

EXECUTIVE SUMMARY

This executive summary presents an overview of the main findings of the Environmental Impact Assessment (EIA) report for the proposed project named as “Waste Disposal, Transportation and storage of Hazardous and Non-hazardous Waste including Installation of Incinerators by M/S Lion Waste Management Private Limited” located near Jageer Abbaspur, Tehsil Ahmedpur Sharkia, District Bahawalpur. The proposed project will be involved in setting up of incinerator facilities for the incineration of waste that can be disposed of through incineration e.g. medical waste, industrial waste, hazardous wastes etc. at the proposed project location. Total area for the proposed project will be 8 kanal.

The project will involve storage transportation and incineration of both hazardous and non-hazardous waste from healthcare units and industries aiming its proper management. It will include the construction of administrative block, waste storage area, and installation of the incinerator facilities.

NAME OF PROPONENT:

Abdul Qadir Lashari is proponent of the proposed project.

DESIGNATION: Chief Executive Officer (CEO)

CONTACT NO: 0300-6418027

NAME OF THE ORGANIZATION PREPARING THE REPORT:

Eco Syntec Consulting Services.

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A BRIEF OUTLINE OF PROPOSAL

The proposed project is the management of hazardous and non-hazardous waste from healthcare as well as industrial units including its disposal, storage and transportation by the installation of two incinerators near Jageer Abbaspur, Tehsil Ahmedpur Sharkia, District Bahawalpur. Two incinerators will be installed with operating

capacity up to 500 kg/hr. The gas temperature in these incinerators reaches 1200 ± 50 °C rapidly and is maintained until the end of the main burn cycle. The operating temperature of primary chamber is 600-850°C and for secondary chamber it is 850- 1200 ± 50 °C. The system will be operated on Oil, Natural gas or LPG. The system also includes a cooling box, scrubber and induced draft fan. Dry Scrubber is included for cleaner emissions and legislation compliance. This, along with highly efficient automatic burners and timer controls are in accordance with international standards and ensures cleaner emissions during operations.

As per Initial Environmental Examination (IEE) /Environmental Impact Assessment (EIA) Regulations, 2000 the project falls in the category of EIA SCHEDULE II (List of projects requiring an EIA) of section G(1) which deals with Waste disposal and storage of hazardous or toxic wastes including landfill sites and incineration of hospital toxic waste.

PROJECT'S SALIENT FEATURES

The salient features of project are as follows:

COST OF THE PROJECT	Rs. 50 million PKR
PROJECT AREA	8 Kanal
NATURE OF LAND	No Current Use of Land/ Open Land
SOURCE OF POWER	MEPCO & 100 KV Generator
SOURCE OF WATER	Ground Water
WATER REQUIREMENTS	2.4 m ³ /day
RAW MATERIAL	Healthcare and Industrial Waste (Hazardous and no-Hazardous)
TYPE OF WASTEWATER	Domestic sewage

OBJECTIVES OF THE PROJECT

The objectives of the proposed incinerator are:

- To incinerate healthcare and industrial hazardous as well as non-hazardous waste
- To prevent the spread of healthcare waste to avoid diseases and injury
- To protect industrial, hospital and municipal workers
- To protect the general public

- To prevent scavenging of hazardous and non-hazardous risk waste.

Most of the alternative methods to incineration have one or two disadvantages when compared to incineration. They are more expensive, require additional mechanical equipment such as shredders or have limitations in the type of waste that can be burned e.g cytotoxic, pathological and chemotherapeutic waste.

The proposed site for the installation of incinerator facilities is located near Jageer Abbaspur, Tehsil Ahmedpur Sharkia, District Bahawalpur with no any human settlement within 2 km and also there is no chance of human population displacement.

EXISTING ENVIRONMENTAL CONDITIONS

For the purpose of this report, environmental and social baseline data and conditions at/around the project site has been studied. The data has been gathered from sources of information included consultation with project proponent, private visits, field surveys, desktop studies, existing information sources. Interviews with people near the project area has been conducted to collect their opinion regarding the proposed project and after finding it has been concluded that the project will not have any major adverse impacts on the socio-economic environment of the existing community. As the project is outside the main city, in barren fields so the functioning of the project will not be the reason of nuisance for the nearby community. Moreover, the project will pose the positive impacts in terms of employment opportunities as it will create jobs during construction and operation and will contribute to the nation economy by meeting the demand. Also, the hazardous waste of Hospitals and Industries will be incinerated to reduce the load of waste.

MAJOR IMPACTS AND RECOMMENDED MITIGATION MEASURES

Keeping in view, all the findings of the baseline study, and through general observation and desktop study, and understanding of the activities and processes involved in the project, environmental impacts have been anticipated. Following impact assessment methodology; i.e. defining the criteria for evaluation of the impacts, identification of mitigation measures (all possible options), evaluation of the residual impacts and identification of the monitoring requirements, adequate and effective mitigation measures have been proposed for all construction and operation related likely environmental impacts of the project. These mitigation measures have

been proposed in order of attempts to eliminate or minimize the impact, provide some compensation or rehabilitate the environment by some means.

The criteria of classification of the impacts as being important, middle or weak are according to:

1. Size and geographical extent
2. Duration and Frequency
3. Irreversibility
4. Ecological context

The major impacts foreseen during construction and operation phase of the proposed extension project are as following:

Table 1: Major Impacts and Recommended Mitigation Measures

Sr. No.	Major Impacts	Mitigation Measures
Construction Phase		
1.	Air pollution may occur be due to exhaust emissions during construction	Water suppression and covered transportation and storage of the construction materials.
2.	Noise may be produced due to construction, transportation activities (transportation of raw materials)	Avoiding or reducing noisy activities or limiting the noise sources far away from the sensitive areas.
3.	Land contamination may occur due to improper disposal of waste.	Proper waste management plan should be followed during construction phase
4.	Water Pollution due to improper discharge of waste water.	Water treatment should be done before its final disposal into main drain.
5.	Health and safety issues to workers during construction	Provision of Personal Protective equipment, good housekeeping and training of workers.
Operation Phase		
1.	Improper disposal of solid waste and ash	Waste will not be disposed off in the open and onsite burning of waste materials will be eliminated. Ash will be handed over to relevant vendor for its further use or disposal accordingly. However, the proposed project itself involves the proper waste management by incineration.
2.	Noise may be produced due to operation & transportation activities.	Generator and vehicles used during the operation will be properly tuned and maintained to minimize noise and air

		emission.
3.	Contaminated water may be disposed off into municipal drains of nearest area.	Domestic wastewater, after proper collection into septic Tank will be discharged into sewage line.
4.	Air pollution may occur be due to exhaust emissions.	Dry scrubber will be installed to filter the air before it will be emitted to ambient air.
5.	Health and safety issues to workers	Provision of Personal Protective equipment, good housekeeping and training of workers.
6.	Accidental spill of waste during transportation may cause land pollution	Transportation vehicles will be maintained in good conditions to avoid the chances of accidents. There will be a proper mechanical department where maintenance of machinery and vehicles will be monitored regularly.

PROPOSED MONITORING

Monitoring at the proposed sites has been conducted for ambient air, Noise level and water and the reports demonstrated that results are within the limits prescribed by PEQs (2016). The values of these parameters are present in baseline study of project.

ENVIRONMENTAL MANAGEMENT & MONITORING PLANS

For the effective implementation and management of the mitigation measures, an environmental management plan has been prepared. The EMP satisfies the requirement of Pakistan Environmental Protection Act. The EMP outlines the aims and objectives, defines the responsibilities of the project owners and contractors and lays down the required communication, reporting procedures and mechanism through which the proposed measures will be monitored.

Environmental impact of a project is worked out using various factors and parameters, so that an Environmental Management Plan can be evolved to take mitigation measures, wherever these might be considered necessary in order of appropriateness of elimination, reduction and compensation as the goals. The development of the EMP is to make some person responsible for implementing the mitigation measures as identified so that smooth implementation of the mitigation measures can be assured. Monitoring plans have also been included to ensure the compliance of the EMP by

contractors and other responsible authorities. These plans have been included in Chapter-6 of the report.

Environmental management approach for the project has been presented for the design, construction and operation phase and to mitigate the adverse impacts during the design, construction and operation phase essential mitigation measures have been recommended and for their sound implementation an Environmental Management Plan (EMPs) has been framed out.

Table 2: Proposed Management and Monitoring Plan

Sr. No.	Impact	Project activity	Monitoring Mechanism	Frequency	Monitoring Authority
Construction and Operational Phase					
1.	Air emissions and dust	Air quality will deteriorate due to transportation and construction activities	Monitoring for the air quality as per PEQS, 2016	Quarterly	Proponent/ Contractor
2.	Water pollution	Water quality will deteriorate due to construction and operational activities	Monitoring for waste water & drinking water quality as per EPA PEQS, 2016.	Quarterly	Proponent/ Contractor
3.	Noise pollution	Construction activities, utilities and transportation activities	Monitoring for noise level as per PEQS, 2016	Quarterly	Proponent/ Contractor

STRUCTURE OF THE REPORT

Chapter 1: **Introduction** briefly presents the brief outline of the project, major impacts, and recommendations for mitigation measures and proposed monitoring.

Chapter 2: **Description of the Project** furnishes project related information such as location, cost, size and major components.

Chapter 3: **Consideration of Alternatives** contains a description and evaluation of the various alternatives that were under consideration and a justification for selecting the proposed system.

Chapter 4: **Environmental Baseline Profile** establishes baseline conditions for physical, biological and socio-economic conditions prevalent in the project area.

Chapter 5: **Stakeholder / Public Participation** identify the main stakeholders and their concerns raised through scoping sessions, and deals with the measures to mitigate the social impacts.

Chapter 6: **Anticipated Environmental Impacts and Mitigation Measures** identifies, predicts and evaluates impacts of the project activities before and during the construction and operation stages and deals with the measures proposed to mitigate potential environmental impacts of the project.

Chapter7: **Environmental Management and Monitoring Plan** outlines institutional arrangements for the implementation of the proposed mitigation measures, training needs of the staff for implementation of the mitigation measures, monitoring requirements, monitoring cost etc.

Chapter 8: **Conclusion and Recommendations**

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CHAPTER I

INTRODUCTION

1.0 PURPOSE OF THE REPORT

The main objectives of this EIA study are:

- To determine and document the state of the environment of the project area and establish a baseline in order to assess the suitability of the Proposed Project in that area.
- To identify pre-construction, construction and operation activities with their consequential impacts on environment.
- Provide assistance to the proponent for planning, designing and implementing the project in a way that would eliminate or minimize the negative impact on the biophysical and socio-economic environment and maximizing the benefits to all parties in cost effective manner.
- To present Mitigation and Monitoring Plan for smooth implementation of the suggested mitigation measures.
- To provide opportunity to the public for understanding the project and its impacts on the community and their environment through public consultation.
- To prepare an EIA Report for submission at the Environmental Protection Agency, Punjab for according Environmental Approval.

1.1 IDENTIFICATION OF THE PROJECT

The proposed project is the management of both hazardous and non-hazardous healthcare as well as industrial waste including its disposal, storage and transportation by the installation of two incinerators. According to projects categorization for environmental assessment studies, the proposed project falls under Schedule II for Environmental Impact Assessment (EIA). It falls under the category G(1) of the Pakistan Review of IEE and EIA Regulations, 2000 which deals with “Waste disposal and storage of hazardous or toxic wastes including landfill sites and incineration of hospital toxic waste”.

1.2 IDENTIFICATION OF THE PROPONENT

Contact Person: Abdul Qadir Lashari

Address: Near Abbasia Chowk, Ahmedpur Sharkia, Bahawalpur

Contact Number: 0300-6418027

1.3 DETAILS OF CONSULTANT

The Environmental Impact Assessment (EIA) has been carried out by Eco-Syntec Consulting Services (ESCS). The consulting team can be approached through the following contact details:

Name Eco-Syntec Consulting Services

Address 35 Usman Block, New Garden Town, Lahore.

Contact No 0342-1112333&0343-1112000

Email ecosyntec@gmail.com

1.4 BRIEF DESCRIPTION OF NATURE, SIZE AND LOCATION OF PROJECT

NATURE:

The proposed project is management of both hazardous and non-hazardous healthcare as well as industrial waste including its disposal, storage and transportation by the installation of two incinerators using environmental friendly techniques.

The two incinerators will have the operating capacity upto 500 kg/hr each. The gas temperature in these incinerators reaches $1200\pm 50^{\circ}\text{C}$ rapidly and is maintained until the end of the main burn cycle. The operating temperature of primary chamber is $600-850^{\circ}\text{C}$ and for secondary chamber it is $850-1200\pm 50^{\circ}\text{C}$.

LOCATION OF PROJECT

The proposed project is located near Jageer Abbaspur, Tehsil Ahmedpur Sharkia, District Bahawalpur. The proposed incinerators installation is planned in an open land, surrounded by the fields. The project site is connected to other areas through metalled National Highway Lahore-karachi (N5).

SIZE:

Total Cost of project is approximately 50 Million PKR including land cost 5 Million, infrastructure cost 15 Million PKR approx.. and machinery cost 30 Million PKR approx.

Lion Waste Management Pvt. Ltd. has planned provision of the basic facilities/utilities for the project. Provision of necessities including access routes and infrastructure for provision of telecommunication services will be developed to meet the future demand. Adequate open space is planned to be provided for developing green belts and area of plantation.

1.5 ECO-FRIENDLY FEATURES OF THE PROJECT

In its truest form, sustainability is a three-prong strategy involving environmental, social and economic requirements. Special feature of the project that add eco-friendly and sustainability element to its overall execution process are the absence of any sensitive or protected area within the impact zone of project site. The nearby residential area named as Jagger Abbaspur is located 1km away, Basti Khokhran is located at an aerial distance of 2.1km and Tibbi Izzat is located at an aerial distance of 2.6km away from the proposed project site, hence taking care of the safety aspects of general community. Moreover, the water requirement will be only for drinking and domestic purposes so the water consumption in the unit will not going to affect the water supply of the nearby areas. The proponent will obtain water from the ground water table through developing a piping network for water extraction. There are no surface water bodies within the 1000m surrounding area of the proposed site. There is no reserved forest or protected area within the 1000m of the proposed site.

1.6 METHODOLOGY FOR ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

This Environmental Impact Assessment is based on methodology provided in the EPA notified guidelines for preparation of EIA report. Initially the baseline of the project area was developed by gathering secondary data, records and information on existing physical and social, and ecological environment. The primary data for the purpose of this EIA report was generated through monitoring and laboratory testing of environmental parameters. The changes expected in the critical environmental aspects

e.g. in the parameters like ambient air, noise, socioeconomic indicators that may be significant with a positive or negative attribution were identified. Subsequent mitigation, management and monitoring measures have been drafted accordingly.

This EIA report presents the existing baseline situation and the environmental aspects involving Eco environmental waste management's current infrastructure for the proposed venture. The EIA study has adopted the following methodology for report compilation:

1.6.1 LITERATURE REVIEW/BASELINE

Existing publications and previous IEE/EIA reports with relevance to the proposed project were studied. In addition, the legislative framework governing the process of EIA and environmental approval were reviewed to ensure that all the parameters are met.

1.6.2 SITE VISITS

This study is based on the finding of the field visits conducted by the team of ESCS. Team members visited the location and neighborhood to perform reconnaissance survey and to gather primary baseline information with reference to environmental and social aspects. Site visits have been done with respect to environmental as well as social aspect evaluation. Questionnaires were distributed among the general public to obtain their view point regarding the proposed project.

1.6.3 PROJECT SPECIFIC DATA

The information related to the project and its infrastructure has been provided by the proponent.

1.6.4 IMPACT IDENTIFICATION AND ASSESSMENT

A categorical assessment of environmental impacts associated with the proposed project with respect to environment and socioeconomic and ecological aspects has been conducted.

1.6.5 MITIGATION MEASURES AND EMMP

Impact assessment has been supplemented by the incorporating mitigation measures to lessen severity of impacts and to manage different activities within the outline of environmental management and monitoring plan. The EMMP is provided to facilitate the proponent in establishing an environmental conscious system that supports conservation at all levels of its construction and operation.

1.7 SCREENING

Screening is an essential part of an EIA process. Screening often results in a categorization of the project and from this a decision is made on whether or not a full EIA is to be carried out. The EPA Punjab has provided a layout for the screening process. Under the Regulations for Review of IEE/EIA, 2000, the EPA Punjab has provided Schedule I and II which categorize projects into IEE and EIA. For this project of construction unit of Lion Waste Management Pvt. Ltd. the same Schedules were consulted. According to the Schedules the proposed project falls under SCHEDULE II (List of projects requiring an EIA) the project falls in the G(1) which deals with “Waste disposal and storage of hazardous or toxic wastes including landfill sites and incineration of hospital toxic waste”.

