		
7	19:30	69		
8	20:30	69		
9	21:30	68		
10	22:30	67	Night Time	65
11	23:30	65		
12	00:30	64		
13	01:30	63		
14	02:30	62		
15	03:30	61		
16	04:30	60		
17	05:30	59		
18	06:30	58		
19	07:30	57	Day Time	75
20	08:30	57		
21	09:30	56		
22	10:30	57		
23	11:30	59		
24	12:30	62		

Note: *The values exceeding PEQs are in bold.*

5.1.9 Testing Team

All laboratory tests for water, noise and ambient air were conducted by Asian Environmental Services Private Limited which is certified laboratory form EPA-Punjab. The testing team of expertise is presented I, **Table** 5-4.

Table 5-4, Testing Team

1	Mr. Sajjad Hussain	Chief Chemist	M.Phil. Chemistry, GCU Lahore
2	Mr. Ashir Shahbaz	Lab Analyst/ Chemist	BS. Chemistry, University of The Punjab
3	Ms. Musharaf Jabeen	Chemist	MSC. Chemistry, University of The Punjab
4	Ms. Sadia Sawar	Environmentalist	B.Sc. Environmental Sciences – Govt. College University, Lahore
5	Hafiz M Haider	Microbiologist	B.Sc. in Microbiology

5.2 Baseline Ecological Environment

5.2.1 Flora

The project is located in industrial area has already has trees, small shrubs and grasses. For the construction of this project, no trees will be removed from the site.

5.2.2 Fauna

For study of fauna in the project area, field guides and books were consulted. On the other hand, field observations were conducted along with the interviews of local community members about the fauna of the area. The equipment used in field included; cameras, binoculars and GPS device (wherever required). It is important to note that there is a number of factors which can change the findings of such survey. It may be pointed out that the pattern of seasonal migration of small birds varies depending upon each species. The proposed site has no fresh water aquatic body except upper Minor Irrigation Canal (located at the distance of 1.14 km from the project area) having no life, hence there is no freshwater aquatic life in the study area. During the construction activity in project area, no important biological feature will be damaged or disturbed. No Fauna Species has been observed during Survey,

The fauna commonly found in District Sheikhupura includes; Hares, Falcon, Eagle, Quail, Starling, Jungle Pigeon, Russian Sparrow, Doves, King Fisher, Parrot, Crow and Local Sparrow. Commonly found mammals in the area include; dogs, cats, horses, house-rats, squirrels, porcupines and bats. However, Small Indian Mongoose and Indian Palm Squirrel are also found in the District Sheikhupura. The list of the mammals along with their scientific names, observed in the study area are enlist in the **Table 5-5** below.

Table 5-5, Mammals of Study Area

Sr. No.	Common Name	Scientific Name
1	Rat	*Rattus*
2	Bat	*Chiroptera*
3	Small Indian Mongoose	*Herpestesjavanicus*
4	Indian Palm Squirrel	*Funambuluspalmarum*
5	Porcupines	*Erethizondorsatum*
6	Squirrels	*Sciuridae*

The commonly found birds' species include; House Sparrow, Crow and some of them are mentioned below with scientific names:

Table 5-6, Birds of Study Area

Sr. No.	Common Name	Scientific Name
1	House Sparrow	*Passerdomesticus*
2	House Crow	*Corvussplenders*
3	Pigeon	*Columbidae*
4	Bulbul	*Pycnonotidae*
5	Teetar	*Francolinusfrancolinus*
6	Parrot	*Psittaciforms*
7	Titodi	*Vanellusindicus*

Table 5-7, Reptiles of Study Area

Sr. No.	Common Name	Scientific Name
1	Snake	*Serpentes*
2	Spiny Tailed Lizard	*Uromastixhardwickii*
3	Fingered Toed Lizard	*Acanthodactyluscantoris*
4	Earthworm	*Lumbricina*

The amphibians commonly seen around the project area, especially during the rainy season includes;

Table 5-8, Amphibians of Study Area

Sr. No.	Common Name	Scientific Name
1	Common Frog	*Ranatemporaria*
2	IndusValley Toad	*Bufostomaticus*

A large number of insects are present due to open fields in the project site. Few of these insects are known to cause diseases in local population. Following is a list of commonly observed insects at the site:

Table 5-9, Insects in Study Area

Sr. No.	Common Name	Scientific Name
1	Black Ants	*Paratracheaiognicornis*
2	Dragon Fly	*Dragon Fly*
3	Houseflies	*Muscadomestica*
4	Butter Flies	*Parnassiusbalucha*
5	Honeybees	*Apismellifera*
6	Wasps	*Anagyruspseudococci*
7	Grasshopper	*Melanoplusdifferentialis*
8	Mosquito	*Anophlesesp.*

No endangered species are found at the site. The area has not been identified as ecologically sensitive area by wildlife department.

5.3 Baseline Socio-economic Environment

This section deals with the socio-economic and cultural conditions of the project area. During the desk/ office study, available reports/ documents were comprehensively studied.

The basic objectives of the social surveys were to:

- Get the primary data from the various sources.
- Informed people about objective and purpose of the proposed project.

- Identify the potential impacts associated with the implementation of the proposed project.
- Get feedback from community about project related social issues.
- And address the mitigation measures about the social issues in the report.

This section provides collective information about the existing socio-economic and environmental condition of the project area within the AOI. The different types of socio-economic aspects were covered such as; demographic profile, occupation, education and health facilities. This data helped in identifying major interventions for the development of Environmental Management and Monitoring Plan (EMMP). The study also helped to assess the positive or adverse impacts on local community. The major occupation of the people in the study area is agriculture and the detail of crops, being sown in this specific area is given below:

5.3.1 Cultivated Crops

The main crops that are being cultivated in the study area includes; Rice, Wheat, Fodder Crops as well as the seasonal crops grown in the region. District Sheikhupura is famous for best Basmati rice production in the world.

5.3.2 Livestock

People in the study area have common livestock which include; Cows, Buffalos, Sheep, Goats and Hens. However, there is no proper cattle or poultry farm observed within the study area.

5.4 Lab Reports of Environmental Analysis

Testing of different parameters was done from a certified laboratory in order to check the quality of different environmental parameters. The copy of the lab reports of these parameters (ambient air analysis, water quality analysis and noise) is attached at **Annexure-07.**

5.5 Site Suitability of the site

The project location is situated in an existing industrial area and is under the ownership of the individual or organization initiating the project. The area currently has a limited amount of vegetation, making it highly suitable for our proposed undertaking.

CHAPTER – 6: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

SECTION - 6: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This section of the report describes the potential impacts imposed upon the physical, biological and socio-economic environment likely to arise from the implementation of proposed project activities. Waste generated during construction and operation activities of the project, is released unchecked into the environment. Hence, it results in the degradation of environment in the form of air, water, soil, noise and social pollution etc.

The sources of pollution are first identified and then their impacts are noticed at each stage of the proposed project i.e., pre-construction, construction, post-construction and operational phase.

The significant hazards imposed upon due the implementation of the proposed project will prove to be guidance for appropriate mitigation measures. Enforcement of the recommended mitigation measures would minimize and eradicate the negative impacts, while enhancing in the positive outcome i.e., sustainable development.

The hierarchy of control is a framework used to manage and prioritize workplace hazards, with the goal of reducing risks to health and safety. While the hierarchy primarily focuses on mitigating risks, it can also be applied to identify and address negative impacts associated with certain activities. Here are some examples of negative impacts that can be considered within the hierarchy of control:

Elimination: The highest level of the hierarchy involves eliminating the hazard or activity that causes negative impacts. For instance, if a particular process or practice is known to have significant negative environmental or social consequences, eliminating it entirely would be the most effective approach.

Substitution: Substituting a hazardous or harmful activity with a less harmful or more sustainable alternative can help minimize negative impacts. For example, replacing a resource-intensive or polluting method with a cleaner and more efficient process can reduce environmental degradation.

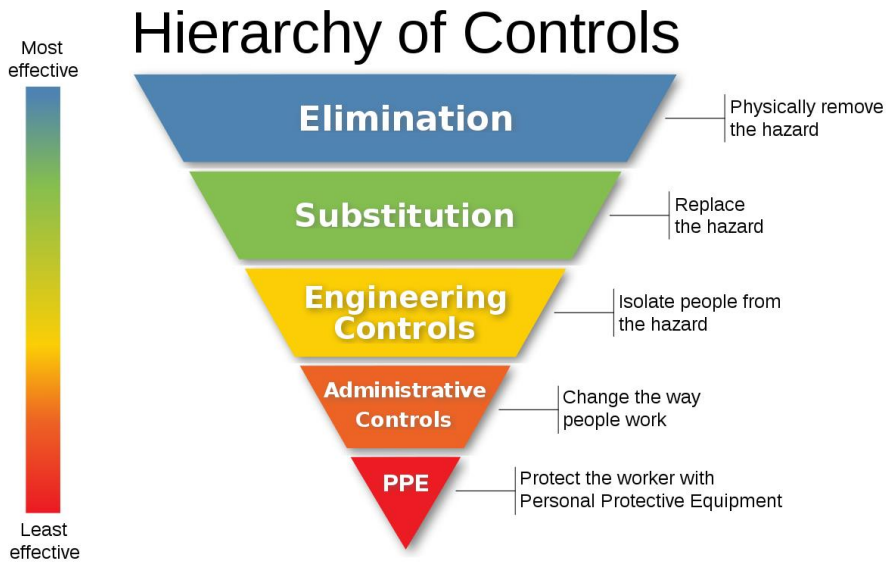
Engineering controls: Engineering controls involve modifying the physical environment or infrastructure to minimize negative impacts. This could include implementing technologies or systems that capture and treat pollutants, reduce emissions, or improve resource efficiency.

