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1 EXECUTIVE SUMMARY

This executive summary represents the finding of Environment impact assessment (EIA) of M/S Al Nafay Waste Management Company (Incineration Unit) at Main Bypass Road, Near Al Gahni Petroleum Tehsil Kamalia District Toba Tek Singh. The main objectives of this project will be ensuring safe disposal of hospital and industrial waste in an environment friendly and scientific method in order to reduce pollution.

1.1 TITLE & LOCATION OF PROJECT

M/S Al Nafay Waste Management Company (Incineration Unit) at Main Bypass Road, Near Al Gahni Petroleum Tehsil Kamalia District Toba Tek Singh.

1.2 NAME OF PROPONENT

Muhammad Kamran S/O Zahoor Ahmad

Mohala Medical Bazar, Haroonabad, District Bahawalnagr

CNIC NO. 33302-0998748-7

1.3 NAME OF ORGANIZATION PREPARING THE REPORT

M/S Al Nafay Waste Management Company (Incineration Unit) has engaged EnvironTech Consultants (Private) Limited at office no. 11, Second Floor, Centre Point Plaza, Main Boulevard, Gulberg-III, Lahore.

Contact no. +92-302-4342302

Email: environtechconsultants@gmail.com

Table 1: Salient features of project

Salient features of project		
1.	Total Area	1.68 Kanal (9139.2 SFT)
2.	Total covered area	5940 SFT
3.	Cost of the project	Pkr/- 60 million approx.
4.	Capacity of project	200 kg/hr
5.	Location of project	30°44'34.9"N 72°39'39.3"E
6.	Nature of area	Self-Developed Industrial area
7.	Present status of land Use	Open/vacant plot.
8.	Land use in the surroundings of project site.	The surroundings are: North Open Plot South Open Plot East Open Plot

		West Road
9.	Waste material	Hazardous & Non-Hazardous Hospital, Industrial, Bio Waste, Organic Waste.
10.	Description of the project	The proposed project is an incineration unit of hazardous waste from industries and hospital.
11.	Nearby emergency services i.e. Hospital, police station, rescue, fire brigade etc.	Hospital, Police station & Rescue 1122 are within the range of 8 to 10-km
12.	Status of Project	Proposed open plot
13.	Source of Power	FEPCO

1.4 A BRIEF OUTLINE OF PROPOSAL (TYPE, PROCESS, TECHNOLOGY AND LAND REQUIREMENTS)

As per Punjab Environmental Protection Act 1997 (amended 2012) and Initial Environmental

Examination (IEE) & Environmental Impact Assessment (EIA) Regulations, 2022 proposed project falls under Category G (2) ***“Waste disposal and storage of hazardous or toxic wastes including landfill sites and incineration of hospital toxic waste”*** mentioned in Schedule-II.

The proposed project is about the Incineration of hospital and industrial waste. Site selected for the proposed project is under the undisputed rental agreement. The incinerator will work with natural gas burners with the option to operate on standby LPG fuel. Combustion gas will re-burn in the post-combustion (secondary) chamber at the temperature range of 1250°C during minimum 2-3 seconds. The incinerator will be designed as a packaged unit, having pre-wired electrical connection and fuel pipes in place, making installation easier at site. Waste will be introduced through a manual front-loading system, continuous interval into the incinerator. Incineration is an important method for the treatment and decontamination of biomedical and health-care waste. Incineration is a high-temperature (850°C to 1250°C) dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and results in a very significant reduction of waste volume and weight the incineration/ pyrolysis should only be carried out in appropriate plants. The system will be designed to cope with the specific characteristics of hazardous health-care waste. The estimated project cost is **PKR 60 million approx.**, and capacity of proposed project will be 200 kg/hr. The project under consideration of this EIA is the industrial and hospital waste Incineration Unit at Main Bypass Road, Near Al

Gahni Petroleum Tehsil Kamalia District Toba Tek Singh. Beyond this scope no other development activities have been covered under this EIA study.

1.5 THE MAJOR IMPACTS & RECOMMENDATIONS FOR MITIGATION MEASURES

The potential impacts associated with the project operation activities

Included: increase in water consumption; surface water contamination, air pollution from vehicle; vehicle movement, noise and disturbance, soil contamination and waste generation.

Automated machineries have been installed to be laid on concrete fortifications. The machinery installation does not require water while only water use will be during washing and domestic activities. Water conservation practices will be utilized to reduce the overall water consumption during the project activities. The impermeable septic tank will prevent untreated sewage from polluting surface water.

The ambient air quality of the area can be affected by exhaust emissions, vehicles and combustion process in construction equipment. The emissions include sulphur dioxide, oxides of nitrogen, carbon monoxide, carbon dioxide, and particulates. The emission levels depend on the type and size of activity, the type and quality of fuel and the manner in which it is burned. The sources of emissions during construction activities will not be significantly enough to alter the ambient air quality at regional level. All vehicles, equipment and machinery will be properly tuned and maintained to minimize emissions. Cleaner fuels if required (less 1% Sulphur content) will be preferred to procure. Monitoring of Ambient air parameters and emissions should be carried out on to ensure compliance with the PEQS.

Noise has the potential to cause an impact to nearby communities and working personnel. To avoid the impact of noise, it will be ensured that, vehicles and other potentially noisy equipment used are in good condition. The noise level monitoring results would be compared with Punjab Environmental Quality Standards (PEQS) for Noise to meet the permissible limits. All on-site personnel will use required personal protective equipment (PPE) in high noise areas that will be clearly marked.

Table 2: Impacts and mitigation measures

Environmental Aspect	Potential Impacts	Mitigation Measures
Water Resources	Depletion in groundwater, contamination of water resources by surface runoff, spillage of fuel	<ul style="list-style-type: none"> ▪ Water extraction will be kept at minimum and water conservation measures will be practiced. ▪ Sewerage Wastewater from project site will be directed to settling tanks. ▪ Fuels and lubricants will be stored in covered and with bund walls, underlain with impervious lining. ▪ Spill prevention plan shall be followed to mitigate any kind of spill.
Air Quality	Dust, combustion emissions, vehicular emissions used for project- related activities.	<ul style="list-style-type: none"> ▪ Water will be sprinkled daily on all exposed surfaces to suppress emission of dust. ▪ Regular maintenance of project vehicles and equipment to ensure that engines are in sound working condition to minimize air emissions. ▪ Use of cleaner fuels for combustion ▪ Ambient monitoring should be carried out to ensure compliance with the PEQS.
Noise	Disturbance to the site workers, Nuisance for surrounding communities and wildlife	<ul style="list-style-type: none"> ▪ Proper maintenance of vehicles and potentially noisy equipment. ▪ Minimize/avoid unnecessary use of noisy machinery. ▪ Blowing of horn will be prohibited. ▪ Provision of Personal Protective Equipment (PPE) to the on-site personnel in high noise areas.
Solid Waste	Soil contamination, air pollution, odor, health hazards, aesthetic issues	<ul style="list-style-type: none"> ▪ Proper testing and in compliance with standards before disposal. A scientifically approved pit will be prepared with the incinerator room and ash will be dumped there. ▪ Ash pits will be constructed to dispose off ash.
Environmental Aspect	Potential Impacts	Mitigation Measures
		<ul style="list-style-type: none"> ▪ Records of all waste generated during the project activity period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a waste tracking register. ▪ Training will be provided to personnel for identification, segregation, and management of waste.

<p>Worker's Health and Safety</p>	<p>Health problems or immediate risk may take place, Occupational health of workers and community may be affected.</p>	<ul style="list-style-type: none"> ▪ No waste will be dumped openly at any location. ▪ Compliance to emergency response plan for emergencies and accidents will be ensured to avoid health safety risks. ▪ Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborers. ▪ Protection devices (earmuffs) will be provided to the workers operating in the vicinity of high noise generating machines. ▪ Proper maintenance of facilities for workers will be monitored. ▪ Provision of protective clothing for laborers e.g. helmet, adequate footwear, protective goggles, gloves ▪ Ensure strict use of wearing PPE during work activities. ▪ Provision of proper safety signage at sensitive/accident prone spots.
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1.6 CONCLUSION

The study was carried out to assess the environmental issues of the installation of Incinerator plant. All the relevant environmental impacts of the study have been identified based on the field survey and accordingly their mitigation measures were proposed in the report. The EIA was carried out keeping in view the Punjab Environmental Protection Act 1997 (amended-2022). In the light of the facts obtained from the project baseline study and control measures, it is envisaged that installation and operation of the said hospital & industrial waste incinerator will be useful for environment and has no adverse social and environmental impacts. The nearby residence communities have no issue with the installation of the project rather it is highly supported project because of present waste management condition, human health and disease risks in area.

2 INTRODUCTION

This chapter of the report provides a brief description of nature, size and location of the project. A defined scope of study, the magnitude of efforts and concise description of project proponent is also included in this chapter. The project objective is to provide proper incineration facility for hospital and industrial waste, keeping in view the business sustainability and to maintain workplace safety. Proposed Project proponent aims to deliver sustainable, industry leading financial performance and earn trust through enhancing quality of life and contributing to a healthier future. The study has been carried out to estimate the potential environmental impacts, both positive and negative, on the environment as well as socio-economic fabric of the surrounding environment during construction as well as operational phase. This report intends to provide satisfactory mitigation measures to avoid/eliminate any chance of adverse environmental impact on the socio-cultural, economic and environmental components. This report also intends to fulfill the regulatory requirements set under Punjab Environmental Protection Act, 1997 (Amended 2012) and its consequent legislative framework for IEE/EIA Regulations 2022 and the guidelines drafted for IEE and EIA under numerous sectorial heads. The entire set of legislative framework requires any new development project to undergo an IEE or EIA based on the categorization of the project under Schedule I and/or Schedule II.

2.1 PURPOSE OF REPORT

As per Punjab Environmental Protection Act, 1997 (Amended 2012) and the IEE/EIA Regulations, 2022 it is mandatory for the proponent of any development project to obtain Environmental Approval before commencing construction from EPA Punjab by filing an IEE or EIA as the case may be before the Agency. This EIA Study presents the findings of this subject unit. For this purpose, the proponent has engaged environmental consultants, M/s EnvironTech Consultants (Private) Limited. The purpose of this study is to identify the environmental baseline i.e. physical, biological and socio-economic/cultural conditions and assess all possible impacts arising during the construction and operation phase of the project with the aim to find out appropriate measures for their mitigation, to either eliminate those impacts or to bring them to acceptable level and formulate Environmental Management and Monitoring Plan (EMMP) for implementation of the project in environment-friendly manner. This EIA Report provides relevant information, as required under the officially approved format, to facilitate the decision makers i.e. EPA Punjab for the issuance of Environmental Approval/NOC.

2.2 IDENTIFICATION OF PROJECT AND PROPONENT

2.2.1 IDENTIFICATION OF PROJECT

The proposed project to which this Environmental Impact Assessment (EIA) relates is entitled as M/S Al Nafay Waste Management Company (Incineration Unit) at Main Bypass Road, Near Al Gahni Petroleum Tehsil Kamalia District Toba Tek Singh.

2.2.2 IDENTIFICATION OF PROJECT PROPONENT

Table 3: Identification of project proponent

Project proponent	Address	CNIC No.
Ahsan Masud	Mohala Medical Bazar, Haroonabad, Bahawalnagr	33302-0998748-7

2.3 DETAILS OF CONSULTANT

The EIA study was carried out by team of EnvironTech Consultant Private Limited comprising of environment scientists and engineers, sociologist, environmental chemist and environmental auditors with diversified experience on local and international assignments. The detail of the project team deputed on this assignment is attached to this report.

2.4 BRIEF DESCRIPTION OF NATURE, SIZE AND LOCATION OF PROJECT

As per Punjab Environmental Protection Act 1997 (amended 2012) and Initial Environmental Examination (IEE) & Environmental Impact Assessment (EIA) Regulations, 2022 the project falls under Category G (2) “Waste Incinerators and autoclaves” mentioned in Schedule-II. The proposed project is an Incineration Unit of hospital and industrial waste. Site selected for the project is rented by the proponent. The incinerator works with natural gas burners with the option to operate on standby LPG fuel. Combustion gas will re-burn in the post-combustion (secondary) chamber at the temperature range of 1250°C during minimum 2-3 seconds. The incinerator will be designed as a packaged unit, having pre-wired electrical connection and fuel pipes in place, making installation easier at site. Waste will be introduced through a manual front-loading system, continuous interval into the incinerator. Incineration is an important method for the treatment and decontamination of biomedical and health-care waste. Incineration is a high-temperature (850°C to 1250°C) dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and results in a very significant reduction of waste volume and weight the incineration/ pyrolysis should only be carried out in appropriate plants. The system will be designed to cope with the specific characteristics of hazardous health-care waste. The estimated project cost is PKR 60 million approx., and capacity of project will be 200 kg/hr. The project

under consideration of this EIA is the industrial and hospital waste Incineration facility at is Main Bypass Road, Near Al Gahni Petroleum Tehsil Kamalia District Toba Tek Singh. Beyond this scope no other development activities have been covered under this EIA study.

2.5 PROJECT NEED

The proposed project intends to incinerate infectious waste from industries and hospitals. Moreover, the project will eliminate infectious waste which will maintain hygiene and healthy surroundings of the area.

3 SCREENING

According to the Section 12 of Punjab Environmental Protection Act, 1997 (amended 2022) which states;

“No proponent of a project shall commence construction or operation unless he has filed with the Government Agency designated by Federal Environmental Protection agency or Provincial Environmental Protection Agencies, as the case may be or here the project is likely to cause an adverse environmental effect an Environmental Impact Assessment (IEE) and has obtained f the Government Agency approval in respect thereof.”

According to Review of IEE and EIA Regulations, 2022; the project falls under Category G (2) **“Waste Incinerators and autoclaves”** mentioned in Schedule-II.

Thus, an EIA Report is being prepared for duly submission in EPA, Punjab.

3.1 EIA PROCESS

3.1.1 OVERVIEW OF EIA

EIA is a systematic process to identify, predict and evaluate the environmental impacts of proposed actions and projects. The process is applied prior to major decisions and commitments being made. Wherever appropriate, social, cultural and health effects are considered as an integral part of EIA. Particular attention is given to practical implementation of EIA to prevent and mitigate significant adverse effects of proposed undertakings.

3.1.2 OBJECTIVES OF EIA

The overall objective of the EIA is as follows:

- Description of the project, including an estimate of emissions, effluent and waste and consideration of the project alternatives;
- Identify and investigate all impacts of the project on the physical, biological, and socio-economic environment;
- Evaluation of the baseline environmental conditions in the impact zone to provide a basis for assessing the incremental impacts of the project, including existing pollution levels and nuisance conditions;
- Identification and assessment of the potential impacts on the environment during each of the project phases;
- To propose mitigation measures that would help the Project Proponent in conducting the operation in an environmentally sustainable manner; and
- To develop an Environmental Management Plan that would assist the Project Proponent in the effective implementation of the recommendations of the EIA.