1.8 SCOPING

1.8.1 INTRODUCTION

Scoping is the stage in EIA at which issues, impacts and preliminary alternatives are determined that should be addressed at subsequent stages. It directly follows the screening stage and is a systematic exercise that establishes the boundaries and Terms of Reference (TOR's) for the EIA. A quality scoping study reduces the risk of including inappropriate components or excluding components which should be addressed. While scoping has been defined by many different terms, the definition adopted in recent guidance on project EIA, developed for the European Commission, sets out its meaning in its broadest sense as follows: “Scoping is the process of determining the content and extent of the matters which should be covered in the environmental information to be submitted to a competent authority for projects which are subject to EIA/IEE.” (European Commission, 2001)

1.8.2 GUIDING PRINCIPLES FOR CARRYING OUT THE SCOPING STAGE

The guiding principle for the proposed scoping stage is the emphasis on anticipated environmental impacts and affected people. The scoping session was initiated at the EIA planning stage to include all relevant stakeholders in the study. This helped in defining the boundaries for field assessment of environmental and social parameters.

1.8.3 OBJECTIVES

The key objectives of this scoping are to:

- Inform the public about the proposed project
- Identify main stakeholders and their concerns and values
- Define reasonable and practical alternatives to be addressed
- Focus the important issues and significant impacts to be addressed in the EIA report
- Define the boundaries in time, space and subject matter
- Set requirements for the collection of baseline and other information
- Establish the Terms of Reference (TOR's) for the EIA study

1.8.4 LEGISLATION AND GUIDELINES DECIDED TO BE FOLLOWED FOR THE EIA/IEE

EPA Punjab has established laws and regulations for environmental assessment studied. These legislations include:

- Punjab Environmental Protection Act, 1997 (Amended 2012)
- Punjab Environmental Quality Standards 2016

In addition to the legislative framework, there are certain guidelines notified by the Pakistan Environmental Protection Agency which provide a standard course of actions to be pursued during such studies. These guidelines are:

- Guidelines for the Preparation and Review of Environmental Reports
- Guidelines for Public Consultation
- Guidelines for Solid Waste Management
- Environmental, Health, and Safety General Guidelines of the World Bank Group.

In addition to these legislations, there are specific rules, made regarding the healthcare waste. They include

- Hazardous Substances Rules, 2003
- Punjab Healthcare waste Management Rules, 2014

1.8.5 EIA REPORT CONTENT

The content of the EIA report for the proposed project will be as according:

1. Introduction
2. Description of the Project
3. Consideration of Alternatives
4. Description of the Environment
5. Involvement of Stakeholder/ Public Consultation
6. Screening of Potential Environmental Impacts and Mitigation Measures
7. Environmental Management and Monitoring Plan
8. Conclusions

1.8.6 BASELINE ENVIRONMENTAL INFORMATION THAT WOULD BE INCLUDED IN THE EIA/IEE REPORT

Physical Resources:

1. atmosphere (e.g. air quality and climate)
2. topography and soils
3. surface water
4. groundwater
5. geology / seismology

Ecological Resources

1. fisheries
2. aquatic biology
3. wildlife
4. forests
5. rare or endangered species
6. protected areas

Economic Development

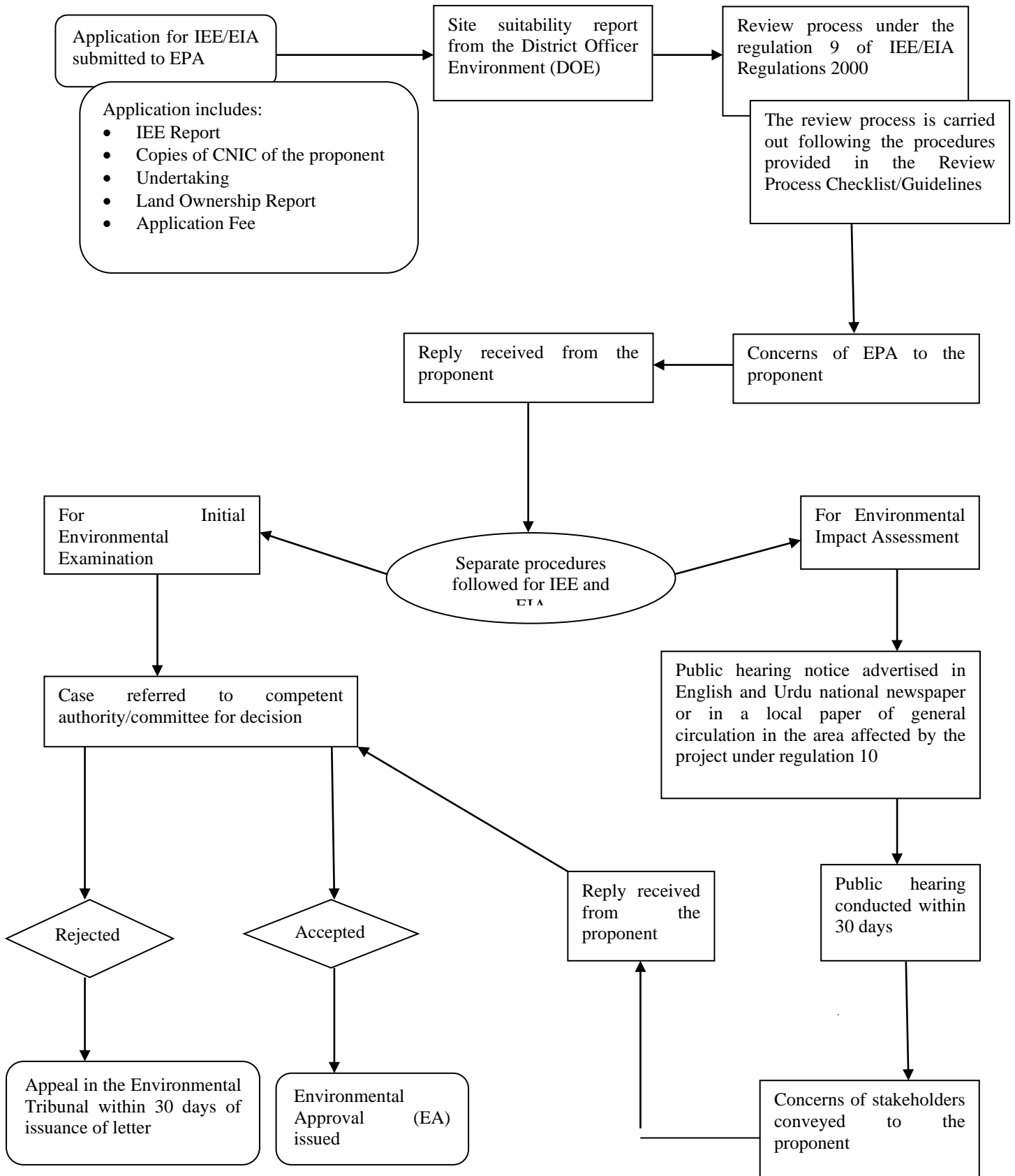
1. industries

2. infrastructure facilities (e.g. water supply, sewerage, flood control)
3. transportation (e.g. roads, harbors, airports, and navigation)
4. land use (e.g. dedicated area uses)
5. power sources and transmission
6. agricultural development
7. mineral development
8. tourism facilities

Social and Cultural Resources

1. population and communities (e.g. numbers, locations, composition, employment)
2. health facilities
3. education facilities
4. socio-economic conditions (e.g. community structure, family structure, social wellbeing)
5. physical or cultural heritage
6. current use of lands and resources for traditional purposes by Indigenous Peoples
7. Structures or sites that are of historical, archaeological, paleontological, or architectural significance.

The proposed EIA will use checklist and matrices for impact identification during construction and operational phases. The impacts due to design and location of the project will also be assessed for the proposed project. Laboratory testing will be done to obtain information on the baseline environmental parameters.

Figure 1.1: EIA Process Flowchart

CHAPTER II

DESCRIPTION OF THE PROJECT

2.1 TYPE AND CATEGORY OF THE PROJECT

According to projects categorization for environmental assessment studies, the proposed project falls under Schedule II for Environmental Impact Assessment (EIA). **Schedule II (G)1** of the IEE/EIA Regulation 2000 mentions that “Waste disposal and storage of hazardous or toxic wastes including landfill sites and incineration of hospital toxic waste” is to be considered under this particular Schedule. This report is required to fulfill the legal requirements set under section 12 of the Punjab Environmental Protection Act, 1997 (Amended 2012). According to the Punjab Environmental Protection Act 1997 (Amended 2012) and its interpretation as per Review of IEE & EIA Regulations, 2000 for filling, review and approval of environmental assessments, the project is categorized in the Schedule-II for EIA, of PEPA, Regulations, 2000, requiring Environmental Impact Assessment (EIA).

This chapter of the study renders a detailed account of the project and its salient features, such as location, processes and activities involved during various phases of the project life cycle.

2.2 OBJECTIVES OF THE PROJECT

Objectives of said project in nut shell are as following;

- To incinerate hazardous and non-hazardous healthcare as well as industrial waste.
- To prevent spread of healthcare waste to avoid diseases and injury.
- To protect industrial, hospital and municipal workers.
- To protect the public.
- To prevent scavenging of non-hazardous & hazardous risk waste.

2.3 ALTERNATIVES CONSIDERED

The alternatives considered for the current project are discussed in chapter 3 in detail.

2.4 LOCATION PLAN/ MAP

The proposed project is located near Jageer Abbaspur, Tehsil Ahmedpur Sharkia, District Bahawalpur. The coordinates of the M/S Lion Waste Management Pvt. Ltd. are as under:

East: **N5 Highway**

West: **Agricultural Land**

South: **Agricultural Land**

North: **Agricultural Land**

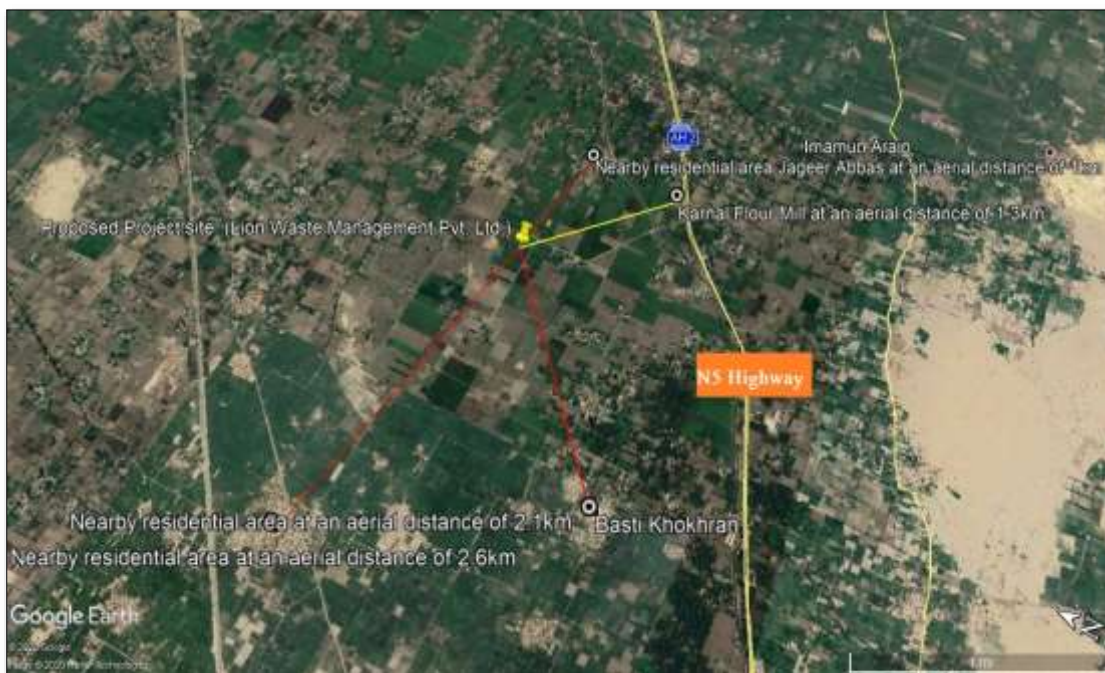


Figure 2.1: Google Earth Showing Proposed Project Site Location

Site layout map for the proposed project is attached as Annex-9.

2.5 LAND USE ON THE SITE:

The site is currently an open land and there is no construction been started yet. The land is already owned by the proponent.

2.6 ROAD ACCESS:

The project site is connected to other areas with metaled roads. National Highway Lahore-Karachi (N5) majorly connects the project site to other areas. The map showing the road network of area is annexed as Annex-9.

2.7 VEGETATION FEATURES OF THE SITE:

The land was previously an agricultural area which is now to be turned into the industrial area. The agricultural fields present near the project include sugar cane and cotton. The trees species present near the project site include orange, sheesham, mulberry etc. No cutting of trees is involved in the project, as there is no tree present on the proposed site.

2.8 COST AND MAGNITUDE OF OPERATION:

Total Cost of project is approximately 50 Million PKR including land cost 5 Million, infrastructure cost 15 Million PKR approx and machinery cost 30 Million PKR approx.

The total area of Project site is 8 Kanal. Project building will have following facilities:

- Incinerator
- Office
- Storage Area
- Open land

2.9 SCHEDULE OF IMPLEMENTATION:

The time required for the construction of proposed project M/S Lion Waste Management Private Limited is approximately 01 year. The work will be started as soon as the environmental approval is granted from EPA. Breakdown of the time for the construction phase is given below in Table 2.1:

Table 2.1: Timeline for Construction of Project

Sr. #	Activities	3 Months		3 Months			4 Months				2Months		
		4W	4W	4W	3W	5W	4W	4W	4W	4W	4W	3W	1W
1	Designing												
2	Mobilization of Contractors												
3	Lean Construction Period												
4	Peak Construction Period												
5	Restoration of Site												

2.10 DESCRIPTION OF THE PROJECT

The proposed project is management of both hazardous and non-hazardous healthcare as well as industrial waste including its disposal, storage and transportation by the installation of two incinerators.

2.10.1 TECHNOLOGY AND MECHANIRY USED ON SITE.

Sr. No.	Specifications of Proposed Incinerator	
1.	Type of Waste	Solid Waste and liquid mixed with solid (saw dust)
2.	Capacity	500 kg/hr
	BTU value of waste	4000 Kcal/Kg (Estimated)
	No of Chambers	2
	Residence Time	>2 Seconds
3.	Primary Chamber	
	Burner Type	Oil, Natural Gas or LPG
	Primary chamber	18ft (l) x 10t (w) x 10ft (h)
	Nos. of Burners:	2.
	Capacity:	3,000,000 btu/hr. each
	Operating Temperature:	650°C -850°C
	Feed doors	4
	Ash Removal Doors	3
	Burner Controls:	(i) Flame Safety System. UV sensor, ignition transformer
	Temperature Controller:	(I) Monitors temperature
	Burner	Package type with ignition electrodes
	Gauges.	Pressure gauge with gas regulator
4.	Secondary Chamber	
	Burner Type	Oil, Natural Gas or LPG
	Secondary chamber	12ft (l)*10ft (w)*10ft
	Nos. of Burners:	2.
	Secondary Burner:	2,000,000 btu/hr
	Operating Temperature	650°C – 1200±50°C
	Ash Removal Door:	2
	Burner Controls	(i) Flame Safety System. UV

		sensor, ignition transformer
	Temperature Controller:	(I) Monitors temperature
	Burner	Package type with ignition electrodes
	Gauges	Pressure gauge with gas regulator
	Loading Capacity	1000kg to 1500kg
	Burn Rate	1000-1500kg per hour
	Weight:	50 tons approx.
5.	Stack	
	Stack Temp:	250-300°C. (Estimated)
	Stack Height:	25 m approx. from ground level
	Feed/ash doors:	Manual (using waste bags)
	Feed Doors	4
	Ash Doors	5
6.	Utilities:	
	Natural Gas	Max 150m ³ /hr.
	Consumption	Average 100m ³ /hr.
	Gas Pressure before Regulator:	8PSIG
	Gas Pressure after Regulator:	2 – 3 PSIG
	Power Consumption	50 KW hr. (Max.)
	Electrical system	Controls: - 220V AC / 50Hz
7.	Motors	
	ID Fan Motor:	30 HP three Phase 25000cfm.
	Primary Burner Blower Motor:	2 HP single Phase.
	Secondary Burner Blower Motor:	2 HP single Phase.
	Air Blowers for Primary chamber:	two and each has 2 hp motor
	Cooling Chamber	Six blowers and each has 1 hp motor
	Pump for scrubber:	6 hp.

