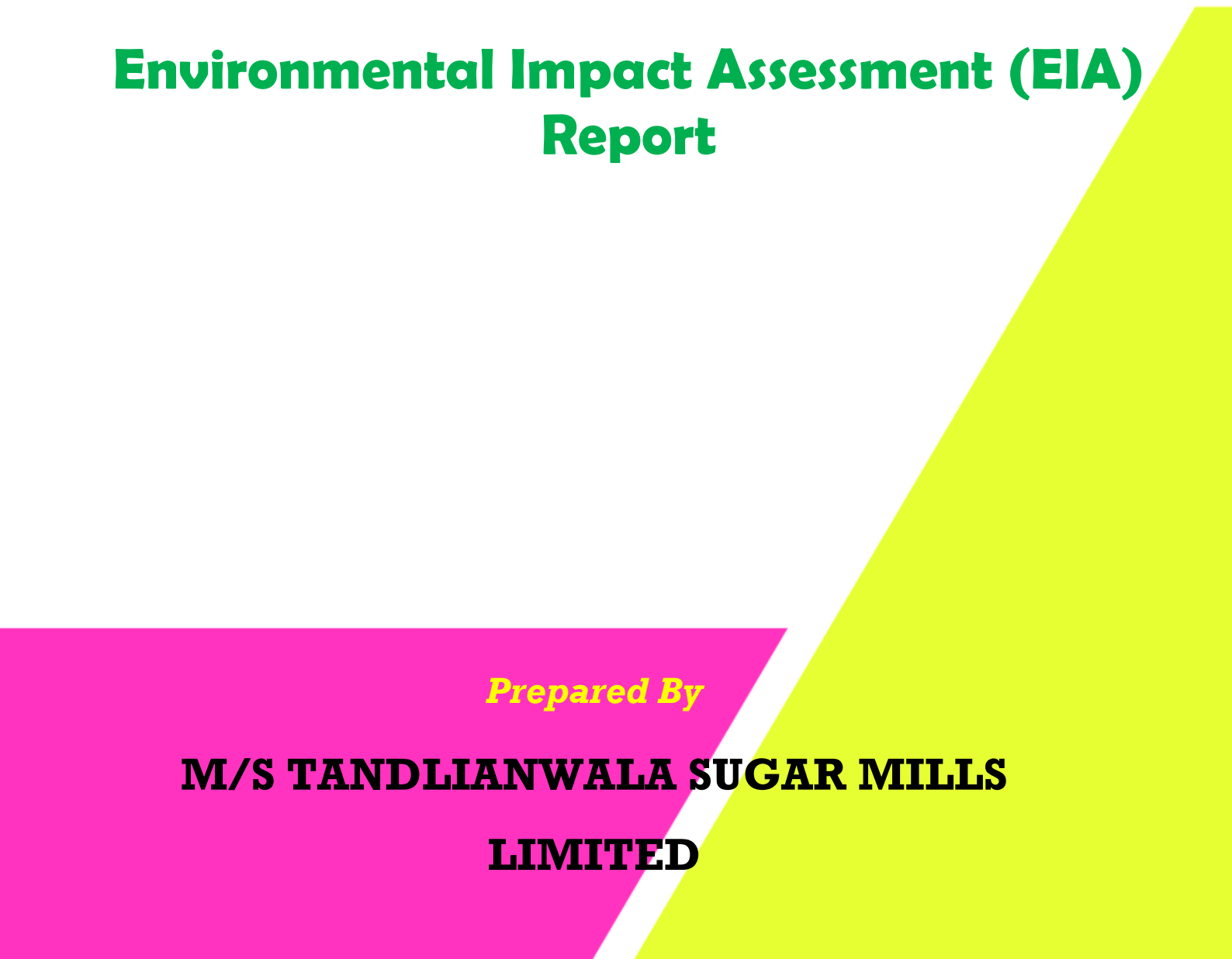




**Construction of Effluent Treatment Plant**  
Tandlianwala Sugar Mill & Distillery Unit Rehman  
Hajira  
Shah Jamal–Muzaffargarh Rd, Mehrpur, Punjab

**Environmental Impact Assessment (EIA)  
Report**



*Prepared By*  
**M/S TANDLIANWALA SUGAR MILLS  
LIMITED**

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## EXECUTIVE SUMMARY

### I. TITLE AND LOCATION OF PROJECT

Construction of Effluent Treatment Plant at Tandlianwala Sugar Mill & Distillery Unit

Rehman Hajira Shah Jamal–Muzaffargarh Rd, Mehrpur, Punjab

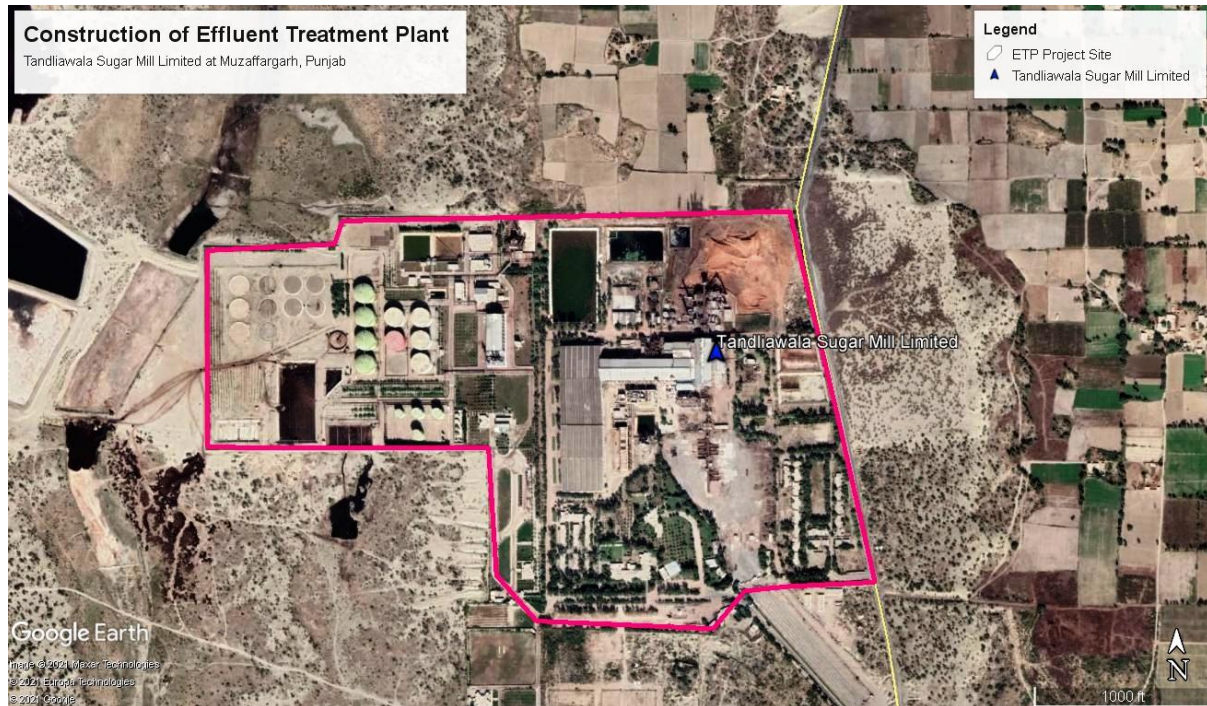


Figure A–1 Location of Project

### II. NAME OF THE PROPONENT

The proposed project is the **Construction of Effluent Treatment Plant (ETP)** at Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira Shah Jamal–Muzaffargarh Rd, Mehrpur, Punjab.

**Gul Rehan**

General Manager (GM) TSML

### III. NAME OF THE ORGANIZATION PREPARING THE REPORT

This report is prepared by the **Tandlianwala Sugar Mills Limited** to fulfill the requirement of Punjab Environmental Protection Act Section 12.

#### **IV. A BRIEF OUTLINE OF THE PROPOSAL**

Proposed project is the construction of Effluent Treatment Plant (ETP) to achieve PEQS Environmental Standards by proposing Physiochemical and Activated Sludge Process. In this two lagoons will be constructed, which would have **maximum depth of 1.5 m** and effective **retention time of 50 – 60 hours**. In last lagoon section sprinkling system will install to ensure the reduction of temperature to less than 40°C prior feeding to ETP.

**Total 06 blowers** have been proposed by technical team for **Secondary Treatment** out of which 05 will be working and one on standby. **01 VFD** will install on blowers with floating behavior. DO concentrations of mg/l will be maintained in the aeration tank

**Plant capacity:** 200m<sup>3</sup>/hr (4,800 m<sup>3</sup>/day)

**Sludge Drying Bed Area** 1546 m<sup>2</sup>

**Total Area Required** 6297.75 m<sup>2</sup>.

#### **V. THE MAJOR IMPACTS**

##### **Construction phase**

- Combustion products, welding aerosols and other harmful substances emitted into ambient air
- Dust Emissions
- Foul odor emission
- Noise Propagation in the Air
- Impact on integrity and stability of soil

##### **Operational phase**

- Foul odor emission
- Noise Propagation in the Air – Exploitation of electric engines
- Contamination of water and related water bodies with suspended particles and organic substances
- Risks related to health and safety of population

#### **VI. RECOMMENDATIONS FOR MITIGATION MEASURES**

### **Construction Phase**

- Water sprinkling would be ensured to minimize the dust arising during the construction phase.
- The provision of face mask and goggles also reduce the impact
- Proper shift hours for the labors will be scheduled to avoid any health risk.
- Provision and accessibility of ear plugs or ear muffs to all workers and visitors to avoid sound volume
- Proper solid waste management would be ensured and if any waste is found, it would be recycled and any other waste would be sold to the contractor

### **Operational Phase**

- Plant trees in landscaping areas to prevent odor dispersion.
- Ensure that all treatment processes, equipment and pipeline work well. Regularly carry out equipment maintenance.
- Using noise-insulation materials during installation of pumping station;
- Arrangement of pumps on vibro-isolating platform, for that thick rubber sheets can be used;
- Installation of auxiliary pump, vacuum pump, generator in avoid downtime
- Solid waste, sludge from suction pump will be clarified, settled and stored in settling tanks. Sludge will be compressed and stabilized so that it causes no odor, is stored and transported to treatment plant.

## **VII. PROPOSED MONITORING**

### **Construction phase**

**Table A.1 Proposed Monitoring During Construction Phase**

| <b>Environmental Component</b> | <b>Key Indicators</b>                                                           |
|--------------------------------|---------------------------------------------------------------------------------|
| Qualitative air quality        | Micro-climate, dust, noise, vibration                                           |
| Construction waste quality     | pH, DO, TSS, COD, BOD5, NH4+, Cl-, NO3, NO2-, PO43- , surfactant, oil, Coliform |
| Hazardous materials and waste  | Oil, petrol, grease, alum, Chlorine, soda                                       |

| Environmental Component   | Key Indicators        |
|---------------------------|-----------------------|
| Community & worker safety | Frequency of injuries |

### Operational phase

**Table A.2 Proposed Monitoring During Operation Phase**

| Environmental Component              | Key Indicators                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Quality of air and noise environment | Temperature, moisture, wind, total suspended particles, NO <sub>2</sub> , SO <sub>2</sub> , CO, noise                                                                                                                                                                                                                                                                               |
| Wastewater quality                   | Color, pH, BOD <sub>5</sub> , COD, SS, Fe, mineral oil and fat, sulfur, ammonium, total N, total P, Coliform                                                                                                                                                                                                                                                                        |
| Monitor in case of incidents         | <p>In case of actual or suspected incidents at wastewater treatment plants, environmental monitoring shall conduct immediately and is similar to a periodic environment monitoring.</p> <p>In addition, the daily operation staff will regularly check wastewater collection, operation of pumping station to detect and timely handle incidents of congestion and pipe damage.</p> |

## **1 INTRODUCTION**

### **1.1 PURPOSE OF REPORT**

According to the Punjab Environmental Protection Act Section 12 – Initial Environmental Examination, and Environmental Impact Assessment.

“No proponent of a project shall commence construction or operation unless he has filed with the Government Agency designated by Provincial Environmental Protection Agencies, as the case may be, or, where the project is likely to cause adverse environmental effects an environmental impact assessment, and has obtained from the Government Agency approval in respect thereof.”

It is this legal requirement from the Government of Punjab that this Environmental Impact Assessment (EIA) report has been prepared to get Environmental Approval (EA) from the Environmental Protection Agency, Government of Punjab.

This report provides detailed information and facts of project; including especially among others environmental, economic, social, etc., enabling its assessment and justification that the project will meet the requirements of environmentally sustainable practices; both during installation and regular operation stages, the Punjab Environment Quality Standards and the rules and the regulations thereof. The other relevant regulations and guidelines considered while preparing this EIA report include:

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

Different environmental aspects like social, physical biological etc and other related features of the project both during installation and its regular occupancy are highlighted in

this EIA report. Measures necessary to be adopted to mitigate any environmental impacts on any part of the environment around are also described. All the important information is also provided as described under the format used to help decision makers, EPA Punjab in the present case, before issuing the desired Environmental Approval (EA).

## **1.2 IDENTIFICATION OF PROJECT AND PROPONENT**

The proposed project is the **Construction of Effluent Treatment Plant (ETP)** at Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira Shah Jamal-Muzaffargarh Rd, Mehrpur, Punjab.

**Gul Rehan**

General Manager (GM)

TSML

## **1.3 DETAILS OF CONSULTANT**

This report is prepared by the **Tanliawala Sugar Mills Limited** to fulfill the requirement of Punjab Environmental Protection Act **Section 12**.

## **1.4 BRIEF DESCRIPTION OF NATURE, SIZE AND LOCATION OF PROJECT**

Proposed project is the construction of Effluent Treatment Plant (**ETP**) to achieve PEQS Environmental Standards by proposing Physiochemical and Activated Sludge Process. In this **two lagoons** will be constructed, which would have **maximum depth of 1.5 m** and effective **retention time of 50 – 60 hours**. In last lagoon section sprinkling system will install to ensure the reduction of temperature to less than 40°C prior feeding to ETP.

**Total 06 blowers** have been proposed by technical team for **Secondary Treatment** out of which 05 will be working and one on standby. **01 VFD** will install on blowers with floating behavior. DO concentrations of mg/l will be maintained in the aeration tank.

***TANDLIANWALA SUGAR MILLS LIMITED (TSML) UNIT REHMAN HAJIRA***

**Plant capacity:** 200m<sup>3</sup>/hr (4,800 m<sup>3</sup>/day)

**Location:** Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira Shah  
Jamal-Muzaffargarh Rd, Mehrpur, Punjab.

Google Earth Map of location is given below:

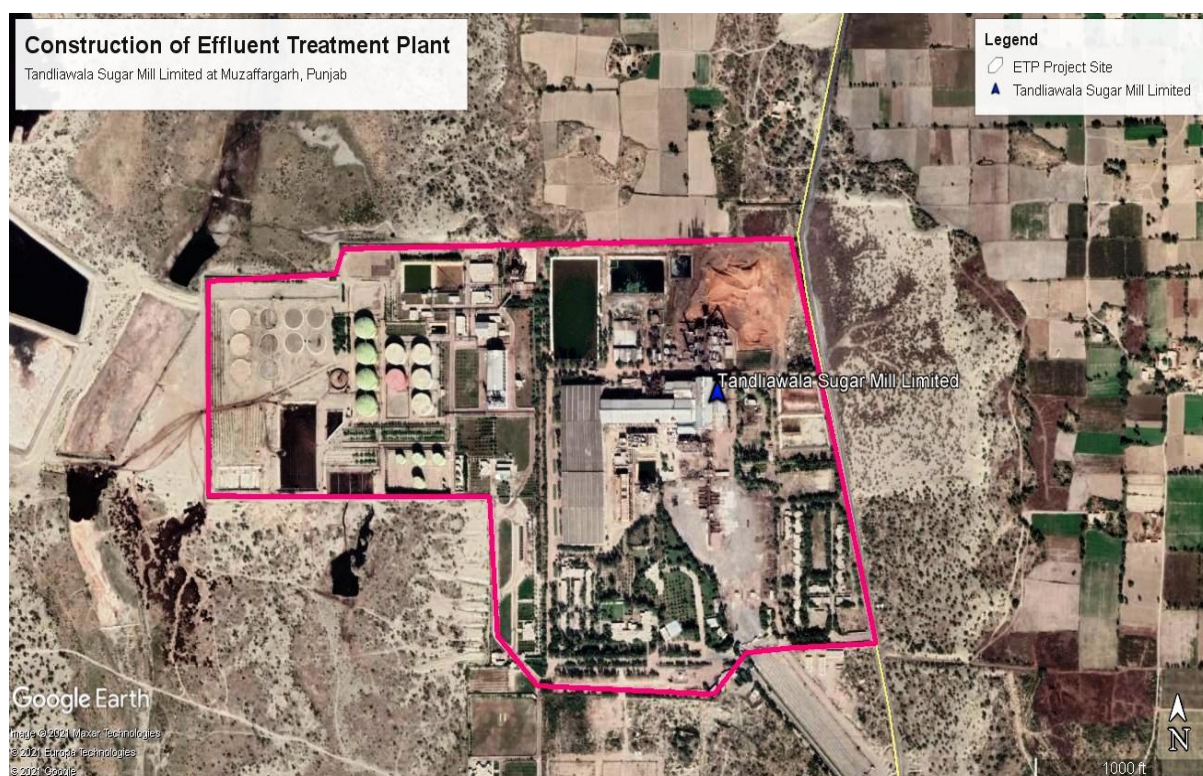


**Table 1.1 Google Earth Map**

## **2 SCREENING**

According to the Punjab Environmental Protection Agency (review of IEE and EIA) regulations, 2016: **Section – 4** Projects requiring an EIA

“A proponent of a project falling in any of the categories listed in Schedule II shall file an EIA with the Agency, and the provisions of Section 12 shall apply to such project.”

In accordance with the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000, SRO # 339 (1)/2000 the project for Waste Disposal (Construction of ETP) falls in Schedule –II, **Section–G.** Waste Disposal , **Sub–section 2–** “Waste disposal processing facilities for domestic or industrial wastes, with annual capacity more than 10,000 cubic meters” for which Environmental Impact Assessment (EIA) report is required for Environmental Approval.

Therefore, to fulfill the legal requirements of the Section–12 of the Punjab Environment Protection Act (amended 2012) the client is required to submit the EIA report in the Environmental Protection Agency, Government of the Punjab, Lahore to obtain the required Environmental Approval (EA).

### **3 SCOPING**

#### **3.1 SPATIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT**

Spatial boundaries for project related to the environmental effects and cumulative effects for Valued Environmental Components. It depends on the Project Development Area and Local and Regional Assessment Area.

The proposed project has already existed in the place where all facilities are available. The Google coordinates of the project are as followings:

- 30°01'16.3"N
- 71°04'14.3"E

Temporal boundaries based on timings and duration of project activity that will happen during construction and operational phase. Construction will be done in an environmental friendly manner that will not harm any existing boundaries and surroundings of project area. Ladders, walkways, safety grills, staircases and platforms will be constructed. In addition one lockable room near the plant site will be allocating for keeping tools and tackles along with security arrangements. While during operational phase all quality test and flow measurement of ETP will be done to achieve Punjab Environmental Quality Standards (PEQS) by proposing Physiochemical and Activated Sludge Process. Untreated and treated effluent testing will be conduct to achieve and compare the targets. Safety roads, access roads / approaches will be maintained. Maximum plantation will be done.