4 SCOPING & CONSIDERATION OF ALTERNATIVES

4.1 SPATIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT

Project land is rented by project proponent. Impacts have been assessed for the immediate and direct area of influence of the project defined as:

- Immediate Area of Influence: Within the project site boundary.
- Direct Area of Influence: Within 5 Km from the project site boundary.

Effects on socioeconomic receptors and resources have been assessed for the construction and operational phases of the project. The project activities are predicted to last for a period of 5-6 months within which the potential impacts have been assessed. The operational impacts have been assessed for the entire lifespan of the facility. The impacts related to the decommissioning of the project will be assessed at the time of decommissioning which will involve carrying out site assessment study at the project location.

4.2 SCOPE OF EIA

This consolidated EIA report covers the examination of physical, biological, environmental and socioeconomic impacts of the project

The spatial and temporal scope of the project is described below:

4.2.1 SPATIAL SCOPE

Impacts have been assessed for the immediate and direct area of influence of the project defined as:

- Immediate Area of Influence: Within the project site boundary.
- Direct Area of Influence: Within 5 Km from the project site boundary.

4.2.2 TEMPORAL SCOPE

Effects on socioeconomic receptors and resources have been assessed for the construction and operational phases of the project. The project activities are predicted to last for a period of 5-6 months within which the potential impacts have been assessed. The operational impacts have been assessed for the entire lifespan of the facility. The impacts related to the decommissioning of the project will be assessed at the time of decommissioning which will involve carrying out site assessment study at the project location.

4.2.3 EIA METHODOLOGY

The EIA project passes through series of stages prior to attaining approval from relevant environmental protection agency. The EIA process and the approach followed for the project is defined below:

4.2.4 SCOPING

Scoping is an early stage in the process and is designed to ensure that the environmental studies provide all the relevant information on:

- The impacts of the project, in particular focusing on the most important impacts;
- The alternatives to the project;
- Other environmental sensitivities to be addressed at early stage.

The EIA process started with the scoping study. The purpose of scoping was to identify:

- Important issues to be considered in an EIA;
- Appropriate time and space boundaries of the EIA study;
- Information necessary for decision-making;
- Significant effects and factors to be studied in detail.

The scoping was followed by data collection describes in subsequent section.

4.2.5 DATA COLLECTION

Following literature reviews and data collection was carried out for EIA:

- A generic description of the project and its related activities was collected from the proponent.
- Legislative review of the applicable laws, regulations, guidelines and standards from literature search.
- Baseline of the area's environmental and socio-economic settings was collected through literature search and field surveys.

4.2.6 Baseline

The environmental impact is measured through a change in the environment, resulting from a designated action or activity. In order to identify such a change, it is essential to have as complete as practicable understanding of the nature of the existing environment, prior to its interaction with the activity. This translates into the need to characterize the existing baseline environmental conditions, including establishing prevailing conditions for a range of environmental media, particularly air, water, soil and groundwater, flora and fauna and the human environment.

This was achieved through a detailed review of all secondary resources (i.e. existing documentation and literature); and the undertaking of project specific baseline studies and surveys to collect supplementary data in the following areas:

- Geology;
- Flora and fauna;
- Water quality characteristics;
- Traffic;
- Ambient air quality;
- Noise conditions;

- Socio-economic conditions;
- Archaeology.

Both the existing secondary sources and literature studies were conducted and integrated into one coherent description of baseline characteristics.

4.2.7 EVALUATION OF ALTERNATIVES

To establish an environmentally sound preferred option for achieving the objectives of the project, different alternatives including site selection and technology alternatives were studied in collaboration with the project proponent. Technology selection was made taking in to consideration environmentally, economically and socially suitable as well as technically feasible options.

4.2.8 STAKEHOLDER CONSULTATION

Stakeholder consultation was carried out for the project with primary and secondary stakeholders of the project. Following steps were involved to attain stakeholder consent:

- Providing information on the project activities;
- Identifying the stakeholders’ concerns, expectations and apprehensions about the project;
- Summarizing the process outcome.

4.2.9 IMPACT ASSESSMENT AND MITIGATION

The information collected in the previous phases was used to assess the potential environmental impacts of the project activities. The impact assessment approach is provided in **Table 4**. Impacts of project activities on environment. The issues studied during impact assessment include potential impacts on:

- Physical environment of the area
- Biological environment of the area
- Socio-economic environment of the area

Table 4: Impact assessment approach

Impact Characteristics	Categories
Nature of the Impact	<p>Direct: The environmental parameter is directly changed by the project.</p> <p>Indirect: the environmental parameter changes as a result of change in another parameter.</p>
Duration of the impact	<p>Short term: Lasting only till the duration of the project such as noise from the construction activities.</p> <p>Medium term: Lasting for a period of few months to a year after the project before naturally reverting to the original condition.</p> <p>Long term: Lasting for a period much greater than medium term impacts before naturally reverting to the original condition.</p>

Geographical Location of the impact	Local: Within the area of project i.e. operation site and access road. Regional: Within the boundaries of the project area. National: Within the boundaries of the country. Global: Trans-boundary impacts
Timing	Construction Operation
Likelihood of the impact	High: High likelihood of occurrence during lifetime of operation, Regular/continuous part of operations. Moderate: Moderate possibility of occurrence during lifetime of operation, Periodic/occasional part of operations. Low: Unlikely to occur during lifetime of operation.

Impact Characteristics Categories

Reversibility of the impact	Reversible: When a receptor resumes its pre-project condition. Irreversible: When a receptor does not or cannot resume its pre-project condition.
Significance of the impact	Major, Moderate, Minor, Negligible and Beneficial Based on the consequence, likelihood, reversibility, geographical extent, duration, level of public concern and conformance with legislative or statutory requirements.
Consequence severity of impact	High: <ul style="list-style-type: none"> ▪ Serious/catastrophic damage to environment ▪ Direct legislative requirement ▪ Corporate requirement ▪ Serious threat to corporate reputation/profitability/ability to do business. Medium: <ul style="list-style-type: none"> ▪ Measurable damage to the environment ▪ Subject to potential future legislation ▪ Potential to affect reputation/cost ▪ Implication/reduced efficiency Low: <ul style="list-style-type: none"> ▪ Negligible damage to the environment No risk to business

4.3 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

During consultation it was observed that maximum of people was in favor of project and following issues and concerns were raised. Stakeholder Consultation it is mentioned in detail in

Chapter 10.

- During survey following concerns of the local community, Government Departments and Environmental Practitioners and experts were noted:
- Nuisance must be controlled.
- Latest/State of the art technology must be adopted.
- Locals should be preferred for the job opportunities.

- Solid waste should be managed effectively by adopting the standard practices of the area.
- Cleanliness of the area should be ensured.
- An effective EMMP should be designed and enforced with true spirit.
- Health of the workers should be ensured.

4.4 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

Main impacts and factors to be determined are:

- Occupational Health and safety
- Site Security
- Traffic Management
- Hygiene management
- Job opportunities for locals
- Resource conservation
- Water consumption
- Proper site restoration after construction
- Tree plantation at designated green areas
- Emergency preparedness

4.5 SITE ALTERNATIVES (SELECTION AND REJECTION CRITERIA)

The land is already owned by the project proponent and considered suitable both in terms of environment and physical constraints. As sufficient area is available for installation that would also reduce the transportation cost for solid waste handling.

- Transportation infrastructure (road network) is available.
- Safe distance from sensitive receptors (residential area & protected area)
- The selected site is under the undisputed rental agreement of the proponent.
- No land use change is being foreseen due to implementation of proposed project.

4.6 PROJECT ALTERNATIVES

It is a common observation that hospitals generate large amounts of waste that falls into different categories in which about 85% is general, non-hazardous waste comparable to domestic waste. The remaining 15% is considered hazardous material that may be infectious, toxic or radioactive. Improper disposal of medical wastes, especially hazardous may lead to significant impacts on human health as well as on environment. This option is unacceptable when one considers the problems associated with the old or ongoing operations to treat hospital waste and its with associated health effects. The hospital hazardous and infectious waste without proper disposal measures will generate various diseases that will be a big threat to human health and the environment. Additionally, the current methods of medical waste management are not consistent with the hospital's waste management rules.

4.7 DESIGN/TECHNOLOGY ALTERNATIVES (SELECTION AND REJECTION CRITERIA)

The project technology will be up to date and will also environment and eco-friendly. So, no other technology will be taken under consideration.

4.8 ENVIRONMENTAL ALTERNATIVES (SELECTION AND REJECTION CRITERIA)

Environmental considerations are of utmost importance in selecting site. Being on a Self-Developed industrial zone there is no sensitivity in the area from environmental setting point of view. Thus, there is no ecologically sensitive or declared protected area such as territorial waters, forest, game reserve or biodiversity parks within a 4 km radius of the project site, requiring the proponent to look for site alternatives.

4.9 ECONOMIC ALTERNATIVES (SELECTION AND REJECTION CRITERIA)

The technology selected for the above stated project will be economical viable than alternatives present as compared to majority of the other available production technologies but it will be most efficient and convenient to use.

5 DESCRIPTION OF PROJECT

This chapter provides the description of “M/S Al Nafay Waste Management Company (Incineration Unit), type and category of project, location and layout, vegetation features of site, project schedule of implementation and complete description of the project related to its process and steps.

5.1 TYPE & CATEGORY OF PROJECT

According to Review of IEE and EIA Regulations, 2022; the project falls under Category G (2) “*Waste Incinerators and autoclaves*” mentioned in Schedule-II.

5.2 OBJECTIVES OF PROJECT

The objective of the project is minimizing the hospital and industrial waste by incineration in environmentally sound manner and minimizing the risk for personnel, general public health and environment Furthermore, recyclable & non-hazardous plastic & other recyclable, material will be recycled.

5.3 LOCATION AND SITE LAYOUT OF PROJECT

The proposed project site is located at Main Bypass Road, Near Al Gahni Petroleum Tehsil Kamalia District Toba Tek Singh. Google Earth map of site is given in **Fig-1**. The nearby population to project is **1km** distant from project site.

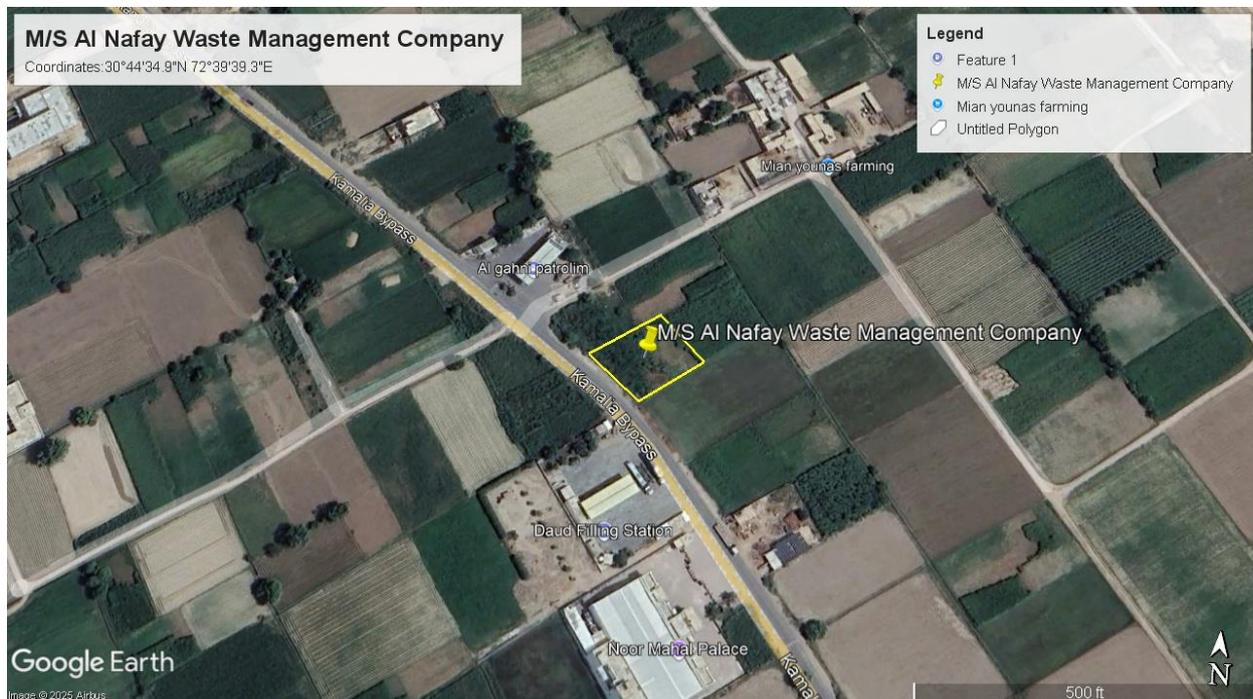


Figure 1: Google earth map of project

5.4 LAND USE ON THE SITE

The site is rented by project proponent. Topography of the area is almost flat with no noticeable variation in the surface. There are no mountains or hills of any kind could be seen in the area.

5.5 ROAD ACCESS

The site is well connected to main road and it is well accessible via main Kamalia by-pass Road access map pf site is given in **Fig-2**

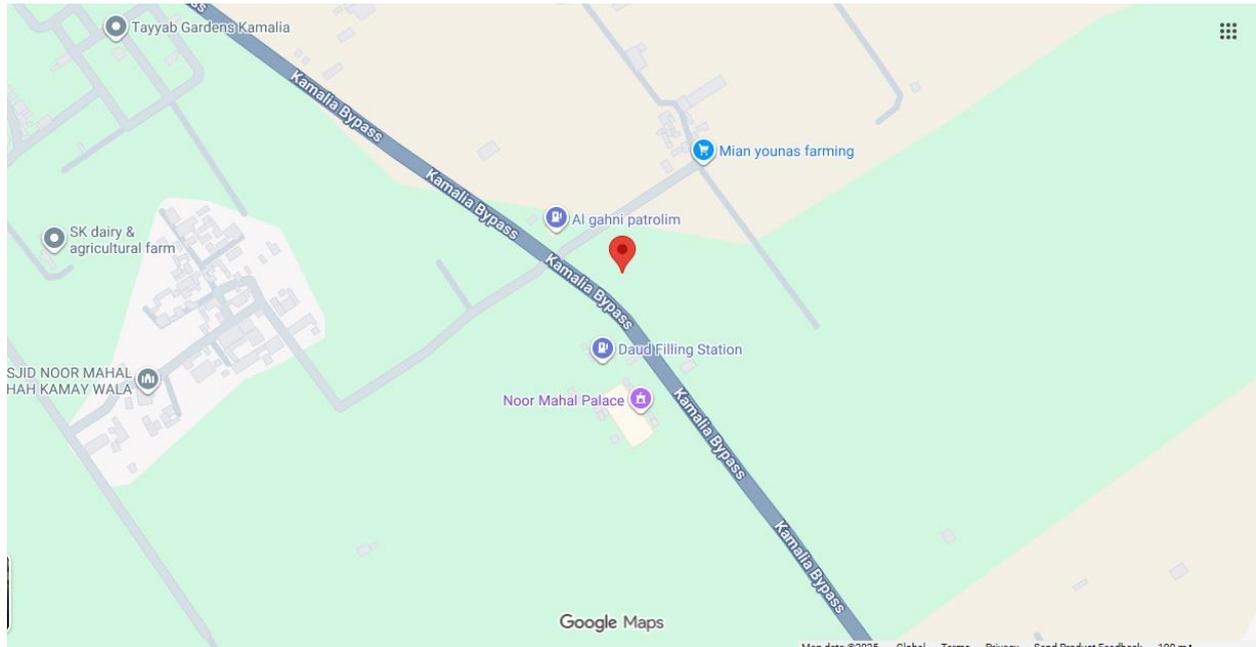


Figure 2: Road access map

5.6 VEGETATION FEATURES OF THE SITE

There is no vegetation, as the current project is located at Self-Developed industrial land. However, proponent will make green belts, garden and plant ornamental plants.