2.10.2 MANAGEMENT OF HAZARDOUS & NON-HAZARDOUS WASTE

The main features of the hazardous and non-hazardous waste management program are:

- Collection and Transportation of hazardous and non-hazardous waste
- Waste Storage
- Incineration of hazardous and non-hazardous waste

For an effective management of hazardous and non-hazardous waste, it is essential to have the necessary tools for assessing the status of readiness at all levels. The absence of waste management, lack of awareness about the health hazards, insufficient financial and human resources and poor control of waste disposal are the most common problems connected with hazardous and health care waste. An essential issue is the clear attribution of responsibility of appropriate handling and disposal of waste. According to the polluter pays principle this responsibility lies with the waste producer, usually being the industry or health care provider or the establishment involved in related activities.

COLLECTION AND TRANSPORTATION OF WASTE

For the current proposed project, waste will be collected from various industries and healthcare units including hospitals, pesticide industries, pharmaceutical industries, textile industries, food processing industries, chemical and paint industries etc.

At the beginning, four vehicles will be used for the transportation of waste. The waste will be collected during night time. The proposed project is located near Jageer Abbaspur, Tehsil Ahmedpur Sharkia, District Bahawalpur. There will be no general traffic disturbance as the project is in the outskirts of the city. The workers will be provided with Personal Protective Equipment for loading and unloading of the waste. Workers safety will be given priority in every stage of the process

HAZARDOUS AND NON-HAZARDOUS WASTE STORAGE

The collected waste has to be properly stored before final disposal by incineration. Segregation of the waste must be done at this stage as well. The following points may help in proper storage of the waste:

- Location of the storage site should be away from residential areas
- Location of the site should be away from food storage or food preparation facilities
- Providing convenient approach for the waste carrying wheel barrows/ trolleys
- Secure from unauthorized access at all times
- Make easily accessible to authorized staff
- Cover and secure properly to keep animals and birds etc. away from the site
- Ensure daily evacuation

For the current project, all of the above points were taken into consideration. The storage area should have an impermeable, hard-standing floor with good drainage; it should be easy to clean and disinfect.

1. 2.3-ton Air Conditioner will be provided for the controlled temperature in the storage area.
2. Retention time will be about 1-2 hours.
3. Healthcare waste would be burnt on daily basis. It will not be stored for too long in the storage area.
4. Location of the site away from food storage or food preparation facilities
5. Provision of convenient approach for the waste carrying wheelbarrows/trolleys.
6. There should be a water supply for cleaning purposes.
7. The storage area should afford easy access for staff in charge of handling the waste.
8. It should be possible to lock the store to prevent access by unauthorized persons.
9. Easy access for waste-collection vehicles is essential.
10. There should be protection from the sun.
11. There should be good lighting and at least passive ventilation.
12. A supply of cleaning equipment, protective clothing, and waste bags or containers should be located conveniently close to the storage area.

INCINERATION OF HAZARDOUS WASTE

Incineration can treat health care and industrial waste at the same time. Incineration at a high temperature in dry oxidation process reduces organic and combustible waste to inorganic, incombustible matter and results in a very, significant reduction of waste volume and weight. This process is usually selected to treat wastes that cannot be recycled, reused or disposed of in a landfill site.

Incinerator breaks down some hazardous, non-metallic organic wastes and destroys bacteria and viruses, which is the main benefit of incineration of healthcare wastes. In considering the hazardous waste incineration option, one must weigh the benefits of incineration against the significant capital and operating costs, potential environmental impacts and technical difficulties of operating an incinerator.

2.10.3 DESIGN AND INSTALLATION OF INCINERATOR

The objective of the project is to install two incinerators to promote cleaner practices and complete combustion of hazardous and non-hazardous wastes with a view to waste volume reduction and amelioration. Incineration can treat healthcare and industrial waste at the same time minimizing impact on the environment.

2.10.4 SCOPE OF WORK

The two incinerators will have the operating capacity upto 500 kg/hr. It contains dual combustion chamber, mix-combustion chamber, smoke filter chamber with refractory lines, and effective high combustion chamber with temperature up to 1200 ± 50 °C which is considered as a high and effective burn rate.

It uses Gasified pyrolysis burning technology which is used to treat and burn various kinds of waste typically generated in hospitals, factories, etc.

It adopts big furnace gates which is easy and practical to deal with all kind of waste. It uses quality optional 304 stainless steel chimney which make it stable and heavy duty. With primary combustion chamber, mix combustion chamber and secondary combustion chamber all waste will be burned with high efficiency rate. With built-in high technology smoke filter particulates and /or gases will be removed from emitted gases. In addition, an optional Water spraying system can be added to reduce the smoke emission in high and effective rate. High effective burn rate ensured by using high quality oil or gas burners.

2.10.5 MAIN FEATURES

The proposed incinerators mainly consist of 6 parts: 1st chamber, 2nd chamber, gas cooling tower, dry scrubber, dedust device and chimney. The control system for the incinerator is PLC with touch screen. The combustion will be mainly carried out in 2 chambers, primary combustion chamber and secondary combustion chamber. It has chamber for Dry Scrubbers (smoke filter) which is of high technology air pollution control devices that can be used to remove some particulates and/or gases from the incinerator.

Water spraying system can be added and installed with the incinerator. The term water spraying system describes a variety of devices that remove and clean mainly

dust and pollutants from a furnace flue gas or from other gas streams. In a water spraying system, the polluted gas stream is brought into contact with the scrubbing liquid, by spraying it with the liquid, by forcing it through a pool of liquid, or by some other contact method, so as to remove the pollutants. The smoke emission will be reduced significantly when using the water spraying system. Gasified incineration, mixed incineration and burnout treatment ensures low emission standard of dust, dioxin and harm gases, in addition it uses dry and Water spraying system which reduce the smoke emission significantly.

Totally enclosed operation is suitable for treating infectious waste to avoid secondary pollution. Chimney (Stack) which is used in this system is made of stainless steel (option) material which makes it heavy duty and leads it to prolong life. The proposed incinerator can be operated by Oil or Gas which fit and suit all customer needs and requirements. It uses latest technology and high-quality burners which cause high effective and high burn rate. It is characterized by compact structure that can be installed in small land area.

COOLING CHAMBER

Hot air coming from the incinerator enter cooling chamber 10ft (L)* 10ft (W)* 10ft (height). The objective is to cool down hot fumes before entering the scrubber. It is a part fabricated using 6mm mild steel plates.

AIR POLLUTION CONTROL DEVICES

In built Dry Scrubber is proposed as an air pollution control system for the incinerator to be installed. Dry Scrubber is highly efficient for filtering the exhaust air from incinerator before its emission into ambient air. The detail for proposed dry scrubber is as follow:

DRY SCRUBBER

Dry scrubbing systems are used to get rid of pollutants and contaminants in exhaust gas without creating a wet sludge. They work by combining carefully chosen chemical reagents with the exhaust stream at incredibly high speeds which neutralizes the pollutants in the gas.

Specifications of Dry Scrubber

The scrubbing system will mainly consist of the following accessories:

- dry absorber chamber
- bag house filter
- reagent feeding tank
- reagent feeding system
- fly ash discharge system
- Exhaust stack

Operation and Maintenance

- Flexible design for easy expansion
- No costly chemicals required
- Virtually maintenance free
- Compact, space-saving footprint

INDUCED DRAFT FAN

An induced draft (ID) Fan is provided to:

- a) Maintain a negative atmosphere in the chamber.
- b) Provide additional cooling air to exhaust gases.
- c) Prevents an accident, when feed door is opened.

This occurs due to backpressure of gases blowing out from the chamber. While opening the feed door, the radiant heat from the chamber can also be dangerous for the operators if the ID fan stops accidentally.

CONTROLS

Temperatures of cooling chambers and scrubber can also be known by means of thermocouples fitted on these components. Controllers are provided to monitor the temperatures of the secondary and primary chambers. These control the whole operation of the incinerator. When secondary chamber controller show requires set temperature then the burner stops working and the primary burner starts automatically. As the temperature reaches set limit, then the burn cycle starts.

SALIENT FEATURES**WASTE TYPE AND BURN RATE**

It is designed specifically to incinerate all kind of hazardous and non-hazardous waste. The two incinerators will have the operating capacity upto 500kg/hr

CONSTRUCTION

Mild steel welded fabrication consisting of sheet steel and structural section supports.

LINING

High grade fire and insulation bricks

BURNERS

High-efficiency burners with electronic ignition, flame recognition and combustion control devices fitted.

FEEDING

Loading waste- Manual

ASH REMOVAL

The ash can be removed from the primary chamber manually through the ash doors. However here we use automatic system to remove ash. There is a movable grate inside the incinerator. The rotary motion of a motor is converted into linear motion of the grate through a gearbox. It is operated by means of a push button. Whenever the ash is to be removed from the incinerator it done by pushing a button. As a result, grate moves out and drops the ash down in the ash pit. The button is again pushed which brings back grate to its original position. Two 5hp motors with gearboxes are used. An automatic system comprises an electric motor, a gearbox. The gearbox is provided with output shaft. A transmission is a machine in a power transmission system, which provides controlled application of the power. Often the term transmission refers simply to the gearbox that uses gears and gear trains to provide speed and torque conversions from a rotating power source to another device.

INSULATION

The incinerator is covered with two inches glass wool and 20-gauge mild steel plates.

EXTERIOR FINISH

Multi-coat high quality, high-temperature blue enamel top coat paint for incinerator body
Blue enamel paint for cooling chamber
Blue enamel paint for induced draft fan
Plain shining stainless body for scrubber
Black enamel paint for stack

WORKING OF INCINERATOR

'Dual chamber' systems typically work by incinerating materials in a primary chamber and then incinerating the gases inside a second combustion chamber for a second time. The resulting emissions from such a system are cleaner and more environmentally friendly.

- In primary chamber, all waste will be first loaded and incinerated, where the volatilization of waste will be achieved. The low air-to - fuel ratio in this starved-air chamber will dry and encourage the waste volatilization, and most of the carbon will be burnt over there.
- In the second chamber, the volatile gases produced in the primary chamber will be fully oxidized for complete combustion in the presence of high temperature, 100 % pure excess air and ample residence time.
- Using Dry scrubber , the gases and airborne particulates will be then subjected to complex (and often expensive) 'clean up' before being emitted into the atmosphere.

The process flow is attached as Annex-7.

2.11 UTILITIES**2.11.1 WATER REQUIREMENT AND WASTEWATER MANAGEMENT****SOURCE OF WATER**

In proposed project the water requirement in the construction and operation phase will be fulfilled by extraction of groundwater through installation of pumps.

WATER REQUIREMENT AND WASTEWATER GENERATION

Water consumption will be only for plant cooling evaporative losses and for domestic use. Domestic wastewater will be handled through Septic Tank and will be discharged off properly.

The Breakup of water requirement and wastewater generation during

construction phase of project are given in Table 2.2:

Table 2.2: Water Requirement and Wastewater Generation during construction

Sr. No.	Description	Water Consumption (m ³ /day)	Wastewater Generation (m ³ /day)	Mode of Disposal
1	Domestic	2.2	1.76	Will be collected through proper network of pipeline into a septic tank and then will be disposed off in Main Drain.
2	Construction and sprinkling	1000	-	-

Breakup of water requirement and wastewater generation during operational phase of project are given in Table 2.3:

Table 2.3: Water Requirement and Wastewater Generation during Operation

Sr. No.	Description	Water Consumption (m ³ /day)	Wastewater Generation (m ³ /day)	Mode of Disposal
1	Domestic	2.4	1.92	Domestic wastewater, after proper collection into Septic Tank will be discharged into sewage line.

2.11.2 SOLID WASTE GENERATION AND MANAGEMENT

• CONSTRUCTION PHASE

The domestic solid waste during construction phase at the project site will be handled properly by its proper collection, reusing of reusable material and then its final disposal. The excavated material from the proposed project site will be used for backfilling of the areas and other construction purposes. For proper waste management, waste bins will be placed in the unit. From these bins the waste will be collected for the proper disposal.

• OPERATION PHASE

During operation phase, there will be two major sources of solid waste. First is domestic solid waste and the other is residual incinerator ash. The generated domestic waste will also be managed properly by its proper collection and disposal. While the

generated residual incinerated ash will be managed properly for which the disposal plan is mentioned below:

ASH DISPOSAL PLAN

- Ash and residues from incineration will be placed in non-combustible containers and will be removed from site by a suitable vendor.
- Ash will be temporarily stored in designated storage area with impermeable flooring packed in sealed suitable bags with no leakage on site with minimal risk of pollution of groundwater and soil.
- Access to the site will be restricted to authorized personnel only. Suitable vendor will be responsible for its sale for further use or ultimate disposal at government approved dumping site or landfill site. The operators will be properly trained especially in safe handling procedures, use of protective equipment and hygiene and emergency response procedures.
- Final disposal of solid waste from proposed incinerator facility will be very much low as compared to initial amount of waste entering in the incinerator.

2.11.2 MANPOWER

The project will require manpower in both of its project phases: construction and operational phase. During the construction phase, 10-15 persons will be required. While During the operational phase of the project, the total manpower requirement is estimated to be 20 persons comprising administrative, technical, and non-technical persons. These include engineers, computer operators, accountants, administrative assistances, secretaries, etc. All recruited staff will be given appropriate training in order to educate them on the specific job tasks to be performed and safety procedures. Working hours for the current project will be 9-5 during construction phase. While there will be 2 shifts of 8 hours during the operational phase of the project.

2.11.3 ELECTRICITY

Source of power will be a MEPCO. The energy demands for the project will be for the administrative block and operation of the incinerator. A generator of 100 kVA will be installed for the operation of the facility in case of power failure.

2.11.4 FUELS

Diesel will be used as a fuel in proposed project.

2.12 HEALTH, SAFETY & HYGIENE

FIRST AID FACILITY

At workplace workers and employers will have enough information, knowledge and training regarding first aid treatment in case of any emergency. The project will provide proper healthcare facilities to workers and staff to cope with any incidental accidents and tackle them.

SAFETY TRAININGS

Workers and all the staff will get proper training about the work and safety practices.

USE OF DRUGS AND NARCOTICS

Drugs and narcotics will be strictly prohibited during working hours in working area.

SECURITY

Safety signs & boards will be placed at the project site during construction phase. At the time of working proper SOPs will be followed like pre-announcement.

PERSONAL PROTECTIVE EQUIPMENT (PPES)

Workers will be provided with PPEs such as Harnesses, Masks, Gloves, Helmets, Safety shoes, Ear plugs, Ear muffs & other personal protective equipment during the working hours to ensure personnel health & safety. Implementation of PPEs will be ensured by the proponent for the project.

RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

Risk Assessment study for the project was carried out. According to the studies and local people of the area the subject area is not natural disaster prone. After all these predictions, said project is also in favor.

OCCUPATIONAL EXPOSURE MITIGATION PLANNING

To control any occupational health and safety impact a detailed planning for mitigation measures will be done. All employees will be trained for Environmental Health and Safety (EHS) policies and practices. The management will follow the environmental management plan to implement the mitigation measures further. Institutional measures such as occupational health & safety planning and environmental compliance monitoring for environmental parameters will be strictly followed.

2.13 RESTORATION AND REHABILITATION PLAN

Land rehabilitation is the process of returning the land in a given area to some degree of its former state, after some process (industry, natural disasters, etc.) has resulted in its damage.

- For the proposed project development, there will be no need for relocation or rehabilitation because the area is currently an open land and is owned by the proponent.
- After completion of the construction work all the disturbed sites will be changed into conditions as they were prior to the commencement of the project or even far better than that.
- As far as the rehabilitation is concerned, the proponent will do proper landscaping once the construction of the project is completed.
- The area will be planted with indigenous vegetation.
- All the concrete will be broken and disposed of according to the rehabilitation plan.
- For improving the environmental and aesthetic value or visual quality of the site, the proponent will carry out landscaping and tree planting within premises of factory for which the Tree Plantation Plan has been provided in Chapter 6 of this report.

2.14 GOVERNMENT APPROVALS

M/s Lion Waste Management Pvt. Ltd. is about to start its new unit. So, this project needs only Environmental Approval after that this project will start construction.

CHAPTER III

CONSIDERATION OF ALTERNATIVES

This section covers the project alternatives which were examined for the proposed project near Jageer Abbaspur, Tehsil Ahmedpur Sharkia, District Bahawalpur. Before carrying out any project, it is imperative to evaluate different alternatives to arrive at the best possible option. An analysis of the available alternatives is necessary to establish the most suitable management and technology options will be adopted for the project, while minimizing environmental impacts. This evaluation explains the selection of appropriate option that was required to ensure optimal results within defined set of economic, environmental, health and safety constraints. In particular, it outlines the following project options:

- No Project option
- Alternative Site Option
- Alternative Technology

3.1 ALTERNATIVE I – NO DEVELOPMENT OPTION:

No project option means that there would be no project at all. The no project option, if taken, would stop the community from an important and necessary project which is the need for today as per alarming situation of waste generated from industries and hospitals.