Administrative controls: Administrative controls focus on changing work practices, policies, or procedures to mitigate negative impacts. This may involve implementing guidelines, training programs, or protocols to ensure responsible and sustainable practices are followed.

Personal protective equipment (PPE): PPE is the last line of defence in the hierarchy of control and is used to protect individuals from hazards. While PPE may not directly

address negative impacts, it can help safeguard workers or individuals against specific risks associated with an activity that cannot be eliminated or substituted.

It's important to note that the hierarchy of control primarily aims to reduce risks and improve safety. However, considering the broader context, it can be extended to include considerations of negative impacts on the environment, social well-being, and sustainability. By applying the principles of the hierarchy of control to identify and address negative impacts, organizations can work towards more responsible and sustainable practices.



6.1 Project location

The QABP where CETP is going to be installed is located at about 6 km North-East of Sheikhupura City and is adjacent to the Lahore-Islamabad Motorway (M2), at a distance of about 3.5 km from Sheikhupura Interchange.

6.2 Approach and Methodology

For impact identification, various EIA methodologies are available including the checklists, interaction matrices, networks and overlays. Among these four methods, following two are used in this EIA.

- Project Interaction Matrix
- Checklists

6.2.1 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 & Socio-economic 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 (construction and operation). The environmental impacts are divided into three main categories including physical, ecological and socio-economic domains.

The environmental impacts of the project actions are identified and weighed into the following categories:

HA = Highly Adverse
MA = Medium Adverse
LA = Low Adverse
HB = Highly Beneficial
MB = Medium Beneficial
LB = Low Beneficial
0 = None/Insignificant

The assignment of significance is based on the previous knowledge and professional judgment of EIA team experts.

The project impact matrix has been developed and attached in Annexure-05. It may be noted that the environmental parameters, which are not related to the implementation of the projects, have not been considered in the matrix.

6.2.2 Screening Checklists

Based on the findings of desk studies, processed satellite imageries, screening checklist was prepared to screen out the potentially significant adverse environmental and social impacts during the construction and operation phase of the proposed Project. The objective of the impact screening is to assess the significance of the issues related to the atmosphere, climate, water resources, land resources, ecological environment, socio-economic environment, transport, infrastructure and communication, natural risks, hazards and external constraints of the Project for the proposed development. After the compilation of baseline information, processing of acquired satellite imagery, the screening checklist was filled to screen out the positive and adverse impact of the proposed Project during the construction and operational phases, attached in **Annexure-06.**

6.3 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** 6-1.

Table 6-1, 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.
Significance of Impact	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.

6.4 Environmental Impacts During Design Phase

The detailed designed of the CETP is explained in section 04 of this report. Environmental impacts dur to project location and design are given below:

6.4.1 Land Use

There will be change of landuse due to construction of proposed CETP. Currently, the predominant landuse in the project area is industrial. There is no need of land conversion.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Land use	Direct	Medium term	Local	Reversible	Almost Certain	Moderate	Low

6.4.2 Communities

They are no settlements in the proximity of the proposed project site.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Communities	Indirect	Medium term	Local	Reversible	Possibly	-	-

6.4.3 Land Acquisition

The gross area of about 634 hectares (1896 acres) has been selected for the project and no land acquisition or voluntary/involuntary settlement is needed since the project is established on the land of QABP.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Land Acquisition	Direct	Medium term	Local	Reversible	Almost Certain	Moderate	Low

6.4.4 Protected areas and Heritage sites

The project site has no protected areas such as wildlife, game reserves or national park, or any archaeological, historical or cultural heritage in its neighborhood or in immediate vicinity; no impact is therefore envisaged.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Protected area and heritage sites	Indirect	Long term	Regional	Irreversible	Likely	-	-

6.4.5 Hydrology

The area surrounding the plant site is plain with moderate slight observed in ground elevation. Establishment of the proposed treatment plant in project area can impact the hydrology of the area through land disturbance due to erosion and changes in runoff patterns. Removal of vegetation and agriculture during site clearance of proposed treatment plant can result in soil erosion during construction. Alterations in land use due to project construction work will also affect the runoff patterns in the project area. It's therefore mandatory that all waste streams resulting from the project area are carefully routed to avoid disturbance and contamination of existing hydrological pattern in project area.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Hydrology	Indirect	Long term	Regional	Irreversible	Possibly	High	High

A) Mitigation Measures

- During construction, all waste streams generated from the project will be routed and managed on-site. Discharge of these streams from the project site will be avoided.
- During operation, waste streams will be routed to nearby sewers. Screening will be ensured to avoid choking of sewers.
- To prevent damage to proposed treatment plant from flood during rainy season, a periphery embankment may be constructed for the protection of proposed treatment plant.
- Sediment traps will be provided during construction.
- Vegetation i.e., tree buffer will be provided along the boundaries of project site to mitigate potential of soil erosion

6.5 Impacts and Mitigations Measures During the Project Construction

During construction stage, following environmental issues will require management through implementation of EMP:

- Soil contamination and erosion
- Construction waste
- Impact on Ambient Air Quality
- Wastewater generation
- Noise & Vibration
- Occupational Health and Safety
- Ecological Environment

6.5.1 Soil Contamination and Erosion

During the construction work, soil erosion may be caused by the exposure of soil surfaces to rain and wind during site clearing, earth moving and excavation activities. This phenomenon is localized to the project site for a short span of time i.e., during construction phase only. The mobilization and transport of soil particles during the construction activities may in turn result in the 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.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Soil contamination and erosion	Direct	Short Term	Local	Reversible	Likely	Minor	Low

Mitigation Measures

- The project should be scheduled to avoid or minimize work during heavy rainfall periods (i.e., during the dry season) or windy days to the extent practical.
- After construction activities, the site which is cleared temporarily should be re-vegetating promptly.
- Off-site sediment transport should be reduced or prevented by the use of settlement ponds, silt fences, water treatment, as well as modifying or suspending activities during extreme rainfall and high winds to the extent practical.
- The environmental impact of soil erosion can best be mitigated by removing vegetative cover only from the specific site on which

construction is to take place and by disturbing the vegetation in adjacent areas as little as possible.

Actions necessary to manage the risk from soil contamination 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 shall cover the following and same is provided in the EMP:

- Vehicles and equipment maintenance should be taken place at specified site with provision of containments.
- Washing of vehicles should be carried out in the designated areas.
- Construction vehicles and machinery should be examined on a regular basis for leakage prevention.
- Removal of oil and contaminated soil in the fuel and oil storage areas will be made possible by the availability of appropriate implements i.e., shovels, plastic bags and absorbent materials.
- A daily leak/ spill record will be maintained for each vehicle and repairs shall be done at the earliest opportunity. Leaking vehicles will not be operated unless repaired.
- All operating vehicles will be checked for any fuel, oil, or battery fluid leakage.

6.5.2 Construction Waste

The construction waste which is normally generated is concrete waste, steel, wooden scaffolding, cement bags, excavated soil, wood remains etc. mismanagement of construction waste may result in choking of nearby sewers and degradation of aesthetic quality of project area.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Construction waste	Indirect	Short Term	Regional	Irreversible	Possibly	Moderate	Medium

Mitigation Measures

- EMP should be implemented to control the impacts of waste generation.
- The construction waste which will be sent for recycling like damage pipes left over steel, wooden and plastic pieces.
- The construction material will be kept in a cover place, especially during the precipitationseason.

- Various waste containers for different types of waste will be deployed onsite. The waste bins will be properly marked for each type of waste produced during the constructional activities.
- The project area will contain the sewage and litter facility to overcome the problem ofunchecked dumping of waste.

6.5.3 Ambient Air Quality

Construction activities such as preparation of construction material, land clearing, levelling, excavation and installation of building foundations are all potential sources of alterations to air quality of project area primarily the fugitive dust emissions caused by a combination of on-site excavation and movement of earth materials, movement of construction machinery on dust tracks.

Another source of emissions may include exhaust from diesel engines of earth moving equipment, as well as from open burning of solid waste on-site.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Air Quality Deterioration (Construction Phase)	Direct	Short term	Local	Reversible	likely	Minor	Medium

Mitigation Measures

- For control of air pollution during construction work, following measures are recommended:
- Minimizing dust from open area sources 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.
- PPEs, such as dusk masks, should be used where dust levels are excessive.
- Avoiding open burning of solid.
- Sprinkling of water and fine spray from nozzles to suppress the dust.
- On-Road- Inspection should be done for black smoke generating machinery.
- Use of cleaner fuel should be done.
- Vehicles having pollution under control certificate may be allowed to supply the construction material to the project site.

- Use of covering sheets should be done for trucks to prevent from dust dispersion caused through the trucks.

6.5.4 Wastewater Generation

Wastewater is generated as run off from construction site during construction work including preparation of building materials, washing activities, runoff due to precipitation, etc. Another source of wastewater includes campsites used by workers during construction phase.

Onsite management of wastewater is important to prevent discharge to other sensitive receptors in the area such as canals and agricultural fields as this may deteriorate the water quality of the surface and groundwater resources near the project site.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Wastewater generation	Indirect	Short Term	Regional	Irreversible	Possibly	Moderate	Medium

Mitigation Measures

- Careful management of construction work is necessary to ensure water is not wasted.
- Where possible, the construction wastewater should be reused after initial treatment (if required such as sedimentation).
- Washing of vehicles and construction machinery should be avoided if possible or be done in a designated area.
- Wastewater generation will be minimized by controlling the pollutant at the source.
- Regular monitoring of the wastewater generation will be taken into consideration.
- Adequate Potable or permanent sanitation facilities serving all workers should be provided at all construction sites.