5.7 COST AND MAGNITUDE OF OPERATION

Total cost of the project is estimated to be around **60 million PKR**. The capacity of unit will be 200 kg/hr.

5.8 SCHEDULE OF IMPLEMENTATION

It is projected that the construction phase of entire project will be started after getting environmental approval from EPA Punjab and will be completed in the period of 5-6 months. Activities involved are:

- Assessment of environmental impacts and its mitigation measures
- EA approval, other local issues
- Implementation of recommended alteration in system, if required

- Commencement of operation

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

2nd Stage: The stage –2 comprises the following task:

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

3rd Stage: The stage –3 comprises the following task:

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

4th Stage: The last stage will be Commencement of regular operation.

5.9 DESCRIPTION OF THE PROJECT (PROCESS FLOW CHART/STEPS, TECHNOLOGY, RAW MATERIAL AND PRODUCES, BY-PRODUCTS)

The project is Installation of Industrial & Hospital Waste Incinerator under the title of M/S Al Nafay Waste Management Company (Incineration Unit). Incineration is an important method for the treatment and decontamination of biomedical and health-care waste. Incineration is high-temperature (850°C to 1250 °C) dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and results in a very significant reduction of waste volume and weight. The incineration/pyrolysis should only be carried out in appropriate plants. The system should be designed to cope with the specific characteristics of hazardous health-care. Only recyclable non-hazardous plastic will be converted in plastic granules and then will be sold.

5.10 HAZARDOUS & NON-HAZARDOUS WASTE

Table 5: Raw materials and storage details

Sr No.	Item	Quantity
Industrial waste		
i.	Plastic	7000-8000 kg/Month
ii.	Rubber	600 kg/ Month
iii.	Mobil Oil	500 kg/ Month
iv.	Chemicals	500 kg/ Month
v.	Fiber	1000 kg/ Month
vi.	Chemical/ Discarded Container	1000 kg/Month
vii.	Wood	1000 kg/ Month
viii.	Rejected & Expired Batch	1000 kg/Month
ix.	Iron Scrap	1000 kg/ Month
Hospital Waste		
i.	Glucose Bottles	500 kg/day
ii.	Syringes	500 kg day

iii.	Bandages	500 kg/day
iv.	Urine Bags	500 kg/day
v.	Other type of Hospital waste	1000 kg/day
Organic Waste		
i.	Organic waste	1000 kg/day
ii.	Foul Organic Waste	1000 kg/day
Industrial Waste		
Total Raw material collection		16-17 tons/day
Yard Storage Capacity		20 tons/day

5.11 TIMING AND FREQUENCY OF COLLECTION OF WASTE

1. Timing: 08:00am to 06:00pm
2. Frequency: 2 times a day (max.)
3. Transportation mechanism: 3 trucks

5.12 LIST OF MACHINERY

Details of machinery to be installed is given below in Table-6.

Table 6: List of Machinery

Sr. No.	Machinery Details	Quantity
i.	Incinerator	01

5.13 RECYCLING OF PLASTIC AND OTHER RECYCLABLE NON-HAZARDOUS WASTE

Non-hazardous plastic & other recyclable waste will be recycled. Tagged bags consisting of recycled waste will be segregated manually and then will be crushed through crushers. Plastic will be converted into plastic granules. All recycled non-hazardous waste will be sold to relevant buyers.

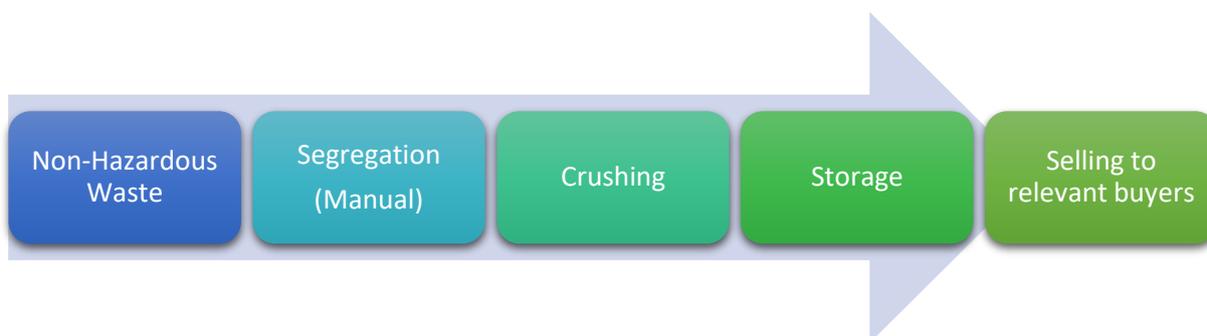


Figure 3: Process Flow Diagram of Recycling of Non-Hazardous Waste

5.14 TECHNICAL SPECIFICATIONS OF THE PROJECT

- The incinerator will have a capacity of 200 kg/hr.

- The incinerator shall work with natural gas burners with the option to operate on standby LPG fuel as well.
- Combustion gas will be re-burned in the post-combustion (secondary) chamber at the temperature of 1250°C.
- The control panel will be fitted with a functional synoptic view showing the operating situation of the whole incinerator and is controlled by P.L.C.
- The incinerator will be designed as a packaged unit, having pre-wired electrical connection and fuel pipes in place, making installation easier at site.
- Waste will be introduced through a manual front-loading system, continuous interval into the incinerator.

5.14.1 COMBUSTION CHAMBER OF WASTE

- The first phase of the incineration combustion will be without air (pyrolytic effect), comparable to gasification.
- The combustion chamber will have thick sheet of steel (5 to 8 mm), especially elaborated in rectangular shape.
- The insulation of the combustion chamber will be composed high content aluminum and insulates bricks in order to assure a minimum temperature on the outside metal sheet.

5.14.2 REFRACTORY

- Thickness: 110 mm
- Maximum temperature: 1650 °C Nature: 42% of Al2O3

5.14.3 INSULATOR

- Thickness: 80 mm
- Maximum temperature: 1250°C Nature: Calcium silicate

5.14.4 COMBUSTION BURNERS

- The combustion hearth has equipped with one combustion burners.
- Automatic burning and mono-bloc casting guiding flames have fitted with an electronic ignition device and permanent ventilation.

5.14.5 SECONDARY COMBUSTION CHAMBER

- The post-combustion of gases will take place at a temperature of minimum 1250°C for seconds. The cylindrical form of the secondary combustion chamber, combined with vortex effect in the secondary air injection enables to assure the achievement of very low hydrocarbon refuse.

- The post-combustion chamber will be fitted with inspection doors so that a periodical cleaning of dust can be achieved.
- The post-combustion will have a lined with high thermal insulating materials having a thickness of 250mm or more.
- The design of the post-combustion burner has similarity to the combustion burner.

5.14.6 SCRUBBER

The incinerator will be equipped with dry scrubber in order to control emissions.

5.14.7 ELECTRIC CONTROL AND REGULATION PANEL

- The panels will have the temperature regulators which have digital showings.
- One for regulating the temperature of combustion burners
- One for regulating the temperature of post-combustion
- The control panel commanded by the P.L.C (Programmable Logic Controller) System.
- The manual commanding is anticipated on each element.

5.14.8 CHIMNEY

- The incinerator will be equipped with a chimney
- The chimney will have a collection point/monitoring point for monitoring of emissions.
- The height of chimney will be 15 m

5.14.9 STANDBY LPG FUEL

An LPG Vaporizer with manifold system for reserve LPG cylinders having sufficient capacity to run the incinerator for at least 12 hours including shed.

5.15 PROCESS FLOW

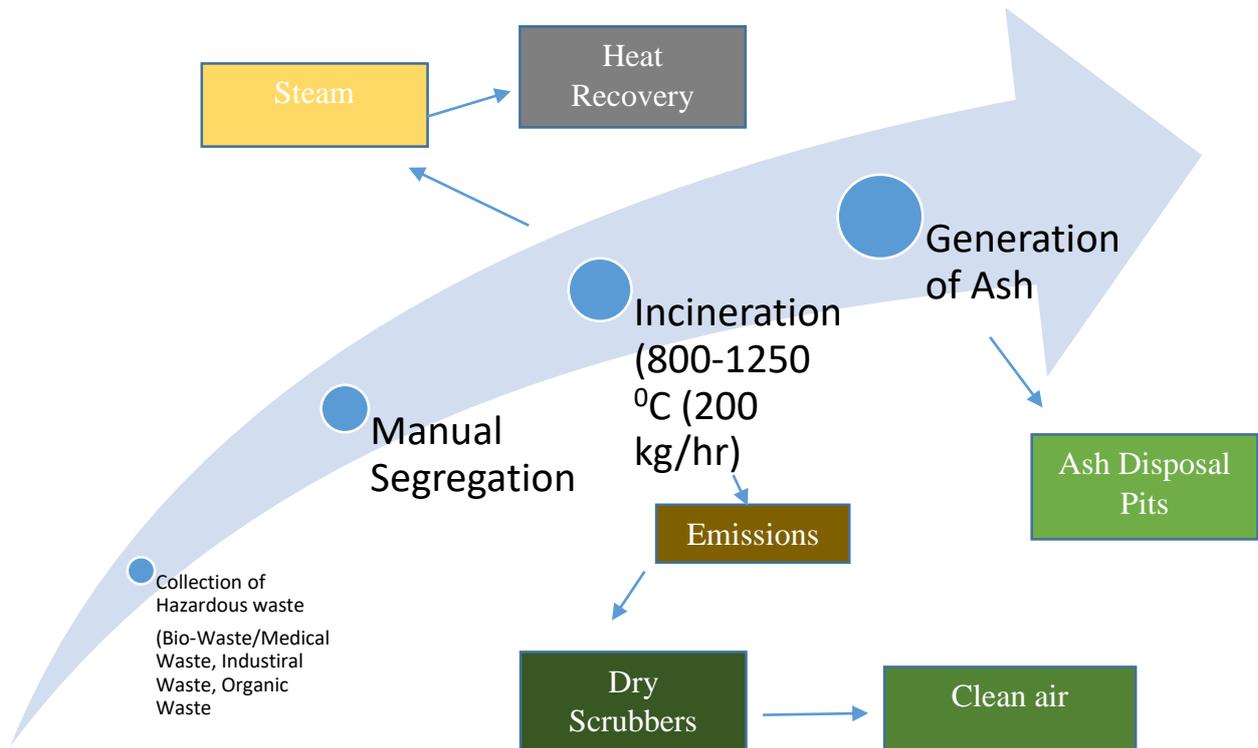


Figure 4: Schematic Flow Diagram of Incineration of Hazardous Waste



Figure 5: Process Flow for Non-Hazardous Waste

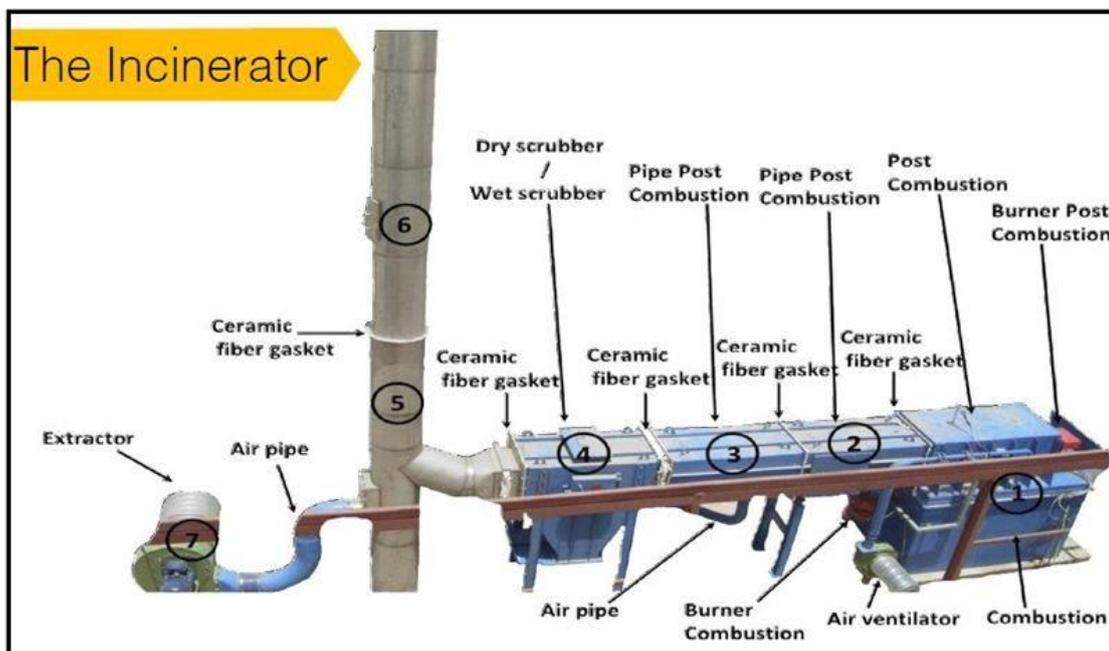


Figure 6: The Incinerator

Table 7: Technical Specifications

Type	Parameter	Recommendation
Capacity	Destruction rate, safety boxes capacity	200 kg/hr
Temperature	Primary chamber Secondary chamber	540 to 980 C 980 to 1200 C (EPA 1990 recommendations) >850/1100* C (S. African and EU standards) >1000/1100* C (Indian and Thai standards) * More than 1% chlorinated organic matter in waste
Residence Times	Gas (secondary chamber)	>1 s
Air Flows	Total combustion air Supply and distribution of air in the incinerator Mixing of combustion of gas and air in all zones Air emissions	140-200% excess Adequate Good Mixing Minimize by keeping moderate air velocity to avoid fluidization of the waste, especially if high >2%
Controls & Monitoring	Temperature and many other parameters	Continuous for some, periodic for others
Waste	Waste destruction efficiency	>97% by weight
Enclosure	Roof	A roof may be fitted to protect the operator from rain, but only minimum walls.