Accelerated growth of population and a gradual increase of per capita solid waste have been observed in the city of Bahawalpur. Lack of awareness prevails among stakeholders regarding reduction at source and segregation of waste and available other options. The existing Bahawalpur solid waste management system is administered by the Municipal Administration of Tehsil (TMA). In addition, the current collection of solid waste is divided into primary and secondary collection systems. There is no proper system of solid waste disposal in the city, even so there is no sanitary land fill site.

If the situation exists for the next few years, the Bahawalpur city will give a picture of heaps of solid waste at public places.

Other impacts of the no project option would be loss in employment and social welfare in the project area, as the project is bound to create jobs and improve the existing condition of the community of the area through different community development and social welfare projects.

From the environmental point of view, this option would result in a loss of opportunity in further improvement of the environmental management of the area, environmental baseline data and the mitigation and compensatory programs.

3.2 ALTERNATIVE II- SITE ALTERNATIVE:

In reference to the project site alternatives, several lands were evaluated. The final selection of site is based on following criterion:

ACCESSIBILITY:

The site should be accessible from a permanent road to allow ready transport.

WATER SUPPLY:

Availability of adequate water supply, which should also meet drinking water standards.

SOIL CONDITIONS FOR CIVIL STRUCTURE:

Availability of sufficient land to design and layout plan in an appropriate manner, with consideration of future expansions.

ELECTRICITY:

Availability of electricity from the MEPCO for an uninterrupted supply of power, required for the project.

In view of the above criteria, it was concluded to establish the incinerator facility on the current site. The geographic position of the proposed project is very ideal which connects it to the neighboring infrastructure through National Highway Lahore-karachi (N5). The proposed project is also away from the human settlement. The nearby residential area named as Jagger Abbaspur is located 1km away, Basti Khokhran is located at an aerial distance of 2.1km and Tibbi Izzat is located at an

aerial distance of 2.6km away from the proposed project site. Moreover, the nearby industry, Karnal flour mills is located at an aerial distance of 1.3km.

Any other site does not possess such a broad spectrum of commercial, industrial and management benefits.

As no important religious, archaeological, historical or recreational site, or any other ecologically sensitive, declared protected area or poor population exists within close vicinity of the selected site. In view of these facts, it can be concluded that the selected project site is very suitable which is outside the city. The project site does not require cutting of trees and the land is already owned by the proponent.

3.2.1 ZONING OR IDENTIFICATION OF LAND OF PRIME IMPORTANCE:

Site selected for the subject project is owned by the proponent. The current site was used for agriculture purposes but now the surrounding land is being converted to be used as industrial land. The land selected for the subject project is not of prime agricultural importance. The establishment of the incinerator here will be out of the city premises and will not cause any disturbance to general public.

3.2.2 SITES OF SPECIAL CULTURAL OR HISTORICAL INTEREST:

There is not any area of historic or cultural importance near the project site, so the impact of the project on destruction of resources of historic and cultural importance is not applicable.

3.2.3 AREAS OF LAND WITH CONSTRAINTS UPON DEVELOPMENT – LAND LIABLE TO FLOODING ETC.

Land is suitable for the development and land is not prone to flooding because history show the area is free from flooding.

3.3 TECHNOLOGY ALTERNATIVE

Incineration of wastes has been widely practiced but alternatives are becoming available such as autoclaving, chemical treatment and microwaving and may be preferable under certain circumstances. Incineration is the method of choice. Lot most

hazardous healthcare wastes and is widely used all over the world. However some recently developed alternative treatment method are also becoming increasingly popular.

Incineration is the method of choice lot most hazardous healthcare wastes and is widely all over the world. Alternatives to incineration are available in many developed countries. As these techniques are either too complicated or very expensive, they are not being used in Pakistan.

Keeping in view all the environmental consideration, best suited technology has been proposed for the said project including no air emissions. Water mitigation techniques are also considered at their best.

However, some techniques used for the healthcare waste disposal are explained below:

3.3.1 STEAM AUTOCLAVING

Steam autoclaving is the most widely used and most efficient alternative healthcare waste treatment technology. Most available autoclaves are designed to handle both biohazard and normal healthcare wastes simultaneously. However they cannot treat pathological animal wastes, chemotherapy wastes and low level radioactive wastes. These wastes have to be treated separately.

Healthcare waste autoclaves usually jointly operate with a shredder and a compactor to minimize the waste volume. In autoclaves the effects of heat from saturated steam and increased pressure decontaminate the healthcare waste by inactivating and destroying microorganisms. There are two types of autoclaves, gravity displacement and pre-vacuum. Those designed for healthcare waste are mostly pre-vacuum.

ADVANTAGES

- Can treat most types of bio healthcare waste
- High level of microbial inactivation of bio healthcare waste
- Does not create hazardous combustion by-products (Dioxin, Furans, etc)
- Produces far fewer emissions than incinerators
- Treated wastes can be land filled along with normal municipal solid waste
- Autoclaves are the most widely used alternative to incineration of bio healthcare waste.

- Autoclaves have extensive field/ historical experience in the healthcare industry
- Many autoclaves require low capital investment
- Easier to operate than incinerator
- The most profitable investment unless there are no regulations at all on incineration emissions.

LIMITATIONS / DRAW BACKS

- Inappropriate for industrial waste
- Most autoclaves do not handle recognizable anatomical wastes
- Do not handle chemo therapeutic or other toxic chemical and radiological wastes
- Large volumes of liquids in sealed containers may not be adequately treated.
- Offensive odors can be generated.
- May exhaust volatile organic compounds
- May require hospital to alter method of separating waste

3.3.2 MICROWAVING

The process combines shredding, steam injection and conventional microwaves to disinfect bio healthcare waste. The microwave process begins when an operator fills the loading bucket with waste. An automatic hoist dumps the material into a hopper at the top of the unit. Before opening, the hopper air is treated with high temperature steam, and then extracted with a high efficiency particulate air filter to capture airborne pathogens. Computers control the shredder and emerges as small bits, unrecognizable as healthcare waste. The granules are automatically conveyed into a treatment chamber where they are moistened by high temperature steam. This mixture runs under a series of conventional microwave generators or waste to energy plants.

ADVANTAGES

- Microwave system is easier to get permitted because it doesn't generate potentially toxic air emissions.
- No obnoxious odors, its quiet

- It eliminates needle sticks and back problems
- Consequently, there is no need for pollution control devices
- The cost for microwaving is about the same as for incineration.

LIMITATION / DRAWBACKS

- Inappropriate for industrial waste
- Not a co-generation process like incinerators.

3.3.3 CHEMICAL TREATMENT

In chemical treatment systems, an anti-microbial chemical such as sodium hypochloride, chlorine dioxide, or per acetic acid decontaminates the waste. Most chemical treatment systems currently in use operate at ambient temperature.

LIMITATIONS / DRAWBACKS

- This kind of treatment could become costly if the waste generated is in large quantity and would require greater amount of chemical
- Chemical treatment requires highly qualified technicians for operation of the process
- Use of hazardous substances also require comprehensive safety measures
- Chemical treatment is inadequate for pharmaceutical, chemical and some type of infectious wastes.

3.3.4 THERMAL SYSTEMS

Some systems use a combination of infrared radiation and forced hot-air convection to treat the waste. The waste then is compacted, preparing it for landfill. Other systems use gamma radiation to heat the waste to disinfecting temperatures. A portion of the solid residue obtained is recycled while the remainder is disposed. Several other thermal systems currently under development use steam, oil, electricity or some form of irradiation as their source of heat.

3.3.5 LAND DISPOSAL

If a municipality or healthcare authority genuinely lacks the means to treat wastes before disposal, the use of a landfill has to be regarded as an acceptable disposal route. Allowing healthcare waste to accumulate at hospitals or elsewhere constitutes a far higher risk of the transmission of infection than careful disposal in a municipal landfill, even if the site is not designed to the standard used in higher income countries.

3.4 CONCLUSION:

The final choice of treatment system is made carefully on the basis of various factors, many of which depend on local conditions

- Disinfections efficiency
- Volume and mass reduction
- Occupational health and safety considerations
- Quantity of wastes for treatment and disposal / capacity of the system
- Types of waste for treatment and disposal
- Locally available treatment options and technologies
- Options available for final disposal
- Training requirements for operation of the method
- Operation and maintenance considerations
- Available space
- Location and surroundings of the treatment site and disposal facility
- Investment and operating costs
- Public acceptability
- Regulatory requirements

Certain treatment options may effectively reduce the hazards of healthcare and industrial waste but simultaneously give rise to other health and environmental hazards. Land disposal may result in groundwater pollution if the landfill site inadequately designed. In choosing a treatment or disposal method the health-care and industrial waste, particularly if there is a risk of toxic emissions or other hazardous consequences it should therefore be carefully evaluated in the light of local

circumstances. So incineration is the best option to be opted for the Hazardous Waste Management in Pakistan.

CHAPTER IV

DESCRIPTION OF THE ENVIRONMENT

4.1 GENERAL

An environmental baseline study is intended to establish a database against which potential project impacts can be predicted and managed later. The EIA of the proposed project covers a comprehensive description of the project area, including the resources which are expected to be affected by the project, as well as, those which are not expected to be directly affected by the construction and operation of the project. The existing environmental conditions around the proposed project have been considered with respect to physical, biological and socio-economic aspects. Site visits were conducted to survey the field area and to collect environmental data on physical, biological and socio-economic parameters. Consultations were held with the general public and stakeholders of the project area in order to seek the public opinion on the implementation of the proposed project.

STUDY PARAMETERS

The existing information to establish a database for the EIA of the project was collected from different government departments; review of previous studies and through the site visits carried out in the project area.

The Social Assessment of the project area was conducted through consultation with the community by interviewing them. Assessment of the area has been carried out distinguishing it into:

STUDY AREA

An area about half a kilometer radius around the project has been considered as influence zone and it has been taken as Study Area (SA) to collect the primary data related to physical, ecological and socio-economic environment.

PROJECT AREA

The boundary of that specific area where the project has been established is taken as Project Area.

4.2 PHYSICAL ENVIRONMENT

The study examines the physical resources, topography, soil, climate, surface and ground water and geology not only of the project site but also the city as whole to assess whether the project under review can or does impact on any of these parameters. The description of physical environment of Lahore city and the project site is present in the following sub sections.

4.2.1 TOPOGRAPHY

The topography of the project area is flat falls in Riverine area. The General height of the area is approximately 181 meters above the Mean Sea Level (MSL). **Figure 1** represents the topography of the area.



Figure 4.1: Topography of Study Area

4.2.2 GEOLOGICAL FORMATION

The geology of the project area is even and alluvial plain. The project area is destitute of mineral wealth.

4.2.3 SOIL

The soil in the Project Area is cohesion less and is of alluvial type deposited by Sutlej River. Various soil layers below the ground level includes: silt, silty clay, silty sand, poorly graded sand with silt, lean clay etc. Soil Map of the Project Area is given in Figure 4.2.

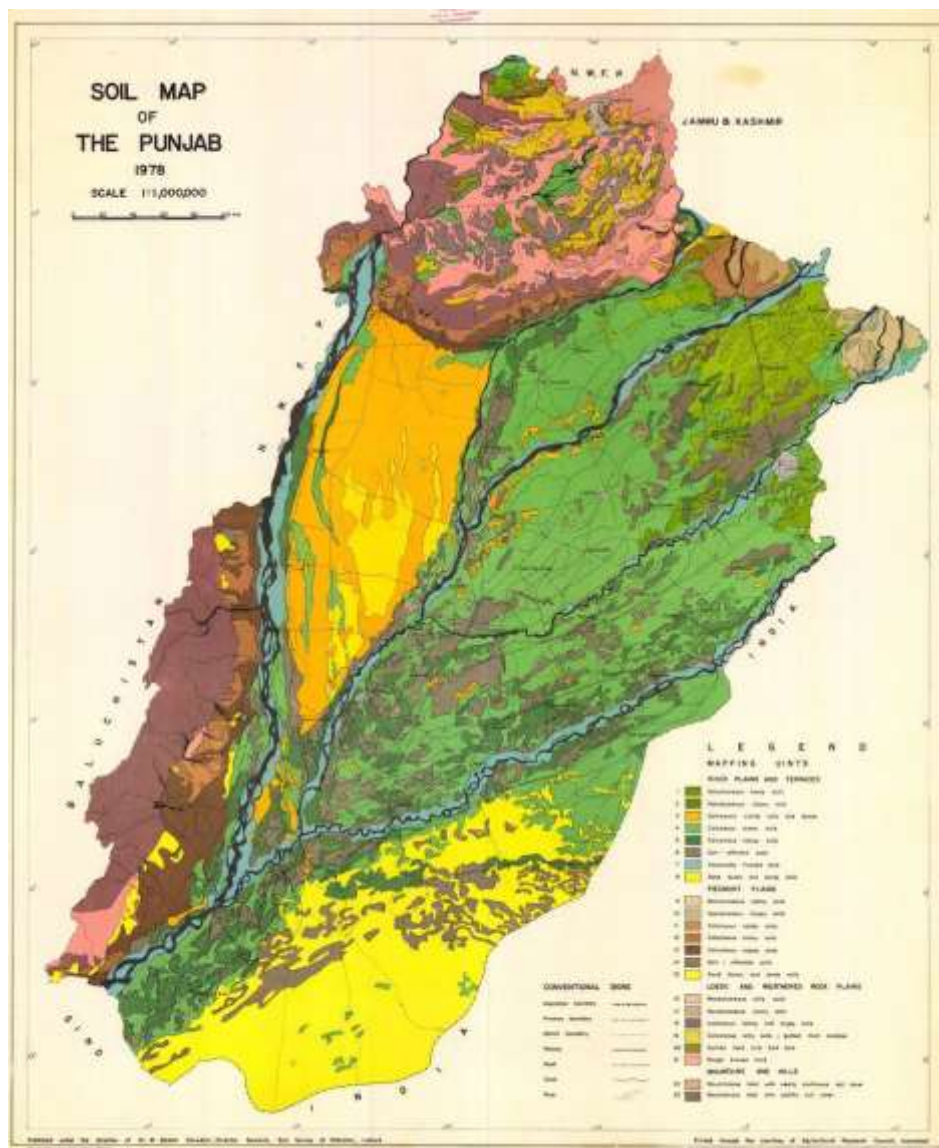


Figure 4.2: Soil Map of the Study area

Alluvium is soil or sediments deposited by a river or other running water. Alluvium is typically made up of a variety of materials, including fine particles of silt and clay and larger particles of sand and gravel. A river is continually picking up and dropping solid particles of rock and soil from its bed throughout its length. Where the river flow is fast, more particles are picked up than dropped. Where the river flow is slow, more particles are dropped than picked up. Areas where more particles are dropped are called alluvial or flood plains and the dropped particles are called alluvium.

4.2.4 CLIMATE

Seasonal climatic conditions must be considered for the design and execution of Project. The climate including air, temperature, precipitation, humidity and evaporation is an influencing factor, affecting the construction of plant and other engineering structures. However, to determine the overall effect of the climatic stresses, daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation must be considered.

The Project Area has extreme climate: it has hot summer and cold winters.

June is the warmest month of the year. The temperature in June averages 35.6 °C. In January, the average temperature is 13.4 °C. It is the lowest average temperature of the whole year. The driest month is November, with 1 mm of rain. Most precipitation falls in July, with an average of 49 mm.

a. Temperature and Precipitation

Average, minimum, maximum temperatures and precipitation for study area is given in following Table 4.1¹

Table 4.1: Temperature and Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Temp. (°C)	13.4	16.4	21.8	27.9	33.1	39.6	34.3	32.9	31.1	26.6	20.4	15.2
Min. Temp. (°C)	5.4	8.5	13.7	19.5	24.8	28.8	28.8	27.7	24.5	18.1	11.4	6.8
Max. Temp. (°C)	21.4	24.4	30	36.3	41.4	42.5	39.8	38.2	37.4	35.2	29.4	23.6

¹ Available on: <https://en.climatedata.org/asia/pakistan/punjab/bahawalpur-3010/>

Precipitation (mm)	6	7	10	6	6	6	49	36	10	2	1	4
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The trends of average minimum and maximum temperature are shown below (Figure 4.3²).