#### **3.2 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION**

The regular survey and background studies were conducted to identify the stakeholders. People of TSML Rehman Hajira Unit was gathered which are likely to be affected, focus group meetings were conducted by the representatives. They were all briefed about the project whereabouts in the nontechnical and understandable way. Certain issues and

suggestion about the project that is included and raised by the locals were filed and recorded.

The consultation with the government officials, welfare organizations was conducted in the formal way which includes the technical approaches to the project and the verdict of the affected or local community was also kept in view.

### **3.3 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED**

Following impacts are considered to be significant and proper mitigation and maintenance plan of these are made

- Increase risk of air and smell pollution
- Noise propagation within the work zone
- Impacts on workers during ETP Operations
- Incidents of equipments
- Impact on quality of water body
- Solid waste & Sludge

## **4 CONSIDERATION OF ALTERNATIVES**

### **4.1 SITE ALTERNATIVES, THEIR SELECTION AND REJECTION CRITERIA**

Proposed project is Construction of Effluent Treatment Plant (ETP) at Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira Shah Jamal-Muzaffargarh Rd, Mehrpur, Punjab. The land is already owned by the project proponent and considered suitable both in terms of environment and physical constraints. As this project is construction of ETP that will treat the water released from existing sugar industry to achieve PEQS Environmental Standard to maintain the quality of wastewater released from outlet of processing. Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira has sufficient area is available for the construction of ETP that would also reduce the transportation cost for waste water transfer and treatment.

- **No Project Option.**

No Project Option is not a good option for the water treatment as ETP helps to purify wastewater generated from industry. The treatment process results in reusable clean water, saves money as well as water and planet.

- **A New Site or Third Party Services.**

By keeping the economical and feasible factor in mind selected site is all mean suitable because from production out channel wastewater will be introduced in ETP Inlet through channels where it will be treated and then drain out from ETP outlet. If new site or third party services will be taken than the cost of project will enhance and environmental impacts from wastewater will boost up.

### **4.2 DESIGN / TECHNOLOGY ALTERNATIVES, THEIR SELECTION AND REJECTION CRITERIA**

Relatively simple wastewater treatment technologies can be designed to provide low cost sanitation and environmental protection while providing additional benefits from the reuse

of water. Different methods are used to treat wastewater but ETP is selected for the wastewater treatment generate by Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira. Other type of methods their advantages and disadvantages are given below in table:

**Table 4.1 Technology Alternatives and Their Selection Rejection**

| <b>TREATMENT TYPE</b>        | <b>ADVANTAGES</b>                                                                                                                                                                        | <b>DISADVANTAGES</b>                                                                                                                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AQUATIC SYSTEMS</b>       |                                                                                                                                                                                          |                                                                                                                                                                                                                     |
| <b>Stabilization Lagoons</b> | <ul style="list-style-type: none"><li>• Low capital cost</li><li>• Low operation and maintenance costs</li><li>• Low technical manpower requirement</li></ul>                            | <ul style="list-style-type: none"><li>• Requires a large area of land</li><li>• May produce undesirable odors</li></ul>                                                                                             |
| <b>Aerated Lagoons</b>       | <ul style="list-style-type: none"><li>• Requires relatively little land area</li><li>• Produces few undesirable odors</li></ul>                                                          | <ul style="list-style-type: none"><li>• Requires mechanical devices to aerate the basins</li><li>• Produces effluents with a high suspended solids concentration</li></ul>                                          |
| <b>TERRESTRIAL SYSTEMS</b>   |                                                                                                                                                                                          |                                                                                                                                                                                                                     |
| <b>Septic Tanks</b>          | <ul style="list-style-type: none"><li>• Can be used by individual households</li><li>• Easy to operate and maintain</li><li>• Can be built in rural areas</li></ul>                      | <ul style="list-style-type: none"><li>• Provides a low treatment efficiency</li><li>• Must be pumped occasionally</li><li>• Requires a landfill for periodic disposal of sludge and septage</li></ul>               |
| <b>Constructed Wetlands</b>  | <ul style="list-style-type: none"><li>• Removes up to 70% of solids and bacteria</li><li>• Minimal capital cost</li><li>• Low operation and maintenance requirements and costs</li></ul> | <ul style="list-style-type: none"><li>• Remains largely experimental</li><li>• Requires periodic removal of excess plant material</li><li>• Best used in areas where suitable native plants are available</li></ul> |
| <b>MECHANICAL SYSTEMS</b>    |                                                                                                                                                                                          |                                                                                                                                                                                                                     |
| <b>Filtration Systems</b>    | <ul style="list-style-type: none"><li>• Minimal land requirements; can be used for household-scale</li></ul>                                                                             | <ul style="list-style-type: none"><li>• Requires mechanical devices</li></ul>                                                                                                                                       |

| TREATMENT TYPE                      | ADVANTAGES                                                                                                                                                                                                                                     | DISADVANTAGES                                                                                                                                                                                                                                                 |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | treatment <ul style="list-style-type: none"> <li>• Relatively low cost</li> <li>• Easy to operate</li> </ul>                                                                                                                                   |                                                                                                                                                                                                                                                               |
| <b>Vertical Biological Reactors</b> | <ul style="list-style-type: none"> <li>• Highly efficient treatment method</li> <li>• Requires little land area</li> <li>• Applicable to small communities for local-scale treatment and to big cities for regional-scale treatment</li> </ul> | <ul style="list-style-type: none"> <li>• High cost</li> <li>• Complex technology</li> <li>• Requires technically skilled manpower for operation and maintenance</li> <li>• Needs spare-parts-availability</li> <li>• Has a high energy requirement</li> </ul> |
| <b>Activated Sludge</b>             | <ul style="list-style-type: none"> <li>• Highly efficient treatment method</li> <li>• Requires little land area</li> <li>• Applicable to small communities for local-scale treatment and to big cities for regional-scale treatment</li> </ul> | <ul style="list-style-type: none"> <li>• High cost</li> <li>• Requires sludge disposal area (sludge is usually land-spread)</li> <li>• Requires technically skilled manpower for operation and maintenance.</li> </ul>                                        |

Mechanical systems are more suitable for places where land availability is a concern, such as hotels and residential areas. Mechanical plants are the least land intensive of the wastewater treatment methods based on natural processes. Comparative performance of sewage treatment systems with removal efficiency is given below in table:

**Table 4.2 Comparative Performance of sewage treatment systems with removal efficiency**

| PROCESS                 | OXYGEN SUPPLY   | REACTOR VOLUME    | RETENTION TIME | REMOVAL EFFICIENCY                |
|-------------------------|-----------------|-------------------|----------------|-----------------------------------|
| <b>Activated Sludge</b> | Pressurized air | 10 m <sup>3</sup> | 4-6 hr         | 90%-95% organic matter<br>90%-95% |

| PROCESS                           | OXYGEN SUPPLY     | REACTOR<br>VOLUME | RETENTION<br>TIME | REMOVAL<br>EFFICIENCY                             |
|-----------------------------------|-------------------|-------------------|-------------------|---------------------------------------------------|
|                                   |                   |                   |                   | suspended solids                                  |
| <b>Biologic<br/>Rotary Discs</b>  | Air               | 1 m <sup>3</sup>  | 1–3 hr            | 90%–95% organic<br>matter                         |
| <b>Ascendant<br/>Flow</b>         | Anaerobic         | 2 m <sup>3</sup>  | 24 hr             | 50%–60% organic<br>matter 57%<br>suspended solids |
| <b>Anaerobic<br/>Filtration</b>   | Anaerobic         | 2 m <sup>3</sup>  | 36 hr             | 40%–50% organic<br>matter 52%<br>suspended solids |
| <b>Septic Tank</b>                | Anaerobic         | 2 m <sup>3</sup>  | 36 hr             | 25% organic matter                                |
| <b>Hydroponic<br/>Cultivation</b> | Aerobic/anaerobic | 6 m <sup>3</sup>  | 12 hr             | 65%–75% organic<br>matter                         |

By viewing all the comparison and removal efficiency Activated Sludge Effluent Treatment Plant has 90%–95% organic matter 90%–95% suspended solids efficiency.

#### **4.3 ENVIRONMENTAL ALTERNATIVES, THEIR SELECTION AND REJECTION CRIETERIA**

The major aim of wastewater treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment. As solid material decays, it uses up oxygen, which is needed by the plants and animals living in the water. The wastewater treatment process does not only produce clean reusable water, but also has the potential to produce various other benefits. It has the potential to reduce a

waste production, to produce energy through methane harvesting, and the potential to produce natural fertilizer from the waste collected through the process. Below is a more detailed explanation of the benefits of wastewater treatment:

i- **Waste Reduction**

Through the treatment of wastewater, the amount of waste that is usually released into the environment is reduced thus improving environment's health. By doing so, in turn reduces the health risks associated with environmental pollution, and reduces the water loss induced through water pollution. Wastewater treatment also reduces the amount of money spent by a management on environmental rehabilitation projects required to battle pollution.

ii- **Energy Production**

The sludge collected during the treatment process is itself treated because it contains a large amount of biodegradable material. It is treated with anaerobic bacteria in special fully enclosed digesters heated to 35 degrees Celsius, an area where these anaerobic microorganisms thrive without any oxygen. The gas produced during this anaerobic digestion process contains a large amount of methane, which is harvested and then burned to generate electricity.

iii- **Fertilizer Production**

Any biodegradable material remaining is dried in "drying lagoons" and is then turned into natural fertilizer. The resulting natural fertilizer is then used in the agricultural sector, increasing crop yields. This decreases the use of chemical fertilizers that pollute the surrounding marine and surface ecosystems.

**In summary**, the combination of these benefits along with water production makes wastewater treatment a sustainable short and long-term solution to the world's water crisis,

which will only increase as the world population increases. This will cause the production of large amounts of fresh usable water, thus helping battle water scarcity.

#### **4.4 ECONOMIC ALTERNATIVES, THEIR SELECTION AND REJECTION**

Managing wastewater is obviously linked to the management of the entire water cycle. Inadequate wastewater management pollutes water bodies that are also important sources for drinking water, fisheries and other services. Therefore, the discharge of wastewater, without or with inadequate treatment, involves significant costs, including environmental and social ones.

Wastewater management and treatment involves significant benefits (avoided costs). Therefore, the cost of no action may be interpreted as benefits not achieved due to the discharge of the wastewater with no or inadequate treatment. In other words, if untreated or inadequately treated wastewater is discharged directly into the environment, costs are generated or potential benefits are lost. The potential benefits associated with improving wastewater management can be grouped into two general categories: market and non-market benefits. Most environmental and health benefits have significant value, but — unlike most benefits from productivity — cannot be valued in monetary units as market prices do not exist. Market benefits are easily identifiable and quantifiable, while non-market benefits are difficult to measure and require specific economic valuation methods. Where these benefits cannot be valued in monetary units because the techniques are in infancy, they will be reported per se into the analysis; no effort will be made to conflate non-monetary units onto monetary values.

## **5 DESCRIPTION OF THE PROJECT**

### **5.1 OBJECTIVES OF PROJECT**

The objective of industrial waste water treatment is to extract pollutants, remove toxicants, neutralize coarse particles, and kill pathogens so that quality of discharged water is improved to reach the permissible level of water to be discharged into water bodies. This project is based on to attain Punjab Environmental Quality Standards by proposing Physicochemical and Activated Sludge Process. Treatment of water thus aims at reduction of BOD, COD, eutrophication etc. of receiving water bodies and prevention of bio-magnification of toxic substances in food chain. The major aim of wastewater treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment. As solid material decays, it uses up oxygen, which is needed by the plants and animals living in the water.

**“Primary Treatment”** removes about **60 percent** of suspended solids from wastewater. This treatment also involves aerating (stirring up) the wastewater, to put oxygen back in.

**“Secondary Treatment”** removes more than **90 percent** of suspended solids.

### **5.2 LOCATION AND SITE LAYOUT OF THE PROJECT**

Selected site for Construction of Effluent Treatment Plant (ETP) is at Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira Shah Jamal–Muzaffargarh Rd, Mehrpur, Punjab. Google Coordinates of site are “30°01'16.3"N 71°04'14.3"E”.

Google Map and Site Layout of the project site is given below in Figure – 5.1



Figure 5-1 Google View of Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira

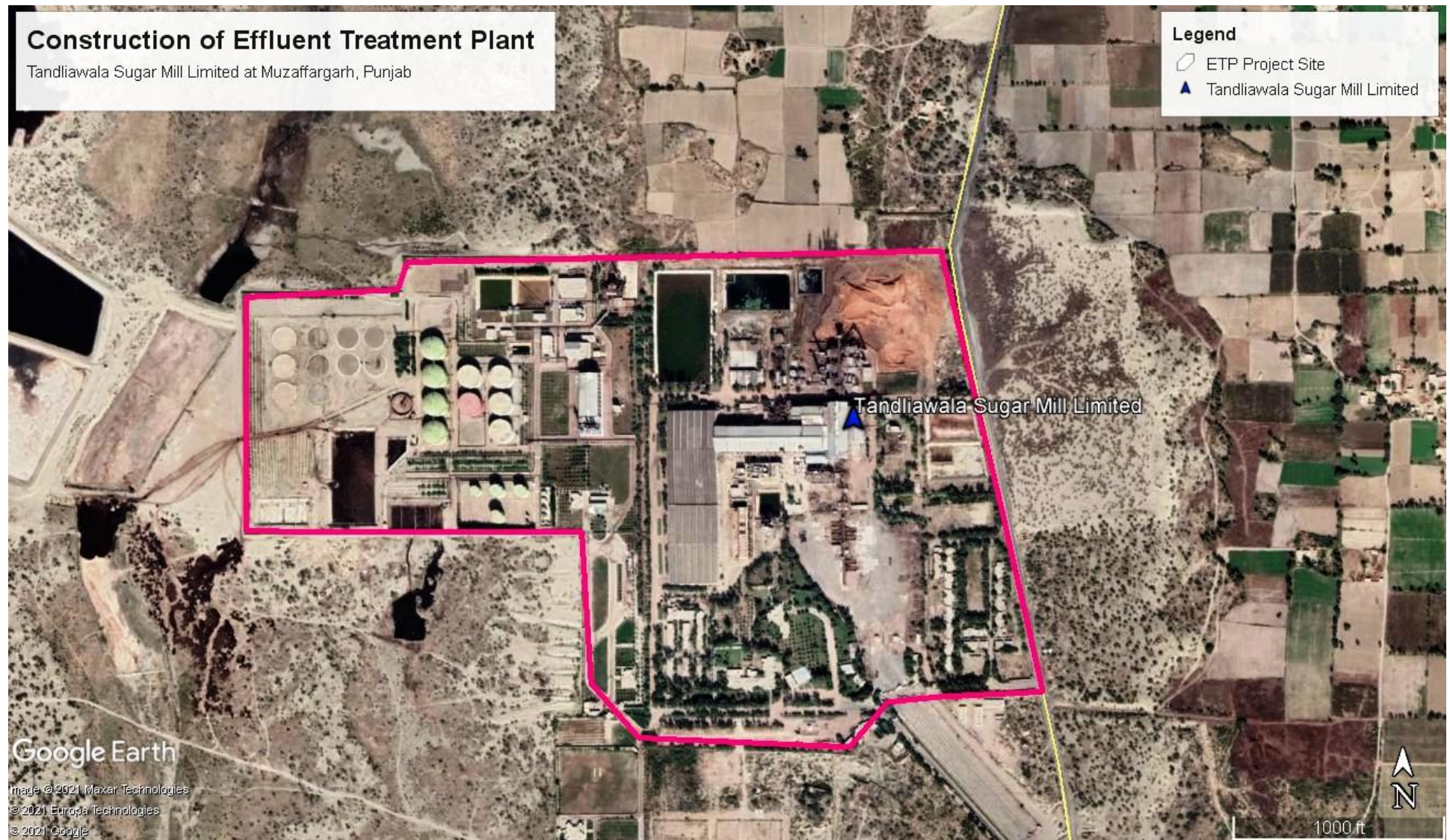


Figure 5-2 Project Site & Location Map

### **5.3 LAND USE ON THE SITE**

Proposed project is the construction of Effluent Treatment Plant (ETP) at Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira unit. Land is already in used by the management. Management selected the area in Tandlianwala Sugar Mill & Distillery Unit for construction of ETP to treat the wastewater generated during the production of sugar.

### **5.4 ROAD ACCESS**

The project site is easily accessible through Shah Jamal–Muzaffargarh Road. Road is good in condition and paved.

Google Earth Map of road access are given below in Figure 5.3

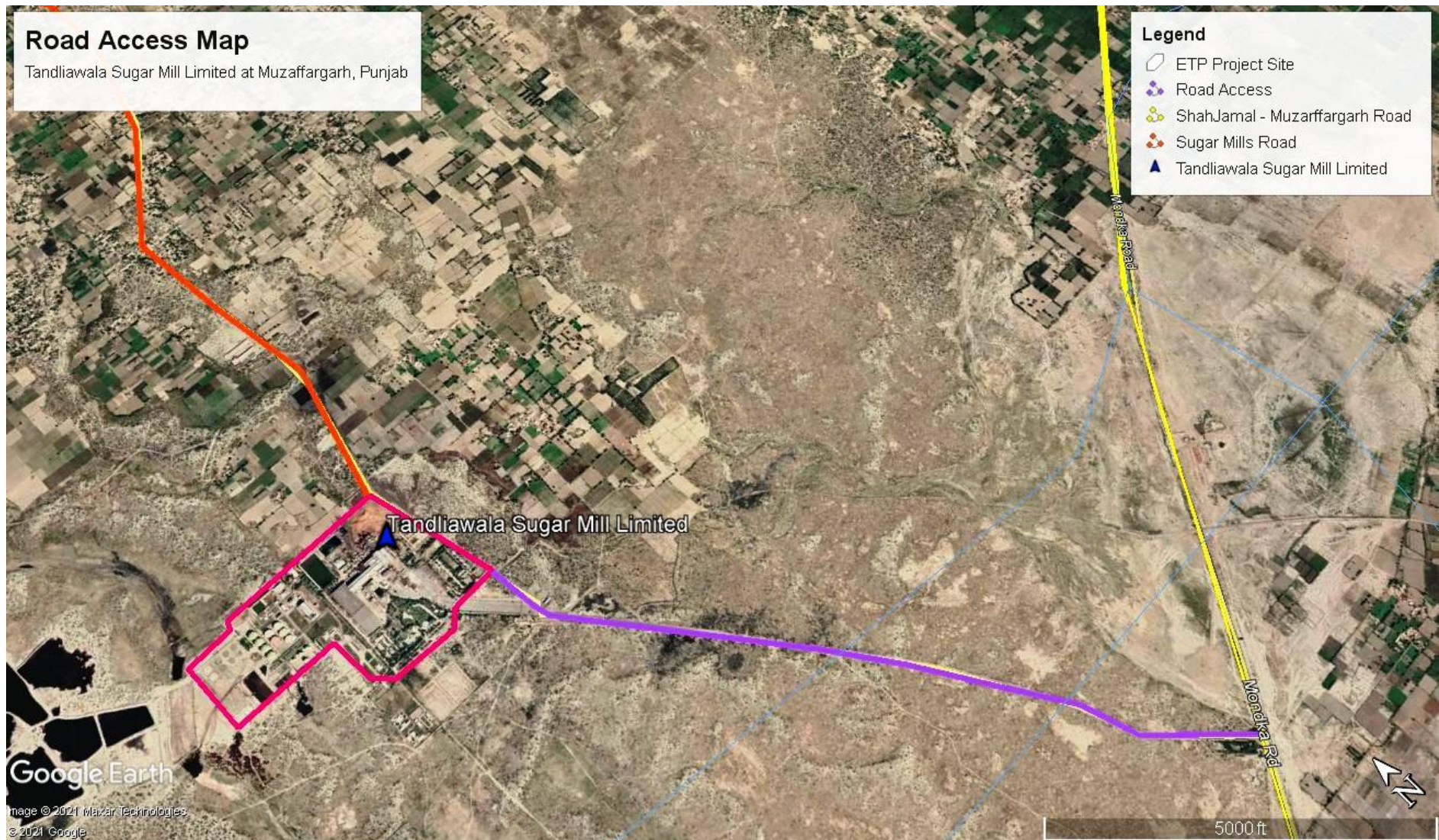


Figure 5-3 Google Earth Map of Road Access

## **5.5 VEGETATION FEATURES OF THE SITE**

There are no vegetative features found on selected site however after the construction of ETP tree plantation will be done to combat global warming by absorbing carbon dioxide, removing and storing carbon while releasing oxygen back into the air.