Chimney	Height	At least 4 – 5 m high, needed for both adequate dispersion plus draft for proper air flow
Pollution Control	Installing air pollution control	Most frequently used controls include packed bed, venturi or other dry scrubbers, fabric filter typically used with a dry injection system, and infrequently electrostatic precipitator (ESP). Modern emission limits cannot be met without APCD.

5.16 RESTORATION AND REHABILITATION PLANS

At the end of the unit life, it will be duly dismantled with special precautions to avoid/minimize pollution and at the same time taking all safety precautions to protect human life and property around the project site. Debris or any other wastes resulting from demolishing will be disposed-off in environmentally sustainable fashion. The materials capable of recycling/reuse will be either sold in the market or to be reused for other suitable purposes. While dismantling, Government rules and regulations as applicable to such activities will be strictly adhered. Safety measures as desired under the code of demolition will be adopted to avoid any harm to humans, property around, or the environment in the project area. On the whole, the project site and the area in its near vicinity will be made neat and clean.

5.17 GOVERNMENT APPROVALS

The environmental approval according to the Section 12 of Punjab Environmental Protection Act is the mandatory requirement of the project.

6 DESCRIPTION OF ENVIRONMENT

This chapter provides baseline data (physical, biological and socio-economic parameters) related to the project and study area. The information has been compiled by using primary and secondary data resources. This chapter also refers to the theoretical analysis of the methodology adopted for collection of baseline data. The underlying principles and practices adopted in this regard are also discussed.

6.1 Methodology

The methodology adopted for the preparation of this baseline study involves both primary and secondary data collection. Primary data was gathered through field visits and interaction with local communities. Secondary data was obtained from relevant government departments, published reports, and recent meteorological datasets for 2024–2025. The data focuses on the physical, biological, and socio-economic environment of the study area in Toba Tek Singh District.

6.1.1 Data Collection

The primary data was collected by visiting the project area and its communities in its nearby vicinity. The secondary data regarding physical parameters (topography, geology, seismology, and climate) was obtained by visiting relevant various government departments and their official websites. The biological parameters such as flora and fauna were studied by preparing a floristic list based on visual observation and fauna was studied by using opportunities approach. The species were recorded with reference to their existence in the project area. Information on wildlife fauna species (mammals, amphibians, reptiles, birds, etc.) in the assessment area was compiled based on opportunistic observation, gathering the existing information and consultation with local experts, community members and government and Non-Government Organizations (NGOs). The socioeconomic aspects were studied and analyzed by studying detailed village profile and by conducting household surveys.

6.1.2 Social Survey

The purpose of social survey was to record the present condition of the people living in the project area and to assess the expected project impacts on their life, subsistence systems and socio-cultural conditions. Prior to conducting the field surveys, the following steps were taken:

- Clear boundaries of the project area were identified
- Decided the sampling procedure in order to draw a representative sample size of the target population and households
- Developed the tools for data collection i.e. questionnaires to access the socio-economic status of the area

6.1.3 *Sampling Design*

Social baseline data of the persons residing in the study area has been estimated and collected through random sampling by using pre-developed questionnaires.

6.1.4 *Questionnaires*

In order to test the validity and reliability of the questionnaires, they were reviewed to assess whether questions needed to be clarified, changed or re-sequenced and then a final editing of questionnaires was conducted prior to their application in the project area. The sample of socio-economic questionnaires used is attached as Annexure.

6.1.5 *Data Editing and Analysis*

The filled questionnaires and recorded information were compiled by the same field investigators who were involved in the data collection. This was done immediately after completing the field investigations. Data sets were processed. Analysis of the data and preparation of conclusions in the minimum possible time was done using statistical techniques of data analysis.

6.2 **Review of Legal and Administrative Framework**

The objective of reviewing legal and administrative framework is to obtain information on all legislation pertaining project development. The Socio-Environment Team of Central Environment Services reviewed the environmental policies, national, international and provincial laws and guidelines relevant to the development of project which helped in systematic identification of impacts.

6.3 **Baseline Conditions**

This chapter provides baseline data (physical, biological and socio-economic parameters) related to the project and study area

6.4 **Physical Environment**

Pakistan Can be divided into five broad physiographical regions. These are the mountainous regions of the north, the western highlands and plateaus, the sub-mountains Indus region, the Potohar Plateau, Salt Range, and the Indus Plain. Brief description of these regions is given below:

Region	Characteristics	Location	Height
Northern Mountainous	Hindu Kush Karakoram and Himalayan Mountain Ranges	Northern Part of KPK, Gilgit Agency, Northern Areas and Kashmir.	Rises above 8,000m
Western Highlands and Plateaus	Toba Kakar, Sulaiman, Central Baruhi, Saihan, Central Makran, Makran Coastal and Kirthar Ranges	Mainly in Baluchistan, also parts of Sindh and KPK	Between 1,200 to 3,000 m
Sub-Mountains Indus	Alluvial filled Basins	Plains of Peshawar Kohat and Bannu	Less than 1,000 m

Potohar Plateau and Salt Range	Flat to gently undulating surface, broken by gullies,	Mainly northern parts of Punjab, some parts of KPK	Less than 1,000 m
Indus Plain	Flood plains of the Indus, Jhelum, Chenab Ravi and Sutlej Rivers	Punjab and Sindh	Less than 1,000 m

6.4.1 Topography

Toba Tek Singh lies in the central plains of Punjab, at approximately 30.97°N latitude and 72.48°E longitude. The district is located at an elevation of about 156 meters above sea level and covers an area of 3,252 km². The terrain is generally flat and fertile, formed by alluvial deposits of the Indus River system. The soil is loamy to clay-loam in texture, suitable for major crops such as wheat, sugarcane, and cotton.

Project Site:

The project site is located in District Toba Tek Singh.

6.4.2 Hydrology

Groundwater is the primary source of water in Toba Tek Singh, commonly extracted from depths between 100 to 250 feet. The groundwater is generally suitable for domestic, industrial, and agricultural use. The district is part of the Lower Chenab Canal irrigation system, which provides water for agriculture throughout the year. There are no major natural surface water bodies within 5 km of the project site.

6.4.3 Seismicity

According to the Seismic Zoning Map of Pakistan, Toba Tek Singh lies in Zone 2A, indicating minor to moderate seismic activity. The area is not prone to frequent earthquakes but may experience mild tremors occasionally due to tectonic movements in northern Pakistan.

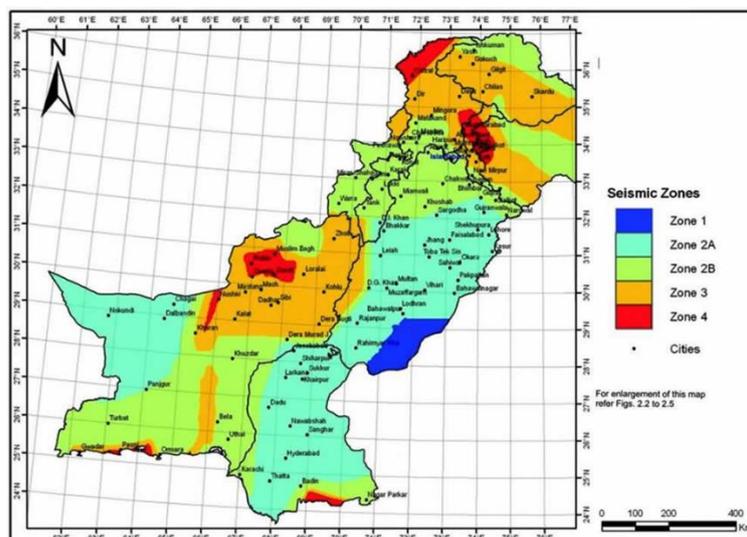


Figure 7: Seismic Zoning Map of Pakistan

6.4.4 Climate

Toba Tek Singh experiences a semi-arid climate characterized by hot summers and mild winters, with a mean annual temperature of approximately 24°C. The hottest months are May and June, when temperatures can soar to 45–46°C during heatwaves, while the coldest months are December and January, with minimum temperatures dropping to around 5–7°C at night. The district receives an average annual rainfall of about 344–352 mm, with July and August being the wettest months, recording 70–80 mm of rainfall per month, whereas October and November are the driest, with less than 5 mm of rainfall. The average wind speed ranges between 4–7 km/h, blowing predominantly from the South and South-West during the summer season. Humidity levels remain around 35–40% during the dry months and rise to 60–65% during the monsoon period, reflecting the region’s distinct seasonal variations.

6.7.6 Wind

The diagram for Toba Tek Singh shows the Max and Average Wind speed and Wind Gust.

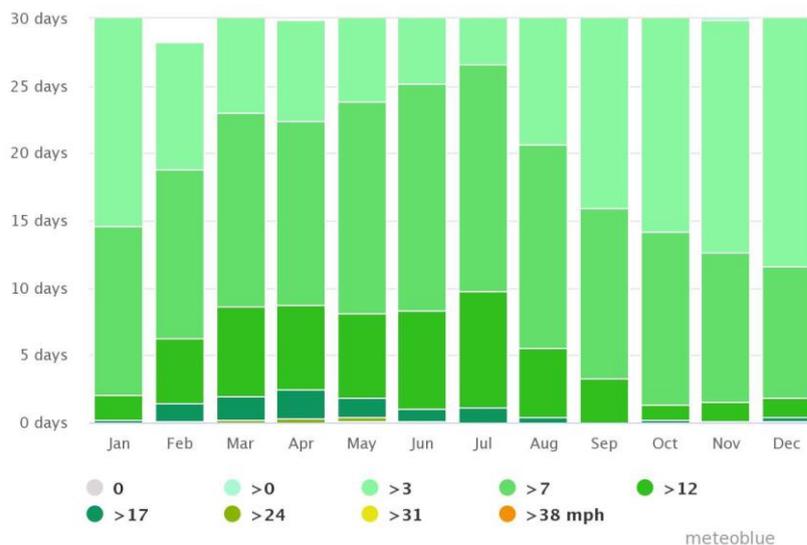


Figure 8: Annual average wind speed in Toba Tek Singh
(<https://www.worldweatheronline.com>)

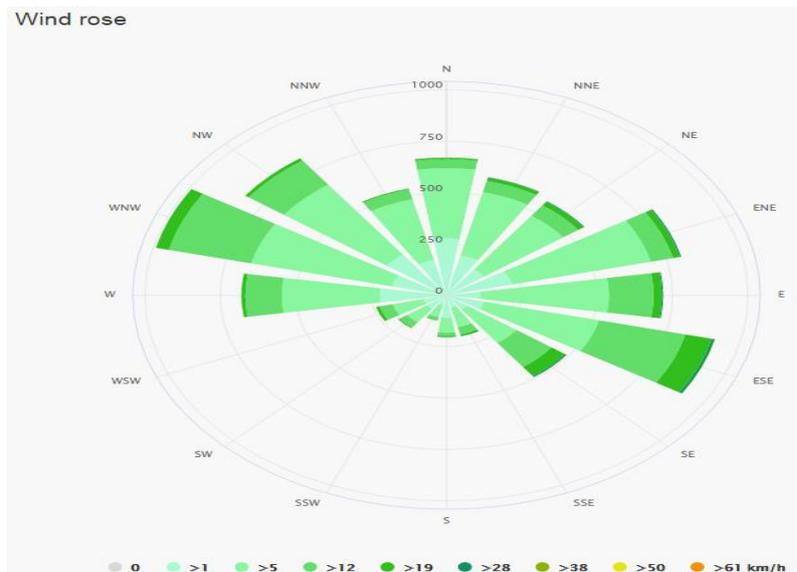


Figure 9: Wind Rose diagram of Toba Tek Singh

The wind rose for Toba Tek Singh shows how many hours per year the wind blows from the indicated direction. Example SW: Wind is blowing from South-West (SW) to North-East (NE).

6.5 Ecological Environment

The natural flora and fauna of Toba Tek Singh are representative of the central Punjab plains. The area has been extensively cultivated; therefore, most of the natural vegetation has been replaced by agricultural crops and planted trees.

6.5.1 Aquatic Flora & Fauna

No aquatic ecosystem (i.e. canal, stream, river or pond) observed within or around the study area, which omits the possibility of any kind of aquatic species that may be harmed due to the establishment of project.

6.5.2 Flora

Common tree species include Neem (*Azadirachta indica*), Kikar (*Vachellia nilotica*), and Eucalyptus (*Eucalyptus globulus*). Agricultural crops consist mainly of wheat, sugarcane, cotton, and maize. Grasses and shrubs are found along canal banks and uncultivated patches. The nomenclature including common, English, local and botanical names of the flora found in the study area are presented in Table

Table 8: Flora of the Study Site

S#	Common Name	Scientific Name
1	Neem	<i>Azadirachta indica</i>
2	Kikar	<i>Vachellia nilotica</i>
3	Safeda	<i>Eucalyptus globulus</i>

6.5.3 Fauna

The fauna includes species adapted to human-influenced environments. Common mammals include the Indian Palm Squirrel, Small Indian Mongoose, rats, and bats. Bird species such as House Sparrow (*Passer domesticus*), Crow (*Corvus splendens*), Pigeon (*Columbidae*), and Parrot (*Psittaci forms*) are frequently observed. Reptiles like Spiny-tailed Lizard (*Uromastix hardwickii*) and snakes (*Serpentes*) are also found in agricultural areas.

Commonly found mammals in the area include; dogs, cats, horses, house-rats, squirrels, porcupines and bats. However, Small Indian Mongoose and Indian Palm Squirrel are also found in the District Toba Tek Singh.

Table 9: Mammals in Study Area

S#	Common Name	Scientific Name
1	Rat	<i>Rattus</i>
2	Bat	<i>Chiroptera</i>
3	Small Indian Mongoose	<i>Herpestes javanicus</i>
4	Indian Palm Squirrel	<i>Funambulus palmarum</i>
5	Porcupines	<i>Erethizon dorsatum</i>
6	Squirrels	<i>Sciuridae</i>

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

In District Toba Tek Singh reptiles such as Snakes (Cobra and Kraits), Spiny Tailed Lizard and Fringed Toed Lizard are common in the tract, but cases of snake bites are very rare, as these reptiles have been either killed by expanding urbanization or they have moved away.