6.5.5 Noise & Vibration

During the construction phase, noise and vibration will result from use of heavy construction machinery such as earth moving and excavation equipment, concrete mixers, movement of equipment and construction machinery, and operation of generators.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Noise & Vibration	Direct	Short term	Local	Reversible	likely	Minor	Medium

Mitigation Measures

The following measures are adopted in order to keep the noise within the limits as prescribed in PEQS:

- The activities associated with greatest potential to generate noise should be planned during the day period that will result in least disturbance to the nearby residents.
- Noise control devices should be used such as temporary noise barriers and deflectors for impact activities.

6.5.6 Occupational Health and Safety Issues of construction work

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 site.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Occupational Health and Safety Issues	Direct	Short term	Local	Reversible	likely	Minor	Medium

Mitigation Measures

Recommendations for their prevention and control include:

- Workers should be trained with lifting and materials handling techniques before the construction of the project, including the placement of weight limits above which mechanical assists or two person lifts are necessary.
- Work site layout should be planned to minimize the need for manual transfer of heavy loads.

- Tools should be selected and work stations would be designed to reduce force requirements and holding times, which promote improved postures, including, where applicable, user adjustable work stations
- Administrative controls, such as job rotations and rest or stretch breaks should be implemented into the work processes.

Slips and fall

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 site.

Mitigation Measures

Recommended methods for the prevention of slips and falls from, or on, the same elevation include:

- Good house-keeping practices, such as the sorting and placing loose construction materials in established areas away from foot paths, should be implemented.
- Excessive waste debris and liquid spills should be cleaned up regularly.
- Electrical cords and ropes should be located in common areas and marked corridors.
- Slip retardant footwear should be used.

Struck By Objects

Construction activities of the project 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.

Mitigation Measures

Techniques for the prevention and control of these hazards include:

- Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap.
- Temporary fall protection measures in scaffolds and out edges of elevated work surfaces should be used, such as hand rails and toe boards to prevent materials from beingdislodged.
- Appropriate PPEs such as safety glasses with side shields, face shields, hard hats, and safety shoes, should be wore.

Moving Machinery

Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose 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.

Mitigation Measures

- The location of vehicle traffic, machine operation, walking areas, and controlling vehicle traffic should be planned and segregated through the use of one-way traffic routes,establishment of speed limits, and on-site trained flag-people wearing high-visibility vestsor outer clothing covering to direct traffic.
- The visibility of personnel should be ensured through the use of high visibility vests whenworking in or walking through heavy equipment operating areas as well as training of workers to verify eye contact with equipment operators before approaching the operating vehicle.
- Inspected and well-maintained lifting devices should be used that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.

Other Site Hazards

Construction on site may pose a risk of exposure to dust, chemicals, hazardous or flammable materials, and wastes in a combination of liquid, solid, or gaseous forms.

Mitigation Measures

- Implementation of environmental management plan
- Implementation of project specific plans and other applicable management practices
- Use of waste-specific PPEs based on the results of an occupational health and safety assessment, including respirators, clothing/protective suits, gloves and eye protection.

6.6 Ecological Environmnet

6.6.1 Impact on Flora

There are few trees present at the proposed site of plant. Few herbs & shrubs are also present on site.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Impact on trees	Direct	Short Term	Local	Reversible	Likely	Minor	Low

Mitigation

- The designated green area will be vegetated and native vegetation present on-site will be preserved
- Biodiversity at the site will be maintained by transplanting or culturing endangered or threatened plants such as Sheesham which is under-attack in Asia will be planted at site.

Threats to the aquatic life due to contamination and Generation of effluent

During construction of waste water treatment plant, Solid waste and liquid waste such as oils and lubricants residues are released that may affect nearby water channels. That will ultimately increase pollution due to water contamination associated with solid waste, sedimentation and sewage generated during project activities, these water bodies may lose the aquatic biodiversity as their biological oxygen demand (BOD) and chemical oxygen demand (COD) may increase.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Threats to the aquatic life due to contamination	Direct	Medium Term	Regional	Reversible	Possibly	Moderate	Medium

Mitigation

The impact will be mitigated with best construction management practices to prevent accidental damage to the water resources.

6.7 Impacts and Mitigations Measures During the Project Operation

Contrary to construction, operation related impacts would require more stringent techniques to handle the pollution and contamination owing to the nature and duration of activities. Potential pollution sources from the operational activities related to water treatment plant are:

- Sludge as solid waste
- Wastewater
- Hazardous Chemicals
- Air emissions
- Ecological impacts

6.7.1 Solid Waste

Sludge Production

Sludge formation at sedimentation tanks originate from 3 processes including:

- Removing suspended solids from raw water,
- Chemical flocs caused by addition of coagulant,
- Chemical flocs caused by hardness removal (if necessary)

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Solid waste	Indirect	Short-term	Local	Irreversible	Likely	Minor	Low

Mitigation measures

Sludge will be managed at the proposed treatment plant by:

1. Reducing the volume of sludge through sludge thickener and sludge dewatering systems which will be designed for sludge treatment system.
2. Storing the dried sludge cake in a separate designated place onsite for end disposal.

This will be ensured by adding sludge dewatering and thickening units to the treatment process:

Sludge Thickening Tanks

The purpose of the sludge thickening tank is to increase the solid concentration in the sludge and thus to decrease the volume rate of the sludge. For that purpose, the sludge which comes to the thickening tank will be kept for a longtime and in the meantime the number of solids will be increased via thickening mechanism by draining the water which is squeezed within the sludge flocks.

Sludge Dewatering Building

The belt filter is selected as equipment for the sludge dewatering in the treatment plant. The thickened sludge from bottoms of the sludge thickening tanks via pipes, will be transmitted into the sludge chamber in the sludge dewatering building by gravity. Then it will be lifted to the belt filters by sludge feeding pumps. The solid concentration of the sludge cake will be increased by dosing polyelectrolyte to the sludge. Thus, the sludge cake will be more stable and its volume will be less.

Storage of sludge cake

The sludge cake which is dewatered in the belt filters, will be transmitted by the screw conveyors to the outside of the building and loaded to the containers. The containers which are filled with sludge cake, will be carried to a separate place for storing.

The sludge resulting from treatment plant after treatment and processing is called biosolid and it can be used or disposed according to certain rules.

The 40 CFR Part 503 rule of the USEPA, defines biosolids as the final solid, semisolid, or liquid residue generated during the treatment of domestic sewage in a municipal wastewater treatment plant. Most of the requirements contained in the 40 CFR Part 503 rule were generated based on results from extensive multimedia risk-assessment studies conducted by the USEPA.

According to this rule, the sludge of the wastewater treatment plant after processing and preparation (biosolid) can be disposed of or used in one of the following ways:

1- Land Application:
2- Surface Disposal:
3- Incineration

It should be noted that the sludge from the wastewater treatment plant is toxic if the influent wastewater contains a high concentration of heavy metals that enter the sludge after removal during the treatment process. But due to the very low concentration of heavy metals in the influent wastewater, the sludge and biosolid produced by this treatment plant is not toxic. Therefore, it is recommended that after testing the sludge for selected parameters including heavy metals, it can either be used for land application, disposed at landfill site or disposed through incineration through EPA certified contractor.

Other Solid Wastes

Other operation related waste during the proposed treatment plant includes process residuals, used filtration membranes/ spent media and wastes from office buildings. The process residues will be collected in the sludge. Most of the waste thus generated is non-hazardous in nature.

Mitigation Measures

- Solid waste generation from screening area is generally non-hazardous in nature such as debris, plastic or wood and will be disposed to nearby waste collection unit (waste bins/designated dumping sites).
- If the waste from screening contains appreciable amount of plastic waste, it will be handled by engaging a waste management contractor for its disposal in an environmentally friendly manner.

- Options such as recycling after segregation would be considered depending on the amount of waste generated.
- Regular disposal of screening waste is required to eliminate the risk of accumulation of waste within the treatment facility area.

6.7.2 Wastewater Generation

Following waste streams will be generated during project operation:

1. Wastewater/sewage from office buildings
2. Filter backwash during filter cleaning
3. Supernatant produced from sludge dewatering

Wastewater from Office buildings

Sewage from office buildings will be routed to the sewer lines and will not require additional management measures.

Filter Backwash

Filter back wash will be stored in filter backwash holding tank, and will be sent back to outlet of the aeration tank and will be treated again.

Supernatant from sludge dewatering

The supernatant water produced in the belt filter, will be collected in the return water pumping station near of the sludge dewatering building. Water will be pumped from this unit to the outlet of the aeration tank and will be treated again.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Water waste	Indirect	Short-term	Local	Irreversible	Likely	Minor	Low

Mitigation Measures

In addition to the mitigation plans describe above, some other recommendations on mitigation measures for sludge are given below:

- Leaching of the sludge into the ground should be controlled through efficient handling.
- In order to overcome the problem of groundwater contamination, sludge should be dried in a leak-proof facility.
- Sludge handling should be monitored along with the effluent monitoring.
- Do not store sludge for prolonged periods.