## **5.6 COST AND MAGNITUDE OF OPERATION**

The project cost has been estimated about PKR 170 million combinations of civil work, Mechanical work, Electrical work, Installation work and environmental budget. The quantities have been worked out from the design drawings and project feasibility. The rates for cost estimates are based on construction work, contractor cost, and cost of the raw materials with 10% escalation for the year 2021. The activities to be carried out within a period of one to two years from the starting date.

## **5.7 SCHEDULE OF IMPLEMENTATION**

It is planned that the following schedule of project implementation will be adhered to, this is subject to the conditions that everything goes according to planning and no serious bottlenecks are encountered. The implementation stages of the project activity include:

### **1<sup>st</sup> Stage.**

The stage –1 comprises the onsite contouring studies and soil investigations.

### **2<sup>nd</sup> Stage.**

The stage –2 comprises the following task:

- i– Laying of foundations excavation and commencement of erection work.
- ii– Start of civil, electrical and mechanical work.
- iii– Development of basic infrastructure.
- iv– Fitting of instrumentation.

### **3<sup>rd</sup> Stage.**

The stage –3 comprises the following task:

- i. Equipment erection completion.
- ii. Completion of the basic infrastructures water supply system, electricity supply etc.

### **4<sup>th</sup> Stage.**

The last stage will be Commencement of regular operation.

## **5.8 DESCRIPTION OF THE PROJECT**

### **5.8.1 CIVIL WORK**

Local company provides the outline drawings of the following civil works associated with wastewater treatment plant. The structural design and civil works execution shall the responsibility of Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira. Following drawings and data for structural design are given:

- Process and Instrumentation Diagram (P&ID)
- Hydraulic Flow Diagram (HFD)
- Equipment Layout Drawing
- Section Drawings
- Foundation Drawing & Loading Data
- Puddle pipe Drawing

Local Contractor will review the structural drawings, with regards to dimensions and puddle pipe orientations for the process control. Moreover, Contractor engineer will pay periodic visits during civil work executions on mutually agreed hold points.

### **5.8.2 SYSTEM OUTLINE.**

In order to plan ETP, **two new lagoons** will be constructed, which will have maximum **depth** of **1.5 m** and effective **retention time** of **50 – 60 hours**. In the **last lagoon**, sprinkling system

is recommended to ensure the reduction of temperature to less than 40°C prior feeding it to the ETP.

From the last lagoon, wastewater will flowthrough new drain channel or through pumping up to proposed site for ETP. In case wastewater flows through drain channel up to the proposed ETP site, a collection pit will be required in which pumps will be installed to feed the effluent into ETP. The project has been based on to achieve PEQS Environmental Standards by proposing Physiochemical and Activated Sludge Process. Wastewater will enter the Oil and Grease Trap, which has been provided to remove the traces Oil & Grease from wastewater. Wastewater will enter into **Neutralization Tank** through gravity flow wherein controlled dose of caustic will be made with the help of Caustic Dosing Pumps to maintain the pH.

Neutralized wastewater by gravity will flow into the Primary Clarifier through gravity flow. Coagulant and Flocculent will be dosed in the reaction channel prior to Primary Clarifiers. PAC & Anion Polymer Dosing System has been provided with one working one standby Dosing Pumps. Through these aids suspended load will be settled down and chemical sludge will be directed to Chemical Sludge Holding Tank, from where it will be pumped to Sludge Drying Beds. Approx. 60% to 80% reduction of suspended solids will be reduced.

**Clarified wastewater** having reduced load of contaminants will flow through gravity into the Aeration Tank. Returned Activated Sludge (RAS) will be mixed to achieve desired MLSS concentration. The **Aeration Tank** has been equipped with air distribution grids on which Fine Bubble Diffusers have been installed for uniform distribution / mixing of air. Nutrients will be dosed manually in the Aeration Tank for the healthy growth of microorganisms. Biomass concentration (Activated sludge) will gradually increase in the Aeration Tank. Aerated water and biomass from Aeration Tank will be divert to the secondary clarifier Solid/ liquid separation will take place in Secondary Clarifier and sludge will be recycled

back to Flow Distributor through Sludge Recirculation Pumps (RAS), one working one standby. Excessive sludge will be removed from the bottom of clarifier periodically. In the Aeration Tank, MLSS concentration in the range of 3000 – 3500 ppm will be maintained. The extra sludge has been directed to Sludge Holding Tank.

**Total 06 Blowers** have been proposed for Secondary Treatment out of which 05 will be working and one standby. One VFD has been installed on blowers with floating behavior. DO concentrations of mg/l will be maintained in the Aeration Tank.

Overflow from Secondary Clarifier will enter into supernatant Sump. At startup of the plant RAS will be 100%. Once the desired concentration of MLSS is achieved in the respective Aeration Tank, recirculation of RAS will be adjusted accordingly. In order to handle variable flows of RAS, its pump has been equipped with VFD. Remaining sludge will be collected in the Sludge Holding Tank, from where it will be pumped to Sludge Drying Beds. Filtrate from the Sludge Drying Bed will be directed to Lagoons. Dried sludge will be manually collected and disposed.

**Building Block** has been planned within Wastewater Treatment Plant area. It will accommodate the following:

- Blowers,
- MCC/Control Panel,
- Chemical Storage Area and
- Laboratory

**Lab Equipment** will be utilized to conduct testing of different parameters at site such as:

- pH,
- Temperature,
- TSS,
- COD,
- SV,
- MLSS &

- TDS.

### **5.8.3 DESIGN BASIS**

- Untreated Effluent Nature: Sugar Industry
- Operating Hours per Day: 24
- Plant Capacity: 200 m<sup>3</sup>/hr (4,800 m<sup>3</sup>/day)

### **5.8.4 OIL AND GREASE TRAP**

- No of Units: 01 No.
- Material of Construction: RCC
- Effective Volume: 78 m<sup>3</sup>
- Total Volume : 89 m<sup>3</sup>

### **5.8.5 NEUTRALIZATION TANK**

- No of Units: 01 No
- Material of Construction: RCC
- Effective Volume: 102 m<sup>3</sup>
- Total Volume: 116 m<sup>3</sup>

### **5.8.6 FLASH CHANNEL**

- No of Units : 01 No.
- Material of Construction : RCC
- Effective Volume : 102 m<sup>3</sup>
- Total Volume : 116 m<sup>3</sup>

### **5.8.7 PRIMARY CLARIFIER**

- Quantity: 01 No.
- Material of Construction: RCC
- Diameter: 13 m
- Side Water Depth: 2.8 m
- Effective Volume: 372 m<sup>3</sup>
- Total Volume: 425 m<sup>3</sup>

#### **5.8.8 ANOXIC CHAMBER**

- No of Units 01 No.
- Material of Construction RCC
- Effective Volume 171 m<sup>3</sup>
- Total Volume 190 m<sup>3</sup>

#### **5.8.9 AERATION TANK**

- No. of Units 01 No.
- Material of Construction RCC / MS
- Effective Volume 10,040 m<sup>3</sup>
- Total Volume 11,111 m<sup>3</sup>

#### **5.8.10 AERATION TANK PTT**

- No of Units: 01 No.
- Material of Construction: RCC / MS
- Effective Volume: 36 m<sup>3</sup>
- Total Volume: 40 m<sup>3</sup>

#### **5.8.11 SECONDARY CLARIFIER**

- Quantity: 01 No.
- Material of Construction: RCC / MS
- Diameter: 20 m
- Side Water Depth: 2.5 m
- Effective Volume: 785 m<sup>3</sup>
- Total Volume: 942 m<sup>3</sup>

#### **5.8.12 SUPERNATANT SUMP**

- No of Unit: 01 No.
- Material of Construction: RCC
- Effective Volume: 75 m<sup>3</sup>
- Total Volume: 94 m<sup>3</sup>

#### **5.8.13 SLUDGE RECYCLING PUMPS PIT**

- No. of Unit: 01 No.
- Material of Construction: RCC
- Total Volume: 75 m<sup>3</sup>

#### **5.8.14 SLUDGE HOLDING TANK**

- No of Units: 01 No. (Two Compartments)
- Material of Construction: RCC
- Effective Volume: 270 m<sup>3</sup>
- Total Volume: 351 m<sup>3</sup>

#### **5.8.15 COAGULANT PREPARATION / DOSING TANK**

- No of Units 01 No.
- Material of Construction RCC /MS
- Effective Volume 6 m<sup>3</sup>
- Total Volume 7 m<sup>3</sup>

#### **5.8.16 FLOCCULANT PREPARATION /DOSING TANK**

- No of Units 01 No.
- Material of Construction RCC
- Effective Volume 6 m<sup>3</sup>
- Total Volume 7 m<sup>3</sup>

#### **5.8.17 EFFLUENT TRANSFER PUMPS – CLIENT’S SCOPE**

- Quantity 02 Nos. (1W + 1S)
- Orientation Horizontal centrifugal
- Capacity 200 m<sup>3</sup>/hr
- Head As per requirement
- Material of Construction Cast Iron
- Make : Grundfos /KSB Pumps / Equivalent

#### **DRIVE**

- Motor Rating IE3
- Motor Protection IP 55 / Class F
- Power : As per manufacturer recommendation

#### **5.8.18 CAUSTIC DOSING SYSTEM**

##### **CAUSTIC DOSING PUMP**

- Quantity 02 Nos. (1W + 1S)
- Capacity 60 L/ hr
- Pressure 02 bar
- Protection IP 65 / Class F
- Power 0.04 kW
- Make EMEC – Italy / Equivalent

##### **DOSING TANK**

- Quantity 01 No.
- Capacity 200 Liters
- Material of Construction PE
- Make Local

#### **5.8.19 MIXER IN ANIONIC POLYMER DOSING TANK**

- Quantity 01 No.
- Type Slow Speed Propeller
- Power 0.75 kW
- Make TIMSA/ EMEC/ Equivalent

##### **ANIONIC POLYMER DOSING PUMPS**

- Quantity 02 Nos. (1W + 1S)
- Capacity 1000 L/ hr
- Pressure 05 bar
- Protection IP 55 / Class F
- Power 0.55 kW
- Make EMEC – Italy / Equivalent
- Accessories Mixer / Agitator for Coagulant Dosing Tank

#### **5.8.20 MIXER IN COAGULANT DOSING TANK**

- Quantity 01 No.
- Type Slow Speed Propeller
- Power 0.75 kW
- Make TIMSA/ EMEC/ Equivalent

## **COAGULANT DOSING PUMPS**

- Quantity 02 Nos. (1W + 1S)
- Capacity 530 L/ hr
- Pressure 05 bar
- Protection IP 55 / Class F
- Power 0.37 kW
- Make EMEC – Italy / Equivalent
- Accessories Mixer / Agitator for Flocculent Dosing Tank

### **5.8.21 PRIMARY CLARIFIER INTERNALS**

#### **SCRAPPING MECHANISM**

- Quantity 01 No.
- Material Of Construction MS Epoxy paint
- Make Local

#### **GEARED DRIVE MOTOR**

- Quantity 01 No
- Type Central Drive
- Motor Power 0.25 kW
- Make Association of 3Co Thailand /Equivalent

### **5.8.22 AERATION TANK INTERNALS**

#### **AIR HEADER**

- Quantity 01 No.
- Material of Construction MS Epoxy Painted or GI
- Make Local

#### **DROP PIPES**

- Quantity 01 Lot
- Material of construction SS-304
- Make Local

#### **AIR DIFFUSERS**

- Quantity 2980 No

- Type Fine Bubble Diffusers
- Material of construction PP / EPDM
- Make Association of 3Co Thailand/ Equivalent

#### **5.8.23 SECONDARY CLARIFIER INTERNALS**

##### **SCRAPPING MECHANISM**

- Quantity 01 No.
- Material Of Construction MS Epoxy paint
- Make Local

##### **GEARED DRIVE MOTOR**

- Quantity 01 No
- Type Central Drive
- Motor Power 0.25 kW
- Make Association of 3Co Thailand / Equivalent

#### **5.8.24 SLUDGE RECYCLING PUMPS**

- Quantity 02 Nos. (1W + 1S)
- Orientation Horizontal centrifugal
- Capacity 200 m<sup>3</sup>/hr
- Head 20 m
- Material of Construction Cast Iron
- Make KSB Pumps / Equivalent

##### **DRIVE**

- Motor Rating IE3
- Motor Protection IP 55 / Class F
- Power 22 kW

##### **VFD**

- Quantity 01 No
- Make ABB/ Siemens / Equivalent

#### **5.8.25 AIR BLOWERS**

- Quantity 06 Nos. (5W + 1S)
- Capacity 2160 N.m<sup>3</sup>/hr
- Make Taiko Kikai – Japan / Equivalent
- Origin Shandong – China\*

\*Under Taiko Kikai (Japan) License is manufactured by Shandong Zhanghuang – China

#### **DRIVE**

- Type Electrically Driven
- Protection IP 54 / Class F
- Power 45 kW

#### **VFD**

- Quantity 01 No.
- Make Danfoss / Siemens / ABB / Equivalent

#### **5.8.26 SLUDGE TRANSFER PUMPS TO SLUDGE DRYING BED**

- Quantity 02 Nos. (1W + 1S)
- Type Centrifugal
- Capacity 50 m<sup>3</sup>/hr
- Head 15 m
- Material of Construction Cast Iron
- Make Grundfos/ Equivalent

#### **DRIVE**

- Type Electrically Driven
- Protection IP 55 / Class F
- Power 04 kW

#### **5.9 LAYOUT / PROCESS FLOW DIAGRAMS.**

#### **5.10 RESTORATION AND REHABILITATION PLANS**

There will be no any matter of rehabilitation as the proposed site is already owned by the project proponent. There will not be any let regarding safety factors as applicable from time to time for such structures on all accounts. During entire construction period, necessary precautions will be taken to ensure that no damage is done to the basic infrastructures like sewer system, power transmission lines roads, private or public property and daily human life as well. Safety measures will be adopted to avoid any harm to humans, property around, or the environment in the project area. Dust to be generated will be minimized by constant sprinkling of water. After completion; all construction matrix, debris and garbage will be removed off immediately from the site within the minimum possible time under safe conditions. Any minor spillover of these materials will be cleared adequately. The land, if and where pitted will be adequately leveled. On the whole, the project site and the area in its near vicinity will be made neat and clean.

## **6 DESCRIPTION OF THE ENVIRONMENT**

### **6.1 GENERAL.**

The proposed project site is situated in District Muzaffargarh which is a city in southwestern Punjab, Pakistan, located on the bank of the Chenab River.

### **6.2 HISTORY OF MUZAFFARGARH.**

The town of Muzaffargarh was founded in 1794 by the Governor of Multan Nawab Muzaffar Khan. The Meaning of Muzaffargarh because the old town lies inside the walls of a fort built by Nawab Muzaffar Khan of Multan. Prior to that the place was known by a shop called "Musan Hatti" on the road leading from Multan to Dera Ghazi Khan. In 1859 the headquarters were moved to Muzaffargarh.



**Figure 6-1 Map Showing Location of District Muzaffargarh**

Muzaffargarh region was agricultural region with forests during the Indus Valley Civilization. The Vedic period is characterized by Indo-Aryan culture that invaded from Central Asia and settled in Punjab region. The Kambojas, Daradas, Kaikayas, Madras, Pauravas, Yaudheyas, Malavas and Kurus invaded, settled and ruled ancient Punjab region.

After over running the Achaemenid Empire in 331 BCE, Alexander marched into present-day Punjab region with an army of 50,000. The Muzaffargarh region was ruled by Maurya Empire, Indo-Greek kingdom, Kushan Empire, Gupta Empire, White Huns, Kushano-Hephthalites and Shahi kingdoms. In 997 CE, Sultan Mahmud Ghaznavi, took over the Ghaznavid dynasty empire established by his father, Sultan Sebuktegin. In 1005 he conquered the Shahis in Kabul in 1005, and followed it by the conquests of Punjab region. The Delhi Sultanate and later Mughal Empire ruled the region. The Punjab region became predominantly Muslim due to missionary Sufi saints whose dargahs dot the landscape of Punjab region. After the decline of the Mughal Empire, the Sikh invaded and occupied Muzaffargarh District. The Muslims faced severe restrictions during the Sikh rule. The British took over Muzaffargarh District in 1848. The Town of Muzaffargarh was founded in 1794 by the Governor of Multan Nawab Muzaffar Khan. The Meaning of Muzaffargarh is "Fort of Muzaffar" because the old town lies inside the walls of a fort built by Nawab Muzaffar Khan of Multan. Prior to that the place was known by a shop called "Musani Hatti", on the road leading from Multan to Dera Ghazi Khan. The city was founded in the sixteenth century. In 1864 it became the headquarters of Muzaffargarh District. The predominantly Muslim population supported Muslim League and Pakistan Movement. After the independence of Pakistan in 1947, the minority Hindus and Sikhs migrated to India while the Muslim refugees from India settled in the Muzaffargarh District.

Muzaffargarh spreads over an area of 8,249 km<sup>2</sup> and forms a strip between the Chenab River on its east and Indus River on its west. Muzaffargarh is one of oldest districts of Punjab. The city is famous for sweet mangoes and nuts. Wheat, cotton and sugarcane are major crops of this area. Muzaffargarh was especially hard hit by the 2010 Pakistan floods, given its position.

### 6.3 BRIEF DESCRIPTION OF MUZAFFARGARH.

District Muzaffar Garh lies in the form of strip between the river Chenab and Indus, which passes along the Eastern and Western boundaries respectively of the district and form a triangle at Alipur tehsil of the district. The district is bounded on the North by newly created district Layyah, on the South by Bahawalpur and Rahimyar Khan Districts across the river Chenab. Districts Multan and Khanewal are on the Eastern side of district Muzaffargarh, across the river Chenab. District Jhang also touches on North-East. While Dera Gahzi Khan and Rajanpur districts lie on the Western side across the river Indus.



**Figure 6-2 Different Towns in District Muzaffargarh**

District Muzaffargarh is spread over an area of 8,249 square kilometers comprising of following four Thesils:

- Muzaffargarh
- Alipur
- Kot Adu
- Jatoi

## **6.4 PHYSICAL ENVIRONMENT.**

### **6.4.1 Topography**

Pakistan lying in the northwestern part of the Southern Asian Subcontinent, occupies the western end of the Indo-Genetic Plain, which is beyond bounded in the north by mountain wall of the Great Himalayas and their offshoots. Physiology of the earth is description of the behavior of the upper crust. Accordingly, some knowledge of the geology is desirable. The project site has a flat topography with terrain slope of about 18–20 cm/km. The project site is situated in agricultural area in Muzaffargarh. The land is plain.