Table 10: Birds in Study Area

S#	Common Name	Scientific Name
1	House Sparrow	<i>Passer domesticus</i>
2	House Crow	<i>Corvus splendens</i>
3	Pigeon	<i>Columbidae</i>
4	Bulbul	<i>Pycno notidae</i>
5	Teetar	<i>Francolinus francolinus</i>
6	Parrot	<i>Psittaci forms</i>
7	Titodi	<i>Vanellus indicus</i>

Table 11: Reptiles in the Study Area

S#	Common Name	Scientific Name
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1	Snake	<i>Serpentes</i>
2	Spiny Tailed Lizard	<i>Uromastix hardwickii</i>
3	Fingered Toed Lizard	<i>Acanthodactylus cantoris</i>
4	Earthworm	<i>Lumbricina</i>

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

Table 12: Amphibians in the Study Area

S#	Common Name	Scientific Name
1	Common Frog	<i>Rana temporaria</i>
2	Indus Valley Toad	<i>Bufo stomaticus</i>

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

Table 13: Insects in Study Area

S#	Common Name	Scientific Name
1	Black Ants	<i>Paratracheaiognicornis</i>
2	Dragon Fly	<i>Dragon Fly</i>
3	House Flies	<i>Musca domestica</i>
4	Butter Flies	<i>Parnassiusbalucha</i>
5	Honey Bees	<i>Apismellifera</i>
6	Wasps	<i>Anagyrus pseudococci</i>
7	Grasshopper	<i>Melanoplus differentialis</i>
8	Mosquito	<i>Anophlese sp.</i>

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

6.5.4 Water Resource

The main source of the water consumption is the ground water which is being pumped from 200 ft borehole and its being used in the study area for domestic purposes. To check the quality of the

water in the area, ground water was collected and analyzed. The ground water was collected from bore hole adjacent to the project area.

6.6 Socio-Economic Resources

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

6.7 Socio-Economic Profile of Study Area

This topic provides an overview of the baseline information relating to the socio-economic environment of the project area and the AOI. The socio-economic study gives information about the demographic profile, occupation, education and health facilities in the project area.

6.8 Demographic Profile

The Demographic Studies are the major source of any city's Socio-Economic profile. Demographic Studies relate to population. Population studies are extremely important from Town Planning point of view. Until and unless we know about population in detail, we cannot do successful planning. All aspects of population, such as sex-age composition, trend of migration, social, cultural, political, economic and administrative works, values and facilities have to be related to planning considerations and decisions. Individuals are the raw material of society; therefore, society is directly affected by size, growth, composition and distribution of its individuals. The term population refers to the number of individuals living within a geographical area at a given time.

Different community individuals in the vicinity of the project area have different family sizes depending upon their living setups. Average family size is however 5-7 individuals per family with 1-2 earning hands per family.

6.8.1 Health Facilities

Health facilities in the district include a District Headquarters (DHQ) Hospital, several Tehsil Headquarters Hospitals, and Basic Health Units (BHUs).

6.8.2 Educational Facilities

Educational institutions include government primary and secondary schools, as well as private colleges located in Toba Tek Singh city and nearby towns.

6.8.4 Demographic Characteristics of the Population

The field survey (including interviews, focus group discussions, census, and area profile) was carried out to collect the socioeconomic data from the project affected people as well as other general population to accomplish the baseline information, which will provide the basis for subsequent monitoring and evaluation studies.

The demographic features include the information on household’s profile, gender composition, occupations, and literacy status of the population residing in the project area. The information relating to the demographic profile of the people in the project area are described below.

6.8.5 Family Size

Based on the field survey of local population, the average family size computed to be 5-6.

6.8.6 Age Groups

Ages of the consulted population were also recorded. The people interviewed for the socio-economic assessment belongs to different age groups i.e. 20-35 years, 36-45 years, 46-55 years, and 56 years and above.

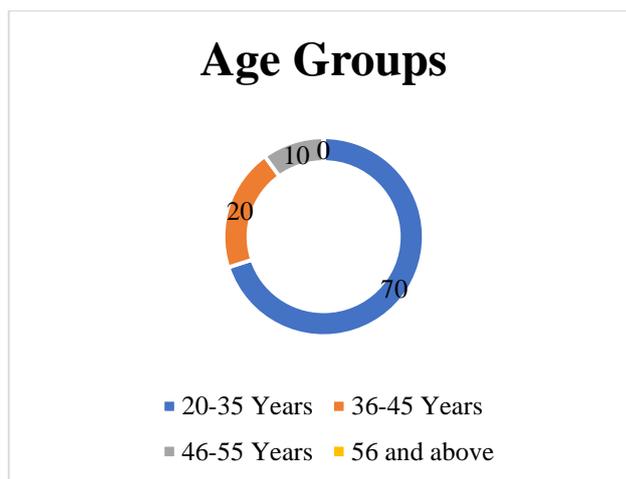


Figure 10: Consulted age groups in the area near project site

6.8.7 Occupation of Respondents

Majority of the respondents (55%) are attached with agriculture, 20% shopkeepers and remaining 150% are labors. During survey, efforts were made to interact with people representing all walks of life. The detailed graphic representation of occupational status is given below:

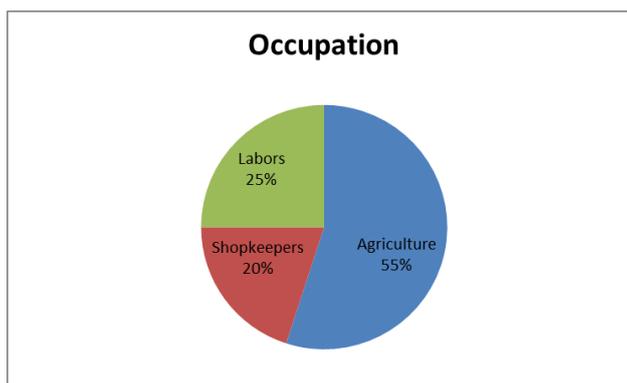


Figure 11: Occupation of Respondents

6.8.8 Literacy Rate

From survey results, it was found that 75 % of the studied population was illiterate, 15% was up to primary level, 10% studied up to middle level.

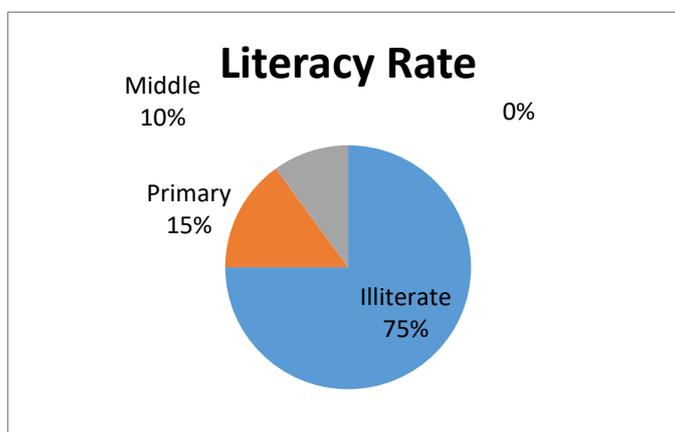


Figure 12: Literacy Rate

6.8.9 Common Diseases

Common diseases reported in the region include Hepatitis B and C, respiratory infections, and water-borne diseases during monsoon season due to poor sanitation and stagnant water conditions.

6.8.10 Cultural, Religious & Other Structures

The project area and its surroundings consist predominantly of Muslim communities. The villages have mosques, madrasas, and small community centers. No archaeological or culturally significant structures were identified within the immediate project vicinity.

6.9 Lab Reports of Environmental Analysis

Testing of different parameters was done from a certified laboratory named SEAL to check the quality of different environmental parameters. The copy of the lab reports of these parameters (ambient air analysis, water quality analysis and noise) is attached at Annexure of this EIA Report.

6.10 Suitability of Site:

Based on the above baseline information, no significant environmental or ecological constraints are expected for project development in Toba Tek Singh. The area is characterized by flat terrain,

moderate seismicity, and agricultural land use. The climate conditions are suitable for industrial and agricultural activities, provided that adequate environmental management and monitoring practices are followed.

7 IMPACT ASSESSMENT

This section discusses the potential environmental impact of the project, methodologies for impact identifications and characteristics of impacts including nature, magnitude, extent and location, timing, duration, reversibility, risk the assessment carried out in this Section is based on potential impacts on overall environmental receptors within the project area.

7.1.1 METHODOLOGIES FOR IMPACT IDENTIFICATION

The potential impacts due to the incinerator are mostly beneficial. During construction phase, adverse environmental & social impacts are depending on the resources and receptors involved along with other parameters such as; geographical scope (magnitude and extent), temporal scope (duration) and reversibility. It is anticipated that this project will have maximum positive impacts as it is environmentally friendly project to reduce pollution load.

Moreover, the project is expected to result in negative impacts of short-term duration and transient in nature. Having identified and characterized the potential significant impacts during design, construction and operation phase of project an Environmental Impact Severity Matrix & checklist to summarize all the identified impacts as mentioned below in tables.

Table 14: Impact significance criteria

Impact	Criteria
No Impact	When the project activity will have no impact
Long Term	When the impact is of high intensity with high spread and high duration or of high intensity with medium spread and medium duration
Moderate Term	When the impact is of moderate intensity with high spread and high duration or of high intensity with low/ moderate spread and low duration
Short Term	When the impact is of low intensity but with moderate spread and moderate duration or of moderate intensity
Insignificant	When the impact is of low intensity, low spread and low duration
Adverse	When the impact is of large intensity, spread easily and long-term
Beneficial	When the impacts are positive and improve the environmental conditions

Table 15: Impact assessment checklist for operational phase

Environmental Sensitivities	Intensity of Impact						Impact Nature		Impact Significance				
	Low Intensity	Moderate Intensity	High Intensity	Local	Moderate	Regional	Beneficial	Adverse	Insignificant	No Impact	Short Term	Moderate	Long Term
Physical Parameters													
Noise		☐											
Water Quality													
Odor	☐												
Biological Parameters													
Land Environment													
Flora													
Fauna													
Physical Parameters													
Local Economy													
Social Impacts													
Health & Safety													

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

The impact characteristics are identified to screen out potentially insignificant environmental and social impacts from potentially significant adverse environmental and social impacts during planning & designing, construction and operational phases of the project. The objective of impact screening process is to assess the significance of issues related to the air, water, noise, soil, transportation, civil work, communication, the hazards and external constraints. The beneficial and adverse impacts of project during planning & designing, construction and operational phases are identified based on their duration, location, frequency, extent, significance and reversibility. The impact of each activity on various environmental parameters is given below:

Table 16: Impact assessment characteristics

Impact Characteristics														
Sr#	Environmental Component	Duration		Location		Frequency		Extent		Significance			Reversibility	
		Long	Short	Direct	Indirect	Cont .	Intermit tent	Wide	Local	Large	Moderate	Minor	Rev .	Irrev.
Beneficial Impacts														
1	Employment Opportunity	☑		☑		☑			☑		☑		☑	
2	Solid Waste Management	☑		☑		☑			☑		☑		☑	
3	Land Value	☑			☑	☑			☑			☑		☑
4	Tree Plantation	☑		☑		☑			☑		☑			☑
5	Wastewater		☑	☑		☑		☑			☑		☑	
Adverse Impacts														
1	Solid Waste	•		•		•			•		•		•	
2	Health and Safety		•		•		•		•			•		•
3	Physical Hazards		•	•			•		•			•		•
4	Security Risks		•		•		•		•		•		•	

8 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This Chapter identifies the potential impacts (positive and adverse) on the physical, biological and socio-economic environment of project area due to the project. It also identifies measures that will help to mitigate the adverse environmental and social impacts (if any) and it will enhance positive impacts of the project. Impacts are assessed by analyzing their magnitude and sensitivity, which is a legal requirement.

8.1 IMPACTS ASSOCIATED WITH PROJECT ACTIVITIES

- Environmental Impact - Operation Activity
- Socioeconomic Impact - Operation Activity

8.2 PROJECT LOCATION

There will be no impacts due to project location as the land is rented by project proponent through proper channel. For the establishment the Incineration Unit an open plot in self-developed industrial area has been selected. In the project area or its vicinity no ecologically, important area is present. However, no human settlement or infra-structure will be dislocated due to the establishment of project. So, no adverse impact is being envisaged. Hence, there is no need to change the design of project is required.

8.2.1 COMPENSATION IN MONEY TERMS

There is no damage envisaged to fauna, flora or any other biological source due to the establishment proposed project. However, agricultural land is being converted to the built-up area. So, no compensation in monetary terms will be needed as the land is owned by the project proponent.

8.2.2 REPLACEMENT/RELOCATION/REHABILITATION

The proposed project is located in open land where there is no sensitive area, population or natural resource is present which could be impacted due to the establishment of project. No replacement, relocation and rehabilitation is required for the proposed project establishment. However, at the end of the life of the unit, it will be duly dismantled with special precautions to avoid/minimize pollution and at the same time taking all safety precautions to protect human life and property around the project site. Debris or any other wastes resulting from demolishing will be disposed-

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

8.3 PROJECT DESIGN

The proponent has planned to construct the unit on modern lines, meeting international standards, with incorporation of imported technology. The design, if maintained and operated in an environment-friendly manner, is expected to cast positive impact on the environment and will not pose any adverse impact or threat on any component of the environment.

The design of the proposed project will be sustainable and will follow the principles of energy conservation. The design of the main public buildings will follow the green building designs such as; maximum utilization of the sunlight, high roofs to keep the building cool, etc. Moreover, the building will be designed by keeping in consideration all the technical standards to avoid adverse impacts on the environment and society.

8.4 CONSTRUCTION PHASE

Following impacts could be impacts during constructional phase of project. The proposed project area is located in well-developed area and existing built-up area categorized as the Self-Developed industrial area (referring to the google earth view). The roads of the area are metaled. During the transportation of the raw-material such as cement, bricks, sand, gravels, etc. The dust clouds may be generated which could impact the local climatic conditions on temporary basis. This impact is considered in-significant because of the metaled road structure.

8.4.1 MITIGATION MEASURES

Impacts of raw materials transportation can be reduced significantly by adopting better management and monitoring practices. Following management and monitoring practices will be adopted to reduce the impacts:

- Proper tuning of vehicles should be done on the regular basis in order to control the air pollution generated by the burning of the fossil fuels in the vehicles
- Restrict excessive transportation of the vehicles as well as the speed of the haulage trucks that shall not exceed the speed limit of 40km/hour
- Careful site planning and managing the transportation routes for the vehicles carrying raw-materials
- Cover the vehicles with tarpaulin carrying sand and loose material

- The wind prone loose material should be covered and sprinkled with water on the regular basis.

8.4.2 IMPACTS ON VEGETATION

There are no vegetation present on site so no mitigation measures are required.