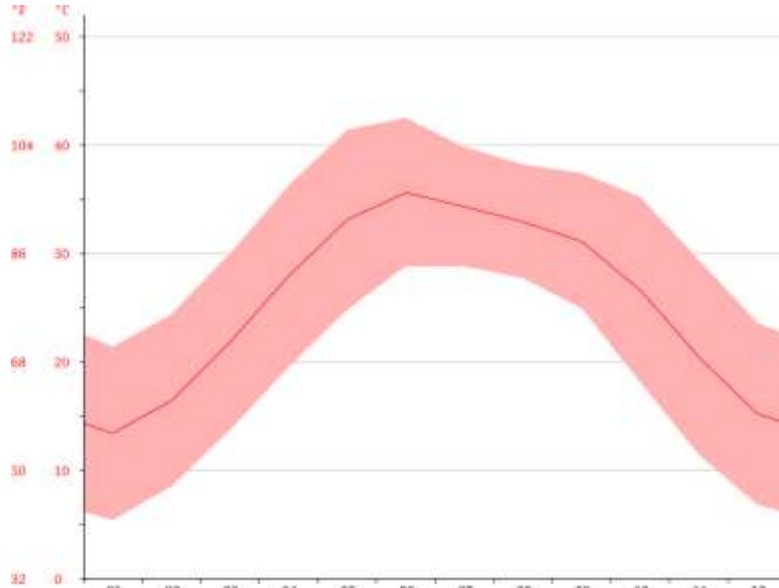


Figure 4.3: Maximum and Minimum Temperature

The trend of average monthly precipitation is shown below (Figure 4.4)³



Figure 4.4: Average Monthly Precipitation (mm)

² <https://en.climate-data.org/asia/pakistan/punjab/bahawalpur-3010/>

³ <https://en.climate-data.org/asia/pakistan/punjab/bahawalpur-3010/>

b. Wind Speed

Wind speed in study area varies throughout the year. The Figure for Bahawalpur shows how many days within one month can be expected to reach certain wind speeds. Monsoons create steady strong winds on the Tibetan Plateau from December to April, but calm winds from June to October. The graphical representation of maximum, average and minimum wind speed for each month is shown below (Figure 4.5⁴).

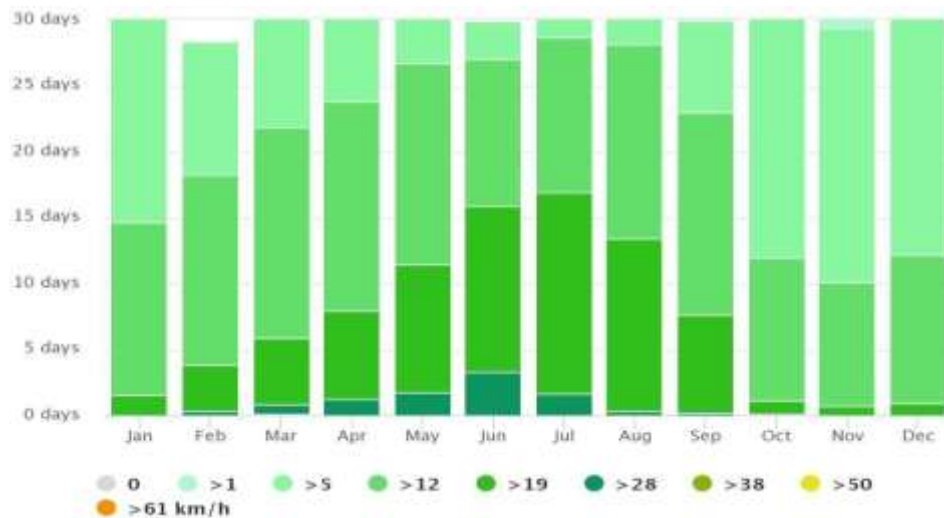


Figure 4.5: Wind Speed

c. Wind Direction

Wind direction of any area shows that from which direction the wind is blowing. For this purpose wind rose diagram is formulated which shows that for how many hours the direction of wind blow from specific direction i.e. from SW to NE etc. the prominent wind direction of district is NS. Wind rose of study area is shown below (Figure 4.6⁵).

⁴

https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/bahawalpur_pakistan_1183883

⁵

https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/bahawalpur_pakistan_1183883

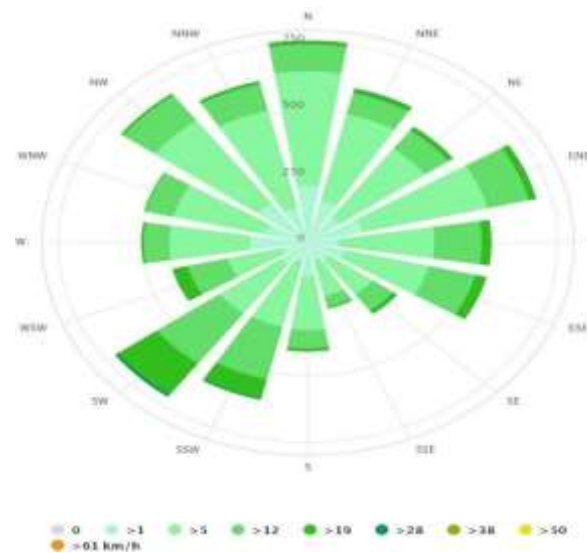


Figure 4.6: Wind Rose Diagram

d. Sunshine

Sunshine of any area shows that how many days are sunny in a month. The sunshine patterns for a specific area vary accordingly. For each month, the number of sunny and cloudy days for study area is shown below (Figure 4.7⁶):

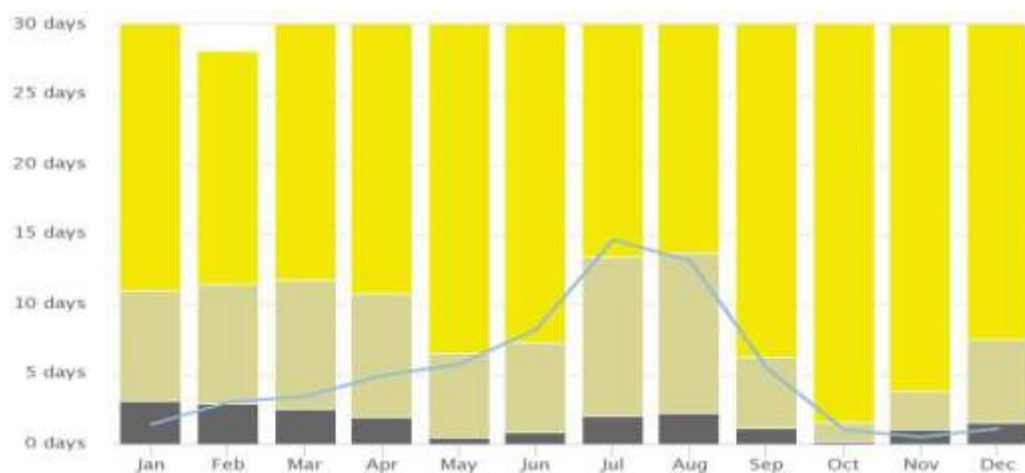


Figure 4.7: Sunshine Patterns

The Figure shows the monthly number of sunny, partly cloudy, overcast and precipitation days. Days with less than 20% cloud cover are considered as sunny, with 20-80% cloud cover as partly cloudy and with more than 80% as overcast.

⁶

https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/bahawalpur_pakistan_1183883

AMBIENT AIR QUALITY

Atmospheric pollution particularly in urban area has a strong impact upon daily life. Lahore is the second largest city of Pakistan. Its economic growth and rising energy consumption are causing the increase in air pollution. The main sources of the air pollution are motor vehicles and industrial activities. SO₂, NO₂, CO₂, CO, O₃ and Particulate Matter (PM) are investigated as the pollution indicators.

4.2.5 WATER RESOURCES

SURFACE WATER

There are no surface water resources like canal or ponds, near the project area.

GROUND WATER

Ground water quality is fresh (defined as acceptable in terms of its salinity). Raw water abstracted from the deep tube wells is believed to be essentially bacteria free.

The water quality in the upper 50 meters zone of subsoil is generally brackish. For city's drinking purposes water is abstracted from groundwater aquifer by means of tube wells located throughout the city. The quality of water is generally adequate for direct consumption. About 83% of city population is consuming groundwater for drinking purposes.

Ground water in the Municipal area is generally saline except along the irrigation canals and the river. The depth of water table varies from 5.5 to 10 meters. Recharge from the canal and river is balancing the extraction presently. The river Sutlej is the main stream of the area, which flows from Northeast to the Southwest. It is the main sources of water supplies and recharge of the groundwater body (in addition to precipitation). The alluvial plain of Upper Indus Basin is also fed by an extensive canal irrigation system. Unconsolidated deposits are widely distributed in the form of alluvial fans. The alluvium is mainly composed of clay, well assorted sand and silt. Near Bahawalpur, the Thar Desert with its finger-like projections of desert and alluvial plain adjoins. In such areas the alluvial projection has sweet water in so-called sweet water pockets. Sand is fine to medium grained

DRAINAGE

Sanitation Services in Bahawalpur are provided by the Tehsil Municipal Administration (TMA). The sewerage system has approximately 24,000 connections according to TMA information. There are 5 existing wastewater disposal (pumping) stations in Bahawalpur.

DRINKING WATER QUALITY

WASA (Water and Sanitation Agency) is providing drinking water to the residents of Bahawalpur. WASA claims the quality of water conform to the Drinking Water Standards.

The increase in population will have direct impact on the water sector for meeting the domestic, industrial and agricultural needs. Pakistan has now essentially exhausted its available water resources and is on the verge of becoming a water deficit country. The quality of water supplies in many cities of Pakistan is deteriorating fast. Over pumping of groundwater due to extended drought has affected the water quality adversely.

Table 4.2: Surface Water Quality Standards

Sr. No.	Parameters	Unit	NEQS
1	Temperature	°c	≤ 40
2	pH	-	6-9
3	Color	Pt-Co	-
4	Biochemical Oxygen Demand (BOD5)	mg/l	80
5	Chemical Oxygen Demand (COD)	mg/l	150
6	Total Suspended Solids (TSS)	mg/l	200
7	Total Dissolved Solids (TDS)	mg/l	3500
8	Oil and grease	mg/l	10
9	Phenolic compounds	mg/l	0.1
10	Chlorides Cl-1	mg/l	1000
11	Chlorine (Residual)	mg/l	-
12	Flouride F-1	mg/l	10

13	Cyanide	mg/l	1.0
14	Anionic Detergent	mg/l	20
15	Sulphate	mg/l	600
16	Sulphide	mg/l	1.0
17	Ammonia	mg/l	40
18	Cadmium	mg/l	0.1
19	Chromium	mg/l	1.0
20	Copper	mg/l	1.0
21	Lead	mg/l	0.5
22	Mercury	mg/l	0.01
23	Selenium	mg/l	0.5
24	Nickel	mg/l	1.0
25	Silver	mg/l	1.0
26	Zinc	mg/l	5.0
27	Arsenic	mg/l	1.0
28	Barium	mg/l	1.5
29	Iron	mg/l	8.0
30	Boron	mg/l	6.0
31	Calcium	mg/L	0.5

Ground water quality testing was carried out to determine its suitability for use. Testing data shows that ground water is suitable for drinking. The results of ground water analysis shows, almost all the parameters are within safe limits of PEQS.

4.2.6 NOISE LEVEL

Noise level was also measured on project site, the noise level recorded at project site was within PEQS.

4.2.7 SEISMOLOGY

Study area is located in the tectonic zone of down wrap and platform slop in the seismic zone of noticeable earthquake from 3.1 to 4.9 on Richter scale (Atlas for Pakistan). According to building code of Pakistan prepared by NESPAK recently, it is

located in Seismic Zone 2A of Pakistan (Lower limit of moderate damage). Zone 2A represents peak ground acceleration (PGA) from 0.08 to 0.16g. **Figure 4.9** shows the seismic zoning map of Punjab with the Project Area falling under Seismic Zone-2A.

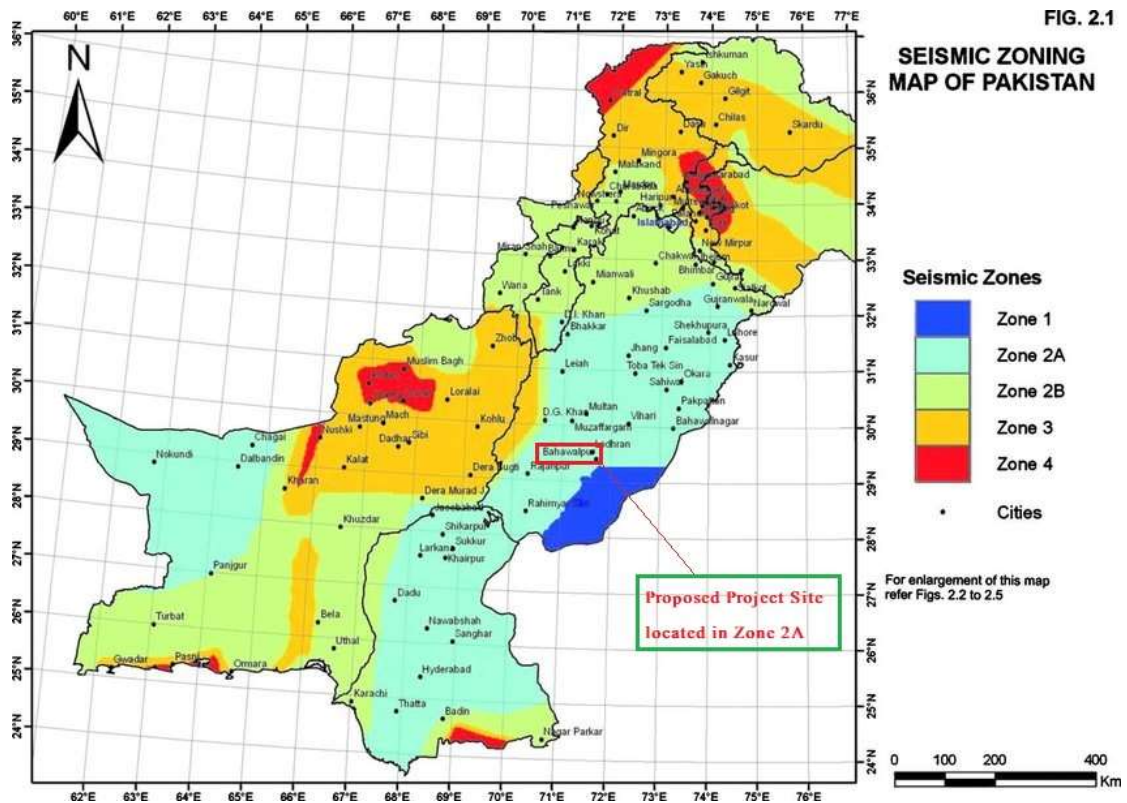


Figure 4.9: Seismic Zoning Map of Punjab

4.3 ECOLOGICAL ENVIRONMENT

The ecological environment of an area is generally considered sensitive to large-scale developments. Disturbances and imbalances in the ecological environment can adversely affect biodiversity features of an area. The biodiversity of an area generally reflects the abundance and richness of the biological and the ecological resources.

4.3.1 FLORA

No significant flora is present in the study area. Some shrubs and grasses were found in study area grown on the bank of roads and open spaces. Although common trees have been grown in the study area including Kikar, Mulbury, Phulahi and Eucalyptus, etc. The detail of the trees is given below in [Table 4.3](#). No forest was found in the study area.

Table 4.3: Common Trees & Plants of Study Area

Sr.#	Scientific Name	Local Name
1	Acacia Karoo	Kikar
2	Morus	Mulbury
3	Acacia modesta	Phulahi
4	Eucalyptus globulus	Eucalyptus

a. GRASSES

The names of common grasses that are found in study area are given in [Table 4.4](#)

Table 4.4: Common Grasses of Study Area

Sr.#	Scientific Name	Common Name
1	Lasiurus scindicus	Sewen
2	Cenchrus ciliaris	Dhaman
3	Panicum antidotale	Morrot
4	Pennisetum purpureum	Sarkanda

b. SHRUBS AND HERBS

The shrubs and herbs provide nutritious supplemental feed to livestock during lean period because they are perennial and have depth root systems. Some of the common shrubs and herbs present in study and project area are Karer, Jand, Aak, Kana and Lana; Botanical names of which are shown below in [Table 4.5](#):

Table 4.5: Major Shrubs and Herbs of Study Area

Sr. No.	Local Name	Botanical Name
1	Karer	Capparis Decidua
2	Jand	Prosopis Cineraria
3	Aak	Calotropis Procera
4	Kana	Sueda Fruticosa
5	Lana	Saccharum Munja

c. ENDANGERED FLORAL SPECIES

No such plant species is encountered at study area that is endangered or declared protected under national, provincial or local government definitions as well as international agreements/protocols ratified by Government of Pakistan.