### **6.4.2 Soils**

Soils form major part of environment. Their fertility and other special characteristics have great relationship with environment. Climate has great influence on the formation of soil; therefore, study of these factors is of great importance. Soil is dynamic layer in which many complex physical, chemical and biological activities are taking place. Therefore, soil is a dynamic changing body.

Soil scientists restrict the word soil or solum to the surface materials which over the ages have adopted the distinctive layers or horizon. Soils are made up of solids, liquids and gases. The solid part of the soil is made up of both inorganic and organic. While weathering of rocks make inorganic particles, the organic solids consist of living and decayed plants. In order to classify the entire soils in Pakistan, the Soil Survey of Pakistan has divided the entire country into nine ecological zones. The soil as a whole is very fertile. The city of Muzafargarh has very high density of trees, vegetation cover, flowers, gardens and parks. The Punjab Government has created Punjab Horticulture Authority which has converted roads sides and open places into beautiful green belts full of flowers, ornamental trees, and spreading the vegetation cover.

The geotechnical investigations carried out at the site for this project have revealed the presence of the three distinct litho logical units. First one is Lean Clay (CL) present in a firm to stiff state up to a depth of 3.0 to 4.0 m below NSL. Second is Silty fine Sand (SM) and poorly graded Sand with Silt (SP-SM) present in medium dense to very dense state following the top layer and extending up to maximum investigation depth of 30 m. Third layer is Lean Clay/Sandy Lean Clay (CL) of thickness ranging from 1.0 to 9.0 m is present at depths ranges from 14.0 to 23.0 m. The groundwater table was observed at a depth of 25 to 38 m below of earth.

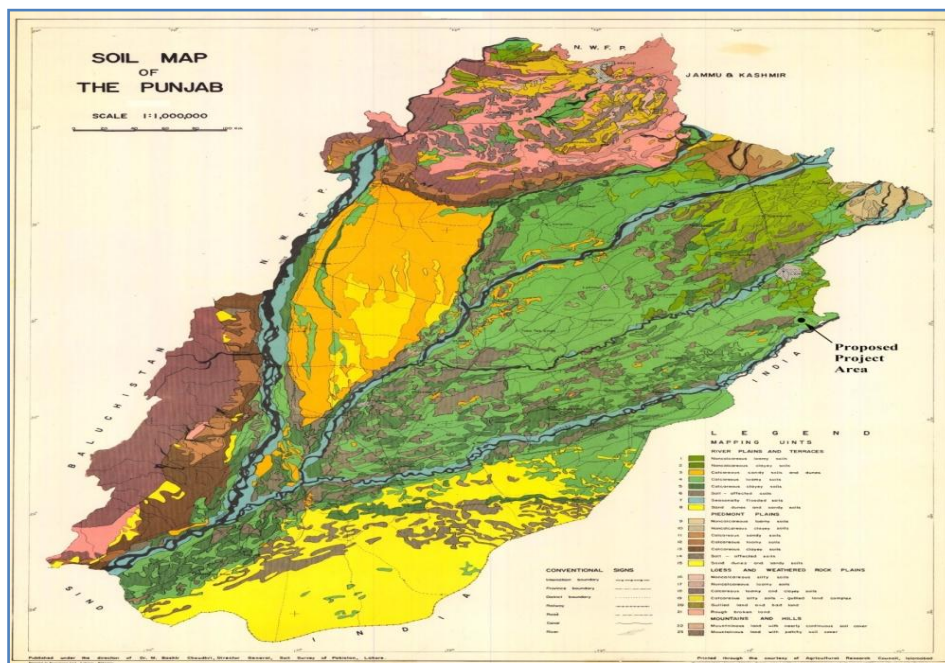


**Figure 6-3 Indicates the Proposed Project Area in the Punjab Soil Map**

### **6.4.3 Seismology:**

Earthquakes are generated due to tectonic processes in the upper part of the earth called lithosphere, which is divided into several rigid parts called “Plates”. Due to the movement of these plates, stress build up takes place and results in the deformation of the crustal mass in the form of folding and faulting. The energy produced due to movement along the faults is depicted in the form of earthquakes.

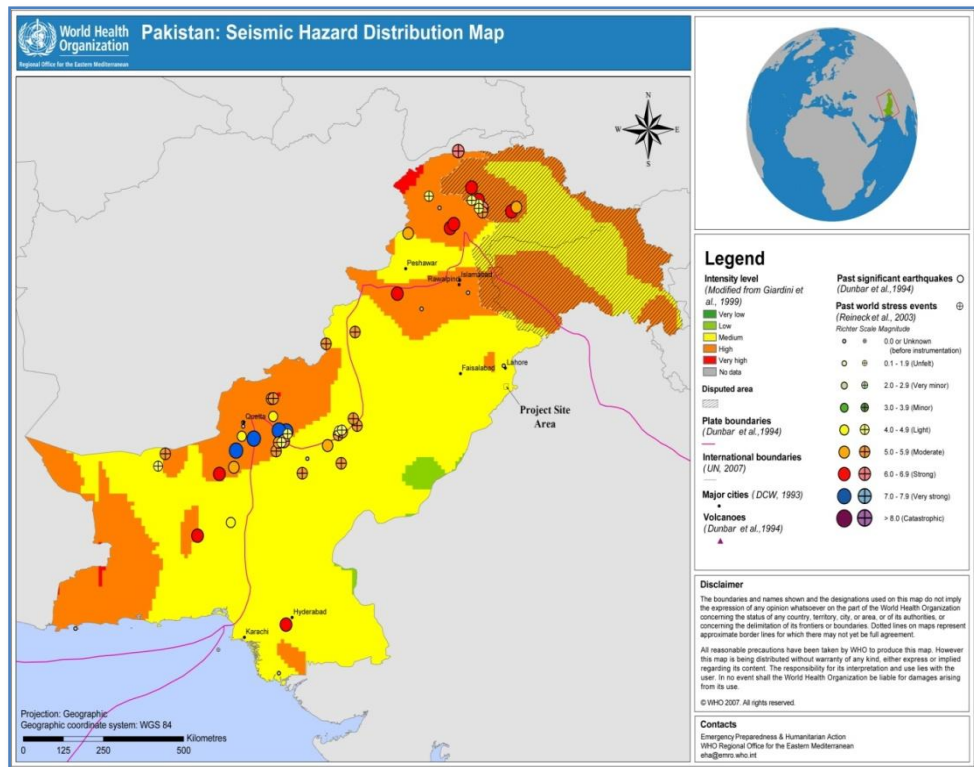


**Figure 6-4 Pakistan Seismic Hazard Distribution Map**

The Project site is located south of the collision zone between the Indian and Eurasian plates. This contact represented by the Himalayas, has always been generating moderate to large earthquakes including Kashmir (2005), Kangra (1905), Nepal-Bihar (1934) and Assam (1897 and 1950) that caused huge damage to life and property. Any major to large earthquake along Himalayan frontal faults can cause appreciable ground motion at site. The Punjab Plain, in which the Project is located, also shows low to moderate level of seismicity which is associated with the faulting in the Basement rocks covered by the alluvial deposits. A concentration of earthquakes has been observed west of the site between Shahkot and Sargodha which could be associated with faults in the Basement High. A minor to moderate earthquake originated from the Basement rocks in Punjab Plain could also produce appreciable ground shaking due to thick alluvial deposits. The project site lies in 2A category as shown in the figure 6.5

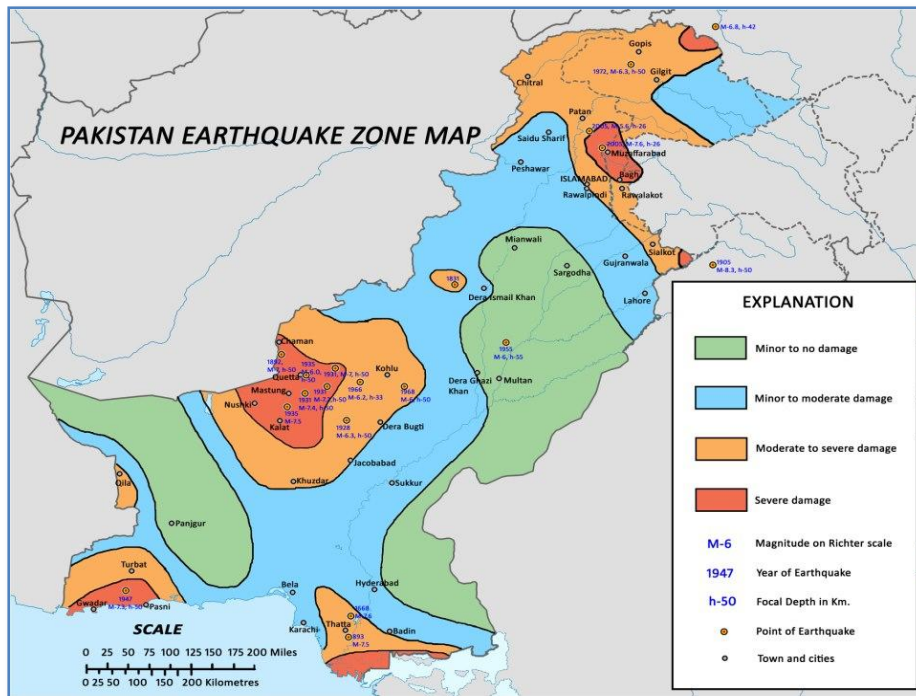


Figure 6-5 Seismic Map of Pakistan

According to Seismic Zoning Map of Pakistan included in the Pakistan Building Code Seismic Provisions (2007), the project site falls in Zone 2A, therefore project structures should be designed in accordance with the requirement of seismic designing Zone 2A after giving due consideration to the foundation material.

#### 6.4.4 Meteorology and Climatology

The project area lies in the plain of southern Punjab. Summers are quite hot with moderate humidity, whilst winters are of extreme cold. Mean winter temperature (December/January) ranges between 6.5°C and 10.5°C. Mean summer temperature remains around 37°C with frequent spells crossing 44-47°C. The mean of the maximum temperature ranges between 32-38°C and mean of the minimum ranges from 19 to 20°C. Spring and autumn seasons are the most pleasant parts of the year and full of colorful activities. The season is divided into a dry period called "Rabi" extending from October to March and a wet one called "Kharif" with substantial precipitation (approx. 50% of annual total) occurring in July and August. Long-term climate trend data was obtained from the

Met office. The meteorological and climatic features of the project site are shown in Table 6.1.

District Muzaffargarh has a hot semi-arid climate with rainy, long and extremely hot summers, dry and warm winters, a monsoon and dust storms. The weather of Muzaffargarh is extreme during the months of May, June and July, when the temperatures soar to 40–48 °C (104–118 °F). From late June till August, the monsoon seasons starts, with heavy rainfall throughout the province. The city's highest maximum temperature was 48.3 °C (118.9 °F) recorded on May 30, 1944 and 48 °C (118 °F) was recorded on June 9, 2007.

**Table 6.1 Meteorological and Climatic Features of the Project Area**

| <b>Climatic Features of the Project Area</b> |                      |
|----------------------------------------------|----------------------|
| Classification of Climate                    | Tropical (hot/humid) |
| Predominant Wind Direction                   | East/Northeast       |
| Wind intensity                               | Weak to moderate     |
| Average annual precipitation                 | >650 mm              |
| Rainy season                                 | July to September    |
| Dry season                                   | October to June      |
| Average annual temperature                   | 19-20 °C             |
| Average summer temperature                   | 36-38 °C             |
| Average winter temperature                   | 6.5-10.5 °C          |

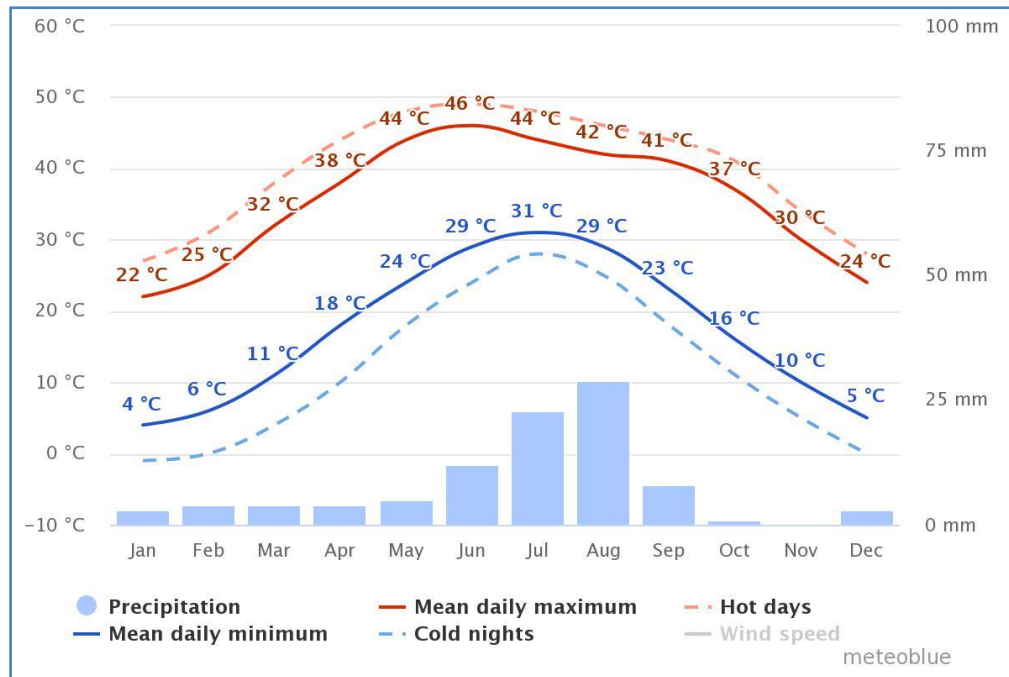


**Figure 6-6 Showing Climatic Data (Temperature & Rain Fall) of Muzaffargarh**

The Project Area has extreme climate; it has hot summer and cold winters. The summer starts from April and lasts till September. May, June, and July are the hottest months. The mean maximum and minimum temperature ranges from 40.4 °C and 27.3 °C respectively for these months. The winter seasons last from November to March. December, January and February are the coldest months. The mean maximum and mean minimum temperature ranges from 21.1°C to 7.2 °C in January. Few days earlier, temperature went down to -2.2 °C, ever minimum recorded in the history.

#### 6.4.4.1 Rainfall

Towards end of June monsoon condition appears and during the following two and half months spells of season alternates with intervals of sultry weather. The winter rain falls during January, February and March ranging from 23 to 31 millimeters. Month wise mean precipitation recorded is given in figure below.

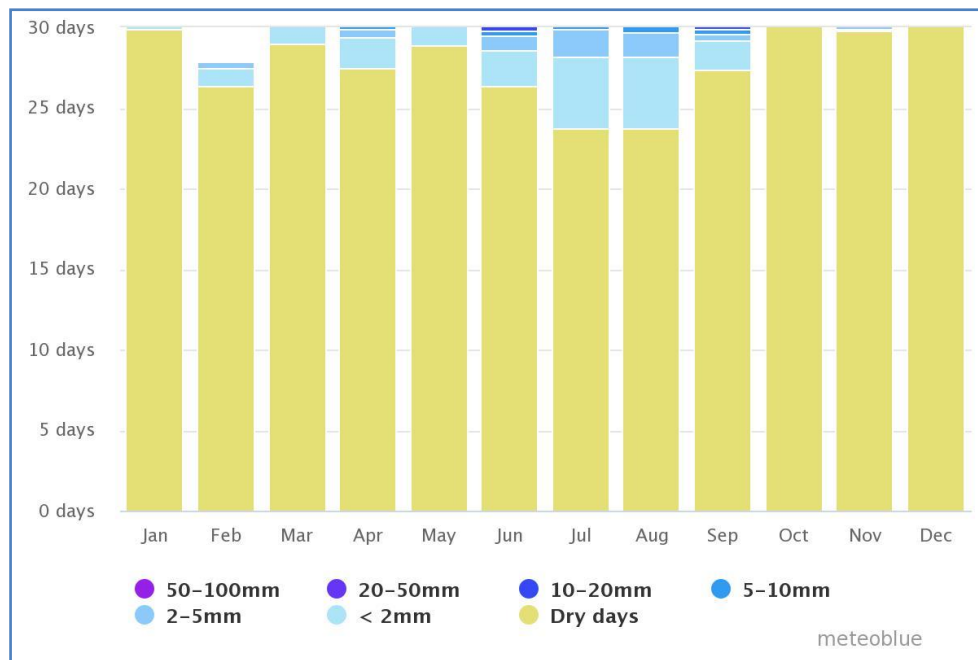


Figure 6-7 Precipitation Amounts in Muzaffargarh

#### 6.4.4.2 Temperature

The maximum temperature diagram for Muzaffargarh displays how many days per month reach certain temperatures. , One of the hottest cities on earth, has almost none days below 40°C in July.

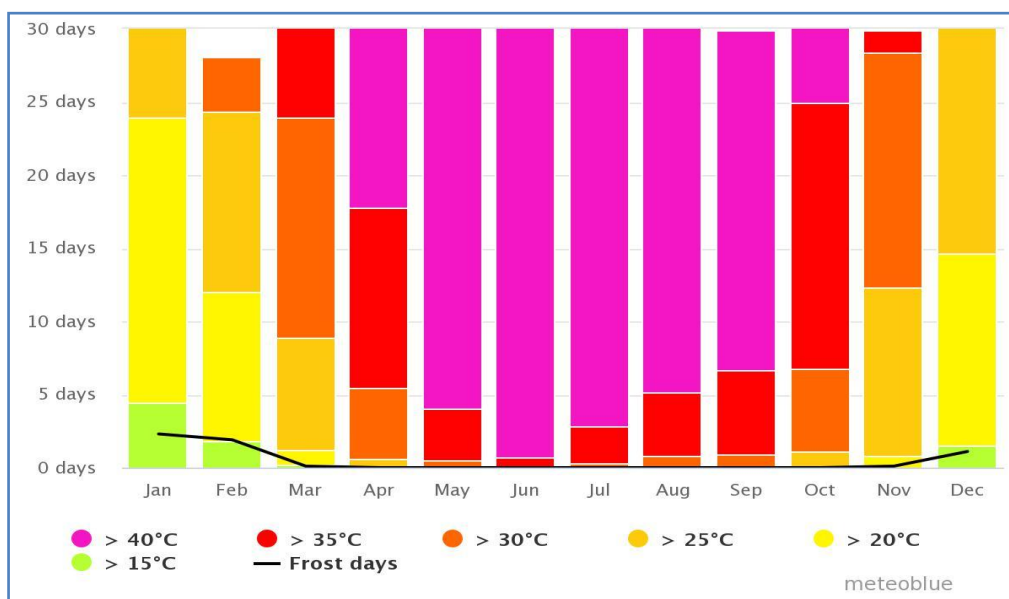


Figure 6-8 Average Temperature at Muzaffargarh

#### 6.4.4.3 Wind Rose

The wind rose for Muzaffargarh shows how many hours per year the wind blows from the indicated direction.