8.4.3 IMPACTS ON WATER SOURCES

During construction phase, water will be used for the preparation of the raw material, for watering under-construction buildings and consumption by the workers in various domestic activities. It will cause negative impact on underground water resource. The consumption of the water will be high causing minor negative impact on the water resource of the area. The groundwater may get polluted due to the presence/consumption of the chemicals and petroleum products on-site

8.4.4 MITIGATION MEASURES FOR WATER

Following mitigation measures will be required for water sources:

- Avoid un-necessary consumption of the water and close the tap when water isn't in use
- Special care will be required to protect the chemicals and petroleum products from spillage and contaminating the ground water sources
- Proper knowledge regarding the watering of the under-construction building should be given to the workers in order to conserve water
- Water efficient equipment and process will be used
- Awareness regarding the water conservation techniques should be carried out

8.4.5 IMPACTS ON AIR QUALITY

During construction phase, the machinery working on project site may cause air pollution due to release of the pollutants such as; carbon dioxide, methane, NO_x and SO_x from the burning of the fossil fuels in the vehicles. Dust may be generated due to the excavation activity and filling activities. No other impact is envisaged that may deteriorate the ambient air quality of the area.

8.4.6 MITIGATION MEASURES FOR AMBIENT AIR QUALITY

Following mitigation measures will be adopted to reduce the impact on the air quality:

- Proper tuning of vehicles should be done on the regular basis in order to control the air pollution
- It should be ensured that the high-quality fuel is being used in the vehicles that are working on-site

- The material prone to wind should be covered with tarpaulin
- Avoid unnecessary movement of the trucks carrying raw-materials to avoid unnecessary air emissions
- Avoid excavation and filling activity on the windy days
- Impact can be minimized through a management program which ensure dust will be controlled by regular watering the dusty and wind areas
- Abandoned excess laterite and stone aggregate littered around stock pile areas after construction completed changes the soil structure
- Regular water sprinkling may be done to control the dust generation

8.4.7 IMPACTS DUE TO NOISE

During construction phase, heavy construction machinery will be use. The machines are noisy and can cause a certain degree of nuisance to the nearby residents. The noise levels of machines and vehicles vary widely depending on the type of noise generated and level of activity. Some common impacts of noise nuisance include annoyance, sleep disturbance and interference with communication. Acceptable levels of noise are regarded to be 40 dB(A) during the night and 50 dB(A) during the day. Since construction will take place during the day only the 50 dB(A) level is of importance. As the proposed project is not located in the residential zone so the noise related impacts will cause insignificant impact on the nearby community

8.4.8 MITIGATION FOR NOISE

Following mitigation measure will be adopted to reduce the noise;

- The noise related activities should be done during the day time to ensure minimum disturbance to the local community
- Proper tuning of the vehicles should be done on the regular basis, so that the noise level will be reduce up to the acceptable limits
- Noise related activities should be done speedily and completed as soon as practically possible
- Construction activity will be confined to the small reserved area

8.4.9 IMPACTS ON SOCIO-ECONOMIC ENVIRONMENT

During this phase, skilled and unskilled labor will be required. Employment opportunities for the un-skilled workers will therefore increase which will enhance the positive benefits for the local people who are in dire need of income for sustenance. Furthermore, indirect opportunities for

employment will arise from the provision of services to the construction teams; sale of raw-material such as cement, bricks, sand etc., as well as food and beverages for the labor. After completion of construction phase serve as a permanent business opportunity.

8.4.10 MITIGATION MEASURES

No mitigation is required.

8.5 OPERATIONAL PHASE

The environmental and socio-economic impacts associated with the operation phase are had been studied in detail. Following is the detailed description:

8.5.1 WATER CONSUMPTION

For the project water usage will be the water required for domestic use of workers & for floor cleaning only.

8.5.2 MITIGATION MEASURES

Following mitigation measures will be adopted:

- Water conservation program will be initiated to prevent wastage of water
- The management will ensure maximum recycling of washing water, so that overall consumption could be reduced
- Reusing the water for sprinkling purpose after floor cleaning

8.5.3 WASTEWATER

The building operations will generate wastewater in the form of domestic wastewater. Domestic wastewater generated during building operation is estimated to be approximately 1.4m³/day. Implementation of the proposed mitigation measures and regular monitoring is not likely to leave any significant impact of the wastewater from the facility.

8.5.4 MITIGATION MEASURES

Following mitigation measures will be adopted for effective management of wastewater:

- The grey water will be treated through settling tank which will be recycled to be re-used in gardening.
- Waste segregation measures would be employed to minimize entry of solid waste into the wastewater stream

- Water conservation strategies will be employed to avoid wastage of water
- Periodic sampling and monitoring of key parameters for wastewater effluent into the receiving body (drain or sewerage system) and for this purpose samples will be collected at the discharge point to ensure effective treatment

8.5.5 NOISE

No significant increase in noise level in the community is envisaged under normal operation. Moreover, implementation of the below-stated mitigation techniques will also keep the noise impacts at minimum to the workers as well as to the community.

8.5.6 MITIGATION MEASURES

Noise management and mitigation plan should follow the underlying strategy:

For people working in noisy installations, ear-protection aids like ear-plugs, ear-muffs, noise helmets, headphones etc. must be provided to reduce occupational exposure. This is possible if working methods are improved by:

- Proper designing and fabrication
- Proper lubrication and better maintenance of machines
- Covering noise-producing machine parts with sound-absorbing materials to check noise production
- Reducing the noise produced from a vibrating machine by vibration damping i.e. making a layer of damping material (rubber, neoprene, cork or plastic) beneath the machine
- Using silencers to control noise from automobiles, ducts, exhausts etc. and convey systems with ends opening into the atmosphere
- Using glass wool or mineral wool covered with a sheet of perforated metal for the purpose of mechanical protection

Noise can also be controlled with barriers by enclosing the source of the noise, by placing sound-reducing barriers between the worker and the source, or by increasing the distance between the worker and the source

- Tree plantation helps to block the propagation of sound. Proponent has planned tree plantation in and around the unit premises
- Sound-proof materials will also be used for construction

- During the project operation, it should be ensured that the noise level does not exceed prescribed limits as set by WHO or Pak-EPA; for which regular monitoring must be carried out.

8.5.7 WASTE MANAGEMENT

Improper disposal off the solid waste generated during the operational phase of the project can pose a health hazard; pollute soil, surface and ground water. Proper implementation of the mitigation measures will ensure that the residual impact from improper management and disposal of the waste is minimal. Monitoring and inspection will be undertaken to ensure compliance and minimize any residual impact.

Following mitigation measures will be adopted:

- Waste generation will be minimized by adopting waste management strategy of reduce, reuses and recycle
- A waste management plan will be prepared, implemented and monitored for the safe collection, storage and treatment/disposal of the building waste
- Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register
- Records of all waste generated will be maintained
- Training will be provided to personnel for identification, segregation, and management of waste
- Various waste containers for waste collection should be placed at appropriate locations in the building
- Waste management inspections will be undertaken on a regular basis of onsite waste management and of waste disposal contractors to ensure that the waste management procedures are being followed

Monitoring measures will include:

- Record of all waste generated
- Quantities of waste disposed, reused at site or sold should be logged on the waste tracking register
- Audit of waste management on annual basis

- The areas around the project boundary and access roads should be periodically inspected to verify that no project related waste is scattered in these areas

8.5.8 AIR EMISSIONS

The air emissions will release dust and particulate matter in the environment and some emissions are expected from the process activities. If these emissions are not handled may damage the health of workers, may be the cause of public nuisances and the wear& tear of the shelling machinery is fast.

8.5.9 MITIGATION MEASURES

Following mitigation measures will be adopted:

- PPEs such as; dust mask will be provided to the workers
- Installation of Dry Scrubber at incinerator.
- Pre-cleaning will be carried out to reduce the dust emission
- Water sprinkling will be carried out as and when required

8.5.10 EMERGENCY RESPONSE

Incidents and accidents may take place unexpectedly during project operations no matter how effective, strong and efficient the mitigation measures for all adverse impacts; especially the safety issues may be adopted. These may include; fire hazard which may poses a serious threat.

8.5.11 MITIGATION MEASURES

Following mitigation measures will be adopted:

- Fire extinguishers should be properly maintained and checked periodically
- Adequate fire hydrant system should be installed
- Flammable materials should be prohibited in the premises
- Fire alarm systems should be maintained for detection and warning of fire
- Adequate training of workers on use of fire-fighting system to deal with the situation.
- Administration of the unit will make a proper evacuation plans for emergency escape from all halls
- Emergency call service must be made available
- Fire-fighting team must remain ready at all times

8.5.12 OCCUPATIONAL HAZARDS

It includes occupational hazards like physical injuries arising from accidents such as being hit by falling weak structures, being overrun by heavy equipment. The major safety issues in operational phase are:

- Electrical Hazards
- Machine Guarding
- Eye, Head and Foot Protection
- Fire and Explosion Hazards
- House-Keeping Issues

8.5.13 MITIGATION MEASURES

Following mitigation measures will be suitable:

- Care will be taken to properly ground and insulate all equipment
- Proper machine guarding, which is critical for the prevention of injuries to workers by isolating them from moving machinery, will be provided
- Head, arms and foot PPE's will be provided
- Fire-fighting equipment will be available and their locations will be clearly marked
- Exits from work places will be well marked and visible in dim light
- Fire water will be located throughout the plant in well-marked piping
- Housekeeping will be frequent and thorough to prevent slips, trips, and falls
- Workers will be told and encouraged to use PPEs as may be standardized
- Workers' awareness and safety wall chart showing safety symbols will be displayed.
- First Aid Box will be kept in easy approach of all in case of any injury or mishap.
- Basic medical and health facilities will be provided to all employees
- Safety and warning devices such as reflectors, lights, etc. shall be installed at designated spots
- Visual monitoring of hazards and accidents will be done in order to control the potential hazard

8.6 POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

Tree plantation within and outside the premises is a potential environmental enhancement measure. A large area will be reserved for tree plantation and among plants native flora like Peepal, Kikar and

Amaltas will be planted in the specified green zone which will have the maximum capacity to reduce noise pollution and tolerance index of these species are more than 10. Some floral species like roses and other ornamental evergreen plants will also be introduced in the lawn which will enhance aesthetic beauty. The proponent will also make arrangements for protection and maintenance of trees

8.7 BUILDING ENHANCEMENT

The introduction of an ecologically effective and efficient design of a commercial building is the environmental enhancement measures planned by the proponent to be incorporated into the design of the intended project.

8.7.1 SOCIAL ENHANCEMENT MEASURES

Following measures will be adopted to improve the socio-economic condition of the area:

8.7.2 EMPLOYMENT/POVERTY ALLEVIATION

The employment opportunities in the project area will be increased by the project in the area. Accounts and managers to run the administration office local community will be considered on the priority basis. In totality, the overall economic conditions of the area will be improved due to the operations project.

8.7.3 LOCAL ECONOMY

The employment opportunities and/or income sources generated by the project operation will be long term in nature. The local economy will experience a slight boom during operations.

9 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

The potential environmental impacts are identified from the planning stage of the project through the Environmental Impact Assessment (EIA) process. The EIA has identified potential impacts that are likely to arise during the project. The EIA has examined in detail both negative and positive impacts at each stage of the project covering both construction and operations phase. To minimize the effects of adverse impacts the EIA has recommended mitigation measures. The proposed mitigation measures have been based on the understanding of the sensitivity and behavior of environmental receptors in the project area, the legislative controls that apply to the project and a review of good industrial practices while operating in similar environments.

For effective implementation and management of the mitigation measures an Environmental Management Plan (EMP) has been prepared. The EMP satisfies the requirement of the Punjab Environmental Protection Department Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2022.

The EMP is a tool that serves as to manage environmental impacts and specifically focuses on implementation of mitigation measures in its true sense against likely environmental impacts.

9.1 PURPOSE AND OBJECTIVE OF THE EMP

The primary objectives of the EMP are to:

- Facilitate the implementation of the mitigation measures identified in the EIA.
- Define legislative requirements, guidelines and best practices that apply to the project.
- Define the responsibilities of the project proponent.
- Define a monitoring mechanism and identify monitoring parameters in order to:
 - Ensure the complete implementation of all mitigation measures.
 - Ensure the effectiveness of the mitigation measures.
- Define requirements for environmental monitoring and auditing.
- Provide a mechanism for taking timely action in the face of unanticipated environmental situations.
- Identify training requirements at various levels.

9.2 COMPONENTS OF THE EMP

The EMP consists of the following:

- Legislation and guidelines
- Organizational structure; roles and responsibilities
- Monitoring/Management plan
- Environmental monitoring
- Communication and documentation
- Change management Plan
- Training program/schedule

9.3 LEGISLATION AND GUIDELINES

The EIA has discussed national and international legislation and guidelines that are relevant to the project; proponent will ensure that the project is conducted in conformance to the project proponent corporate environmental policy, national legislation and relevant international conventions and that guidance is sought from national and international guidelines. Project proponent will also ensure that its key project management staff and all its assigned contractors are aware of these legislation and guidelines prior to the start of project activities

9.4 DESCRIPTION OF PROPOSED MITIGATION ACTIONS

It lists all the mitigation measures identified in the EIA and the associated environmental or social aspect in line during construction and operational phase with the administrative framework involving all the responsible implementing authorities who are required to take the planned actions/measures and monitor it accordingly. It enhances project benefits by reducing its impacts and making it environmentally friendly. The environmental management and monitoring plan is given below in table.