- Ensure prompt sludge dewatering to avoid nuisance due to odors and flies
- In case the sludge is to be kept for some period; ensure it is properly covered and confined
- Adopt containment procedures to avoid spillage of sludge

6.7.3 Odor

In general, most areas of a wastewater treatment facility contain some level of odor. Processes at ETP can produce various odors, the most common of which found include hydrogen sulfide, ammonia, sulfur dioxide, skatoles, mercaptans, amines and indoles.

Odors can be minimized by ensuring adequate plant operations, prevention of leaks, seepages and leachate, periodic cleaning of pre-treatment chambers and adequate and timely disposal of sludge.

6.7.4 Water Contamination

Groundwater contamination due to leachate will not result from the proposed treatment plant operation since the surface water will be treated which generally lacks potentially harmful contaminants such as heavy metals which are often the constituents of sewage.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Water Contamination	Indirect	Short-term	Local	Irreversible	Likely	Minor	Low

Mitigation Measures

- Careful selection of lining material used for interior lining of sedimentation, aeration tanks and other plant equipment and facilities.
- Regular inspection of tanks and basins for structure breakage
- The system for the treatment of the wastewater and effluent production should ensure minimization of leakages of wastewater to groundwater (connections between pipes and tanks should be water-tight)
- Refueling of vehicles and equipment on the site shall be strictly controlled
- Washing of vehicles and equipment on the site shall be restricted

6.7.5 Noise Abatement

Sources of noise during plant operations would include process equipment like pumps, power supply equipment including generators as backup power supply, and genets, exhaust fans etc. it is anticipated that average noise levels in the plant site shall remain between 70-80dBA (within PEQS limits). Some area such as generator rooms, pump room etc. will havesignificant noise levels and will require noise abatement measures to be put in place.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Noise Abatement	Direct	Short Term	Local	Irreversible	Likely	Minor	Low

Mitigation Measures

Noise abatement should be accomplished by using:

- source containment (enclosing noisy equipment in rooms),
- isolating noise sources from other treatment units,
- placing signage to communicate noise hazard to workers and intimating requirement for use of PPE

6.7.6 Chemical Hazard

The proposed facility will consume Polyelectrolytes and Sodium hypochlorite in moderate quantities. These chemicals will be stored in a separate designated area.

To prevent potential health hazards during chemical handling, following mitigation measures are recommended:

- Proper signage including Material Safety Data Sheet (MSDS) should be displayed at the storage area to communicate the hazard.
- PPE should be made mandatory for personnel dealing with these chemicals.
- Adequate First Aid should be available onsite to immediate remedy the affected person.
- Trainings should be imparted to the staff on safe use and handling of these chemicals.

6.7.7 Impact on Flora& Fauna

The physical existence and operations of the plant may generate noise, odour nuisance and fugitive. These issues may scare the birds from nesting around the site.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Impact on Flora & Fauna	Direct	Short Term	Local	Reversible	Likely	Minor	Low

Mitigation Measures

- Tree planting will enhance biodiversity at the site.
- Trees will attract many bird species and other animal species.
- The designated green area will be vegetated and native vegetation present on-site will be preserved

6.7.8 Socio-economic Impacts

In project area, no significant changes are envisaged in the traditional life style and occupation of the local people in residing in the nearby communities. The local people are rather benefited due to the provision of job opportunities. No impact is envisaged due to the influx of the workers as the local will be preferred and hired for working.

Social issues may arise which will cause minor negative impact on the social life style of the people. Moreover, health and safety related issues may arise during the construction activities. These impacts are in-significant can be further reduced significantly by adopting best management practices.

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Impact on Socio Economy	Direct	Short Term	Local	Reversible	Likely	Minor	Medium

Mitigation Measures

- Good relations with the local communities will be promoted by encouraging Contractor to provide opportunities for skilled and un-skilled employment to the locals as well as on-job training
- In the case of not hiring the locals, Contractor will restrict his permanent staff to mix with the locals to avoid any social problems

- The contractor will keep the copy of National Identity Card (CNIC) of his employees and will warn the workers not to involve in any anti-social activities otherwise they may face dire consequences
- At the time of hiring the Contractor has to ensure that the workers should be of good repute
- First aid kits having all the necessary first aid stuff will be available at the site
- Routine medical check-ups of all the field staff including unskilled labor needs to be conducted by qualified physician and surgeon
- Training of workers should be carried out for operating various constructional machinery, safety procedures should be adopted, environmental awareness should be carried out, equip all workers with safety boots, helmets, gloves, protective masks and monitoring of their proper and sustained usage will be carried out. In case of accidents, contractor will provide free medical treatment to the community
- The Contractor will be responsible for the sensitivity towards the local customs and traditions

CHAPTER – 7: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

SECTION - 7: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

This Chapter provides an overall approach for managing and monitoring the environmental issues and describes the institutional framework and reporting mechanism to implement the Environmental Management Plan (EMP) for the proposed CETP. The EMP has been prepared with the following objectives:

- Provide the details of the project impacts along with the proposed mitigation measures, and a corresponding implementation schedule.
- Define the roles and responsibilities of the project proponent, contractor, and supervisory consultants in order to effectively communicate environmental issues among them.
- Frame a monitoring mechanism, reporting frequency, auditing mechanism and identifying monitoring parameters to ensure that all the mitigation measures are completely and effectively implemented.
- Define the requirements necessary for documenting compliance with EMP and communicating it to all the concerned regulatory agencies.

7.1 Mitigation Management Matrix (MMM)

This mitigation management matrix identifies the environmental impacts of the installation of CETP during the construction and operation stages and establishes the linkages between the environmental and social impacts, mitigation management strategy, control and the persons responsible for execution. The MMM presented in Table 7-1 identifies the following:

- The impact of the activity and objective to minimize the impact
- Management strategy in order to reduce or eliminate the impact
- The person/organization directly responsible for adhering to or executing the required mitigation measures.
- The person/organization responsible for ensuring and monitoring adherence to the mitigation measures.
- Performance indicators with corrective action.
- The parameters which will be monitored to ensure compliance with the mitigation measures.
- The timing at which the mitigation or monitoring has to be carried out constructional phase.

Table 7-1, Environmental Management Plan (Mitigation Matrix)

Sr. No.	Affected areas	Possible Mitigation Measures	Responsibility	Duration (stage)
Construction phase				
1.	Soil contamination and erosion	• The project should be scheduled to avoid or minimize work during heavy rainfall periods (i.e., during the dry season) or windy days to the extent practical. • After construction activities, the site which is cleared temporarily should be re-vegetating promptly. • Off-site sediment transport should be reduced or prevented by the use of settlement ponds, silt fences, water treatment, as well as modifying or suspending activities during extreme rainfall and high winds to the extent practical. • The environmental impact of soil erosion can best be mitigated by removing vegetative cover only from the specific site on which construction is to take place and by disturbing the vegetation in adjacent areas as little as possible.	Construction Contractor & QEPB Proponent	At the time of construction
2.	Construction Waste	• EMP should be implemented to control the impacts of waste generation. • The construction waste which will be sent for recycling like damage pipes left over steel, wooden and plastic pieces. • The construction material will be kept in a cover place, especially during the precipitation season. • Various waste containers for different types of waste will be deployed onsite. The waste bins will be properly marked for each type of waste produced during the constructional activities. • The project area will contain the sewage and litter facility to overcome the problem of unchecked dumping of waste.	Construction Contractor & QEPB Proponent	During construction

Sr. No.	Affected areas	Possible Mitigation Measures	Responsibility	Duration (stage)
3.	Ambient Air Quality	• For control of air pollution during construction work, following measures are recommended: • Minimizing dust from open area sources 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. • PPEs, such as dusk masks, should be used where dust levels are excessive. • Avoiding open burning of solid. • Sprinkling of water and fine spray from nozzles to suppress the dust. • On-Road- Inspection should be done for black smoke generating machinery. • Use of cleaner fuel should be done. • Vehicles having pollution under control certificate may be allowed to supply the construction material to the project site. • Use of covering sheets should be done for trucks to prevent from dust dispersion caused through the trucks.	Construction Contractor & QEPB Proponent	During construction
4.	Wastewater Generation	• Careful management of construction work is necessary to ensure water is not wasted. • Where possible, the construction wastewater should be reused after initial treatment (if required such as sedimentation). • Washing of vehicles and construction machinery should be avoided if possible or be done in a designated area. • Wastewater generation will be minimized by controlling the pollutant at the source. • Regular monitoring of the wastewater generation will be taken	Construction Contractor & QEPB Proponent	At time of construction

Sr. No.	Affected areas	Possible Mitigation Measures	Responsibility	Duration (stage)
		into consideration. • Adequate Potable or permanent sanitation facilities serving all workers should be provided at all construction sites.		
5.	Noise & Vibration	• The activities associated with greatest potential to generate noise should be planned during the day period that will result in least disturbance to the nearby residents. • Noise control devices should be used such as temporary noise barriers and deflectors for impact activities.	Construction Contractor & QEPB Proponent	At time of construction
6.	Occupational Health and Safety Issues of construction work	• Workers should be trained with lifting and materials handling techniques before the construction of the project, including the placement of weight limits above which mechanical assists or two person lifts are necessary. • Work site layout should be planned to minimize the need for manual transfer of heavy loads. • Tools should be selected and work stations would be designed to reduce force requirements and holding times, which promote improved postures, including, where applicable, user adjustable work stations • Administrative controls, such as job rotations and rest or stretch breaks should be implemented into the work processes.	Construction Contractor & HSE Officer	As and when required
7.	Impact on Flora	• The designated green area will be vegetated and native vegetation present on-site will be preserved • Biodiversity at the site will be maintained by transplanting or culturing endangered or threatened plants such as Sheesham which is under-attack in Asia will be planted at site.	Construction Contractor & QEPB Proponent	At time of construction
Operational phase				
8.	Solid Waste (Sludge Production)	**Sludge** • Reducing the volume of sludge through sludge thickener and sludge dewatering systems which will be designed for sludge	QEPB Proponent & HSE Manager	During Operation