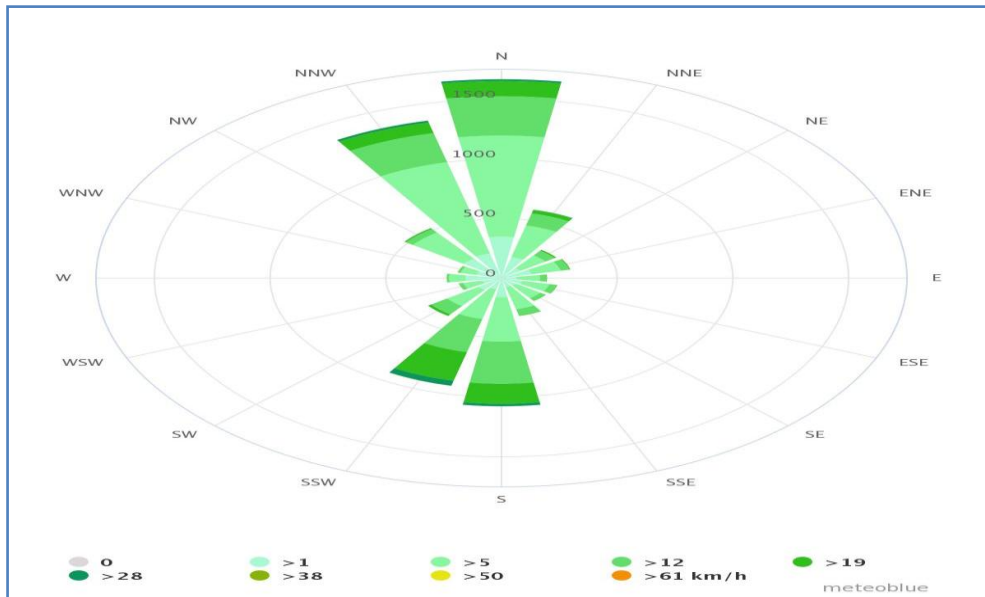


Figure 6–9 Wind Rose at Muzaffargarh

#### 6.4.5 Water Resources

##### 6.4.5.1 Rivers

The only river touch the boundaries of project area is river Chenab. However, this river is being polluted by the extensive drainage of the industrial and domestic effluents from all around the Multan and its surroundings.

##### 6.4.5.2 Canals

Muzaffargarh canal is passing about 300 meters near the project area. This canal water can also be used as source of water supply to meet the water requirements at the project site.

#### **6.4.5.3 Groundwater**

The project area is underlain by unconsolidated alluvial deposits laid by river Chenab and its tributaries. Fine to medium sands from aquifer material and fine sediments (clay, silt) occur as discontinuous layers/lenses. The aquifer is fairly thick and may be considered continuous on regional basis. Groundwater table generally occurs at the site from 50 to 80 meter below the existing surface. Keeping in view the general hydro-geological set up of the regional aquifer, it is estimated that existing underground water source is sufficient to meet small water requirements of proposed project.

#### **6.4.5.4 Ecological Resources/Biodiversity.**

The project area lies in the rural area having dominant trends of industrialization.

#### **6.4.5.5 Fauna**

In urban Muzaffargarh, there are areas which can truly be classified as places of breeding, nesting and roosting for several bird species. According to one study conducted in 1965 there were 140 bird species in Muzaffargarh. However, with an increase in the rate of urbanization/industrialization, the ecology has been considerably affected and population of birds in Muzaffargarh has reduced to just 80 including the resident and migratory ones.



**Figure 6–10 Mammals in the Project Area**



Figure 6-11 Fauna at the Project Site

Table 6.2 List of Birds Present in Muzaffargarh

| Sr # | Common Name            | Zoological Name                   |
|------|------------------------|-----------------------------------|
| 1    | Bank Myna              | <i>Acridotheresginginianus</i>    |
| 2    | Blackbird              | <i>Turdusmerula</i>               |
| 3    | Black drongo           | <i>Dicrurusmacrocerus</i>         |
| 4    | Rock Pigeon            | <i>Columbia livia</i>             |
| 5    | Common babbler         | <i>Turdoides caudate</i>          |
| 6    | Common Myna            | <i>Acridotherestrictis</i>        |
| 7    | Garden Warbler         | <i>Sylvia borin</i>               |
| 8    | Indian Robin           | <i>Saxicoloides</i>               |
| 9    | White-browed wagtail   | <i>Motacillamadaraspatisensis</i> |
| 10   | Little green bee-eater | <i>Meropsorientalis</i>           |
| 11   | Asian Pied Starling    | <i>Sturnus contra</i>             |
| 12   | Red turtle dove        | <i>Streptopelia tranquebarica</i> |

| Sr # | Common Name              | Zoological Name                   |
|------|--------------------------|-----------------------------------|
| 13   | Red-vented bulbul        | <i>Pycnonotus cafer</i>           |
| 14   | Ring-necked dove         | <i>Streptopelia capicola</i>      |
| 15   | Lang-tailed Shrike       | <i>Lanius schach</i>              |
| 16   | Great spotted woodpecker | <i>Dendrocopos major</i>          |
| 17   | White-browed wagtail     | <i>Motacilla maderaspatensis</i>  |
| 18   | Asian Koel               | <i>Eudynamis scolopacea</i>       |
| 19   | Common hawk-cuckoo       | <i>Cuculus varius</i>             |
| 20   | Common Koel              | <i>Eudynamis scolopacea</i>       |
| 21   | Pied Cuckoo              | <i>Clamator jacobinus</i>         |
| 22   | Red turtle dove          | <i>Streptopelia tranquebarica</i> |
| 23   | Ring-neck dove           | <i>Streptopelia risoria</i>       |
| 24   | Rose-ring parakeet       | <i>Psittacula krameri</i>         |

Not only the birds, but different other classes of the animal species also play an important role for the habitat of the area as shown in Table below

**Table 6.3 List of Different Classes of Animals**

| Mammals    | Reptiles       | Amphibians               | Insects   |
|------------|----------------|--------------------------|-----------|
| Stray dogs | Monitor Lizard | Indus valley<br>bullfrog | Dragonfly |

| Mammals            | Reptiles | Amphibians   | Insects     |
|--------------------|----------|--------------|-------------|
| Feral cats         | Geckos   | Common frogs | Damselfly   |
| Donkeys            | -        | Toads        | Butterflies |
| Cows               | -        | -            | Honey bees  |
| Bats               | -        | -            | Earthworms  |
| Goats              | -        | -            | Centipedes  |
| Buffalo            | -        | -            | -           |
| Mole               | -        | -            | -           |
| Horse              | -        | -            | -           |
| Sheep              | -        | -            | -           |
| Camel              |          |              |             |
| <i>Source:</i> WWF |          |              |             |

#### 6.4.6 Flora

The present site topography shows that no tree cutting will be involved during construction of the project as land area was exclusively used for agricultural activities in past, now it is barren and some area is under the stagnant water. Several types of floral species are present in Muzafargarh, some of the principal trees, shrubs (plants) and herbs (ground covering plants). In addition, there are few floral species which are at the risk of extinction. Table-3.8 shows the list of endangered and prohibited floral species. However, there were no species reported by Forest and Wildlife Departments to be threatened at project site, which are included in the IUCN Red data book.



**Figure 6-12 Flora (shrubs) at the project site**

#### **6.4.7 Sensitive Habitat**

No sensitive habitat has been seen or reported by any authority in or around the proposed site.

#### **6.5 CULTURAL & OTHER HERITAGE.**

The city of Muzaffargarh as well as the project area where the project site exists is not rich in cultural and heritage.

#### **6.6 EXISTING SOCIO- ECONOMIC CONDITIONS IN PROJECT AREA.**

##### **6.6.1 Population and Communities**

The project site is situated in agricultural area of Muzaffargarh.

**Table 6.4 Showing important Socio-economic feature of Project District**

|                                 |                                   |
|---------------------------------|-----------------------------------|
| Population                      | 342000                            |
| Area (Square Kilometers)        | 8,249                             |
| Population Density (per sq.Km.) | 320                               |
| Tehsils                         | Muzaffargarh, Alipur, Kot Adu and |

|                                  |                                                                                                                                                                         |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  | Jatoi.                                                                                                                                                                  |
| National Assembly Seats          | 5                                                                                                                                                                       |
| Punjab Provincial Assembly Seats | 11                                                                                                                                                                      |
| Union Councils                   | 93                                                                                                                                                                      |
| Literacy Ratio (10 +)            | 28.5% (According to 1998 Census )                                                                                                                                       |
| Main Towns                       | Khan Garh, Shaher Sultan, Seet Pur, Jatoi, Rangpur, Gujrat, Mehmood Kot, Kotla Leghari, Sanawan, Basira, Dera Din Panah, Chowk Munda, Shah Jamal and Karam Dad Qureshi. |
| Language                         | "Saraki" is the local language, Urdu, Punjabi & English languages are also acceptable.                                                                                  |
| Main Crops                       | Wheat, Sugarcane and Cotton.                                                                                                                                            |
| Main Fruits                      | Mangoes, Dates, Citrus and Pomegranate                                                                                                                                  |
| Main Vegetables                  | Onion, Carrot, Cauliflower and Peas                                                                                                                                     |
| Forest (Area in Acres)           | 1,02,110                                                                                                                                                                |
| Total Metalled Roads (Km)        | 1,084                                                                                                                                                                   |

|                            |       |
|----------------------------|-------|
| No. of Grid Stations       | 11    |
| No. of Telephone Exchanges | 27    |
| Number of Industrial Units | 1,178 |

### **6.6.2 Industries**

The district's major industries include cotton ginning and pressing, flour mills, jute textile, oil mills, paper/paperboard articles, petroleum products, polypropylene bags, power generation, readymade garments, solvent extraction, sugar, textile composite and textile spinning. PARCO Pak-Arab Refinery (PARCO)'s Mid-Country Refinery is the country's latest, largest and most complex refinery and employs critical processes involved in refining. Commissioned in the year 2000, Pak-Arab Refinery's 100,000 barrels per day, state-of-the-art Mid-Country Refinery (MCR) at Qasba Gujrat in Muzaffargarh, represents about 35% of Pakistan's refining capacity. It helps substitute import of refined, value-added oil products to the tune of US\$ 100 million per year. The MCR mainly processes crude oil of Upper Zakum from Abu Dhabi and light Arabian crude from Saudi Arabia. Kot Addu Power Company (KAPCO) was incorporated in 1996 with the purpose of contributing economic power to the national grid. KAPCO has shown exceptional results in the area of plant maintenance, availability, quality standards and financial performance. The total generation capacity of KAPCO is 1600 MW. The Thermal Power Station Muzaffargarh consists of 3 oil-fired steam-operated units of 210 MW, each with provision of adding another 3 units of same or more capacity. The total generation capacity of TPS is 1350 MW. This Power Station is a vital and major thermal power generating installation connected with National grid system in Pakistan. According to the Wall Street Journal, Pakistan Atomic Energy Commission (PAEC) plans to install three Chinese nuclear reactors at Muzaffargarh and the

site is now being prepared. Muzaffargarh Nuclear Power Complex would have 1100 MW Nuclear reactor.

### **6.6.3 Land Use Planning**

The entire land use planning is carried out according to the provincial laws.

### **6.6.4 Power Sources and Transmission**

Water And Power Development Authority (WAPDA) network operates in the area. Transmission of power is through overhead electric transmission lines. National grid is the source of all power in the area.

### **6.6.5 Public Health of the Project Area**

The health of the project area is sound, private and government medical facilities are inadequately available within the project area.

### **6.6.6 Employment and Sources of Income**

Most of the people have adopted multiple sources of income to sustain their lives. Government and private services, petty business and transport are the other sources of income of the people.

### **6.6.7 Basic Facilities Available in the Study Area**

Basic facilities including electricity, water, telephone, roads and transport are available to every pocket of the Muzaffargarh. Cellular/mobile telephones are available with a large number of the people. Sewerage facilities are not available in the entire project area.

### **6.6.8 Dialects of Punjabi**

Following are the demographics of the Muzaffargarh district, by spoken language:

- Punjab local people different dialects: 95%

- Other: 5%

Inhabitants of Muzaffargarh District speak a great variety of Punjabi dialects. Thalochi (Mainly), Majhi or standard (Sizeable population in cities also in newly cultivated areas), Raangri (A mixture of Punjabi and Urdu spoken by sizeable population in cities), Chinawari/Jhangvi (North Border areas near Khanewal district), Derawali (West Border areas near DG Khan & Rajanpur districts), Multani (East Border areas near Multan district), Riyasti (South Border areas near Rahim Yar Khan district). Other Languages include:

- Urdu is mother tongue of few people but being national language is spoken and understood by the sizeable population.
- English is also understood and spoken by the educated elite.
- Pashto is also spoken by very few people in the cities.

#### **6.6.9 Religion**

Nearly 99% of the population of Muzaffargarh is Muslim. Majority of Muslims belong to Sunni Hanafi Fiqh while there is small minority following Shia Ithna ashari Fiqh.

#### **6.6.10 Transportation**

Muzaffargarh has connections with other cities by a variety of means of transportation. The district has concrete road reaching up to 983.69 km. The district is linked with D.G. Khan, Layyah and Multan districts through concrete roads. Buses to Multan leave frequently, since it is located closely to the city. Muzaffargarh is connected by rail with all parts of the country and lies on the Branch track between Rawalpindi, Multan, Mianwali and Attock. The main Peshawar–Karachi railway line passes through Multan district.

The people of Muzaffargarh use Multan International Airport because it is nearer to Muzaffargarh and a 25 minute drive. Multan International Airport is an airport situated 10 km away from the city centre of Multan. Educational institutions

#### **6.6.11 Major crops**

Wheat, sugarcane and cotton are the main crops grown in the district. Rice, jawar, bajra, moong, mash, masoor, ground nuts, maize and oil seeds such as rape / Fruits

Mangoes, dates, citrus and pomegranate are the main fruits grown in the district. Dates, jaman, pears, phalsa and bananas are also grown in minor quantities in the district. Mustard and sunflower are also grown in minor quantities in the district.

#### **6.6.12 Vegetables**

Onions, carrots, cauliflower and peas are the main vegetables grown in the district. Ladyfinger, turnips, tomatoes, potatoes, garlic and chillies are also grown in the district in minor quantities.

#### **6.6.13 Fish Farming**

Muzaffar Garh is the leading district in Pakistan in fish farming. About 15000 acres of land are under fish farming. Mainly Indian Major Carps are cultured. Now some progressive farmers are turning to Tilapia farming as well.

#### **6.6.14 Road-Links**

The district has a total metalled road-length of 1084 Kilometres. The district is linked with Multan, Rajanpur, D.G.Khan and Rahimyar Khan Districts through metalled roads.

#### **6.6.15 Effluent Disposal Facilities**

There are two nullahs available in the district. However, permission from Irrigation and Power Department, Government of the Punjab is necessary for disposal of effluent after pre-treatment. 4.5.18 Power Supply There is 11 grid stations in the district (ranging in capacity from 11 kV, 132 kV, and 220kV).

#### 6.6.16 Natural Gas Availability

Natural gas is available in Muzaffargarh City, Kot Adu, Shah Jamal, Mondka and Khangarh.

#### 6.6.17 Telephone Facilities

There are 27 telephone exchanges operating in the district (ranging in capacity from 50 lines to 4000 lines). Cellular

#### 6.6.18 Social Infra-Structural Facilities

Social infrastructure facilities (Public Sector) available in the district are given here Tehsil – Wise basis.

**Table 6.5 Tehsil Profile of Muzaffargarh**

| Tehsils       | School | college | Hospital | Police Stations | Railway Stations | Post Offices | Banks |
|---------------|--------|---------|----------|-----------------|------------------|--------------|-------|
| Muzaffer Garh | 696    | 5       | 4        | 8               | 3                | 24           | 22    |
| Kot Addu      | 627    | 5       | 4        | 5               | 5                | 16           | 22    |
| Ali Pur       | 252    | 3       | 1        | 6               | –                | 12           | 14    |
| Jatoi         | 273    | 1       | 1        | 3               | –                | 4            | 4     |

### 6.7 ENVIRONMENTAL MONITORING DATA

#### 6.7.1 Water Analysis

Water samples data was retrieved from the number of the studies carried out by the proponent. The result indicates that the project site is plain and underground water is sweet in most of the areas.



**Figure 6-13 Water Sampling**

**Table 6.6 Water Analysis Data**

| <b>Sr. No.</b> | <b>Parameters</b>            | <b>Units</b>  | <b>PDWQS</b>      | <b>Results</b>    | <b>Remarks</b>                 |
|----------------|------------------------------|---------------|-------------------|-------------------|--------------------------------|
| 1              | pH                           | --            | 6.5-8.5           | 7.7               | In Compliance with PEQS values |
| 2              | Taste & Odor                 | --            | Non Objectionable | Non Objectionable |                                |
| 3              | Color                        | TCU           | <15               | 6.9               |                                |
| 4              | Turbidity                    | NTU           | <5                | 4.1               |                                |
| 5              | Total Coliform               | Number/100 mL | 0 Number/ 100 mL  | 0                 |                                |
| 6              | E-Coli                       | Number/100 mL | 0 Number/ 100 mL  | 0                 |                                |
| 7              | Total Dissolved Solids (TDS) | mg/L          | <1000             | 803               |                                |
| 8              | Total Hardness               | mg/L          | <500              | 304               |                                |
| 9              | Nitrate                      | mg/L          | ≤50               | 3.3               |                                |
| 10             | Nitrite                      | mg/L          | ≤3                | 0.086             |                                |
| 11             | Ammonia                      | mg/L          | ---               | 0.07              |                                |
| 12             | Arsenic                      | mg/L          | <0.05             | 0.008             |                                |
| 13             | Antimony                     | mg/L          | <0.005            | N.D.              |                                |

| Sr. No. | Parameters | Units | PDWQS | Results | Remarks |
|---------|------------|-------|-------|---------|---------|
| 14      | Barium     | mg/L  | 0.7   | N.D.    |         |
| 15      | Chloride   | mg/L  | 250   | 99      |         |

### 6.7.2 Ambient Air Quality

The monitoring result of ambient air quality is shown below:



Figure 6-14 Ambient Air Quality Monitoring

Table 6.7 Ambient Air Quality

| Sr. No. | Parameters                              | Time Duration | Results ( $\mu\text{g}/\text{m}^3$ ) | PEQSAA                           | Result                                |
|---------|-----------------------------------------|---------------|--------------------------------------|----------------------------------|---------------------------------------|
| 1.      | Particulate Matter ( $\text{PM}_{10}$ ) | 12:00 P.M     | 115.4                                | 150 ( $\mu\text{g}/\text{m}^3$ ) | 104.6083 ( $\mu\text{g}/\text{m}^3$ ) |
| 2.      |                                         | 01:00 P.M     | 113.8                                |                                  |                                       |
| 3.      |                                         | 02:00 P.M     | 109.3                                |                                  |                                       |
| 4.      |                                         | 03:00 P.M     | 105.6                                |                                  |                                       |
| 5.      |                                         | 04:00 P.M     | 101.9                                |                                  |                                       |

| Sr. No. | Parameters | Time Duration | Results ( $\mu\text{g}/\text{m}^3$ ) | PEQSAA | Result |
|---------|------------|---------------|--------------------------------------|--------|--------|
| 6.      |            | 05.00 P.M     | 98.5                                 |        |        |
| 7.      |            | 06.00 P.M     | 96.5                                 |        |        |
| 8.      |            | 07.00 P.M     | 93.3                                 |        |        |
| 9.      |            | 08.00 P.M     | 92.5                                 |        |        |
| 10.     |            | 09.00 P.M     | 86.5                                 |        |        |
| 11.     |            | 10.00 P.M     | 80.4                                 |        |        |
| 12.     |            | 11.00 P.M     | 80.7                                 |        |        |
| 13.     |            | 12.00 A.M     | 80.9                                 |        |        |

### 6.7.3 Noise Level

Noise levels have been monitored at two locations along the project road using the Digital Sound level meter and results are given in Table 6.8

**Table 6.8 Noise Levels**

| Sr. No. | Location                     | Units  | Minimum | Maximum | Leq   | Remarks                       |
|---------|------------------------------|--------|---------|---------|-------|-------------------------------|
| 1       | Boiling House/ Process House | dB (A) | 68.4    | 76.1    | 72.25 | In-Compliance with PEQS value |
| 2       | Mill House                   |        | 62.3    | 65.8    | 64.05 |                               |

| Sr. No. | Location           | Units | Minimum | Maximum | Leq   | Remarks |
|---------|--------------------|-------|---------|---------|-------|---------|
| 3       | Power House        |       | 67.9    | 74.3    | 71.1  |         |
| 4       | Officers Mess Area |       | 56.3    | 60.4    | 58.35 |         |
| 5       | Main Gate Entrance |       | 54.7    | 59.8    | 57.25 |         |
| 6       | Near Office Area   |       | 58.9    | 60.1    | 59.5  |         |
| 7       | Walls boundary     |       | 53.4    | 56.5    | 54.95 |         |

## 6.8 SUITABILITY OF SITE

Currently, land for the proposed project is owned by the Tandlianwala Sugar Mill Limited Unit Rehman Hajira Muzaffargarh. And there are no features of ecological importance thus the land is not prohibited by any means.