Table 17: Management and Monitoring Plan – Constructional

Sr. No.	Project Activity	Impacts	Mitigation Measures	Responsibility
1	Water Resources	<ul style="list-style-type: none"> ▪ Depletion in groundwater aquifer ▪ Water contamination 	<ul style="list-style-type: none"> ▪ Water extraction will be kept at minimum and waste management plan will be developed. ▪ Wastewater from construction & installation site will be directed to settling tanks. ▪ Fuel and chemicals will be stored in covered and with bund walls, underlain with impervious lining. ▪ Spill prevention plan shall be followed to mitigate any kind of spill. 	Proponent & Contractor
2	Air Quality	<ul style="list-style-type: none"> ▪ Dust emissions during construction activities. ▪ Combustion products from vehicles used for project-related activities. 	<ul style="list-style-type: none"> ▪ Water will be sprinkled daily on all exposed surfaces to suppress emission of dust. ▪ All construction equipment used during the project will be properly tuned and maintained in good working condition. ▪ Regular maintenance of project vehicles to ensure that engines are in sound working condition and are not emitting smoke; 	Proponent & Contractor
3	Noise	<ul style="list-style-type: none"> ▪ Noise Pollution ▪ Disturbance to the site workers ▪ Nuisance for surrounding communities and wildlife 	<ul style="list-style-type: none"> ▪ Proper maintenance of vehicles and potentially noisy equipment. ▪ Minimize/avoid unnecessary use of noisy machinery. ▪ Blowing of horn will be prohibited. ▪ Provision of Personal Protective Equipment (PPE) to the on-site personnel in high noise areas. 	Proponent & Contractor
4	Solid Waste	<ul style="list-style-type: none"> ▪ Surface and groundwater pollution ▪ Soil contamination ▪ Air pollution, odor ▪ Health hazards ▪ Aesthetic issues 	<ul style="list-style-type: none"> ▪ Recyclable material will be separated at source and will be sold to waste contractor. ▪ Hazardous waste will be segregated and stored in closed containers in a fenced storage area with paved floor; ▪ On-site audits of the waste management will be undertaken on a regular basis during the period of project activity. ▪ Records of all waste generated during the project activity period will be maintained. Quantities of waste disposed, 	Proponent & Contractor

			<p>recycled, or reused will be logged on a waste tracking register.</p> <ul style="list-style-type: none"> ▪ Training will be provided to personnel for identification, segregation, and management of waste. ▪ No waste will be dumped at any location. 	
5	Traffic Control	<ul style="list-style-type: none"> ▪ Disturbance to local community 	<ul style="list-style-type: none"> ▪ Movement of vehicles (trucks) will remain confined to defined access and limited to a specific duration. ▪ Regular maintenance of vehicles to reduce exhaust emissions. ▪ Parking at NO PARKING areas shall not be allowed. 	Proponent & Contractor
6	Worker's Health and Safety	<ul style="list-style-type: none"> ▪ Health problems or immediate risk may take place. ▪ Occupational health of workers and community may be affected. 	<ul style="list-style-type: none"> ▪ Compliance to emergency response plan for emergencies and accidents will be ensured to avoid health safety risks. ▪ Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborers. ▪ Protection devices (earmuffs) will be provided to the workers operating in the vicinity of high noise generating machines. ▪ Proper maintenance of facilities for workers will be monitored. ▪ Provision of protective clothing for labors e.g. helmet, adequate footwear, protective goggles, gloves ▪ Ensure strict use of wearing PPE during work activities. ▪ Provision of proper safety signage at sensitive/accident prone spots. 	Proponent & Contractor
7	Socio-Economic / Local community	<ul style="list-style-type: none"> ▪ Community disturbance ▪ Community awareness ▪ Skilled and un-skilled jobs for local community 	<ul style="list-style-type: none"> ▪ All community grievances will be recorded and maintained in a Community Complaint's Register. ▪ Maximum number of unskilled and semi-skilled jobs will be reserved for the local communities. ▪ An increase in the income of locals may occur due to employment during project activities. ▪ Communities will be informed about the project activities and possible disturbance in advance. 	Proponent & Contractor

Table 18: Management and Monitoring Plan – Operation

Sr. No.	Project Activity	Impacts	Mitigation Measures	Responsibility
1	Water Use / Wastewater	<ul style="list-style-type: none"> Surface water contamination Pollution risk from accidental spillage 	<ul style="list-style-type: none"> Wastewater from the activities will be contained in settling tanks and will be reused. Compliance of effluent with PEQS will be ensured prior to discharge in water body. Water conservation practices will be followed to minimize the water usage. Water use will be monitored periodically to ensure that water is not wasted. In case of any accidental spillage, emergency plan should be implemented. 	Proponent & Management of unit
2	Air Emissions	<ul style="list-style-type: none"> Compliance with prescribed PEQS for ambient air 	<ul style="list-style-type: none"> Proper ventilation and exhaust system for air passages; Control of processing exhaust emissions by proper maintenance of production unit/equipment; Proper maintenance of machinery and scrubber is required to control emissions; Daily maintenance of transport vehicles is required to control air emissions. 	Proponent & Management of unit
3	Noise	<ul style="list-style-type: none"> Noise Pollution Disturbance to the personnel handling the installations 	<ul style="list-style-type: none"> The noise generating area at the operations will be lined with boundary wall to reduce impact on the workers. Operators of the developments will wear ear protections while operating or working nearby high noise emission sources. Tree plantation to reduce the effect of noise pollution. 	Proponent & Management of unit

			<ul style="list-style-type: none"> The project will be placed such that the cumulative noise levels at walkways and worker locations will not exceed PEQS for noise. 	
4	Waste Management	<p>If not managed properly;</p> <ul style="list-style-type: none"> Surface and groundwater pollution Soil contamination Air pollution, odor Health hazards Aesthetic issues 	<p>Solid waste management plan will be implemented and following mitigation measures will be taken:</p> <ul style="list-style-type: none"> Only municipal solid waste will be produced which will be segregated and disposed off using environment friendly techniques Area supervisor will mark the quantity/weight and nature of the material on the drums and logbook. Training will be provided to personnel for identification, segregation, and management of waste. 	Proponent & Management of unit
5	Occupational Health and Safety	<ul style="list-style-type: none"> Health problems or immediate risk may take place. Occupational health of workers and community may be affected. 	<ul style="list-style-type: none"> Providing basic medical training, safety training to work staff and basic medical service during operations. Firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents. Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction; Adequate signage, safety cones, lightning devices, barriers, yellow tape and persons with flags. Adequate signage, safety cones, lightning devices, barriers, yellow tape and persons with flags during operations. 	Proponent & Management of unit

9.5 SCHEDULE OF IMPLEMENTATION AND ENVIRONMENTAL BUDGET

9.5.1 SCHEDULE OF IMPLEMENTATION

The total cost of the project is **PKR 60 million approx.** Schedule is given below

9.5.2 ENVIRONMENTAL BUDGET

Environmental budget will be allocated for protection of environment. PKR 1.0 million will be allocated as environmental budget in both constructional and operational phase of project.

Table 19: Cost breakup of environmental budget

Constructional Phase		
Serial No.	Activity	Environmental Budget
1.	Air Quality Monitoring/Emission monitoring	Pkr/- 200,000
2.	Noise Monition	Pkr/- 50,000
3.	Waste Water Monitoring	Pkr/- 200,000
4.	Fire Safety	Pkr/- 200,000
5.	PPE's	Pkr/- 50,000
6.	Potential Environment Enhancement Measures	Pkr/- 200,000
Total		Pkr/- 100,000,0
Operational Phase		
Serial No.	Activity	Environmental Budget
1.	Air Quality Monitoring/Emission monitoring	Pkr/- 200,000
2.	Noise Monition	Pkr/- 50,000
3.	Waste Water Monitoring	Pkr/- 200,000
4.	Fire Safety	Pkr/- 200,000
5.	PPE's	Pkr/- 50,000
6.	Potential Environment Enhancement Measures	Pkr/- 200,000
Total		Pkr/- 100,000,0

9.6 ENVIRONMENTAL MANAGEMENT TEAM ALONG WITH THEIR ROLES AND RESPONSIBILITIES

Proponent shall hire environmental management team in operational phase of project. The roles and responsibilities of environmental management team are given below in table.

Table 20: Roles & responsibilities of environmental management team

Roles and Responsibilities		
Sr#	Concerned Persons	Duties
1	The Project Manager (Proponent)	Following will be the responsibilities of the Project Proponent: <ul style="list-style-type: none"> ▪ Ensure that the contractor is aware of all specifications, legal constraints, standards and procedures pertaining to the project specifically with regards to environment.

		<ul style="list-style-type: none"> ▪ Ensure that all stipulations within the EMMP are communicated and adhered to by contractor(s) ▪ Monitor the implementation of the EMMP throughout the project by means of site inspections and meetings. This will be documented as part of the minutes of the site meeting documents ▪ Ensuring project execution within defined budget and timelines ▪ Conducting regular check of the project status and meetings with project team ▪ Provide support and guidance to project team as and when needed ▪ Project proponent is expected to continually monitor and improve the overall performance of their operation
4	HSE Manager	<p>In addition to the health and safety responsibilities held by staff, managers and supervisors must do whatever is reasonably practical to ensure that both the workplace and the work itself are safe. This includes:</p> <ul style="list-style-type: none"> ▪ Ensuring that staff are appropriately trained and supervised ▪ Identifying, assessing and managing health and safety risks ▪ Consulting with workers (including staff, affiliates and contractors ▪ Health and safety risk assessments ▪ Decisions are made about the measures to be taken to eliminate or control these risks ▪ Health and safety risk assessments ▪ Implementing health and safety risk management programs relevant to their operations, teaching, research and consulting functions and work environment ▪ Reporting investigating and responding to all hazards, accidents, incidents and taking action to control the risk ▪ Assisting with the development, implementation and maintenance of a return to work program for injured staff. ▪ Be fully conversant with the EIA and conditions of its approval ▪ Be fully conversant with the EMMP ▪ Be fully conversant with all relevant environmental legislation, policies and procedures, and ensure compliance ▪ Convey the contents of this document to the contractor site staff and discuss the contents in detail with the Project Manager and Contractor <ul style="list-style-type: none"> ▪ Undertake regular and comprehensive inspection of the site and surrounding areas in order to monitor compliance with the EMMP ▪ Take appropriate action if the specifications contained in the EMMP are not followed

		<ul style="list-style-type: none"> ▪ Monitor and verify that environmental impacts are kept to a minimum, as far as possible ▪ Review and approve construction methods, with input from the Site Manager, where necessary ▪ Ensure that activities on site comply with all relevant environmental legislation ▪ Compile progress reports on regular basis, with input from the Site Manager, for submission to the Project Manager, including a final post excavation audit ▪ Liaise with the Site Manager regarding the monitoring of the site ▪ Report any non-compliance or remedial measures that need to be applied ▪ All environmental problems arising on the construction area will be reported to the Site Manager by the Environmental Manager. Reports on such problems will be submitted to the Project Manager by the Site Manager
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9.7 PROPOSED MONITORING PROGRAM TO ASSESS PERFORMANCE OR OUTPUT OF EMP

For effective monitoring, management and documentation of the environmental performance during the construction and operational phase of the project, environmental matters will be discussed during meetings held on-site. Environmental concerns raised during the meetings will be mitigated after discussions between project proponent and the contractors. Any issues that require attention of project proponent higher management will communicate to them for action. Project proponent and its contractors will ensure that the communication and documentation requirements specified in the EMP are fulfilled during the project.

Environmental monitoring can be categorized into two types; 1) compliance monitoring and 2) effects monitoring. The environmental monitoring program is summarized in **Table 17** which identify the roles and responsibilities of project monitoring, further described in detail in following section

9.8 COMPLIANCE MONITORING

Compliance monitoring will be carried out to ensure compliance with the requirements of the EIA. The objectives of the EIA compliance monitoring will be to:

- Systematically observe the activities undertaken by the contractors or any other person associated with the project.
- Verify that the activities are undertaken in compliance with the EIA and other conditions identified by project proponent.
- Document and communicate the observations to the concerned person(s) of project

proponent so that any corrective measures, if required, can be taken timely.

- Maintain a record of all incidents of environmental significance and related actions and corrective measures.

Compliance monitoring will be the responsibility of all teams involved in the project activities i.e. project proponent and the contractors. Project proponent staff and contractors will carry out the inspections on a set frequency.

9.9 EFFECTS MONITORING

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

Considering the environmental conditions of the project area and the assessment of potential impacts of the project made in the EIA, the following environmental parameters will be monitored at identified locations.

Table 21: Environmental monitoring plan

Component	Parameters	Monitoring Frequency Operation	Responsibility Operation
Ambient Air Quality	SO _x , NO _x , CO, PM ₁₀ , Smoke	As per EPA, Punjab Guidelines	Proponent
Ground Water Quality	pH, TDS, Chloride, Fluoride, Colour, NO ₃ ⁻ , Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminium, Chromium, Cadmium, Boron, Barium, Antimony, Aresenic, Cyanide, Mercury, Nickel, Total Coliform, E.Coli, Total count.	As per EPA, Punjab Guidelines	Proponent
Surface & Waste Water Quality	pH, DO, TSS, Alkalinity, BOD ₅ , COD, Turbidity.	As per EPA, Punjab Guidelines	Proponent
Noise Level	Using noise level meter (minimum dB and maximum dB)	As per EPA, Punjab Guidelines	Proponent
Occupational Health & Safety	Proper provision of PPEs to workers	Daily	Proponent

9.10 PROPOSED EMP REPORTING AND REVIEWING PROCEDURES

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.

- Monitoring reports will be reviewed by EMP team and HSE department
- Photographic records will also be maintained
- Recorded data will be reviewed by supervisory contractor/proponent so that it can be further improved if required.

Specific responsibilities of key role players are illustrated hereunder:

A. Proponent

The proponent will be responsible for ensuring overall implementation of the EMP during operational stages of the project. The responsibilities of the proponent and the site team supervising the project activities include.

Project Manager (Proponent)

- Make sure that all activities are completed according to specifications.
- Certify that work being done by the contractor/s is in accordance to the EMP.
- Make sure that the specific system for environmental management is planned, documented, implemented and maintained through all stages of the project.
- Coordinate with regulatory agencies like TMA and EPA, etc.
- Communicate with local community in order to get time to time feedback of these stakeholders on various social and environmental concerns.
- Make sure liaison between the contractor/s and environmental consultant men to check environmental compliance with EPA requirements.

I. Supervisor

- Attend site induction and other training sessions.
- Make sure that procedures are followed.
- Advise site supervisor of any potential or actual breaches of plans.

II. Work Crew

- Attend site induction and other training sessions.

- Make sure that procedures are followed.
- Advise site supervisor of any potential or actual breaches of plans.

B. Consultant

The principal responsibilities of the Consultant include:

- Coordination with provincial and local officials, community groups, government departments etc. on environmental issues and obtaining the necessary clearances from the regulatory authorities.
- Monitoring of the environmental aspects of project during construction to ensure that the environmental requirements of the contract and the mitigation measures proposed in the EMP are implemented.
- Supervising Contractor preparing environmental input to the progress report
- Developing and conducting environmental training activities for Contractor and the Supervision Consultant staff
- Devise solutions to environmental issues as they arise particularly related to dust, noise levels and other impacts that are in some instances unavoidable. Good construction supervision requires that every effort be made to minimize these impacts.

C. EPA

- The role of EPA is on the apex and includes checking:
- Whether requirements of the conditional NOC awarded by the EPA against EIA report are met.
- The Implementation of mitigation recommendations as given in EIA.
- Approval for starting actual project operations is obtained from EIA.
- Review of audit/monitoring reports prepared internally or by a third-party monitoring
- Suggest or order any appropriate solutions if something goes against the given EMP.

9.11 TRAINING NEED

Environmental training will help to ensure that the requirements of the EIA and EMP are clearly understood and followed by all project personnel throughout the project period. Environmental training will form part of the environmental management system. The training will be directed towards all personnel for general environmental awareness

9.12 OBJECTIVES OF THE TRAINING PROGRAM

The key objective of training program is to ensure that the requirements of the EMP are clearly

understood and followed throughout the project. The trainings to the staff will help in communicating environmental related controls specified in the EIA and EMP.

9.13 OBJECTIVES OF THE TRAINING PROGRAM

The key objective of training program is to ensure that the requirements of the EMP are clearly understood and followed throughout the project. The trainings to the staff will help in communicating environmental related controls specified in the EIA and EMP.