4.3.2 FAUNA

The study on terrestrial fauna in the study area is based upon the field investigation and reports of Forest Department. A variety of animals found in study area which are categorized as Mammals, Birds, Reptiles and Amphibians.

a. MAMMALS

Some of the common Mammals found in study area are Urial, Dog and Monkey. Following table gives the Common and Zoological names of Mammals:

b. BIRDS

Native species of birds present in study area are pigeon, sparrow, crow, golden orioles, wood peckers and black partridges. Common and Zoological names of birds are given in Table 4.6:

Table 4.6: Major Birds present in Study Area

Sr. No.	Common Name	Zoological Name
1	Pigeon	Columbidae
2	Sparrow	Passeridae
3	Crow	Corvus
4	Golden orioles	Oriolus oriolus
5	Woodpeckers	Picidae
6	Black partridges	Melanoperdix niger

c. REPTILES AND AMPHIBIANS

The native species of reptiles and amphibians observed in Study Area are Snake, Lizard and Frog.

Table 4.7: Reptiles and Amphibians of Study Area

Sr. No.	Common Name	Zoological Name
1	Snake	Serpentes
2	Lizard	Lacertilia
3	Frog	Anura

a. ENDANGERED FAUNAL SPECIES

The endangered species present in study area is Urial which has been declared protected under national, provincial or local government definitions as well as international agreements/protocols ratified by Government of Pakistan.

WILDLIFE SANCTUARIES AND GAME RESERVES

No wildlife sanctuary or Game Reserve is located in the vicinity of the study area.

CRITICAL HABITATS

No wild life sanctuary or game reserve (Critical Habitats), exists near the project area or the study area and therefore it can be stated that this project does not affect any critical habitat as, no critical habitat is located close to the project area.

4.4 SOCIO ECONOMIC ASSESSMENT

Social change is the consequence of almost any intrusion into the community life of any society. The intrusion can be in the form of any developmental projects or nonspecific, less tangible forms such as increased exposure to other cultures, technological changes and so on. The social change that results from intrusion into community life can also be beneficial, but can have undesirable or negative outcomes. Even that change in the long run may have positive effect on the social well being of a community.

Social Impact Assessment is a methodology used for examining social change due to external sources, especially specific developmental projects, but also government policies, technological changes and social processes or anything that has a social impact.

The objectives of the given study are outlined as follow:

- To carry out the assessment of social impact.
- Acquire socioeconomic data to evaluate and identify the project interventions.
- Assess needs of community related environmental concerns.
- To assess adverse and beneficial socioeconomic and health impacts of the activity.
- To suggest remedial measures and solutions to improve socio economic

conditions.

- To analyze socio economic conditions of community, with special reference to environment and conservation of natural resources.

4.4.1 DEMOGRAPHIC PROFILE OF BAHWALPUR

According to the 2017 population census the district has a population of 1,281,199. From 1998 to 2017, the population grew with an estimated average annual growth rate of 1.84 %. Population Statistics of district Bahawalpur is given below in [Table 4.8](#):

Table 4.8: Population Statistics of Bahawalpur District

District/Tehsil	Population	
	2017	1998
Bahawalpur District	3,668,106	2,433,091
Hasilpur Tehsil	456,006	317,513
Khairpur Tamewali Tehsil	262,628	184,914
Yazamn Tehsil	614,143	405,787
Ahmedpur East Tehsil	1,078,683	718,297
Bahawalpur City Tehsil	681,696	419,542
Bahawalpur Saddar Tehsil	574,950	387,038

4.4.2 HEALTH FACILITIES

The health facilities including various healthcare centers, hospitals, dispensaries, basic health units, dental clinics and city healthcare centers are present in the study area, aim to provide the citizens best healthcare facilities and prevention from contagious and other harmful diseases.

There is no health facility or any dispensary near the project area.

4.4.3 EDUCATIONAL FACILITIES

There are number of government and private schools, colleges and universities are being functional in the study area which is imparting education to the locals.

There are no any main private or government school seen in the nearby vicinity of the proposed site however there are some private educational institutes which include

schools, madrassa and academies are present at approximately 4-5km away from the site.

4.4.4 TRANSPORTATION AND COMMUNICATION

Public transport is not available in the project area. The public transport terminals there are plenty of rickshaws are available which run on compressed natural gas to reduce pollution in the city and of course the few residents and site owners have their own conveyances.

RAILWAYS

The national intercity railway line is passing through the city.

4.4.5 INDUSTRIAL ACTIVITIES

Industries are the most important industries playing fundamental role in the economy of the area. The proposed project will be constructed on agricultural area. The nearby industry, Karnal flour mills is located at an aerial distance of 1.3km.

4.4.7 WATER SUPPLY

The proposed project will use groundwater. The water will be used only for the domestic purposes during construction phase. While during operational phase, water will be used for domestic as well as for cooling purpose.

4.4.8 ELECTRIC SUPPLY

MEPCO power supply will be available at the proposed site. Application for electricity connection is submitted to the concerned department. Apart from that, they are planning for a backup system to overcome the load shedding and sudden electricity breakdown. The proposed back up plan will be comprised of generator of capacity 100 kVA.

4.4.9 TELEPHONE FACILITIES

Landline and Cellular telephone facilities are present in the area and proposed site will purchase their own landline service for the office and factory.

4.4.10 INFRASTRUCTURE

The road infrastructure is generally good for existing requirements; this includes the roads condition and road lanes, chowks. Project area can be accessed through National Highway Lahore-karachi . Most of the families live there in houses made up of cement and bricks.

4.5 QUALITY OF LIFE VALUES

The proposed project site is surrounded by other industrial units as well as open plots. There is no any planned residential area near the project site therefore, individuals and workers from neighboring areas were interviewed. The individuals assessed from the neighboring communities of the project area were involved in agricultural practices and private jobs in nearby industries. Most of the people work in the shops or small units.

Neighboring community inhabitants involved in different occupations were asked about their monthly income but most of them hesitated to tell and stated that they earn just enough to fulfill their basic demands. Regarding the project, almost all of the interviewed members are in favor of the project as it will not involve any operational activities which will generate pollution rather this project intends to abate pollution by incineration process.

Data was also collected to assess the health status of the community members at the project site. Complaints about different diseases were also recorded during the study. The diseases prevalent in the community were stomach disorders, fatigue, joint pain, diabetes and arthritis. But it is observed that all these diseases are commonly due to improper diet and water contamination.

RELIGION

Most residents are Muslims, while other minorities like Hindu etc. are very small in number.

ETHNIC STRUCTURE

The principal inhabitants of the region surrounding Bahawalpur are Jat and Baloch peoples.

MOTHER TONGUE

The mother tongue refers to the language used for communication between parents and their children in any household. The local language is Saraiki, while Urdu and English is the official language used by various institutions of education and administration.

SITES OF HISTORICAL SIGNIFICANCE IN BAHAWALPUR

Bahawalpur city has a rich heritage, and is an important hot spot for historians and archaeologists too. There are several historic sites in the district, including Uch, an ancient town southwest of Bahawalpur.

Bahawalpur is renowned for its exceptionally delicate pottery, cotton, silk, embroidery, carpets and. The Punjab Small Industries Corporation (PSIC) has set up a Craft Production Center for the Cholistan Region outside Farid Gate, Bahawalpur.

CHAPTER FIVE

INVOLVEMENT OF STAKEHOLDER/ PUBLIC CONSULTATION

5.1 SOCIAL IMPACT ASSESSMENT

Social Impact Assessment is a methodology used for examining social change due to external sources, especially specific developmental projects, but also government policies, technological changes and social processes or anything that has a social impact. We define social impact assessment in terms of efforts to assess or estimate, in advance the social consequences that are likely to follow from specific proposed project. The social change that results from intrusion into community life can also be beneficial but can have undesirable or negative outcomes. Even that change in the long run may have positive effect on the social well-being of a community.

5.2 OBJECTIVES

The foremost objectives of social impact assessment are:

- Acquire socioeconomic data to evaluate and identify the project intervention
- Evaluate needs of community related environmental concerns
- To evaluate adverse and beneficial socioeconomic and health impacts of the activity
- To give suggestion and find solutions to improve socio economic conditions
- To analyze socio economic conditions of community, with special reference to environment and preservation of natural resources

5.3 STAKEHOLDERS CONSULTATION

It is a mean of involving the both primary and secondary stakeholders in the project decision making process in order to address their concern, improve project design and give the project legitimacy. The stakeholders' consultation has been conducted in a participatory and objective manner to enhance the project stability.

Public discussions were held with the inhabitant of the surrounding area. They are quite positive to the project and see the project as growing business. The people

observe strong positive impacts regarding employment, business and structural development due to this project. EIA findings depict that people perceive overall positive social and economic impacts by the project. Their attitude towards the project operation is highly optimistic. Majority of the people are convinced for development in the area and they correlate this progress with the pace of their social mobility but they were also concerned with scenic beauty of the area and employment which the proponent has ensured to maintain the aesthetics of the area, reclaim the land and also to provide jobs/employment during construction and at the time of functioning of the project. Moreover, project proponent admitted to adopt all the mitigation measures to control any impacts resulting from the subject project.

5.4 IDENTIFICATION OF STAKEHOLDERS:

The identification of stakeholder is important for the sustainability of a development project. Stakeholder will be identified as the people who may directly or indirectly affected by the project activities. This will be helpful in predication and assessment of project impacts at an early stage; and accordingly, appropriate mitigation measures can be suggested. The stakeholders that are likely to be influenced by the project activities or would like to participate in the project will include the following

- Communities in the project or surrounding area;
- Government Departments;
- Non-Governmental Organizations (NGO) and community Based Organizations

PROPONENT

Possible impacts and mitigation measures related to the subject incinerator project were discussed with the project proponent and management. They assured to take all suggested mitigation measures to control any deviation arose by the project and to make the project Environmental friendly.

RESPONSIBLE AUTHORITY

Management of M/S Lion Waste Management Pvt. Ltd. is the responsible authority to take all mitigation measures prior to the construction and operational activities.

OTHER DEPARTMENTS AND AGENCIES

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

ENVIRONMENTAL PRACTITIONERS AND EXPERTS

Team of Eco Syntec Consulting Services (ESCS) visited the project site, had discussion with stakeholders and consulted with the local people of nearby and other villages to evaluate the project socioeconomic impacts. People of the area belong to different professions like mostly belong to employment, own businesses, doctors, some of them communicated but according to social value of the area they mostly hesitate to communicate comfortably and get pictured. People provide the massive information about the project and have positive remarks regarding the project development.

TARGET POPULATION

The target population was comprised of the Site workers and the people living nearby the site area.

5.5 METHODS OF PUBLIC CONSULTATION

Public Consultation was carried out for two days. The following methods were used for public consultation with project stakeholders in order to ascertain their concerns regarding project implementation.

- Focused Group Discussion (FGD)
- Scoping Sessions
- Formal Group Meetings
- Informal Group Meetings

5.5.1 STUDY AREA

The proposed plant site and its surrounding areas were visited for socio-economic aspects. The people of following surrounding village of the proposed plant site were consulted:

- Jageer Abbaspur

Data was analyzed for the selected parameters for the socioeconomic assessment of community members. Microsoft excel (2019) was used to graphically represent the main finding of the social survey.

5.5.2 STUDY SIZE

About twenty-three (30) individuals from general community with different socio-economic conditions were surveyed. These were ranged in age from 20 years to more than 50 years. The information of these respondents is summarized in table 5.1 below.

Table 5.1: Details of Consulted Stakeholders

Sr. No	Name	CNIC / Contact number	Address	Suggestions
1	Muhammad Yousaf	31201-03179550-7	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Create Job opportunities for local people
2	Muhammad Asghar	31201-4687905-2	Imam Arrain, Tehsil Ahmadpur, District Bahawalpur	No Complain.
3	Muhammad Khalid	31201-6185808-1	Abbaspur, Tehsil Ahmadpur, District Bahawalpur	No Complain
4	Saeed Anwar	31201-6269454-9	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	No Complain
5	Mehboob Bhatti	0301-7725562	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people.
6	Muhammad Hashim	31201-5068090-5	Post Office TibhiIjatpur, Tehsil Ahmadpur, District Bahawalpur	No Complain
7	Muhammad Alaziz	31021-4949541-5	Amaom Rai, Tehsil Ahmadpur, District Bahawalpur	Create Job opportunities for local people
8	Muhammad Shabir	0300-43277140	Basti Bhattian, Tehsil	Project will

			Ahmadpur, District Bahawalpur	prove helpful for people
9	Abdul Rasheed	310201-9028964-5	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people
10	Muhammad Hamdi	31021-0293664-1	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	No Complain
11	Yar Muhammad	31201-3317484-3	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Create Job opportunities for local people
12	Rana Bilal	31201-5627273-7	Chak no 156, Tehsil Ahmadpur, District Bahawalpur	Create Job opportunities for local people
13	Muhammad Tariq	31201-8152045-3	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people
14	Ghulam Mustafa	31201-6764342-7	Basti Ginwan, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people. They need to create Job opportunities for local people
15	Muhammad Niaz	31201-6529643-1	Basti Ghagra, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people. They need to create Job opportunities for local people
16	Pir Baksh	31201-1653103-9	AmamuArrain, Tehsil Ahmadpur, District Bahawalpur	No Complain
17	Chand Wada	31201-1953977-7	Mohallah Sher Shah Town, Post Office Sawans, Mianwali	No Complain
18	Muhammad Tahir	0303-8415753	Nil Basti, Kasmabad	Create Job opportunities for local people
19	Muhammad Sadir	31021-6943940-5	Jageer Abbas, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people.

20	Khuda Baksh	31201-0300036-3	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	No Complain
21	Saeed Ahmad	31201-0300024-7	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people. They need to create Job opportunities for local people
22	Allah Ditta	31201-0299325-9	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people. They need to create Job opportunities for local people
23	Bilal Ahmad	31201-0299322-9	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people.
24	Muhammad Iqbal	31201-9115373-1	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people. They need to create Job opportunities for local people.
25	Abdul Gafoor	31201-0300029-5	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people. They need to create Job opportunities for local people.
26	Muhammad Pathan	31201-6714573-1	Qadarpur, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people. It should be done.
27	Muhammad Shad	0301-4601734	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Provide Job opportunities for local people.
28	Mushtaq Ahmad	31201-6297923-1	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	Project will prove helpful for people.
29	Muhammad Ali	0304-1041937	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	No Complain
30	Muhammad Riaz	0308-4641236	Basti Bhattian, Tehsil Ahmadpur, District Bahawalpur	No Complain

5.5.3 STUDY INSTRUMENT

Data collection tool used was questionnaire; it was 18 items based semi structured questionnaire attached as Annex-3. The questionnaire was designed to address education, employment and population issues. Their responses were duly recorded. Some of the questions were asked not only to get the information but also to get the impression of an interviewee.





Figure: 5.1 Photolog of Social Survey

5.6 RESULTS OF SOCIO-ECONOMIC DATA COLLECTION

The questions were designed in order to know that what inhabitants think about the proposed project and it was amazing to note that majority of the population think in the positive manner about the installation and expansion of new industries in their area. The people foresee strong impacts regarding employment, business and structural development due to this project. The management of M/S Lion Waste Management Pvt. Ltd. ensures its commitment towards maintaining the aesthetics and environmental quality of the area, land reclamation and providing job opportunities subject to relevant skills assessment of the local community during construction and operation of the project.

Table 5.2: Analysis community problem and solution

Main Theme	Concerns	Solutions
Employment	To engage local people during construction and operation phases on priority basis	M/S Lion Waste Management Pvt. Ltd. will engage local people on priority basis It will develop job opportunities

		for the locals based on skills assessment of individuals
Environmental Impact	Air pollution and noise impacts need to be properly mitigated	<p>M/S Lion Waste Management Pvt. Ltd. will ensure water sprinkling for mitigation of issues related to dust/PM.</p> <p>Tree plantation act as natural noise barrier.</p> <p>Process and instrument efficiency ensure mitigating problems related to noise and air pollution.</p>

Table 5.3: Awareness about project

Awareness Regarding the Proposed Project	Acceptability of the Proposed Project
Although people did not know the exact project; 80 % respondents were aware about the increased industrial activity in the area in upcoming years.	100% favored the Project with demand of job opportunities for the local

5.7 RESULTS

5.7.1. DEMOGRAPHIC PROFILE

The participants of the survey were interviewed to get information about their personal details such as age, education, marital status, religion, number of children and family size. The findings of the personal information are given below:

Age of Respondents

Respondents were asked about their age in which age of 20% of them were ranged between 20-30 years, 37 % respondents ages were 30 to 40years, 27% respondents age were 40 to 50 years, 16% respondents ages were more than 50 years.