## **7 IMPACT ASSESSMENT**

### **7.1 PROBLEM AND ITS OCCURRENCE**

On the basis of the findings of the EIA, it is concluded that the project will not pose any adverse impact on the local population and the environment. A proper management plan shall be prepared in case of any accident like;

- Any health hazard to workers/other persons during construction or operation phase.
- Odour emissions to the environment.
- Inappropriate waste sludge handling.

As mention above that the project will not pose any adverse impacts to the environment. An assessment of impact during construction and operation phase is given in Table-7.1, which indicates the impact and their magnitude.

Table 7.1 Anticipated Impacts of Proposed Project

| Components     | Elements                      | Impacting Actions |            |              |                  |             |                      |                     |            |              |            |                |             |
|----------------|-------------------------------|-------------------|------------|--------------|------------------|-------------|----------------------|---------------------|------------|--------------|------------|----------------|-------------|
|                |                               | During Project    |            |              |                  |             | After Completion     |                     |            |              |            |                |             |
|                |                               | Relocation        | Demolition | Construction | Wildlife Habitat | Air Quality | Residential Building | Commercial Building | Recreation | Conservation | Water Body | Odour Problems | Solid Waste |
| Biophysical    | Soil and geology              | ✓                 | ✓          | ✓            | -                | ✓           | ✓                    | -                   | -          | ✓            | ✓          | -              | -           |
|                | Hydrology                     | ✓                 | ✓          | ✓            | ✓                | ✓           | ✓                    | ✓                   | -          | ✓            | ✓          | ✓              | -           |
|                | Flora                         |                   | -          | ✓            | ✓                | ✓           | ✓                    | -                   | ✓          | -            | -          | ✓              | ✓           |
|                | Fauna                         |                   | -          | ✓            | ✓                | ✓           | ✓                    | -                   | ✓          | -            | -          | ✓              | ✓           |
|                | Air quality                   |                   | -          | ✓            | ✓                | ✓           | ✓                    | -                   | -          | -            | -          | ✓              | ✓           |
|                | Land use                      | ✓                 | -          | ✓            | ✓                | ✓           | ✓                    | -                   | -          | -            | -          | -              | -           |
|                | Roads                         |                   | -          | -            | ✓                | -           | ✓                    | ✓                   | -          | -            | -          | -              | -           |
|                | Public transport              | -                 | -          | ✓            | -                | -           | -                    | ✓                   | -          | -            | -          | -              | -           |
|                | Resource Consumption          | ✓                 | -          | ✓            | ✓                | -           | -                    | ✓                   | -          |              | -          | -              | ✓           |
|                | Open space                    | -                 | -          | -            | -                | -           | -                    | -                   | -          | -            | -          | -              | -           |
| Socio-Economic | Demand for ancillary services | -                 | -          | ✓            | ✓                | -           | -                    | -                   | -          | -            | -          | -              | ✓           |
|                | Health and Safety             | -                 | -          | ✓            | ✓                | -           | -                    | -                   | -          | -            | ✓          | -              | ✓           |
|                | Industry                      | -                 | -          | -            | ✓                | -           | -                    | -                   | -          | -            | -          | ✓              | -           |
|                | Commercial                    | -                 | -          | -            | -                | -           | -                    | ✓                   | -          | -            | -          | -              | -           |
|                | Tourism                       | ✓                 | -          | -            | -                | -           | -                    | ✓                   | -          | -            | -          | -              | -           |

| Components | Elements            | Impacting Actions |            |              |                  |             |                      |                     |            |              |            |                |             |
|------------|---------------------|-------------------|------------|--------------|------------------|-------------|----------------------|---------------------|------------|--------------|------------|----------------|-------------|
|            |                     | During Project    |            |              |                  |             | After Completion     |                     |            |              |            |                |             |
|            |                     | Relocation        | Demolition | Construction | Wildlife Habitat | Air Quality | Residential Building | Commercial Building | Recreation | Conservation | Water Body | Odour Problems | Solid Waste |
| Cultural   | Infrastructure      | -                 | -          | -            | -                | ✓           | -                    | -                   | -          | -            | -          | -              | -           |
|            | Landscape           | -                 | -          | -            | -                | -           | -                    | -                   | -          | ✓            | -          | -              | -           |
|            | Historic Structures | ✓                 | -          | ✓            | -                | ✓           | ✓                    | -                   | -          | -            | ✓          | -              | ✓           |
|            | Ethnic groups       | -                 | -          | ✓            | ✓                | ✓           | ✓                    | -                   | -          | -            | ✓          | -              | ✓           |
|            |                     |                   |            |              |                  |             |                      |                     |            |              |            |                |             |

**7.2 CHARACTERISTICS OF IMPACTS (NATURE, MAGNITUDE, EXTENT AND LOCATION, TIMING, DURATION, REVERSIBILITY, RISK)**

The detailed characteristics of impacts during construction and operation phase of project is shown below

Table 7.2 Characteristics of Impacts during Plant Construction

| Parameter           | Description Of Impacts And Impact Sources                                                                                                                                                                                                                                                                                                                                                                                  | Impact Receptors                                               | Impact Assessment |                          |                                      |                                                             |               |                                                             |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------------|--------------------------|--------------------------------------|-------------------------------------------------------------|---------------|-------------------------------------------------------------|
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                | Nature            | Probability of Influence | Influence Area                       | Duration                                                    | Reversibility | Residual Impact                                             |
| Construction Phase  |                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                |                   |                          |                                      |                                                             |               |                                                             |
| Ambient Air Quality | Combustion products, welding aerosols and other harmful substances emitted into ambient air<br>– Combustion products sources – activities requiring construction and special machinery. These include earth works, transportation of building materials, construction/arrangement of infrastructural units, diesel generators, etc.<br>– Welding aerosols source – Installation of metal structures.<br>– Other sources of | Residents of nearby settlements, staff, biological environment | Direct, Negative  | Medium Risk              | Construction site and adjacent areas | Medium term (Depends on the duration of construction works) | Reversible    | Low, Taking into account the mitigation measures – very low |

| Parameter          | Description Of Impacts And Impact Sources                                                                                                                | Impact Receptors | Impact Assessment |                          |                                      |             |               |                                                                         |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------|--------------------------|--------------------------------------|-------------|---------------|-------------------------------------------------------------------------|
|                    |                                                                                                                                                          |                  | Nature            | Probability of Influence | Influence Area                       | Duration    | Reversibility | Residual Impact                                                         |
| Construction Phase |                                                                                                                                                          |                  |                   |                          |                                      |             |               |                                                                         |
|                    | harmful substances – Gaseous emissions of chemical substances (fuel – lubricants, fuel tanks, etc.).                                                     |                  |                   |                          |                                      |             |               |                                                                         |
|                    | Dust Emissions – Source – earth works, transportation, storage and usage of bulk construction materials, movement of equipment and vehicles, and others. |                  | Direct, Negative  | High risk                | Construction site and adjacent areas | Medium Term | Reversible    | Medium or low, Taking into accounts the mitigation measures – Very low. |
|                    | Foul odor emission – Source – painting works.                                                                                                            |                  | Direct, Negative  | High risk                | Construction site and adjacent areas | Short Term  |               | Very low                                                                |

| Parameter          | Description Of Impacts And Impact Sources                                                                                                                                                | Impact Receptors                                                | Impact Assessment |                                                                               |                                                                           |                                                                   |               |                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------|---------------|------------------------------------------------------------------------------|
|                    |                                                                                                                                                                                          |                                                                 | Nature            | Probability of Influence                                                      | Influence Area                                                            | Duration                                                          | Reversibility | Residual Impact                                                              |
| Construction Phase |                                                                                                                                                                                          |                                                                 |                   |                                                                               |                                                                           |                                                                   |               |                                                                              |
| Noise impact       | Noise Propagation in the Air – Noise propagation from construction equipment and construction operations; – Noise caused by construction/installation works; – Noise caused by vehicles. | Population, project stuff, animals inhabiting in adjacent areas | Direct, negative  | Adjacent to the populated area – medium risk. Area of activities – high risk. | About 0.35 km radius adjacent to construction site and construction camp. | Medium term (depending on the duration of the construction works) | Reversible    | Low or Medium. Taking into account the mitigation measures – low or very low |
| Water              | Changes in groundwater debit                                                                                                                                                             | Population, animals, surface waters with a hydraulic connection | Indirect          | Low risk                                                                      | Construction camps and construction sites                                 | ≈1 year                                                           | Reversible    | Very low, or impact is not expected                                          |

| Parameter          | Description Of Impacts And Impact Sources                                                                                                                                                              | Impact Receptors                                  | Impact Assessment                                                                   |                                                                 |                                                                           |                                                                 |                                                 |                                                                             |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------|
|                    |                                                                                                                                                                                                        |                                                   | Nature                                                                              | Probability of Influence                                        | Influence Area                                                            | Duration                                                        | Reversibility                                   | Residual Impact                                                             |
| Construction Phase |                                                                                                                                                                                                        |                                                   |                                                                                     |                                                                 |                                                                           |                                                                 |                                                 |                                                                             |
| Soil               | <b>Impact on integrity and stability of soil.</b> Lose of topsoil – Vehicle and construction equipment movement; – Earth works, arrangement of access roads and various facilities; – Waste management | Vegetation, animals, population                   | Direct, Negative                                                                    | Medium risk, taking into account mitigation measures – low risk | Construction camp, construction sites and corridors of roads for vehicles | Medium or long term                                             | Reversible. In exceptional cases – irreversible | <b>Low</b> – taking into account mitigation measures – <b>very low</b>      |
|                    | <b>Soil contamination</b> – Spillage of oil or other chemical substances, pollution by waste.                                                                                                          | Vegetation, surface and ground waters, population | Direct (in case of siltation with sediment contaminated water – indirect). Negative | Medium risk                                                     | Construction camp, construction sites and corridors of roads for vehicles | Medium-term (Limited to the duration of the construction phase) | Reversible                                      | <b>Medium</b> , taking into account mitigation measures – <b>very low</b> . |

| Parameter              | Description Of Impacts And Impact Sources                                                                                                                                                                                                              | Impact Receptors                                                                | Impact Assessment             |                          |                                                                                                                                                      |                                                 |                                                 |                                                  |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------|--------------------------------------------------|
|                        |                                                                                                                                                                                                                                                        |                                                                                 | Nature                        | Probability of Influence | Influence Area                                                                                                                                       | Duration                                        | Reversibility                                   | Residual Impact                                  |
| Construction Phase     |                                                                                                                                                                                                                                                        |                                                                                 |                               |                          |                                                                                                                                                      |                                                 |                                                 |                                                  |
| Biological Environment | Vegetation destruction / damage. Habitat loss / fragmentation. – Direct impact: o Vegetation removal from the area; o Damage of vegetation caused by violating traffic routes. – Indirect impact: o Water pollution; o Soil contamination and erosion. | Area selected for the construction of the treatment plant, wildlife, population | Direct and indirect, negative | Medium risk              | Direct impact area – construction camp and construction site – Indirect impact area – areas adjacent to the construction camp and construction site. | Medium term. Permanent on the construction site | Reversible. On construction site – irreversible | Low. Considering mitigation measures – Very Low. |

| Parameter          | Description Of Impacts<br>And Impact Sources                                                                                                                                             | Impact<br>Receptors | Impact Assessment |                                |                                      |                                               |               |                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------|--------------------------------|--------------------------------------|-----------------------------------------------|---------------|--------------------|
|                    |                                                                                                                                                                                          |                     | Nature            | Probability<br>of<br>Influence | Influence<br>Area                    | Duration                                      | Reversibility | Residual<br>Impact |
| Construction Phase |                                                                                                                                                                                          |                     |                   |                                |                                      |                                               |               |                    |
| Socio-Economic     | Restriction of access to resources: – Impact on land owners – implementation of any type of activity on their lands, or damage of their property; – Limited use of water resources, etc. | Local population    | Direct, negative  | Low risk                       | Area adjacent to the treatment plant | Duration is limited by the construction phase | Reversible    | Low                |

Table 7.3 Characteristics of Impacts during Plant Operations

| Parameter           | Description Of Impacts And Impact Sources                                                                                                                  | Impact Receptors                                                | Impact Assessment |                          |                                          |            |               |                 |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------|--------------------------|------------------------------------------|------------|---------------|-----------------|
|                     |                                                                                                                                                            |                                                                 | Nature            | Probability Of Influence | Influence Area                           | Duration   | Reversibility | Residual Impact |
| Operation Phase:    |                                                                                                                                                            |                                                                 |                   |                          |                                          |            |               |                 |
| Ambient Air Quality | Foul odor emission –Degradation process of organic matter in treatment plant.                                                                              | Population, technical staff, biological environment             | Direct, Negative  | Low Risk                 | Constructi on site and adjacent areas    | Short term | Reversible    | Very low        |
| Noise Impact        | Noise Propagation in the Air – Exploitation of electric engines; – During the maintenance / repair works – used vehicles and spec. technology by vehicles. | Population, project stuff, animals inhabiting in adjacent areas | Direct, negative  | Low Risk                 | They are adjacent to the treatment plant | Long term  | Reversible    | Very low        |

| Parameter        | Description Of Impacts And Impact Sources                                                                                                                                                   | Impact Receptors                                  | Impact Assessment |                          |                                          |            |               |                  |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------|--------------------------|------------------------------------------|------------|---------------|------------------|
|                  |                                                                                                                                                                                             |                                                   | Nature            | Probability Of Influence | Influence Area                           | Duration   | Reversibility | Residual Impact  |
| Operation Phase. |                                                                                                                                                                                             |                                                   |                   |                          |                                          |            |               |                  |
| Water            | Contamination of <b>water</b> and related water bodies with suspended particles and organic substances – Source of contamination – wastewater discharged into the river from treatment plan | Population, animals, surface                      | Indirect          | Low Risk                 | Project area and surrounding             | Short term | Reversible    | Low and very low |
| Soil             | Soil contamination – Spillage of oil or other chemical substances, pollution by waste                                                                                                       | Vegetation, surface and ground waters, population | Direct, Negative  | Low Risk                 | Areas adjacent to the treatment facility | Long Term  | Reversible.   | Low or very Low  |

| Parameter              | Description Of Impacts And Impact Sources                                                                                                     | Impact Receptors                                                                | Impact Assessment             |                          |                                      |            |                   |                 |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------|--------------------------|--------------------------------------|------------|-------------------|-----------------|
|                        |                                                                                                                                               |                                                                                 | Nature                        | Probability Of Influence | Influence Area                       | Duration   | Reversibility     | Residual Impact |
| Operation Phase.       |                                                                                                                                               |                                                                                 |                               |                          |                                      |            |                   |                 |
| Biological Environment | Impact on fauna, including: – Noise and odor propagation; – Contamination of water; – Lightening; – Visual impact, etc.                       | Area selected for the construction of the treatment plant, wildlife, population | Direct and indirect, negative | Medium Risk              | Areas adjacent to the project area   | Long Term. | Mostly reversible | Very Low.       |
| Socio-Economic         | Risks related to health and safety of population: – Indirect – spread of unpleasant odor; In case of maintenance works atmospheric emissions, | Plant staff and local population                                                | Direct, negative              | Low Risk                 | Area adjacent to the treatment plant | Long Term  | Irreversible      | Very Low        |

| Parameter        | Description Of Impacts And Impact Sources                        | Impact Receptors               | Impact Assessment |                          |                |           |               |                 |
|------------------|------------------------------------------------------------------|--------------------------------|-------------------|--------------------------|----------------|-----------|---------------|-----------------|
|                  |                                                                  |                                | Nature            | Probability Of Influence | Influence Area | Duration  | Reversibility | Residual Impact |
| Operation Phase. |                                                                  |                                |                   |                          |                |           |               |                 |
|                  | increased acoustic background, water and soil pollution          |                                |                   |                          |                |           |               |                 |
|                  | Employment – Creation of jobs;                                   | Employment of local population | Direct positive   | High Probability         | Nearby Area    | Long Term | –             | Low             |
|                  | Improvement of local wastewater infrastructure (positive impact) | Local population and tourists  | Direct positive   | High Probability         | Nearby Area    | Long Term | –             | High            |

## 8 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### 8.1 ENVIRONMENTAL PROBLEMS DUE TO INSTALLATION AT PRESENT LOCATION OF PROJECT

Environmental problems related to location of the project are mostly in the areas of physical setting, socioeconomic setting, ecological setting and special areas. Field survey revealed that the impacts of the project due to its location are mostly insignificant in nature.

### 8.2 PROJECT DESIGN RELATED ENVIRONMENTAL PROBLEMS

The design of Effluent Treatment Plant has sought to minimize any environmental potential impacts by ensuring that the project shall in according to the environmental standards. Local aesthetic value is another issue to be considered during project design.