Sr. No.	Affected areas	Possible Mitigation Measures	Responsibility	Duration (stage)
		treatment system. • Storing the dried sludge cake in a separate designated place onsite for end disposal.		
9.	Wastewater Generation	• Leaching of the sludge into the ground should be controlled through efficient handling. • In order to overcome the problem of groundwater contamination, sludge should be dried in a leak-proof facility. • Sludge handling should be monitored along with the effluent monitoring. • Do not store sludge for prolonged periods. • Ensure prompt sludge dewatering to avoid nuisance due to odors and flies • In case the sludge is to be kept for some period; ensure it is properly covered and confined • Adopt containment procedures to avoid spillage of sludge.	QEPB Proponent & HSE Manager	During Operation
10.	Odor	• Careful selection of lining material used for interior lining of sedimentation, aeration tanks and other plant equipment and facilities. • Regular inspection of tanks and basins for structure breakage • The system for the treatment of the wastewater and effluent production should ensure minimization of leakages of wastewater to groundwater (connections between pipes and tanks should be water-tight) • Refueling of vehicles and equipment on the site shall be strictly controlled • Washing of vehicles and equipment on the site shall be restricted.	QEPB Proponent & HSE Manager	During operation
13.	Chemical Hazard	• Proper signage including Material Safety Data Sheet (MSDS) should be displayed at the storage area to communicate the	HSE Officer	During operation

Sr. No.	Affected areas	Possible Mitigation Measures	Responsibility	Duration (stage)
		hazard. • PPE should be made mandatory for personnel dealing with these chemicals. • Adequate First Aid should be available onsite to immediate remedy the affected person. • Trainings should be imparted to the staff on safe use and handling of these chemicals.		
14.	Impact on Flora & Fauna	• Tree planting will enhance biodiversity at the site. • Trees will attract many bird species and other animal species. • The designated green area will be vegetated and native vegetation present on-site will be preserved	QEPB Proponent & HSE Manager	During operation
15.	Socio-economic Impacts	• Good relations with the local communities will be promoted by encouraging Contractor to provide opportunities for skilled and un-skilled employment to the locals as well as on-job training • In the case of not hiring the locals, Contractor will restrict his permanent staff to mix with the locals to avoid any social problems • The contractor will keep the copy of National Identity Card (CNIC) of his employees and will warn the workers not to involve in any anti-social activities otherwise they may face dire consequences • At the time of hiring the Contractor has to ensure that the workers should be of good repute • First aid kits having all the necessary first aid stuff will be available at the site • Routine medical check-ups of all the field staff including unskilled labor needs to be conducted by qualified physician and surgeon • Training of workers should be carried out for operating various	HSE Department/HSE Officer	During operation

Sr. No.	Affected areas	Possible Mitigation Measures	Responsibility	Duration (stage)
		constructional machinery, safety procedures should be adopted, environmental awareness should be carried out, equip all workers with safety boots, helmets, gloves, protective masks and monitoring of their proper and sustained usage will be carried out. In case of accidents, contractor will provide free medical treatment to the community • The Contractor will be responsible for the sensitivity towards the local customs and traditions		

7.2 Implementation of EMP

The main parties involved in the implementation and management of EMP will be as follows:

- Proponent
- Construction Contractor (CC)
- HSE Department

7.3 Schedule of Implementation and environmental Budget

The completion duration for the installtion of CETP is about one year (12 months).

7.3.1 Preconstruction Phase

This phase includes:

- Site investigation & Evaluation
- Budgeting
- Design
- Schedules of working
- Obtaining all relevant NOC

7.3.2 Construction Phase

This phase includes:

- Management team & Construction Crew
- Excavation
- Installation of plant as per design
- Mitigation process
- Amenities and Development
- Managing safety
- Monitoring & Evaluation

7.3.3 Environmental Budget

The cost required to effectively implement the mitigation measures is important for the sustainability of the project both in the construction and operation phases. These costs are summarized below:

Table 7-2, Environmental Mitigation, Monitoring and Training Cost

Components	Quantity	Frequency	Responsibility	Duration	Cost (Rs.)
	(No. of samples x No. of Locations x Frequency				
A) Construction Phase (12 months)					
Ambient Air Quality	1x1x4= 4	Quarterly @ Rs. 40,000 per sample	CC and PS	24 hours	160,000/-
Noise Level	1x1x4= 4	Quarterly @ Rs. 1,000 per point	CC and PS	24 hours	4,000/-
Drinking Water Quality	1x1x4= 4	Quarterly @ Rs. 16,000 per sample	CC and PS	Grab	64,000/-
Total (A)					**228,000/-**
B) Operational Phase					
Ambient Air Quality	1x1x4= 4	Quarterly @ Rs. 40,000 per sample	QABP	24 hours	160,000/-
Noise Level	1x1x4= 4	Quarterly @ Rs. 1,000 per point	QABP	24 hours	4,000/-
Drinking Water Quality	1x1x4= 4	Quarterly @ Rs. 16,000 per sample	QABP	Grab	64,000/-
Surface Water Quality	1x1x4= 4	Biannually @ Rs. 12,000 per point	QABP	Grab	48,000/-
Total (B)					**276,000/-**
Grand Total					**504,000/-**

CC = *Construction Contractor*
PS = *Plant Supervisor*
QABP = *Quaid-e-Azam Business Park*

7.4 Roles and Responsibilities

The key organizations mentioned in the following roles and responsibility during the construction and operation stages:

7.4.1 Construction stage

During the construction stage, Construction Contractor (CC) will be mainly responsible for the execution of the mitigation measures. Plant Supervisory (PS)/HSE Department will be responsible for the monitoring of the compliance with top supervision by the QABP. The Plant Supervisory will submit regular Environmental Compliance Report to QABP and PAK- EPA.

7.4.2 Operation stage

During the operational stage of the project, role of CC and PS will gradually decrease. During this phase of the project, implementation of recommendations of EMP and its supervision will be the responsibility of QABP with supervision of other Government Departments as defined in monitoring plan.

7.5 Environmental Monitoring Plan

The objectives of the environmental monitoring during the construction and operation stages are as follows:

- To check compliance with the requirements of the EMP by monitoring activities of the project contractors. This will be called Activity Monitoring.
- To monitor actual impacts of the project activities on physical, ecological and socioeconomic receptors that any impacts not anticipated in the EMP or impacts which exceed the levels anticipated in the EMP can be identified and appropriate mitigation measures can be adopted in time. This objective will be achieved through effects monitoring.
- To achieve these objectives, the aforementioned monitoring plan will be implemented.

Table 7-3, Monitoring Plan

MonitoringAreas	Location of monitoring	Parameters and techniques tomonitor	Monitoring Frequency	Reason to monitor parameter	Responsibility
During Construction					
Noise	Generators	Noise levels in dB(A) Vibration meter (mils/sec)	Quarterly	Legal compliance Ensure structural safety	HSE Officer
Air Emissions	Exhausts of generators and vehicles	Composition of exhaust flue gases: • CO, NOx, SOx, Particulate matter(mg/Nm^3) • Noise, smoke and CO for vehicles	Quarterly	Legal compliance	HSE Officer
Wastewater disposal	Discharge pump	As per PEQS effluent standards	Quarterly	Legal compliance	Plant Supervisor HSE Officer
Ambient Air quality	CETP premises	Parameters as per PEQS	Quarterly	Legal Compliance	HSE Officer
Occupation Hazard	CETP premises	• Working practices Use of PPE • Safety of work place • Identification of hazard and hazard control measures	Daily during operations	HSE safety Legal compliance	HSE Department
During Operation					
Monitoring Areas	Location of monitoring	Parameters and techniques to monitor	Monitoring Frequency	Reason to monitor parameter	Responsibility
Noise	Standby Generators (whenoperational)	Noise levels in dB(A) Vibration meter (mils/sec)	Quarterly	Legal compliance Ensure structural safety	HSE Officer
Ambient Air quality	CETP premises	All parameters as per PEQS	Quarterly	Legal Compliance	HSE Officer

MonitoringAreas	Location of monitoring	Parameters and techniques tomonitor	Monitoring Frequency	Reason to monitor parameter	Responsibility
Treated effluent	Final outfall of plant	All 32 parameters as per PEQS	Monthly	To optimize and conservewater use Legal compliance	Plant Supervisor HSE Officer
Untreated influent	Inlet of CETP	All 32 parameters as per PEQS	As required	Legal Compliance	HSE Officer
Occupation Hazard	CETP premises	• Working practices Use of PPE • Safety of work place • Identification of hazard and hazard control measures	Periodically duringoperations	HSE safety Legal compliance	HSE Department
Sludge storage anddisposal	CETP premises	Visual inspection, maintenance ofdisposal records	Periodically duringoperations	Environmental aspect	HSE Department

7.6 Propose EMP Reporting and Reviewing Procedure

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

- EIA Report & File Submission
- SIR Letter
- Review of EIA 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

7.7 Training Program

Necessary training on environmental and other safety issues will be provided to the technical and supporting staff before start of activities to ensure that all the staff is well acquainted with the nature of job, inherent risks, hazards, requirements of job safety and EMP. The HSE Manager will determine the training requirements.