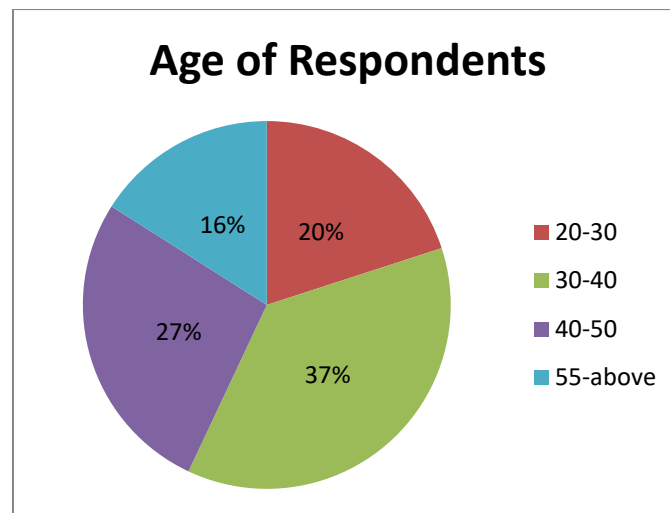


Figure 5.2: Graph Showing Age of Respondents

Education Level

During Survey respondents were asked about their educational level, 57% of them were uneducated, 33% were studied till middle level and 20% respondents reported that their educational level was primary respectively.

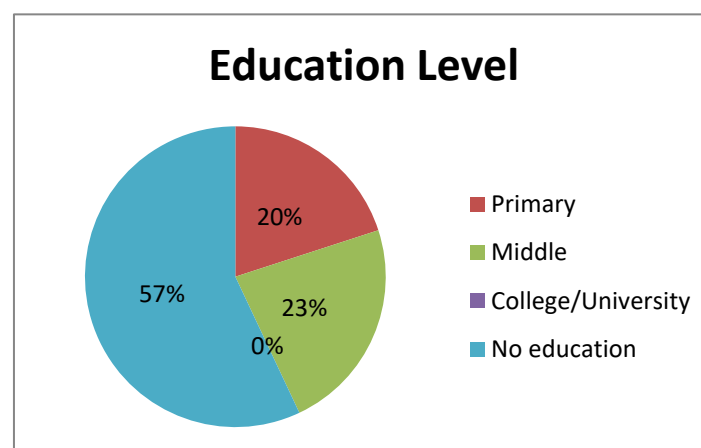


Figure 5.3: Graph Showing Educational Level of Respondents

Marital status

Respondent were asked about their marital status in which 87% respondents reported that they were married and rest were single.

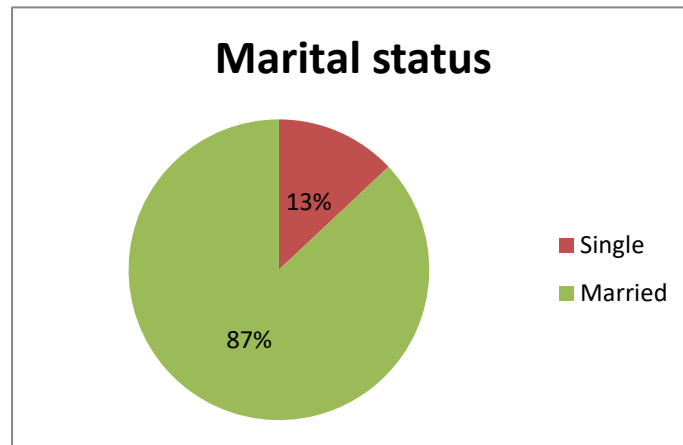


Figure 5.4: Graph Showing Marital Status of Respondents

Religion of Respondents

Respondents were asked about their religion in which all of them reported that they were Muslim as shown in figure 5.5.

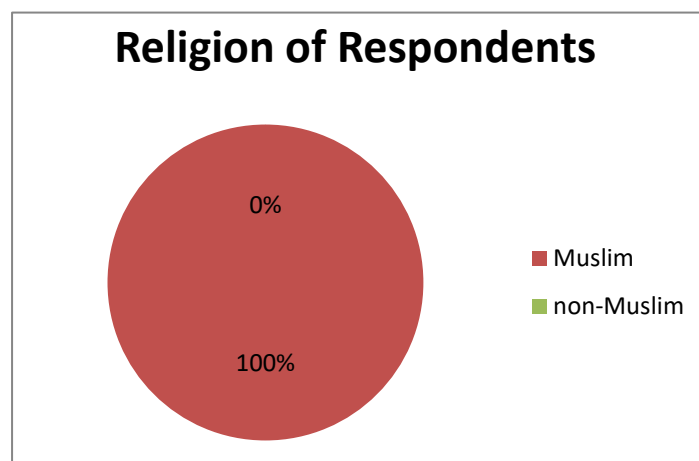


Figure 5.5: Graph Showing Religion of Respondents

Family size of respondents

During survey respondents were asked about their family size in which 10% reported that their family consists of two to four members, 26% and 67% respondents reported that their family size is five to seven and eight to twelve respectively.

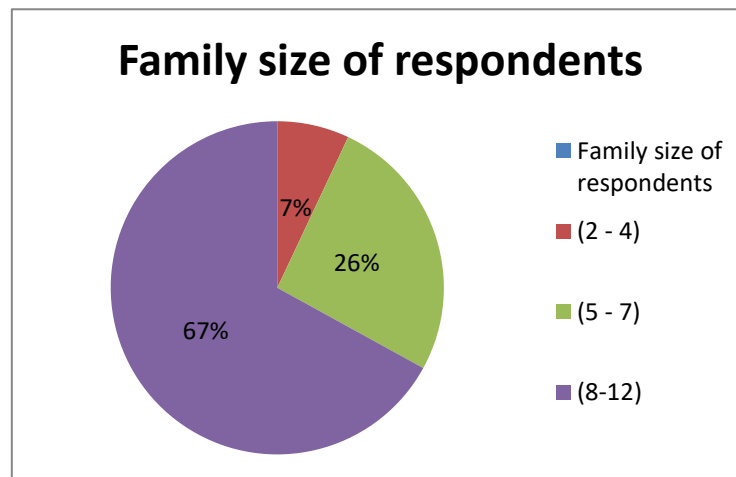


Figure 5.6: Graph Showing Family Size of Respondents

Number of Children

During survey respondents were asked about number of children they had and 20% respondents informed that they had no child, 33% had less than three children, 44% respondents had more than three, and 3% had more than seven children.

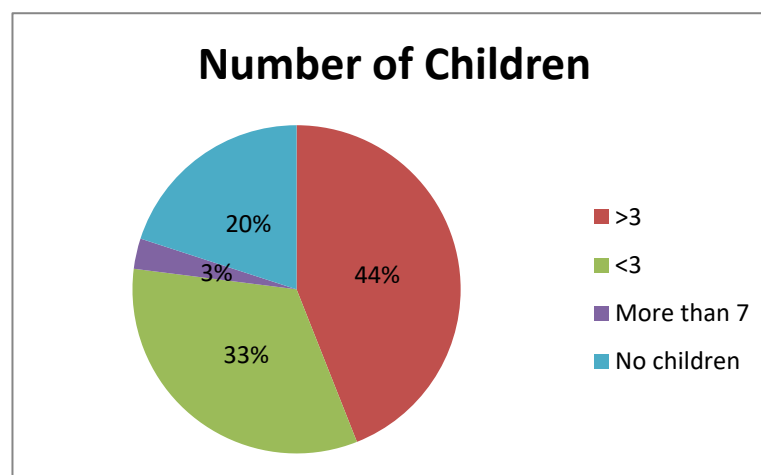


Figure 5.7: Graph Showing Number of Children of Respondents

5.7.2. SOCIOECONOMIC AND HEALTH STATUS

The socioeconomic status of the respondents was evaluated by getting information about their income level, sources of income and number of earning hands in the family.

Income Level

During survey respondents were asked about their income level (in PKR) 53% respondents reported that their income level was 5000 to 10,000, 30% respondents reported that their income level was 11,000 to 15,000, 10% respondents reported that their income level was between 16,000-25,000 and 7% of respondents had more than 25,000 income.

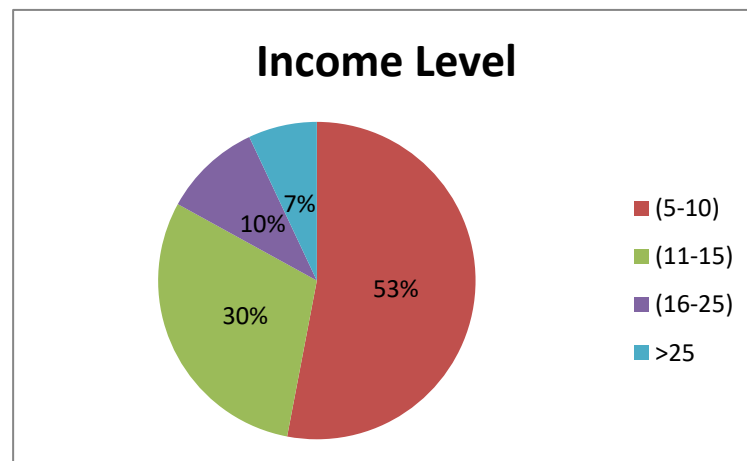


Figure 5.8: Graph Showing Income Level (PKR) of Respondents

Occupation & source of income

Respondents were asked about their occupation and 47% were land owners, 26% were labor, 17% were doing a job, and 10% were farmer.

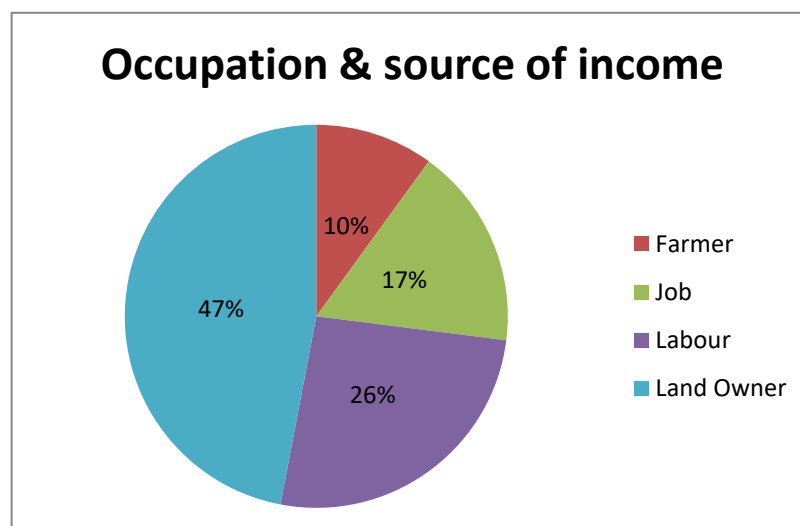


Figure 5.9: Graph Showing Occupation of Respondents

Earning Member in Family

About 57% respondents reported that there was only one earning member in their family, 30% respondents were having more than 2 earning members, 10% were having 3 earning members in their family and 3% were having more than 3 working family members.

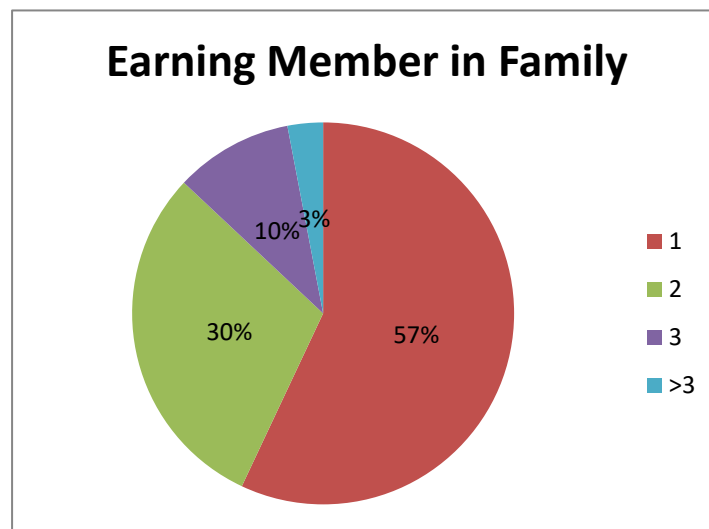


Figure 5.10: Graph Showing Earning Member in Respondents Family

Disease in Respondents

Respondents were asked about disease if they have 93% respondents reported that they had no disease and 7% respondents informed that they had disease. Blood Pressure, Diabetes etc in the family.

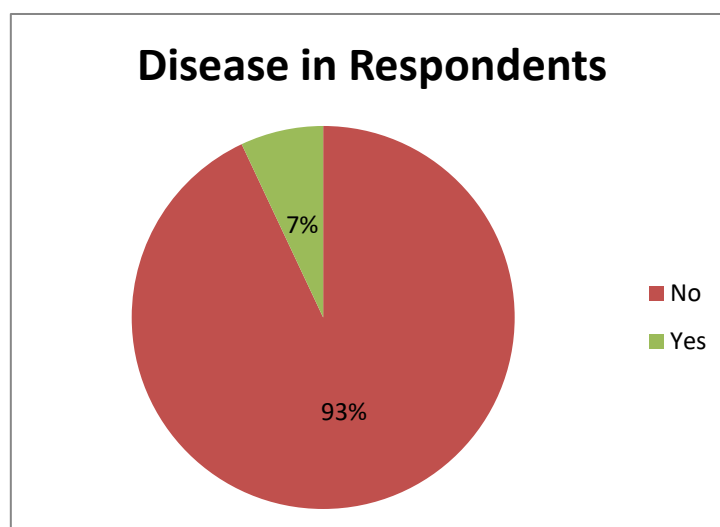


Figure 5.11: Graph Showing Disease

5.7.3. ANTICIPATED ENVIRONMENTAL IMPACTS

The survey group was asked about a few questions regarding their concerns about the environmental impacts of the proposed project. It included an array of questions regarding anticipated impacts on water, soil and air quality. They were also asked if they foresee generation of wastewater, solid waste and accidents related to project activity. These are summarized below:

Water

During survey respondents were asked about anticipated impact caused by project activity on Water. Interestingly, all of them answered as No Impact on water.

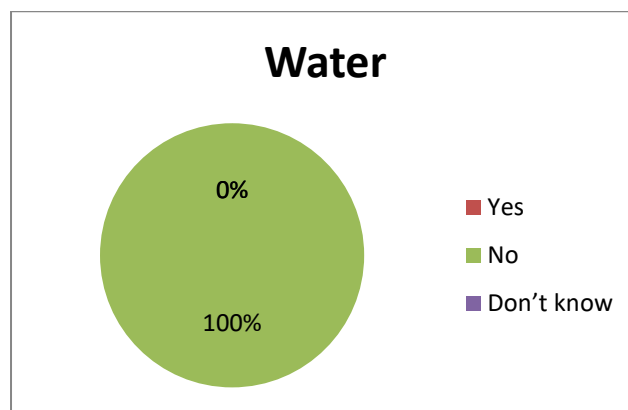


Figure 5.12: Graph Showing Impact Anticipated Caused by Project on Water

Soil

Respondents were asked about anticipated impacts on Soil and 85% respondents answer was No, while 15% remarked as "They don't know".

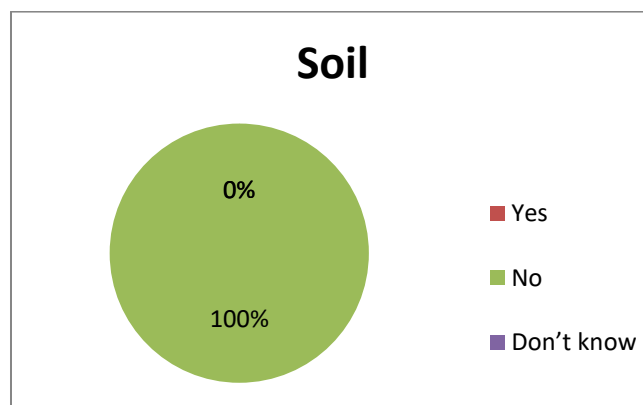


Figure 5.13: Graph Showing Anticipated Impact on Soil

Air

As per survey, 50% respondents remarked that they observed no impact on the air quality of the area and 10% of them remarked as yes, while 90% remarked no.

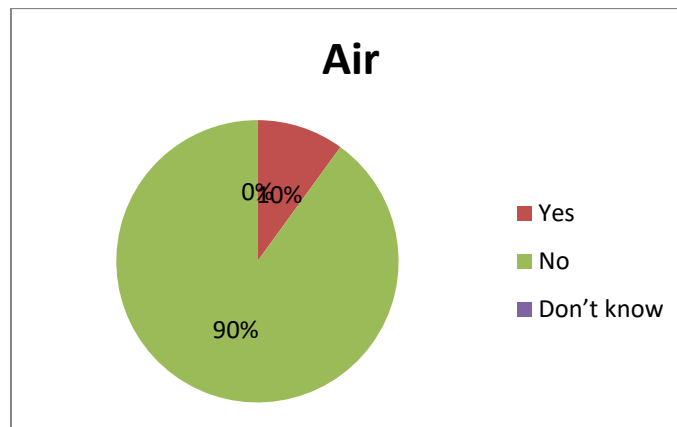


Figure 5.14: Graph Showing Anticipated Impact on Air

Noise

During survey, respondents were asked about anticipated noise pollution in the area and majority (97%) of respondents' response was no while 3% said yes.