### 8.3 ENVIRONMENTAL PROBLEMS ASSOCIATED WITH CONSTRUCTION

The construction will also sometimes go round the clock, therefore, during all construction activities the followings will be the major pollutants/wastes or project related pollution aspects:

**Table 8.1 Environmental Problems during Construction Phase of Project**

| Sr no                     | Project activity & its impact | Mitigation measures                                                                                                                  |
|---------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>Construction phase</b> |                               |                                                                                                                                      |
| 1                         | <b>Air quality</b>            | <ul style="list-style-type: none"> <li>Proper ventilation and exhaust system for air passages in all subjected buildings.</li> </ul> |

| Sr no                     | Project activity & its impact | Mitigation measures                                                                                                                                                                                                                                                                                                  |
|---------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Construction phase</b> |                               |                                                                                                                                                                                                                                                                                                                      |
|                           |                               | <ul style="list-style-type: none"> <li>• Water sprinkling would be ensured to minimize the dust arising during the construction phase.</li> <li>• The provision of face mask and goggles also reduce the impact</li> <li>• Daily maintenance of transport vehicles are required to control air emissions.</li> </ul> |
| 2                         | Soil contamination            | <ul style="list-style-type: none"> <li>• Vehicles would be properly Maintained and the construction Material would be used for the Filling purpose. However in case of spillage, spill kits would be used.</li> </ul>                                                                                                |
| 3                         | Biological aspect             | <ul style="list-style-type: none"> <li>• Minimize trees cutting (if any) and clearing of vegetation</li> <li>• Plan and implement afforestation measures</li> <li>• Report incidents and any significant problems with animals and birds to the appropriate authorities</li> </ul>                                   |
| 4                         | Noise and vibration           | <ul style="list-style-type: none"> <li>• Proper shift hours for the labors will be scheduled to avoid any health risk.</li> <li>• Provision and accessibility of ear plugs or ear muffs to all workers and visitors to avoid sound volume</li> </ul>                                                                 |

| Sr no                     | Project activity & its impact | Mitigation measures                                                                                                                                                                                   |
|---------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Construction phase</b> |                               |                                                                                                                                                                                                       |
| 5                         | <b>Social aspect</b>          | <ul style="list-style-type: none"> <li>Noise has been monitored to carry out and duly monitored regularly to comply with statutory requirements</li> </ul>                                            |
| 6                         | <b>Solid waste</b>            | <ul style="list-style-type: none"> <li>Proper solid waste management would be ensured and if any waste is found, it would be recycled and any other waste would be sold to the contractor.</li> </ul> |

#### 8.4 ENVIRONMENTAL PROBLEMS RESULTING FROM PROJECT OPERATION

Environmental problems relating to operation phase are insignificant, which are given in Table

**Table 8.2 Environmental Problems during Operational Phase of Project**

| Sr no                    | Project activity & its impact                                                            | Mitigation measures                                                                                                                                                                                                                                                         |
|--------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operational phase</b> |                                                                                          |                                                                                                                                                                                                                                                                             |
| 1.                       | Increase risk of air and smell pollution due to operation of wastewater treatment system | <ul style="list-style-type: none"> <li>Design and install ventilation system</li> <li>Plant trees in landscaping areas to prevent odor dispersion.</li> <li>Ensure that all treatment processes, equipment and pipeline work well. Regularly carry out equipment</li> </ul> |

| Sr no                    | Project activity & its impact                                                                                                                          | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operational phase</b> |                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                          |                                                                                                                                                        | <p>maintenance.</p> <ul style="list-style-type: none"> <li>• Air pollutants caused by sludge and sewage will be purified</li> </ul>                                                                                                                                                                                                                                                                                                          |
| 2.                       | Noise propagation within the work zone. Impact on other receptors: on operation phase propagation of noise produced by the working of electric motors. | <ul style="list-style-type: none"> <li>• Installation of high quality pumping stations on treatment plant site;</li> <li>• Using noise-insulation materials during installation of pumping station;</li> <li>• Arrangement of pumps on vibro-isolating platform, for that thick rubber sheets can be used;</li> <li>• Place pumps in closed containers, special shells. E. Frequent shift of workers, working with noisy devices.</li> </ul> |
| 3.                       | Incidents of equipment (pipeline, tanks) in wastewater treatment plants resulting in spills of oil, chemical and untreated sewage                      | <ul style="list-style-type: none"> <li>• Provision of adequate budget for operation and annual maintenance to ensure all equipment to be in good order.</li> <li>• Install auxiliary pump, vacuum pump, generator in avoid downtime.</li> <li>• All staff will be trained on operation of wastewater treatment system.</li> <li>• Regularly recheck accident management and emergency</li> </ul>                                             |

| Sr no             | Project activity & its impact              | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operational phase |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   |                                            | check plan. Develop prevention plan of environmental incidents (spill of oil, chemical) for approval by authorities.                                                                                                                                                                                                                                                                                                                                                           |
| 4.                | Impacts on quality of receiving water body | <ul style="list-style-type: none"> <li>Regularly supervise quality of treated water of two plants to meet required standards (PEQS on industrial wastewater, column a: water into receiving unit for domestic use)</li> <li>Install emergency response system to promptly inform people using downstream water</li> </ul>                                                                                                                                                      |
| 5.                | Solid waste and sludge                     | <ul style="list-style-type: none"> <li>Operating unit will develop sludge management plan</li> <li>Regularly check, monitor and analyze treated sludge quality. If any treated sludge fails to meet PEQS limit, it will be transported and treated by specializing unit in hazardous waste treatment and transport.</li> <li>Sludge will be delivered in appropriate time of lowest traffic level. It will be contained in closed tanks on specializing vehicles to</li> </ul> |

| Sr no                    | Project activity & its impact | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operational phase</b> |                               |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                          |                               | <p>minimize odor and dust during transport.</p> <ul style="list-style-type: none"> <li>• Solid waste, sludge from suction pump will be clarified, settled and stored in settling tanks. Sludge will be compressed and stabilized so that it causes no odor, is stored and transported to treatment plant.</li> <li>• Waste is separately stored in tanks and daily treated by environmental service company</li> </ul> |

## 8.5 POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

As described above the worth mentioning waste will be effluent and solid waste in the plant in the form of ashes. In order to enhance environment the following measures will be adopted:

### **Solid Waste & Sludge management**

Solid wastes are likely to consist of organic cake from drying beds. The proponent will address all waste in the following ways:

- Dewatered sludge from the treatment plant, to be placed at sanitary landfill on the contractual basis.

- Solid domestic waste shall be transported to final disposal site by special vehicles to avoid pollution of environment
- Proper solid waste receptacles and storage containers will be provided
- Appropriate PPE will be provided, and usage at all times ensured, to the workers handling hazardous substances.
- An inventory register will be kept and updated as appropriate.

### **Health and Safety**

- PPEs will be provided at all stages of project cycle to all workers and it will be ensured they use them at all time.
- A policy on health and safety at the workplace will be developed.
- All the employees shall be trained on safety and health.
- A health and safety audit will be conducted annually as required by the occupational health and safety department.

## **9 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM**

### **9.1 DESCRIPTION OF PROPOSED MITIGATION ACTIONS**

#### **9.1.1 Level of treatment provided to sewage produced**

Large amount of wastewater will be generated from sugar industry for which the ETP has been provided. It will be able to receive and treat all the sewage described above before disposal, with secondary treatment removing more than 90% of organic loadings and tertiary treatment bringing the BOD concentrations below PEQS.

#### **9.1.2 Effluent quality and maintenance of effluent quality**

The use of natural means to treat the sewage is strongly recommended in keeping with earlier comments. The combination of the sewage lagoons and the aeration will provide effluent of a high quality. Through the monitoring of this development a further design strategy can be implemented in the second phase of the plant to ensure that the BOD level is further reduced. As effluent quality is good it will also be considered for use as irrigation, especially if used in the normal flood method within the cane producing areas.

#### **9.1.3 Sludge management**

Scum develops on the top of lagoons and requires management to reduce accumulation. Scum accumulation can create three main problems: It accumulates in specific areas induced by the wind and direction of flow through the plant and eventually affects the design flow regime. It produces odours because it accumulates and becomes anoxic.

The radial design of the system will reduce the effects of accumulated scum. The shape is intended to have the ponds aligned with the wind so that the scum will not accumulate because the flow is in opposition to the wind and the accumulation areas are in the acute angular

corners out of which the sewage is discharged. The sewage flow will therefore push the scum out of these areas and reduce accumulation. Once the ponds are emptied, sludge at the bottom of the ponds will be allowed to drain and dry. As the dry sludge at the bottom will be stabilized, it could be gathered by mechanical means and removed

#### **9.1.4 Odour**

In order to avoid odour problems that may occur in these systems re-circulation of plant effluent to system inlet is added at a minimum rate, thereby reducing the load on the plant inlet and primary pond.

Another potential source of odour is scum which has already been discussed above. If the ponds are overloaded it will result in odour problems because the treatment capacity will be exceeded.

If for process reasons or others, scum does accumulate at a particular time, scum removal systems will be in place including: High-pressure water spray to break up the scum so that it will settle. Boats and rakes to allow staff to break up the scum or remove it from the pond

Finally, preliminary treatment (screening) was added (also existing grit channels will remain) and pumping station, thereby reducing one of the sources of odours.

## **9.2 SCHEDULE FOR IMPLEMENTATION AND ENVIRONMENT BUDGET**

### **9.2.1 Schedule for Implementation**

It is planned that the following schedule of project implementation will be adhered to, this is subject to the conditions that everything goes according to planning and no serious bottlenecks are encountered. The implementation stages of the project activity include:

**1<sup>st</sup> Stage:** The stage –1 comprises the onsite contouring studies and soil investigations.

**2<sup>nd</sup> Stage.** The stage –2 comprises the following task.

- v– Laying of foundations excavation and commencement of erection work.
- vi– Start of civil, electrical and mechanical work.
- vii– Development of basic infrastructure.
- viii– Fitting of instrumentation.

**3<sup>rd</sup> Stage.** The stage –3 comprises the following task.

- i. Equipment erection completion.
- ii. Completion of the basic infrastructures water supply system, electricity supply etc.

**4<sup>th</sup> Stage.** The last stage will be Commencement of regular operation.

#### **9.2.2 Environmental Budget**

The total cost for the environmental management is estimated as 05 million Pak Rupees both during construction and its regular operation. The estimations are as followings;

**Table 9.1 Environment Management Cost**

| <b>Environmental Component</b>                        | <b>Quantity</b> | <b>Amount<br/>PKR</b> |
|-------------------------------------------------------|-----------------|-----------------------|
| (i) Tree Plantation                                   | 7000            | 2 Million.            |
| (ii) Health and Safety Measures and Provision of PPEs | L.S.            | 1 Million             |
| (iii) Air and Water Quality & Noise Monitoring        | L.S.            | 1 Million             |

| Environmental Component                                   | Quantity | Amount<br>PKR |
|-----------------------------------------------------------|----------|---------------|
| (iv) Environmental Trainings                              | L.S      | 1 Million     |
| <b>Total Environmental Management and Monitoring Cost</b> |          | 05 Million    |

### 9.3 ENVIRONMENTAL MANAGEMENT TEAM ALONG WITH THEIR ROLES AND RESPONSIBILITIES

In light of TSML Unit Rehman Hajira Wastewater Management shall consist of the following members from the industry.

List of members that shall part of environmental management team as mentioned in **table** below

**Table 9.2 Members of Environmental Management Team**

| Environmental Management Team |                                |             |
|-------------------------------|--------------------------------|-------------|
| a)                            | Project Manager.               | Supervisor. |
| b)                            | Heads of all departments       | Member      |
| c)                            | Health and Safety Officer      | Member      |
| d)                            | Water Treatment Plant Engineer | Member      |

| Environmental Management Team |                                                             |        |
|-------------------------------|-------------------------------------------------------------|--------|
| e)                            | Head of the sanitation staff.                               | Member |
| f)                            | Other Industry members as the Superintendent may designate. | Member |

In TSML Unit Rehman Hajira where the posts describe above do not exist; the Project manager shall designate another staff member to perform the duties and responsibilities of the holder of such posts.

#### **9.4 ENVIRONMENTAL MANAGEMENT PLAN**

Environmental monitoring plan, developed for treatment facility construction and operation project aims at solving following problems:

- Monitoring of compliance with environmental legislation during construction and operation processes;
- Ensuring controllability of risks and environmental impacts;
- Provision of stakeholders with relevant environmental information;
- Confirmation of mitigation measures' implementation, determination of their efficiency and their adjustment whenever necessary;
- Permanent environmental control throughout the project implementation period (construction works and operation).

Table 9.3 Environmental Management Plan during Construction Phase of Project

| Sr No              | Project Activity & Its Impact | Targets To Be Achieved                                | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                           | Responsibility                              |                                                                                   |
|--------------------|-------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------|
|                    |                               |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                               | Implementation                              | Monitoring                                                                        |
| Construction Phase |                               |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                               |                                             |                                                                                   |
| 1                  | Air Quality                   | Compliance with prescribed PEQS of ambient air.       | <ul style="list-style-type: none"><li>• Proper ventilation and exhaust system for air passages in all subjected buildings.</li><li>• Water sprinkling would be ensured to minimize the dust arising during the construction phase.</li><li>• The provision of face mask and goggles also reduce the impact</li><li>• Daily maintenance of transport vehicles are required to control air emissions.</li></ul> | Safety health & environment (SH &E) officer | <ul style="list-style-type: none"><li>• HSE manager</li><li>• Proponent</li></ul> |
| 2                  | Soil Contamination            | Avoid soil contamination during construction facility | <ul style="list-style-type: none"><li>• Vehicles would be properly</li><li>• Maintained and the construction</li><li>• Material would be used for the</li><li>• Filling purpose. However in case of spillage, spill kits would be used.</li></ul>                                                                                                                                                             | Safety health & environment (SH &E) officer | <ul style="list-style-type: none"><li>• HSE manager</li><li>• Proponent</li></ul> |

| Sr No              | Project Activity & Its Impact | Targets To Be Achieved                                            | Mitigation Measures                                                                                                                                                                                                                                                      | Responsibility                              |                                                                               |
|--------------------|-------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------|
|                    |                               |                                                                   |                                                                                                                                                                                                                                                                          | Implementation                              | Monitoring                                                                    |
| Construction Phase |                               |                                                                   |                                                                                                                                                                                                                                                                          |                                             |                                                                               |
| 3                  | Biological Aspect             | The flora and fauna will not be harmed with the proposed project. | <ul style="list-style-type: none"><li>Minimize trees cutting (if any) and clearing of vegetation</li><li>Plan and implement afforestation measures</li><li>Report incidents and any significant problems with animals and birds to the appropriate authorities</li></ul> | Safety health & environment (SH &E) officer | <ul style="list-style-type: none"><li>HSE manager</li><li>Proponent</li></ul> |
| 4                  | Noise And Vibration           | Compliance with Punjab environment standards of noise             | <ul style="list-style-type: none"><li>Proper shift hours for the labors will be scheduled to avoid any health risk.</li><li>Provision and accessibility of ear plugs or ear muffs to all workers and visitors to avoid sound volume</li></ul>                            | Safety health & environment (SH &E) officer | <ul style="list-style-type: none"><li>HSE manager</li><li>Proponent</li></ul> |
| 5                  | Social Aspect                 | Residents and employees would not be greatly affected.            | <ul style="list-style-type: none"><li>Noise has been monitored to carry out and duly monitored regularly to comply with statutory requirements</li></ul>                                                                                                                 | Safety health & environment (SH &E) officer | <ul style="list-style-type: none"><li>HSE manager</li><li>Proponent</li></ul> |

| Sr No              | Project Activity & Its Impact | Targets To Be Achieved           | Mitigation Measures                                                                                                                                                                                 | Responsibility                              |                                                                               |
|--------------------|-------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------|
|                    |                               |                                  |                                                                                                                                                                                                     | Implementation                              | Monitoring                                                                    |
| Construction Phase |                               |                                  |                                                                                                                                                                                                     |                                             |                                                                               |
| 6                  | Solid Waste                   | Solid waste management practices | <ul style="list-style-type: none"><li>Proper solid waste management would be ensured and if any waste is found, it would be recycled and any other waste would be sold to the contractor.</li></ul> | Safety health & environment (SH &E) officer | <ul style="list-style-type: none"><li>HSE manager</li><li>Proponent</li></ul> |

Table 9.4 Environmental Management Plan during Operation Phase of Project

| Sr No           | Project Activity & Its Impact                                                            | Targets To Be Achieved | Mitigation Measures                                                                                                                                                                                                                                                                  | Responsibility                               |                |
|-----------------|------------------------------------------------------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------|
|                 |                                                                                          |                        |                                                                                                                                                                                                                                                                                      | Implementation                               | Monitoring     |
| Operation Phase |                                                                                          |                        |                                                                                                                                                                                                                                                                                      |                                              |                |
| 1.              | Increase risk of air and smell pollution due to operation of wastewater treatment system | Comply with PEQS       | <ul style="list-style-type: none"><li>Design and install ventilation system</li><li>Plant trees in landscaping areas to prevent odor dispersion.</li><li>Ensure that all treatment processes, equipment and pipeline work well. Regularly carry out equipment maintenance.</li></ul> | Operating unit of wastewater treatment plant | Plant operator |

| Sr No           | Project Activity & Its Impact                                                                                                                          | Targets To Be Achieved                                                                                                                                                              | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Responsibility                               |                |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------|
|                 |                                                                                                                                                        |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Implementation                               | Monitoring     |
| Operation Phase |                                                                                                                                                        |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                              |                |
|                 |                                                                                                                                                        |                                                                                                                                                                                     | <ul style="list-style-type: none"><li>Air pollutants caused by sludge and sewage will be purified</li></ul> <u>Significance of residual impact , “ very low”</u>                                                                                                                                                                                                                                                                                                                     |                                              |                |
| 2.              | Noise propagation within the work zone. Impact on other receptors: on operation phase propagation of noise produced by the working of electric motors. | Minimize noise propagation. Reduce environmental impact, such as: <ul style="list-style-type: none"><li>impact on human health;</li><li>animal disturbance and migration.</li></ul> | <ul style="list-style-type: none"><li>Installation of high quality pumping stations on treatment plant site;</li><li>Using noise-insulation materials during installation of pumping station;</li><li>Arrangement of pumps on vibro-isolating platform, for that thick rubber sheets can be used;</li><li>Place pumps in closed containers, special shells. E. Frequent shift of workers, working with noisy devices.</li></ul> <u>Significance of residual impact , “ very low”</u> | Operating unit of wastewater treatment plant | Plant operator |
| 3.              | Incidents of equipment (pipeline, tanks) in wastewater treatment plants                                                                                | Reduce the spillage of any hazardous material                                                                                                                                       | <ul style="list-style-type: none"><li>Provision of adequate budget for operation and annual maintenance to ensure all equipment to be in good order.</li><li>Install auxiliary pump, vacuum pump, generator in avoid downtime.</li></ul>                                                                                                                                                                                                                                             | Operating unit of wastewater treatment plant | Plant operator |

| Sr No           | Project Activity & Its Impact                             | Targets To Be Achieved                           | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                | Responsibility                               |                |
|-----------------|-----------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------|
|                 |                                                           |                                                  |                                                                                                                                                                                                                                                                                                                                                                                    | Implementation                               | Monitoring     |
| Operation Phase |                                                           |                                                  |                                                                                                                                                                                                                                                                                                                                                                                    |                                              |                |
|                 | resulting in spills of oil, chemical and untreated sewage |                                                  | <ul style="list-style-type: none"><li>All staff will be trained on operation of wastewater treatment system.</li><li>Regularly recheck accident management and emergency check plan. Develop prevention plan of environmental incidents (spill of oil, chemical) for approval by authorities.</li></ul> <p><u>Significance of residual impact , “ very low”</u></p>                |                                              |                |
| 4.              | Impacts on quality of receiving water body                | Effluent does not affect the nearby water bodies | <ul style="list-style-type: none"><li>Regularly supervise quality of treated water of two plants to meet required standards (PEQS on industrial wastewater, column a: water into receiving unit for domestic use)</li><li>Install emergency response system to promptly inform people using downstream water</li></ul> <p><u>Significance of residual impact , “ very low”</u></p> | Operating unit of wastewater treatment plant | Plant operator |

| Sr No           | Project Activity & Its Impact | Targets To Be Achieved                                                               | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Responsibility                               |                |
|-----------------|-------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------|
|                 |                               |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Implementation                               | Monitoring     |
| Operation Phase |                               |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                              |                |
| 5.              | Solid waste and sludge        | Proper management of sludge generated from the WWTP to avoid any nuisance conditions | <ul style="list-style-type: none"><li>Operating unit will develop sludge management plan</li><li>Regularly check, monitor and analyze treated sludge quality. If any treated sludge fails to meet PEQS limit, it will be transported and treated by specializing unit in hazardous waste treatment and transport.</li><li>Sludge will be delivered in appropriate time of lowest traffic level. It will be contained in closed tanks on specializing vehicles to minimize odor and dust during transport.</li><li>Solid waste, sludge from suction pump will be clarified, settled and stored in settling tanks. Sludge will be compressed and stabilized so that it causes no odor, is stored and transported to treatment plant.</li><li>Waste is separately stored in tanks and daily treated by environmental service company</li></ul> <p><u>Significance of residual impact : “ very low“</u></p> | Operating unit of wastewater treatment plant | Plant operator |