During the training, the following areas of knowledge and experience are considered essential:

- Understanding the properties (e.g., flammability, corrosiveness, toxicity, reactivity) of hazardous substances, as well as the levels at which they pose a significant danger requiring protective measures.
- Awareness of early-warning indicators, hazards/risk identification, and ability to recognize potentially hazardous situations.
- Familiarity with engineering controls to avoid occurrence of hazardous situations.
- Familiarity with capabilities and limitations of the facility to respond to hazardous emergencies: ventilation system, plumbing systems, shut-off systems, containment devices, and emergency response procedures.
- Knowledge of the use and maintenance of emergency response equipment, as well as routine equipment for health and safety monitoring and protection.

- Knowledge of methods and procedures for decontaminating equipment, and facility, following potential chemical contamination.

Records of all trainings should be maintained. It is recommended that in case of any undesirable event or emergency situation, a follow-up session should be arranged to review the weaknesses ad gaps in the existing system and possible reasons which caused the event. This would enable the management in keeping such events from recurring by placing additional and more efficient controls.

7.7.1 Training Plan

A detailed training plan incorporating the international Occupational Health and Safety Guidelines (such as those of OHSA) shall be developed by the HSE department for the operational phase to effectively meet all training requirements of the concerned personnel. As a prerequisite of EMP implementation, all workers (construction workers as well as operators of proposed treatment plant) will receive training in:

- The use of personal protective equipment (including dust masks, face shields, safety shoes, safety glasses, clothing/protective suits, gloves, eye and ear protection, respirators)
- to protect them against smoke, odors, dust, fumes, noise, chemicals and oxygen deficiency;
- Reading and understanding of MSDS (that will enable the workers to use and store chemicals in a safe and responsible manner);
- Confined Space Entry procedures, emergency response (to deal with fire, accidental chemical releases, medical emergencies etc.), safety practices and evacuation procedures.

The HSE Officer will determine the training requirements of the staff working in the proposed treatment

CHAPTER – 8: PUBLIC & STAKEHOLDERS CONSULTATION

SECTION - 8: PUBLIC & STAKEHOLDERS CONSULTATION

8.1 General

The participation of project stakeholders in project planning, design and implementation is now universally recognized as an integral part of environmental & social impact assessment. Local communities, their representatives, government departments, national and international NGOs and the civil society at large may all be able to contribute to and benefit from, the dialogue directed at identifying and resolving key project-related issues. Stakeholder consultation has become an important requirement of the EIA study after the enactment of the guidelines for public consultation under the Pakistan Environmental Protection Act (PEPA) 1997. After the 18th Amendment to the Constitution, the Government of Sindh passed the Sindh Environmental Protection Act 2014, which also stresses the importance of engaging with the concerned primary and secondary stakeholders during the EIA study.

The proposed project "Combined Effluent Treatment Plant" will be a modern plant planned to be used for treating waste water of the nearby industries. The project is planned to be constructed on land area of about 634 hectares (1896 acres), is located at about 6 km North-East of Sheikhupura City and is adjacent to the Lahore-Islamabad Motorway (M2), at a distance of about 3.5 km from Sheikhupura Interchange. New developments in the area will change the overall landscape and can create both challenges and opportunities for the existing and new residents and businesses in the area.

While in the short-term, the impacts might be felt only in the microenvironment of the project, in the long-term, the impacts may also spread to other nearby neighborhoods and activities including traffic management, the swift passageway for fire tenders and ambulance and stress on existing utilities. Instead of these perceived impacts, meaningful engagement with the project stakeholders has been carried out to identify the potential positive and negative impacts, assess the magnitude of these impacts from a social perspective and prescribe solutions for the construction and operations phase of the proposed project.

8.2 Proponent Environmental Management Team

HSE Team will be taking charge of the proposed project. They will be managing health and safety issues as well as issues to employees and locals. The staff will include:

Sr. No.	Designation	Sr. No.	Designation
1.	HES Manager	5.	Fire Man
2.	Safety Supervisor	6.	Fire Man
3.	Safety Officer	7.	Fire Man
4.	Fire Chief	8.	Fire Man

8.3 Responsible Authority

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

8.4 Other Department and Agencies

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.

The project has direct impacts on any individual; therefore, so primary stakeholders are identified. Secondary stakeholders are institutional stakeholders, which includes Project Proponent, local Government representatives, and Government officials of the relevant departments, NGO, general public, local residents, shop keepers, vendors, hospital owners/staff, teachers, pedestrians, and businessmen/traders of the city. The categories of the stakeholders who provided useful feedback, included:

- Project Proponent
- Government officials
- Environmental practitioners and experts
- Teachers/students
- Shopkeepers

All those stakeholders have different types of stakes according to their involvements in various aspects of the Project. The consultant tried to contact all the stakeholders and shared their views and concerns and also interacted with the community-based organizations that can support the community.

8.5 Environmental Practitioner and expert

The project involves stakeholders from various segments of the society, who have direct or indirect interest in the developmental activity. The Environment and Social team have endeavoured to hold consultative sessions with a number of prominent stakeholders (Project Proponent, Government departments, line agencies, NGOs 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 EIA/ EMMP.

8.6 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 8-1, Summary of issues and commitments by Proponent

Issue	Aspect / Concern raised by Stakeholders	Project Proponent Commitments
Employment Opportunities	• Expectations of employment are very high. Job opportunities are less for herders as they generally have less skills and training.	• Employment is the main priority of the industry. Mostly locally skill and unskilled labor will be prioritized and also there will be job in executive level. • Max. persons according to the requirement will be employed by the industry.
Training Opportunities	• People are keen to consult with subject industry if the Project offers training and upgrading opportunities to enhance their trade or professional skills.	• Development of the Training Strategy, including commitment of allocation of budget investment for training infrastructure, delivery and design. • Installation of training facilities in for worker of the company and students will also be accommodate.
Health & safety	• Health and safety issues may be arising due to industrial and constructional activity.	• All possible safety measures will be taken during operation and construction phase. • Akbari Chemical Industry will designate teams for HSE concern emergency equipment like fire extinguishers, spill kits, water hydrant system, effective use of PPEs and first aid are already well managed.
Local economy and business	• Local service providers are keen to participate in	• Proponent has main focus that they will all the

Issue	Aspect / Concern raised by Stakeholders	Project Proponent Commitments
development	providing services to provide raw material and expect to receive in order to adjust their businesses to meet specific needs.	material regarding construction to buy from the local market. • This will help the local and small business and to people who are keen interested to become suppliers.
Environmental Issues	• Dust and noise impacts, particularly from the construction activities and in operation of mechanically unfit machines, are of concern to nearby residents. • Environmental degradation during construction.	• Implementation of controls under the Environmental Management Plans, including on and off-site dust and noise monitoring. • A Participatory Environmental Monitoring Program will be launched to spread awareness.
Water quantity and quality	• Water quality and quantity, and impacts from the wastewater disposal are all key concerns for nearby community.	• Implementation of consultation in relation to water use, recycle and development of the Participatory Environmental Monitoring Program.

CHAPTER – 9: CONCLUSIONS AND RECOMMENDATIONS

SECTION - 9: CONCLUSIONS AND RECOMMENDATIONS

The establishment of the proposed CETP is intended to resolve the Industrial Effluent Treatment issues in QABP located at about 6 km North-East of Sheikhupura City.

In view of the current environmental legal framework, the proposed development needs to be evaluated for its potential environmental impacts on the ambient environment. For this purpose, a detailed Environmental Impact Assessment Study was conducted. During the EIA study, potential environmental impacts of the project were investigated during the EIA and appropriate mitigation measures were also suggested, the implementation of which shall effectively minimize the environmental concerns related to the project.

The study was conducted so as to cover all the aspects of the project (such as project location, construction and operations) and their anticipated impacts. The study was comprehensive and was carried out in accordance with national legislative requirements.

The environmental, socioeconomic data collected through secondary and primary sources was reviewed to assess the potential impacts of the proposed activities. The project site is a calm environment with fair air quality due to limited sources of air emissions and presence of agriculture activity in the area. The major current sources of air emissions are vehicular traffic and dust emissions from unpaved roads.

Based on the detailed impact assessment carried for the CETP, the consultant recommends that:

- The structures and materials for the proposed treatment plant should conform to recommended standards and follow standard practice of civil works.
- Environmentally sound materials and goods are selected, with priority being accorded to products meeting national and international standards.
- Temporary inconveniences due to construction works are minimized through planning and coordination with local population and organizations in the neighbourhood.
- A reverse osmosis (RO) will be installed on project site. RO reduces TDS by forcing water through a fine membrane with microscopic pores, eliminating even the smallest particles.
- For control of potential environmental impacts, the EMP provided in the report should be implemented in its essence to ensure sound environmental management during the project.

This EIA Study finds that the value-addition characteristics of proposed treatment plant would respond to the principles of sustainable development that aim at "socially equitable and economically viable development to improve the quality of life for all citizens of the Earth, without altering the balance in the ecosystem".

The Study therefore recommends that the EIA Report should be approved with the provision that the suggested mitigation measures will be adopted and the Environmental Management.