9.14 TRAINING SCHEDULE

The training modules will include air, noise and water pollution monitoring, social awareness, Environmental Laws, Environmental Quality Standards usage of personal protection equipment, and health and safety related issues on the construction site.

Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation. A generic scope of the training which covers the requirements of the EIA and the EMP is discussed below in **Table 15** while site contractor will prepare site specific training plan considering these training contents.

Table 22: Training needs

Target Audience	Contents	Schedule
Selected management staff	<ul style="list-style-type: none"> ▪ Introduction to project EIA and EMP. ▪ Key findings of EIA ▪ Mitigation measures ▪ EMP ▪ Social and cultural values of the area. 	During the project life
All site personnel (including locally hired staff)	<ul style="list-style-type: none"> ▪ Environmental sensitivity of the project area ▪ Waste disposal ▪ Community issues/ Social and cultural values 	During the project life
Drivers	<ul style="list-style-type: none"> ▪ Safety provision ▪ Road access restrictions ▪ Dust reduction ▪ Waste disposal ▪ Emergency response preparedness 	During the project life
Selected staff o	Safety provision Hazardous waste disposal Emergency response preparedness	During the project life

10 STAKEHOLDER'S CONSULTATION

Public consultation refers to the process by which the concerns of local affected persons and others who have plausible stake in impacts assessment of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate. According to the IEE and EIA Review Regulations, 2022 public consultation is mandatory for any socio-environmental study. For this purpose, assessment survey and public consultation sessions held with different stakeholder groups that may be impacted. The consultation process was carried out in accordance with the guidelines laid by EPA, Punjab. The objectives of this process were to:

- Share information with stakeholders on the project operations.
- To assess the impacts on the physical, biological, and socio-economic environment.
- Understand stakeholder concerns regarding various aspects of the project.
- Understand the perceptions, assessment of social impacts and concerns of the communities of the project area.
- Find out the awareness level and situation of acceptability to identify any issues for the implementation of proposed project.
- To invite people to express their views about the positive/negative impacts on their life styles and environment.

This report includes all the comments, which were taken into account in preparing the definitive development concept for the subject facility.

10.1.1 CONSULTATION MECHANISM

Primary stakeholders were consulted during informal and formal meetings. The consultation process was carried out in the Urdu language. During these meetings a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact. This was followed by an open discussion allowing participants to voice their concerns and opinions. In addition to providing communities with information on the proposed project, their feedback was documented during the primary stakeholder consultation. The issues and suggestions raised were recorded in field notes for analysis, and interpretation.

By reaching out to a wider segment of the population and using various communication tools such as participatory needs assessment, community consultation meetings, focus group discussions, in-

depth interviews, and participatory rural appraisal EIA involved the community in active decision-making. This process will continue even after this EIA has been submitted, as well as during future EIA in which similar tools will be used to create consensus among stakeholders on specific environmental and social issues.

Secondary stakeholder consultations were more formal as they involved government representatives and local organizations, consulted during face-to-face meetings. They were briefed on the EIA process, the project design, and the potential negative and positive impact of the project on the area's environment and communities. It was important not to raise community expectations unnecessarily or unrealistically during the stakeholder consultation meetings in order to avoid undue conflict with community's leaders or local administrators. The issues recorded in the consultation process were examined, validated, and addressed in the EIA report.

This section involves communication of possible impacts and concerns with

- Proponents Environmental Management Team
- The responsible authority
- Other departments and agencies
- Environmental Practitioners and experts
- Affected and wider community

10.2 PROPONENT'S ENVIRONMENTAL MANAGEMENT TEAM

Consultation regarding M/S Al Nafay Waste Management Company (Incineration Unit) was done with stakeholders and anticipated impacts were discussed. Concerns of locals, Environmental Practitioners & experts and Government departments were discussed and asked to consider them while construction of proposed project. Locals will be preferred for employment after providing proper training. Mitigations measures mentioned in EMP will be truly implemented.

10.3 THE RESPONSIBLE AUTHORITY

Overall responsibility for implementation of EMP will be that of project proponent. He will appoint an HSE/Project Manager of relevant qualification. HSE/Project Manager will act as Environmental Manager and will manage the all HSE condition at the PEQS.

10.4 THE OTHER DEPARTMENTS AND AGENCIES

Different Government departments were consulted regarding the subject project. Government officer was consulted by the socio-environmental team of the consultants and concerned details about the project were noted down through personal interviews, group meetings, etc., in their offices.

10.5 ENVIRONMENTAL PRACTITIONERS AND EXPERTS

Consultation with Environmental Practitioners and experts was done and following comments and suggestions were observed.

Table 23: Consultation with environmental practitioners and experts

Name	Qualification	Comments/suggestions
Ms. Rabiya Mahmood	Ph.D. (scholar) Environmental Sciences	Following comments are summarized: <ul style="list-style-type: none"> ▪ Latest technology must be preferred ▪ Regular monitoring should be conducted
Ms. Nusrat Ehsan	Ph.D. (scholar) Environmental Sciences	<ul style="list-style-type: none"> ▪ She said that current project must be installed as : ▪ It will incinerate infectious waste from hospitals and industrial activities. ▪ good household practices must be practiced
Mr. Danial Zaib	BS Environmental Sciences	He said that: <ul style="list-style-type: none"> ▪ Locals should be preferred for employment. ▪ In case of outsider's residence must be provided ▪ Proper mitigation measures must be adopted while construction and operation of this project

10.6 AFFECTED AND WIDER COMMUNITY

Social survey was conducted to consult with local community. Their concerns were noticed and discussed with proponent and their team. Majority was in favor of project their details are attached along with the EIA as an Annexure (Appendices: 12.3).

11 CONCLUSION AND RECOMMENDATION

11.1 CONCLUSION AND RECOMMENDATIONS

M/S Al Nafay Waste Management Company (Incineration Unit) respects the environment, supports sustainable development and is committed to environmentally sound business practices. This study was carried out to assess the environmental and socioeconomic impacts of the project. The assessment was carried out in keeping with the legislation of Pakistan, as well as national and international guidelines.

Baseline environmental and socioeconomic information was collected from a variety of sources, including reports of previous studies, published literature, and field surveys. The information collected was used to compose profiles of the natural, socioeconomic, and cultural environment likely to be affected by the project.

The project activities were reviewed, and an assessment was made of the potential impacts of these activities on the area's natural and socioeconomic environments, using both qualitative and quantitative assessment methods. Where appropriate, mitigation measures were recommended to keep the environmental impacts within acceptable limits.

It was analyzed that most of the aspects related with the project have very minor impacts. It is therefore concluded that if the implementation of all mitigation measures is carried out as described in this report, the anticipated impact of the project on the area's natural and socioeconomic environment will be well within acceptable limits.

Proponent of subject project has expressed strong commitment to protection of the social and natural environment from any potential adverse impact of the project. A preventive maintenance philosophy supported by robust inspection plans and sound operational practices will be adopted to ensure sustainable and sound functioning of the project. Therefore, it is recommended that the competent authority may please be issues Environmental Approval for the operation of this project.

12 APPENDICES

12.1 GLOSSARY

Air Quality	Measurement of the pollutants in the air; a description of healthiness and safety of the atmosphere.
Consultation	Consultation refers to two-way transfer of information or joint discussion between project staff and the affected population. Systematic consultation implies a sustained and rigorous sharing of ideas. Bank experience shows that consultation often yields the best resettlement alternatives, fruitful procedures for continued participation, and independent information on actual conditions for implementation.
Closure	The action of making new or secret information known.
Env. Management	Attempt to control human impact on and interaction with the environment in order to preserve natural resources
Effluent	Wastewater - treated or untreated - that flows out of a treatment plant, sewer, or industrial outfall. Generally, refers to wastes discharged into surface waters.
Evaluation	The making of a judgment about the amount, number, or value of something; assessment.
Geology	A science that studies rocks, layers of soil, etc., in order to learn about the history of the Earth and its life.
Ground Water	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."
Hazardous	Substance or material, which could adversely affect the safety of the public, handlers or carriers during transportation.
Household	People residing under one roof, using the same hearth and operating as a single economic unit.
Impact	Effect on someone or something
Jurisdiction	The extent of the power to make legal decisions and judgments.
Land Acquisition	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

Supervising activities in progress to ensure they are on-course and on schedule in meeting the objectives and performance targets.

Occupational Health Maintenance of the highest degree of physical, mental and social wellbeing of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs.

pH pH is a measure of how acidic/basic water is.

Project Area 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.

Proponent A person who advocates a theory, proposal, or course of action.

Capacity The volume of products or services that can be produced by an enterprise using current resources.

Quality Control A system of maintaining standards in manufactured products by testing a sample of the output against the specification.

Rehabilitation 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.

Scope The extent of the area or subject matter that something deals with or to which it is relevant.

Social Environment It includes the culture that the individual was educated or lives in, and the people and institutions with whom they interact.

Stakeholders Include affected persons and communities, proponents, private and public businesses, NGOs, host communities and EPA.

Topography Details of the surface features of land. It includes the mountains, hills, creeks, and other bumps and lumps on a particular hunk of earth.

12.2 LIST OF ABBREVIATIONS

EIA	Environmental Impact Assessment
EMMP	Environment Mitigation and Monitoring Plan
EMP	Environmental Management Plan
EPA	Environmental Protection Agencies
PEPC	Pakistan Environmental Protection Council
IEE	Initial Environmental Examination
NGO's	Non-Government Organizations
NOC	No Objection Certificate
O&M	Operation and Maintenance
PEPA	Pakistan Environmental Protection Act 1997
PEQS	Punjab Environmental Quality Standards
CBD	Convention on Biological Diversity
DO	District Officer
PKR	Pak Rupees
hr	Hour
mg/l	Milligram per Litre
PPE	Personal Protective Equipment
QC	Quality Control
SEO	Site Environment Officer
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
SPM	Suspended Particulate Matter
SMART	Self-Monitoring and Reporting Tool
NOX	Oxides of Nitrogen
SOX	Oxides of Sulphur
PM	Particulate Matter

12.3 LIST OF INDIVIDUALS AND ORGANIZATIONS CONSULTED ALONG WITH THEIR WRITTEN FEEDBACK

Sr No.	Interviewer's Name	Contact	
1.	Fahim Khan	0345-4166073	<p>The survey in the study area following concerns of the local community were noted:</p> <ul style="list-style-type: none"> ▪ Wastewater should be properly treated prior to final disposal in nearby drain. ▪ Solid waste should be managed effectively by adopting the standard practices of the area. ▪ Cleanliness of the area should be ensured. ▪ An effective EMMP should be designed and enforced with true spirit. ▪ Health of the workers should be ensured. ▪ Plantation should be carried out at extensive scale. ▪ Noisy activities should be confined. ▪ Workers should be hired from local community. ▪ PPE's must be provided to workers ▪ Indigenous trees around the facility should be planted to control air pollution. ▪ Removal of shrubs and bushes should be avoided to the extent possible.
2.	Mudddasar Ahmd	0323-7141371	
3.	Mudassar Pervaiz	0302-9383501	
4.	Muhammad Zahid	0304-8141488	
5.	Muhammad Aslam	0345-6032550	
6.	Ghulam Niazi	0300-4577547	
7.	Muhammad Danish	0308-4522737	
8.	Sajjad AHmad	0300-4966961	
9.	Adeel Ahmad	0306-4054157	
10.	Abid Azeem	0333-4598420	
11.	Azeem Sarwar	0304-0113595	
12.	Mudassar Ali	0301-6065885	
13.	Muhammd Jamil	0307-8750545	
14.	Waseem Masroor	0311-7990673	
15.	Sohail Ahmad	0307-4273364	
16.	Muhammad Aslam	0300-8972941	
17.	Hussain Ali	0304-8141488	
18.	Muhammad Siddique	0300-4577547	
19.	Amjad Ali	0304-6368671	
20.	Sabir Mahmood	0300-7987863	
21.	Shakeel Subhani	0343-2920843	
22.	Kareem Niazi	0306-7869122	
23.	Subhan Ali	0301-9356728	
24.	Shahbaz Ahmad	0333-2029043	
25.	Muhammad Shahid	0313-8398423	

12.4 SOURCES OF DATA AND FULL LIST OF ALL REFERENCE MATERIAL USED

1. Field surveys,
2. Government site
3. Stakeholder consultation
4. Proponent
5. Published articles
6. Culaba, A. 2020. A methodology for the life cycle and sustainability analysis of manufacturing processes. Ph.D. dissertation, University of Portsmouth, England.
7. Culaba, A. B. and M. R. I. Purvis. 2019. A methodology for the life cycle and sustainability analysis of manufacturing processes. *Journal of Cleaner Production* 7(6): 435–445.
8. ISO (International Organization for Standardization). 1997. ISO 14040: Environmental management—
9. Life cycle assessment—Principles and framework. Geneva: ISO.
10. Jensen, A., L. Hoffman, T. Moller, A. Schmidt, K. Christiansen, and J. Elkington. 2017. *Life cycle assessment: A guide to approaches, experiences and information sources*. Copenhagen: European Environment Agency.

12.5 TERMS OF REFERENCES

The consultants is required to carry out an environmental impact assessment study of the project under Section-12 of Pakistan Environmental Protection Act 1997/ Punjab Environmental Protection (Amendment) Act 2012.

The Study should be comprehensive and should cover all aspects which are envisaged under the relevant national and provincial laws & regulations including but not limited to:

- Identification and recommendation for suitable solution/treatment/mitigation measures for emissions and effluents such as wastewater 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.

The Study should be acceptable to the relevant national and/or provincial authorities (relevant authorities) in Punjab.

12.6 LIST OF NAME, QUALIFICATION AND ROLES OF TEAM MEMBERS CARRYING OUT IN IEE/EIA STUDY

Sr.No.	Name	Designation	Role and Responsibility
1.	Dr. Mateen Shafqat	Peer Advisor	Technical Peer Review
2.	Mr. Kamal Ahmed Cheema	Lead Environmentalist	Technical Peer review
3.	Ms. Maham Ayesha	Manager Operations	Legal framework review and Stakeholder consultation IEE/EIA Expert, Environmental & Social Baseline, Report Writing.
4.	Arslan Iqbal	Environmentalist	Project Coordination and management, Impact Assessment and Mitigation Measures, Environmental Management Plan, Technical Report Writing.
5.	Mr. Jawad Shafiqe	Zooligist	Legal framework review and Stakeholder consultation, IEE/EIA Expert, Environmental & Social Baseline, Report Writing.
6.	Ms. Amna Hafeez	Environmentalist & GIS Expert	Legal framework review and Stakeholder consultation, IEE/EIA Expert, Environmental & Social Baseline, Report Writing. Project GIS Mapping
7.	Ms. Rahma Butt	GIS Expert	Legal framework review and Stakeholder consultation, IEE/EIA Expert, Environmental & Social Baseline, Report Writing.

12.7 APPROVALS FROM OTHER CONCERNED DEPARTMENTS

Attached.