## 9.5 PROPOSED MONITORING PROGRAM TO ASSESS PERFORMANCE OR OUTPUT OF EMP

Table 9.5 Environmental Monitoring Plan

| Environmental Component                        | Key Indicators                                                          | Performance Objectives                                                                                                                   | Data Sources                                             |
|------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| <b>Pre-Construction</b>                        |                                                                         |                                                                                                                                          |                                                          |
| Public consultation and information disclosure | Affected communities and stakeholders                                   | Meeting with stakeholders during the EIA & stakeholders summoned for following meetings & introduction about grievance redress mechanism | Meeting minutes and list of participants                 |
| Bidding documents                              | Requirements of EMP/ CEMP (EMP of the Contractor)                       | EMP will be attached in appendix of bidding document with clear instructions of the contractor related to CEMP                           | Bidding documents                                        |
| Plant Operator training                        | Training courses and schedule                                           | Before pre-construction, needed training courses will be prepared and developed.                                                         | Contents of training courses, participants and schedule. |
| Surface water quality                          | pH, BOD5, COD, DO, TSS, ammonium, nitrate, Pb, Fe, As, grease, coliform | Record basic conditions under the monitoring plan                                                                                        | Survey                                                   |

| Environmental Component       | Key Indicators                                                                                                                                                                      | Performance Objectives                                                                                                    | Data Sources                                      |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| <b>Construction-Phase</b>     |                                                                                                                                                                                     |                                                                                                                           |                                                   |
| All construction sites        | Habitat, precious or endangered species if any                                                                                                                                      | Habitat, precious or endangered species if not being changed and affected                                                 | Monitored by plant operator                       |
| Qualitative air quality       | Micro-climate, dust, noise, vibration                                                                                                                                               | Not exceeding the base in preconstruction phase                                                                           | Monitoring reports of plant operator & contractor |
| Construction waste quality    | pH, DO, TSS, COD, BOD5, NH <sub>4</sub> <sup>+</sup> , Cl <sup>-</sup> , NO <sub>3</sub> , NO <sub>2</sub> <sup>-</sup> , PO <sub>4</sub> <sup>3-</sup> , surfactant, oil, Coliform | Strictly comply with procedure and regulation on collection and storage of construction wastes                            | Monitoring reports of plant operator & contractor |
| Hazardous materials and waste | Oil, petrol, grease, alum, Chlorine, soda                                                                                                                                           | Strictly comply with procedure and regulation on collection and storage of wastes from construction site and worker camps | Monitoring reports of plant operator & contractor |
| Community & worker safety     | Frequency of injuries                                                                                                                                                               | Comply with regulations/policies on health and work accident to avoid accidents                                           | Reports of the contractor                         |
| Cultural assets               | Damages or complaints                                                                                                                                                               | No culturally valuable assets,                                                                                            | Public input, reports of contractor,              |

| Environmental Component                      | Key Indicators                                                                                                                                                                                                                                               | Performance Objectives                                                                                     | Data Sources                                                                             |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|                                              |                                                                                                                                                                                                                                                              | excavated relics affected in any forms                                                                     | reports of plant operator                                                                |
| Transport                                    | Interruption frequency and traffic congestion                                                                                                                                                                                                                | Interruption, suspension or bypasses are absolutely managed                                                | Public input, reports of contractor, reports of plant operator                           |
| <b>Operation of Effluent Treatment Plant</b> |                                                                                                                                                                                                                                                              |                                                                                                            |                                                                                          |
| Quality of air and noise environment         | Temperature, moisture, wind, total suspended particles, NO <sub>2</sub> , SO <sub>2</sub> , CO, noise                                                                                                                                                        | Comply with regulations/policies on air and noise environment of PEQS                                      | Periodic environmental monitoring report of operating unit                               |
| Wastewater quality                           | Color, pH, BOD <sub>5</sub> , COD, SS, Fe, mineral oil and fat, sulfur, ammonium, total N, total P, Coliform                                                                                                                                                 | Comply with regulations/policies of PEQS                                                                   | Periodic environmental monitoring report of operating unit                               |
| Monitor in case of incidents                 | In case of actual or suspected incidents at wastewater treatment plants, environmental monitoring shall be conducted immediately and is similar to a periodic environment monitoring. In addition, the daily operation staff will regularly check wastewater | Comply with PEQS<br>Respond to environmental incidents arisen, minimize adverse impacts on the environment | Environmental incident response report of operating unit of wastewater treatment plants. |

| Environmental Component | Key Indicators                                                                                                | Performance Objectives | Data Sources |
|-------------------------|---------------------------------------------------------------------------------------------------------------|------------------------|--------------|
|                         | collection, operation of pumping station to detect and timely handle incidents of congestion and pipe damage. |                        |              |

## 9.6 PROPOSED EMP REPORTING AND REVIEWING PROCEDURES

This section will specify institutional responsibilities for contractors, Borrower, local authorities, and EPA, with the roles that prepare, submit, receive, review, and approve the reports. An implementation schedule detailing the timing, frequency and duration of mitigation measures, monitoring, and reporting of the progress will be prepared, showing phasing and coordination with procedures in the project operations manual and loan agreement. Recipients of such reports will include those with responsibility for ensuring timely implementation of mitigation measures and for undertaking remedial actions. In addition, the structure, content and timing of reporting will be specified to facilitate supervision, review and approval (if necessary) by EPA.

The implementation of the EMP will be the prime responsibility of the project proponents who designate responsibilities and obligations to their selected contractors and staff. Monitoring, documentation and reporting the compliance components of the EMP will be the responsibility of proponent.

### 9.6.1 Reporting

The relevant reporting structure will be included in site environmental training and induction and will be clearly displayed, along with contact names and numbers. In the event of an incident that causes, or is likely to cause, environmental harm, as defined in the

EP Act, immediate action will be taken to minimize the effects of the incident. As soon as is reasonably practicable, the details of the incident and corrective actions taken will be reported to Plant Operator.

#### **9.6.2 Review and Update**

The EMP is intended to be dynamic and will be reviewed as often as necessary in accordance with changes to:

- Selected technologies or equipment
- Operational activities
- The legislative environment and/or approval conditions
- Improvements in best practice environmental management
- Corrective actions implemented as a result of complaints, incidents or non-conformance situations
- Audit Report recommendations.

#### **9.7 ANY TRAINING NEED TO REQUIRE TO ENSURE IMPLEMENTATION OF EMP AND MONITORING PLANS**

All staff and contractors will receive induction training about the general requirements of the EP Act and their specific duties and responsibilities associated with the operation of the WWTP and with the EMP. At a minimum, the environmental component of the induction will address the following:

- ‘General environmental duty’ and ‘duty to notify environmental harm’
- Specific environmental risks identified for the Project
- Requirements of the EMP
- Emergency contact information. In addition, relevant environmental issues will be reinforced at regular opportunities.

## **10 STAKEHOLDERS CONSULTATION**

### **10.1 PROPONENT'S ENVIRONMENT MANAGEMENT TEAM**

The following chapter includes the detailed information of the process and parties that depicts the involvement and consultation of the important stakeholders that is conducted by the Sustainable Environment Consultant. The consultation is carried out to resolve any kind of issues that involved and can be potentially affected by the proposed project. The activity plays an important role in the decision making and the keeps in view the concerns of stakeholders. The parties that are involved in the process are as follows:

- Local government
- Local community
- Affected community (directly and indirectly)
- General public
- Service providers
- Proponents

### **10.2 PROPONENT ENVIRONMENT MANAGEMENT TEAM**

Environment Management Team of Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira includes the following members for smooth operation of Effluent treatment plant

- Project Manager
- HSE Officer
- Water Treatment Plant Engineer
- Waste Management Team
- Electrical Technician

The above all members will be hired after the completion of construction activities

### **10.3 THE RESPONSIBILITY AUTHORITY**

The Tandlianwala Sugar Mill & Distillery Unit Rehman Hajira management shall be the responsible authority to take all measures prior to start the project and during operation.

### **10.4 OTHER DEPARTMENTS AND AGENCIES**

For the impact analysis detailed with the management, local community, educational institutes, industrial locals. All issues were discussed related to implementation of the project. Scoping sessions, focused group discussion and way side consultations were held with the relevant stakeholders in the area.

### **10.5 ENVIRONMENTAL PRACTITIONERS AND EXPERTS**

During visit to the project site, discussion with stakeholders and consulted with the local people of nearby and other towns to evaluate the project socio-economic impacts. People of the area belong to different professions like mostly belong to employment, own businesses, doctors, some in abroad, teaching, in agriculture etc. women were also consulted for their point of view regarding the betterment of the area by this project, some of them communicated but according to social value of the area they mostly hesitate to communicate comfortably and get pictured. People provide the massive information about the project and have positive remarks regarding the project development.

### **10.6 AFFECTED AND WIDER COMMUNITY**

There is no affected community present in the area of the proposed project. Team has consulted with the inhabitants or neighboring areas. The remarks of people are positive regarding the project and people foresee positive impacts like employment opportunities, business, development of the area etc.

## **GLOSSARY**

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Air Blowers</b>             | For gadgets and electronics that have delicate parts that cannot be cleaned with a cloth, this is when you need air blowers to remove dust with its continuous air pressure.                                                                                                                                                                                                                                               |
| <b>Air Diffusers</b>           | An air diffuser or membrane diffuser is an aeration device typically in the shape of a disc, tube or plate, which is used to transfer air and with that oxygen into the sewage or industrial wastewater. Oxygen is required by microorganisms/bacteria residents in the water to break down the pollutants.                                                                                                                |
| <b>Air Quality</b>             | Measurement of the pollutants in the air; a description of healthiness and safety of the atmosphere.                                                                                                                                                                                                                                                                                                                       |
| <b>Anionic Polymer</b>         | Anionic polymerization is a typical ionic polymerization, which proceeds with the growing chain end carrying negative charge and counter cation.                                                                                                                                                                                                                                                                           |
| <b>Anoxic</b>                  | Anoxic waters are areas of sea water, fresh water, or groundwater that are depleted of dissolved oxygen and are a more severe condition of hypoxia.                                                                                                                                                                                                                                                                        |
| <b>Coagulant</b>               | To induce coagulation, a coagulant (typically a metallic salt) with the opposite charge is added to the water to overcome the repulsive charge and "destabilize" the particles in water.                                                                                                                                                                                                                                   |
| <b>Compensation</b>            | Includes cash payment, deferred payment, a bond, an insurance policy, stipend, payment in kind, rendition of services, grant of privileges and disturbance money, entitlement to special treatment by government and semi government entities, grant of alternative land, grant of import licenses and business, trade and commercial facilities in addition to the rehabilitation and resettlement of an affected person. |
| <b>Coordinates Contaminate</b> | Each of a group of numbers used to indicate the position of a point, line, or plane to make impure, pollute.                                                                                                                                                                                                                                                                                                               |
| <b>DO Meter</b>                | Dissolved oxygen (DO) meters are used to measure the amount of dissolved oxygen in a liquid. Oxygen makes its way into water through a variety of processes, including aeration, as a byproduct of photosynthesis, and from surrounding air.                                                                                                                                                                               |

|                                 |                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Effluent Treatment Plant</b> | Effluent treatment plant cleans industrial effluents, contaminated water from rivers and lakes, and so on just in order to reuse the water for additional purposes. It is mostly used in industries such as pharmaceuticals, textiles, tanneries, and chemicals where there is a chance of extreme water contamination. |
| <b>Environmental Management</b> | Attempt to control human impact on and interaction with the environment in order to preserve natural resources.                                                                                                                                                                                                         |
| <b>Evaluation</b>               | The making of a judgment about the amount, number, or value of something; assessment.                                                                                                                                                                                                                                   |
| <b>Geology</b>                  | A science that studies rocks, layers of soil, etc., in order to learn about the history of the earth and its life.                                                                                                                                                                                                      |
| <b>Ground Water</b>             | Aquifers currently being used as a source of drinking water or those capable of supplying a public water system. They have a total dissolved solid content of 10,000 milligrams per liter or less, and are not "exempted aquifers."                                                                                     |
| <b>Hazardous</b>                | Substance or material, which could adversely affect the safety of the public, handlers or carriers during transportation.                                                                                                                                                                                               |
| <b>Land Acquisition</b>         | The process whereby a person is compelled by a public agency to cede all or part of the land a person owns or possesses, to the ownership and possession of that agency, for public purpose in return for compensation.                                                                                                 |
| <b>Neutralization Tank</b>      | Neutralization tanks are used to alter the pH level of corrosive waste drainage—by dilution or chemical neutralization. A range of smaller point-of-use or larger centralized tanks are available.                                                                                                                      |
| <b>Occupational Health</b>      | Maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs.                                                                                       |
| <b>Primary Clarifier</b>        | A circular tank in which wastewater is held for a period of time to allow heavier solids to settle to the bottom as sludge and lighter materials to float to the water surface as scum.                                                                                                                                 |

|                           |                                                                                                                                                                                                                                     |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project Area</b>       | The area specified by the funding and/or implementing agency according to the official gazette notification and includes the areas within the administrative limits of the federal or a provincial government.                      |
| <b>Proponent</b>          | A person who advocates a theory, proposal, or course of action.                                                                                                                                                                     |
| <b>Rehabilitation</b>     | Include all compensatory measures to re-establish; at least lost incomes, livelihoods, living and social systems. It does not include the payment of compensation for required assets.                                              |
| <b>Scope</b>              | The extent of the area or subject matter that something deals with or to which it is relevant.                                                                                                                                      |
| <b>Scum</b>               | A layer of dirt or froth on the surface of a liquid.                                                                                                                                                                                |
| <b>Sludge</b>             | Sludge is semi-solid slurry that can be produced from a range of industrial processes, from water treatment, wastewater treatment or on-site sanitation systems.                                                                    |
| <b>Sludge Drying Bed</b>  | Sludge drying bed (SDB) is the most widely used method for sludge dewatering. Sludge drying involves natural ways of drying to mechanical ways of removing water content. Requires stabilized sludge to prevent nuisance and odors. |
| <b>Social Environment</b> | It includes the culture that the individual was educated or lives in, and the people and institutions with whom they interact.                                                                                                      |
| <b>Stakeholders</b>       | Include affected persons and communities, proponents, private and public businesses, NGOS, host communities and EPA.                                                                                                                |
| <b>Supernatant</b>        | Denoting the liquid lying above a solid residue after crystallization, precipitation, centrifugation, or other process.                                                                                                             |
| <b>Topography</b>         | Details of the surface features of land. It includes the mountains, hills, creeks, and other bumps and lumps on a particular hunk of earth.                                                                                         |

**LIST OF ABBREVIATIONS**

|                   |                                          |
|-------------------|------------------------------------------|
| <b>BOD</b>        | Biochemical Oxygen Demand                |
| <b>COD</b>        | Chemical Oxygen Demand                   |
| <b>EA</b>         | Environmental Approval                   |
| <b>EIA</b>        | Environmental Impact Assessment          |
| <b>EMP</b>        | Environmental Management Plan            |
| <b>EPA</b>        | Environmental Protection Agency – Punjab |
| <b>ETP</b>        | Effluent Treatment Plant                 |
| <b>HFD</b>        | Hydraulic Flow Diagram                   |
| <b>LAA</b>        | Land Acquisition Act                     |
| <b>MSW</b>        | Municipal Solid Wastes                   |
| <b>NGOs</b>       | Non–Government Organizations             |
| <b>NOC</b>        | No Objection Certificate                 |
| <b>O&amp;M</b>    | Operation and Maintenance                |
| <b>OHS</b>        | Occupational Health and Safety           |
| <b>PC</b>         | Primary Clarifier                        |
| <b>P &amp; ID</b> | Process and Instrumentation Diagram      |
| <b>PEQS</b>       | Punjab Environment Quality Standards     |
| <b>PEPA</b>       | Punjab Environment Protection Agency     |
| <b>PKR</b>        | Pak Rupees                               |
| <b>RAS</b>        | Returned Activated Sludge                |
| <b>SPM</b>        | Suspended Particulate Matter             |
| <b>VOC</b>        | Volatile Organic Compounds               |

## **REFERENCES**

Listed below are some of the documents, reports and other references consulted during the preparation of this report:

- a. Information and data provided by project proponents;
- b. Project Pre-feasibility Study Report;
- c. Technical Design Data related to the project.
- d. Information gathered through discussions with the project related persons of the project proponent;
- e. Information collected from the Technical documents of various suppliers of machinery/equipment.
- f. Punjab Environment Quality Standards for Ambient Air November 2010;
- g. Punjab Environment Quality Standards Noise Levels November 2010;
- h. Punjab Environment Quality Standards for Drinking Water November 2010;
- i. Pakistan Environmental Protection Act, 1997;
- j. The Punjab Environmental Protection (Amendment) Act 2011 covers aspects related to:
  - The protection, conservation, rehabilitation and improvement of the environment and the prevention, control of pollution and promotion of sustainable development;
  - Establishing complete regulatory and monitoring bodies, policies, rules, regulations and Punjab environmental quality standards; and
  - To ensure enforcement, the act establishes regulating bodies i.e. Punjab Environmental Protection Council (PEPC) and responsible bodies i.e.

Punjab Environmental Protection Agency (Punjab EPA) at Provincial level.

- k. Environment related Laws in Pakistan and the Province of Punjab;
- l. Government of Pakistan, Pakistan Environmental Protection Agency, Policy and Procedures for Filing, Review and Approval of Environmental Assessment, 2000;
- m. Google earth, maps.
- n. Guidelines for Public Consultations – These guidelines cover:
  - Consultation, involvement and participation of Stakeholders
  - Techniques for public consultation (principles, levels of involvements, tools, building trust)
  - Effective public consultation (planning, stages of EIA where consultation is appropriate)
  - Consensus building and dispute resolution.
- o. workplace safety and health act 2011
- p. Land Acquisition Act (LAA) of 1894
- q. The forest Act 1927
- r. Pakistan Penal Code, 1860

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gg. workplace safety and health act 2011

hh. Land Acquisition Act (LAA) of 1894

ii. The forest Act 1927

jj. Pakistan Penal Code, 1860

## **TERMS OF REFERENCES**

1. The Consultant is required to carry out an Environment Assessment Study of the Project as required under section 12 of Punjab Environmental Protection Act 1997 (amended 2012).
2. The Study will be comprehensive and shall cover all aspects which are envisaged under the relevant national and provincials laws & regulations including but not limited to:
  - Identification and recommendation for suitable solution/treatment/mitigation measures of emissions and effluents such as waste water and sludge etc in accordance with Punjab Environmental Quality Standards (PEQS).
  - Identification and recommendation for suitable solution/treatment/mitigation measures of solvents, oils (tar), hazardous waste, organic compounds, steam, flue gases, particulate matter and chemical compounds harmful for the environment and other substances leading to air, noise, water and soil pollution in accordance with PEQS.
3. The Study will be acceptable to the relevant national and/or provincial authorities (relevant authorities) in Punjab.