ANNEXURES

ANNEXURE - 1: GLOSSARY

ANNEXURE - 1: 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

ANNEXURE – 2: LIST OF ABBREVIATIONS

ANNEXURE - 2: LIST OF ABBREVIATIONS

Words	Abbreviation
PEPA	Punjab Environmental Protection Act
PEQS	Punjab Environmental Quality Standards
EMP	Environmental Management plan
CWTF	Combined Effluent Treatment Plant
Pak-EPA	Pakistan Environmental Protection Agency
W.H.O	World Health Organization
PET	Punjab Environmental Tribunal
SWM	Solid Waste Management
CSR	Corporate Social Responsibility
MSWs	Municipal Solid Wastes
PPEs	Personal protective equipment's
PM	Particulate matter
OHS	Occupational Health and Safety
SOPs	Standard Operating Procedure
PS	Plant Supervisor
CC	Construction Contractor
HSE	Health Safety and Environment

ANNEXURE - 3: REFERENCES

ANNEXURE - 3: REFERENCES

1. Rainfall and Other Data from Pakistan Metrological Department, Regional office Lahore.
2. Topographic Surveys
3. Punjab-EPA Guidelines
4. Schedule I of Punjab Environmental Protection Act 1997 (Amended 2012)
5. Section 12 of Punjab Environmental Protection Act 1997 (Amended 2012)
6. Pakistan Environmental protection act 1997
7. Punjab Environmental Protection Act 1997 (Amended 2012)

ANNEXURE - 4: EIA TEAM

ANNEXURE - 4: EIA TEAM

Sr. No.	Team Member	Position Held	Qualifications
1	Aleem Butt	Chief Environmentalist Team Leader- EIA	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	Ayesha Rasheed	Environmentalist	M.Phil Environmental Sciences, Government College University (GCU), Lahore
4	Asma Butt	Sociologist	M.Sc. Sociology, University of the Punjab, Lahore

ANNEXURE – 5: PROJECT IMPACT MATRIX

ANNEXURE - 5: PROJECT IMPACT MATRIX

Project Impact Matrix																															
Environmental Component → / Project Component ↓	Physical, Ecological and Social Environment																														
	Land Acquisition	Downstream Water Users	Air Quality	Noise	Soil Contamination	Aesthetic	Liquid and Solid Waste	Material Quarries and 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	Employment Opportunities	Economic Uplift
A. Planning & Design Phase	1	2	3	4	5	8	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Land Use	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	-1	0	0
Communities	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	0	0	0	0	0
Land Acquisition	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	0	0	0	0	0
Protected areas and Heritage sites	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	0
Hydrology.	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	0	0	0

B. Construction Phase	1	2	3	4	5	8	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Soil contamination and erosion	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	0	1	3
Construction Waste	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	0
Ambient Air Quality	0	0	-1	-1	-2	-1	-1	0	0	0	0	0	0	0	0	0	0	-2	0	0	-1	0	0	0	0	0	0	0	0	0
Wastewater Generation	0	0	-2	-2	-1	-1	-1	0	0	0	0	-2	-1	-1	-1	0	-1	-1	0	-1	-1	0	0	0	0	0	0	0	1	1

Noise & Vibration	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	0
Occupational Health and Safety Issues of construction work	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	0
Ecological Environmnet	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	0
C. Operational Phase	1	2	3	4	5	8	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Solid Waste (sludge)	0	0	-1	-1	-1	0	-1	0	0	0	0	0	0	0	0	0	-1	-1	-1	0	1	-1	0	0	0	-2	0	0	0	0
Wastewater generation & Contamination	0	0	-1	-1	0	0	-1	0	0	0	-1	-1	0	0	0	0	0	-1	-1	0	1	-1	0	0	0	-2	0	-1	0	0
Oduor	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	0
Noise Abatement	0	0	-1	-1	-1	0	-1	0	0	0	0	0	0	0	0	0	-1	-1	-1	0	1	-1	0	0	0	-2	0	1	0	0
Chemical Hazard	0	0	-1	-1	-1	0	-1	0	0	0	0	0	0	0	0	0	-1	-1	-1	0	1	-1	0	0	0	-2	0	1	0	0
Impact on Flora & Fauna	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	3
Socio-economic Impacts	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	3

Beneficial		Impact Significance		Adverse
1		Low		-1
2		Medium		-2
3		High		-3

0	**Insignificant or no impact**

ANNEXURE – 6: CHECKLIST

ANNEXURE - 6: CHECKLIST

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	--	--	-	-
B	Primary Pollutants	0	--	--	-	-
C	Secondary Pollutants	0	-	--	0	-
D	Noise	0	--	--	-	-
E	Vibration	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	-	-	-	-

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
	Quantity	0	-	-	-	-
	Potential Extraction	0	-	-	-	-
	Usage	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	-
B	Soil	0	-	0	0	-
C	Major Land use	0	0	0	0	0
5	**Ecological Environment**					
A	Terrestrial Ecology	-	--	0	-	+
	Flora	-	--	0	-	+
	Fauna					
B	Aquatic Ecology	0	--	0	-	0
	Aquatic Flora	0	--	0	-	0
	Aquatic Fauna	-	--	0	-	+
	Fisheries	0	0	0	0	0
C	Wildlife	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
D	Social Equity	0	0	0	0	0
E	Settlement Patterns	0	-	0	0	0
F	Land Holdings & Titling	0	0	0	0	++
G	Common Resource Rights	0	0	0	0	0
H	Fish	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
I	Wood	0	0	0	0	0
J	Grazing	0	0	0	0	0
K	Fodder	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
O	Health	0	-	--	0	-
P	Waterborne Disease	0	0	0	0	0
Q	Common Diseases	0	-	--	0	0
R	Mental Health	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	-
X	Landscape	0	-	-	0	-
Y	Livelihood	0	--	0	0	-
Z	Agriculture	0	0	0	0	0
	Livestock	0	0	0	0	0
	Forestry	0	0	0	0	0
	Fisheries	0	0	0	0	0
	Industry	0	0		++	++
	Other Cash Income	0	+	+	+	++
7	**Transport, Infrastructure & Communication**					
A	Roads	0	-	-	0	-
B	Tracks	0	-	-	0	-
C	Bridges	0	0	0	0	-
D	Pedestrian Tracks	0	-	+	0	
E	Navigation	0	0	0	0	0
F	Energy and Power	0	-	-	0	-
G	Telecommunication	0	0	0	0	++
8	**Natural Risks and Hazards**					
A	Earthquake	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
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	--	--	-	-
H	Pollution	0	--	--	-	--
I	Social Instability	0	0	0	0	+
J	Economic Instability	0	0	+	0	++
K	Political Instability	0	0	0	0	0
9	**External Constraints**	**0**	**0**	**0**	**0**	**0**
A	Upstream Constraints	0	0	0	0	0
B	Upstream Impacts	0	0	-	0	0
C	Downstream Constraints	0	0	-	0	0
D	Downstream Impacts	0	0	0	0	0

ANNEXURE – 7: BASE LINE ENVIRONMENTAL MONITORING

ANNEXURE - 7: BASELINE ENVIRONMENTAL MONITORING

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BASELINE ENVIRONMENTAL MONITORING & ANALYSIS REPORT

CONSTRUCTION OF COMBINED EFFLUENT TREAMTMNET PLANT (CETP) FOR QUAID-E-AZAM BUSINESS PARK (QABP), SHEIKHUPURA

- Ambient Air Monitoring
- Noise Level Monitoring
- Ground Water Analysis

Reference No.: AES-ENV-QB-098/2023 | Dated: 26 October, 2023

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Location for Ambient Air Monitoring-01

NEAR PROPOSED PLANT SITE

Sheikhupura

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Ambient Air Monitoring Report

Monitoring Details

Reference Number	AES-ENV-QB-098/2023-AA-01	**Monitoring Point**	Near Proposed Plant Site, Sheikhupura
Date of Monitoring	17-10-2023 to 18-10-2023	**Monitoring Coordinates**	31°44'16" N 74°2'15" E
Validation Officer	Mr. Muhammad Ajmal (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	13:00	1.94	19.51	42.27	61.69	45.77
2	14:00	1.96	20.85	41.50	62.27	46.83
3	15:00	1.97	22.19	40.35	62.46	48.43
4	16:00	2.03	22.76	39.59	62.27	49.23
5	17:00	2.08	24.10	39.02	63.03	47.63
6	18:00	1.99	25.05	57.18	82.13	44.97
7	19:00	1.87	26.58	37.29	63.79	43.90
8	20:00	1.85	24.67	36.53	61.12	46.57
9	21:00	1.91	23.14	35.76	58.83	47.63
10	22:00	1.82	21.99	34.62	56.54	48.96
11	23:00	1.73	21.42	33.47	54.82	50.82
12	00:00	1.71	20.08	32.32	52.33	49.23
13	01:00	1.66	17.60	46.86	64.37	26.93
14	02:00	1.61	16.64	48.20	64.75	27.30
15	03:00	1.65	16.07	48.96	64.94	28.10
16	04:00	1.59	14.92	50.68	65.51	29.88
17	05:00	1.71	13.20	52.40	65.51	30.65
18	06:00	1.77	14.34	50.49	64.75	31.11
19	07:00	1.72	15.11	49.34	64.37	31.90
20	08:00	1.66	16.45	47.62	63.99	33.15
21	09:00	1.73	17.98	46.09	63.99	34.49
22	10:00	1.82	18.93	45.33	64.18	36.06
23	11:00	1.85	19.89	44.37	64.18	36.61
24	12:00	1.91	19.48	43.41	62.82	39.39
Average Concentration		1.82	19.71	43.49	63.11	39.81

Monitored By

Reviewed By (TM)

Approved By (QM/Chief Chemist)

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Ambient Air Monitoring Report

Monitoring Details

Reference Number	AES-ENV-QB-098/2023-AA-01	**Monitoring Point**	Near Proposed Plant Site, Sheikhupura
Date of Monitoring	17-10-2023 to 18-10-2023	**Monitoring Coordinates**	31°44'16" N 74°2'15" E
Validation Officer	Mr. Muhammad Ajmal (Research Officer Punjab EPA)		

Parameters	Units	Monitoring Duration	LDL	Average Obtained Concentration	PEQS	Remarks
Nitrogen Dioxide (NO_2) *	µg/m³	24Hours	1.00	43.49	80.0	Optimal
Nitrogen Oxide (NO)*	µg/m³	24Hours	1.00	19.71	40.0	Optimal
NO_x*	µg/m³	24Hours	1.00	63.11	120.0	Optimal
Sulphur Dioxide (SO_2) *	µg/m³	24Hours	1.00	39.81	120.0	Optimal
Carbon Monoxide (CO) *	mg/m³	24Hours	0.01	1.82	05.0	Optimal
Particulate Matter (PM_{10}) *	µg/m³	24Hours	1.00	94.01	150	Optimal
Particulate Matter ($PM_{2.5}$) *	µg/m³	24Hours	1.00	22.64	35	Optimal
Total Particulate Matter (TSP)	µg/m³	24Hours	1.00	140.03	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-QB-098/2023-AA-01	Monitoring Point	Near Proposed Plant Site, Sheikhupura
Date of Monitoring	17-10-2023 to 18-10-2023	Monitoring Coordinates	31°44'16" N 74°2'15" E
Validation Officer	Mr. Muhammad Ajmal (Research Officer Punjab EPA)		

Sr. No.	Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
1	13:30	31	SE	1.02	40	757.70
2	14:30	32	E	1.04	40	757.50
3	15:30	33	E	1.04	41	757.70
4	16:30	32	E	1.08	40	757.90
5	17:30	31	E	2.11	41	758.20
6	18:30	31	E	1.14	40	757.80
7	19:30	30	NE	1.19	41	757.40
8	20:30	30	NE	1.24	42	757.10
9	21:30	29	NE	1.18	43	756.70
10	22:30	28	NE	1.14	43	756.30
11	23:30	27	E	1.09	42	755.90
12	00:30	26	E	1.06	43	755.60
13	01:30	26	NE	1.02	44	755.30
14	02:30	26	NE	0.99	44	754.90
15	03:30	25	NE	0.9	45	754.40
16	04:30	26	NE	0.8	44	753.90
17	05:30	27	E	0.7	45	753.50
18	06:30	27	E	0.9	46	753.10
19	07:30	27	E	1.02	47	752.70
20	08:30	28	E	1.04	43	753.90
21	09:30	29	SE	1.03	42	754.70
22	10:30	29	SE	1.03	41	755.60
23	11:30	30	SE	1.04	40	756.90
24	12:30	30	SE	1.02	39	757.40

Monitored By

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Noise Monitoring Report

Monitoring Details			
Reference Number	AES-ENV-QB-098/2023-AA-01	Monitoring Point	Near Proposed Plant Site, Sheikhupura
Date of Monitoring	17-10-2023 to 18-10-2023	Monitoring Coordinates	31°44'16" **N** 74°2'15" **E**
Validation Officer	Mr. Muhammad Ajmal (Research Officer Punjab EPA)		

Sr. No.	Time	Noise dB(A)		PEQS
1	13:30	67		
2	14:30	67		
3	15:30	67		
4	16:30	68		
5	17:30	68	Day Time	75
6	18:30	69		
7	19:30	69		
8	20:30	69		
9	21:30	68		
10	22:30	**67**		
11	23:30	65		
12	00:30	64		
13	01:30	63		
14	02:30	62	Night Time	65
15	03:30	61		
16	04:30	60		
17	05:30	59		
18	06:30	58		
19	07:30	57		
20	08:30	57		
21	09:30	56	Day Time	75
22	10:30	57		
23	11:30	59		
24	12:30	62		

Note: The values exceeding PEQs are in bold.

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GROUND WATER ANALYSIS REPORT

Sample Detail

Reference No.	AES-ENV-QB-098/2023-GW-69	**Reporting Date**	26-10-2023
Nature of Sample	Ground Water	**Sampling Method Reference**	AES/LMS/QSP-014
Grab/Composite	Grab	**Sample Collected by**	AES
Sampling Date	18-10-2023	**Sample Receiving Date**	18-10-2023
Analysis Completion Date	25-10-2023	**Lab Temp & Humidity**	25.9 °C & 53%
Ambient Temperature & Humidity at the Time of Sampling			29°C & 51%
Sample ID	AES-ENV-GW-69/2023	**Sampling Location**	Main Office
Clint Details	Construction of Combine Effluent Treatment Plant (CETP)	**Validation Officer**	Mr. Muhammad Ajmal (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	**9.61**	N.A.	High
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	300	± 1.79	Optimal
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	768	± 8.02	Optimal
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.67	± 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	37	± 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	0.41	± 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	5.88	± 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

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26-10-2023

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GROUND WATER ANALYSIS REPORT

Sample Detail

Reference No.	AES-ENV-QB-098/2023-GW-69	Reporting Date	26-10-2023
Nature of Sample	Ground Water	Sampling Method Reference	AES/LMS/QSP-014
Grab/Composite	Grab	Sample Collected by	AES
Sampling Date	18-10-2023	Sample Receiving Date	18-10-2023
Analysis Completion Date	25-10-2023	Lab Temp & Humidity	25.9 °C & 53%
Ambient Temperature & Humidity at the Time of Sampling			29°C & 51%
Sample ID	AES-ENV-GW-69/2023	Sampling Location	Main Office
Clint Details	Construction of Combine Effluent Treatment Plant (CETP)	Validation Officer	Mr. Muhammad Ajmal (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	0.041	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

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Analyzed By

Reviewed By (TM) 26-10-2023

Approved By (QM/ Chief Chemist)

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

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ANNEXURE – 8: NOISE & VIBRATION MANAGEMENT FRAMEWORK

ANNEXURE - 8: NOICE & VIBRATION MANAGEMENT FRAMEWORK

Objective

This management plan defines the measures to control and limit noise emissions and vibration levels, at residential properties and other sensitive receptors in the vicinity of the Project.

General Requirements

Best Practicable Means (BPM) of noise control will be applied during construction works to minimize noise (including vibration) at neighboring residential properties and other sensitive receptors arising from construction activities

The general principles of noise management are given below:

Control at source:

Equipment – noise emissions limit for equipment brought to site.

Equipment – method of directly controlling noise e.g. by retrofitting controls to plant and machinery.

Equipment - indirect method of controlling noise e.g. acoustic screens.

Equipment - indirect method of controlling noise e.g. benefits and practicality of using alternative construction methodology to achieve the objective e.g. vibratory piling techniques or hydro- demolition as opposed to more conventional but noisier techniques; selection of quieter tools/machines; application of quieter processes.

Control across site by:

- Administrative and legislative control,
- Control of working hours,
- Control of delivery areas and times,
- Careful choice of compound location,
- Physically screening site,
- Control of noise via Contract specification of limits,
- Noise Monitoring, to check compliance with noise level limits, cessation of works until alternative method is found.
- Many of the activities which generate noise can be mitigated to some degree by careful operation of machinery and use of tools. This may best be addressed by tool box talks and site inductions.

The maintenance of good community relations is vital. Experience shows that construction noise has the potential to cause disturbance but can be tolerated if prior warning and explanation has been given to residents. In particular advice regarding the nature of construction works, the duration of the works and mitigation measures to be implemented can help to reduce people's reaction to noise.

Contractors will consult local residents/communities regarding works and to give them details of a responsible appointed person on site who will be able to deal with queries.

Construction working hours should be carefully managed. All works should take place between normal working hours 07:30 and 18:30, Monday to Friday with the exception of restricted works.

Noise and Vibration Control Measures

In addition to specific requirements of the Local Authority, the Contractor will be required to adopt the following more specific measures:

Control measures

Without prejudice to the other requirements of this section, the Contractor shall comply with the recommendations set out in BS5228:2009 and in particular with the following requirements:

- Vehicles and mechanical plant will be maintained in a good and effective working order and operated in a manner to minimise noise emissions. The contractor will ensure that all plant complies with the relevant statutory requirements;
- Site vehicles will be equipped with broadband, non-tonal reversing alarms;
- Compressor, generator and engine compartment doors will be kept closed and plant turned off when not in use;
- All pneumatic tools will be fitted with silencers/mufflers;
- Care would be taken when unloading vehicles to avoid un-necessary noise;
- Maintenance operations will be undertaken at distance from noise-sensitive receptors;
- Reduce the speed of vehicle movements;
- Ensure that operations are designed to be undertaken with any directional noise emissions pointing away from noise-sensitive receptors;
- Vehicles should be prohibited from waiting within the site with their engines running or alternatively, located in waiting areas away from sensitive receptors;

Vibration Mitigation

All vibration producing machinery will be identified by the contractor and vibration producing machinery will be operated at low frequency to reduce the vibration impacts.

Vibration monitoring will be carried out in accordance with German Standard DIN 4150 (heritage structures) and BS 7385: Part 2 – 1993 (other structures).

- vibration monitoring will be undertaken at the nearest buildings to the construction sites during times of vibration intensive works
- Where exceedances of the criteria are recorded, corrective actions would be implemented where soils at risk of vibration induced settlement are identified.

Noise and vibration monitoring

A regular programme of noise and vibration monitoring shall be implemented as a minimum in accordance with of this document.

The Contractor will submit the proposed method, the frequency and the location of monitoring site to the Planning Authority for agreement prior to commencing works. Noise baseline levels will be agreed prior to commencement of construction.