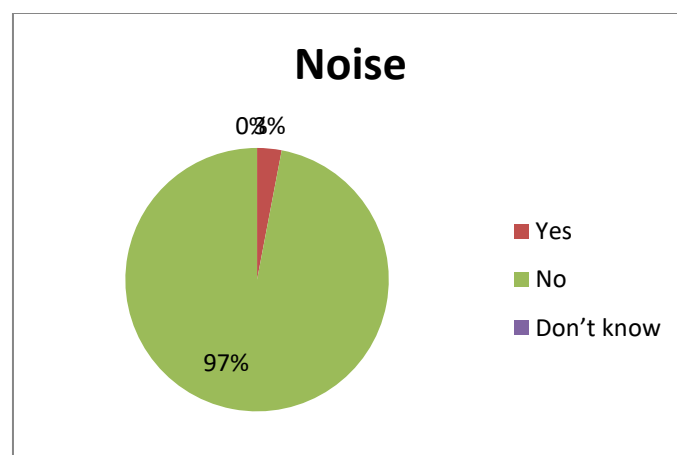


Figure 5.15: Graph Showing Anticipated Impacts on Noise

Solid waste

During survey respondents were asked about solid waste generation due to proposed incinerator project and most of them (100%) remarked as no impact has been expected while 0% remarked as Yes.

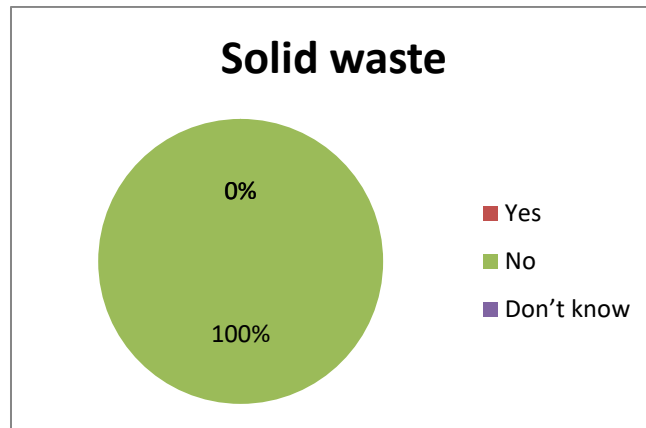


Figure 5.16: Graph Showing Anticipated Impacts of Solid Waste

Wastewater

About 100% of the participants of this survey informed that they didn't expect issue of wastewater due to project whereas no one of them expressed their views as they didn't know about the impacts caused by proposed project.

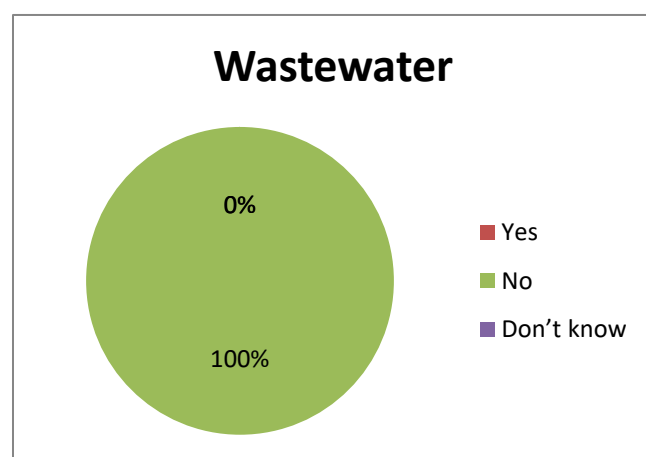


Figure 5.17: Graph Showing Anticipated Impacts Caused by Water Waste

Accidents

During survey respondents were asked about any accident that might be caused by proposed project site and majority (100%) of respondent's answer was No.

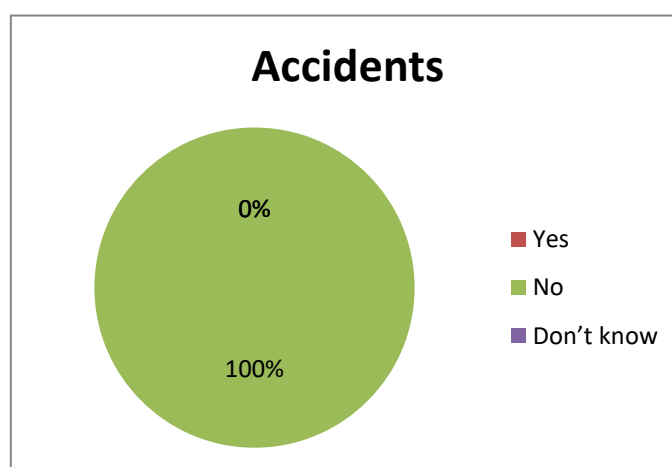


Figure 5.18: Graph Showing Percentages of Accident Anticipated by Project Activity

5.8 MAJOR FINDINGS

Following are the findings of the socioeconomic impact assessment:

- Most of the population was uneducated with a poor source of income. Also, the numbers of earning hands per family were less.
- According to collected data respondents were of opinion that project is good for business and employment. They were of the view that local people should be given preference for employment in the proposed project

5.9 STAKEHOLDER CONCERNS AND RECOMMENDATIONS

The community consultations demonstrated that goodwill towards the project proponent indeed exists. Approval for project activities by communities was evident. The consultations were considered a good gesture and were appreciated. Number of earning hands is such that communities are looking forward to any project proponent to improve their financial well-being to a great extent

During interviews with different inhabitants of the community, it was found that some of the people were aware and most of them were in favor the project only because they believed that such projects might provide job opportunities for people of the area. For them earning at any level is equally important. It is the most effective and attractive source of income for them.

It was observed through interviews that some of the diseases were seen more often with the seasonal variations, but still the common diseases narrated by the community inhabitant included heart problem, arthritis, paralysis, allergy and cancer.

After assessing the impacts of the proposed project of Lion Waste Management Pvt. Ltd. on socioeconomic and health status of local inhabitants, it was observed that the project had insignificant adverse socioeconomic and health impacts. The proposed environmental mitigation measures in EMP has adopted well, in fact the project proves to be beneficial for the people in regard to the job opportunities hence it also contributes in the improvement of socioeconomic status of the inhabitants. Socioeconomic and health status are interlinked. The project not only helps to provide support in terms of economic uplift but also helps in improving the health status of inhabitants and environment of the area.

SOCIAL MANAGEMENT PLAN

Potential socio-economic impacts to accrue from the project activity are described as under:

- The proposed Project has provided jobs to workers during construction and regular operations of the proposed incinerator site.
- Both Provincial and Federal Governments have received taxes and duties on recurring basis.
- Basic infrastructure of the area has improved.
- Supply of vendors' services is yet another opportunity of earnings for the people of the area.
- Supply of edibles like fruit, milk and other food items to project team is another source of income for the local.

Addition to the awareness of the people has set trends in getting education among the people of the project area. It has improved their social status thus bringing a lot of tangible change in the overall life style of the people.

Recommendations and Mitigation Measures

The following recommendations are made preliminary and will be adjusted based on the results of the Social Impact Assessment process.

Based on the initial benchmark study, the following preliminary recommendations will be further adjusted according to the results of the Social Impact Assessment process to be conducted at a later stage:

- The management of the Project can capitalize on the positive attitude of the people of area towards proposed Project by offering them maximum employment opportunities at the development stage and any stage of operational phase.
- Insufficient and inadequate socio-economic structure of the community of the area also provides ample opportunities to Company management by introducing meaningful and manageable plan of community development.
- Aggressive and comprehensive plantation plan can also lessen fear of local people towards environmental issues.
- Sustainable development approach through conservation of natural resources would be the best strategy to compensate negative socio-environmental impacts.
- Social responsible attitude and stewardship of company management towards local people and resources can make project people friendly.
- Prior to action of the Project installation a comprehensive awareness campaign may be launched at masses level to avoid any conflict.

5.10 CONCLUSION

Comparison of potential adverse and beneficial impacts of the proposed project shows that it has proved to be beneficial for the inhabitants of the area. The project implementation has provided job opportunities for the local inhabitants hence improve their socioeconomic status. Employment opportunities generated by the project include construction labor at the site in the initial stages of setting up of the proposed facility, skilled and unskilled labor and security (chowkidars) during the production phase. Additional employment opportunities are envisaged, such as provision of daily raw materials. Reliance on local markets for provision of construction materials and other supplies pose significant effect. Following mitigations are recommended for the anticipated social impacts:

- Opportunity for Employment generation for the local
- Environmental safeguard

The overall socio-economic impact of the project is interpreted in relation to the existing environmental conditions. It followed that such a development that is proposed can contribute in improvement of socio-economic and health status of inhabitants of the community if environmental management measures are adopted in true sense. The project, overall, does not have major adverse impacts on the existing environment and people. Suitable mitigation measures have been recommended to minimize the adverse impacts identified in this study. With due implementation of the mitigation measures, there would be very insignificant adverse impacts on the socio-economic environment.

CHAPTER VI

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 GENERAL

The potential environmental impacts related to the project have been studied in context of construction stages of the Project. Environmental protection measures are recommended to eliminate adverse impacts on environment or to reduce them to an acceptable level within the prevailing legislative and regulatory framework, although running plant is already working in environment friendly conditions. These Impacts are evaluated on the basis of magnitude, immediacy and sustainability. A careful consideration of project aspect, their potential environmental impacts and mitigation measures are proposed in this chapter. Evaluation criteria are as follow:

Magnitude:	Type of impact (direct, indirect, and cumulative)
Immediacy:	Temporal extent (during construction, after construction) Spatial extent (local, widespread)
Sustainability and	
Reversibility:	Mitigability (fully, partially)
Monitoring	(fully, partially)

6.2 OBJECTIVES

Objectives of screening all possible impacts and then providing their mitigation measures are:

- To find alternatives and ways of doing the project activities.
- To enhance the environmental and social benefits of proposal.
- To avoid, minimize and remediate adverse impacts.
- To ensure that residual adverse impacts are kept in acceptable limits.

6.3 IMPACT ASSESSMENT METHODOLOGY

6.3.1 SCREENING OF POTENTIAL IMPACTS

Based on site visit, observation, brain storming, provided information and social interviews, significant impacts were anticipated and evaluated. Then qualitative and

quantitative (where possible) assessment of these anticipated impacts is to be carried out.

POTENTIAL ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

An assessment of potential environmental impacts of the proposed project has been done and shown in table 6.1 which indicates the magnitude of the impacts.

Table: 6.1 Assessment Matrix of Impacts and their Magnitude of Proposed Project

Environmental Aspect	Activities														
	Pre-Construction Phase Activities		Construction Phase Activities					Operation Phase Activities						Decommissioning Phase Activities	
	Land Clearing	Placement of Provisional facilities	Excavation and leveling	Operation of construction machinery/ generators	Transportation of construction material	Structural Development	Provision of basic facilities	Storage of raw material	Incineration	Transportation of waste	Operation of generators	Improper disposal of solid waste	Improper disposal of liquid waste	Site Clearing	Improper disposal of waste
Land use	3- 9-		3- 9-			3+ 9-									
Soil erosion	2- 8-	1- 4-	3- 9-		1- 6-	2- 3-				1- 6-				1- 7	
Soil Quality	1- 7-		1- 7-	1- 7-	1- 3-	1- 4-				1- 3-					
Air quality	1- 9-		1- 9-	2- 9-	1- 9-	2- 9-		1- 6-	1- 10-	1- 7-	1- 7-				
Surface water quality															
Ground water quality				1- 5-		2- 8-									
Noise	2- 9-	3- 1-	3- 9-	2- 9-	1- 6-	3- 8-			2- 7-	3- 6-	1- 7-				
Flora	1- 8-		1- 8-	2- 6-											
Fauna	1- 8-		1- 3-	1- 3-											
Resettlement & Relocation															
Health issues	1- 8-	2- 3-	2- 8-	2- 9-	1- 7-	1- 8-		1- 7-	1- 7-	1- 7-					
Basic utilities (gas, electricity, telecommunication)									3- 9-			1- 5-			

supply)															
Road access		1- 3-		1- 7-	1- 9-	1- 9-				1- 7-					
Employment opportunities	8+ 10+	8+ 10+	8+ 10+	8+ 10+	8+ 10+	8+ 10+	8+ 10+	8+ 10+	8+ 10+	8+ 10+	8+ 10+			9.5+ 10+	

KEY

MAGNITUDE OF NEGATIVE IMPACT	INDEX FOR NEGATIVE IMPACT
NIL	
LOW	1-3 -
MEDIUM	4-6 -
HIGH	7-10 -
MAGNITUDE OF POSITIVE IMPACT	INDEX FOR POSITIVE IMPACT
LOW	1-3 +
MEDIUM	4-6 +
HIGH	7-10 +

6.3.2 IMPACTS ANALYSIS AND PREDICTION

Impacts analysis and prediction can be done by following techniques:

- Meetings
- Workshops
- Consultation / Case Studies

Impacts of the Project are predicted by consultation and case studies.

6.3.3 IDENTIFICATION OF MITIGATION MEASURES

After anticipation and screening of significant impacts, certain mitigation measures are to be provided in order to enhance benefits of project and reducing impacts.

6.3.4 EVALUATION OF THE RESIDUAL IMPACTS

Incorporation of suggested mitigation measures may reduce the magnitude of the environmental impacts of the project but sometimes, it may fail in bringing them within the acceptable limits. This step refers to the identification of the anticipated remaining impacts after mitigation measures have been applied.

6.3.5 IDENTIFICATION OF MONITORING REQUIREMENTS

The last step in the assessment process is the identification of minimum monitoring requirements. The scope and frequency of monitoring depends on the residual impacts. The purpose of the monitoring is to confirm that the impact are within the prescribed limits and to provide timely information if acceptable limits are being breached.

6.4 ANTICIPATED POTENTIAL ENVIRONMENTAL IMPACTS

Characterization is done on the basis of significance, probability and prevalence of the potential impacts in the surrounding environment. Primarily, anticipated impacts have been categorized as direct, indirect and induced. These groups of impacts can be further broken down according to their nature into:

- Positive and negative impact
- Minor, major and moderate impact
- Local and widespread impact

- Temporary and permanent impact
- Short and long term impact
- Reversible and Irreversible impact

CONSTRUCTION PHASE			
POTENTIAL NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	MONITORING RESPONSIBILITY	PARAMETERS FOR MONITORING
Dust Emissions	On exposed construction surfaces during dry/windy periods fugitive dust generation will be suppressed by spraying of water	Proponent/Contractor	Air Quality
Soil Erosion	Exposed surface will be resurfaced and stabilized as soon as possible	Proponent/Contractor	Soil
Solid Waste Generation	Dedicated waste segregation units will be provided. Recyclable items will be provided to recycling contractors	Proponent/Contractor	Solid Waste Management
Health and Safety of Workers	All occupational health and safety requirements for workforce will be adhered to.	Proponent/Contractor	Health and Safety

OPERATION PHASE			
POTENTIAL NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	MONITORING RESPONSIBILITY	PARAMETERS FOR MONITORING
Solid Waste	Waste will not be disposed off in the open and on-site burning of waste materials will be eliminated. Dedicated waste segregation units/containers will be built or placed.	Proponent	Solid waste Management

Noise Pollution	Generator and vehicles used during the operation will be properly tuned and maintained to minimize noise and air emission. The access road will be watered regularly to minimize dust emissions (if required).	Proponent	Noise Level
Waste Water	Contaminated water will be disposed off into municipal drains of nearest area.	Proponent	Water Quality

6.4.1 NOTION OF SIGNIFICANCE

Evaluation of impacts will be based on determining the significance of impacts as well as characteristics of impacts. Indicators considered for determining the significance include: predicted increase in the acceptable level (established standard e.g., PEQS and duration) in relation to key species life cycle and requirement for population maintenance, geographical extent of an effect, assimilative capacity of environmental attributes. To determine the significance of impacts on bio-physical and socio-economic environment of the proposed project, impact characterization is discussed and is given as Table for construction and operation phase.

The criteria used to define the significance of impacts in terms of low, moderate and severe impact are as follows:

Negligible/No Impact: The impact, which has unapparent and negligible influence on natural and socio-economic environment.

Low Adverse Impact: The impact, which has a slight influence on the natural and socio-economic environment.

Moderate Adverse Impact: The impact, which can be eliminated/ mitigated after applying the appropriate mitigation measures.

Severe Adverse Impact: The impact, which can be partially/ but not fully mitigated by applying the mitigation measure.

Positive/Beneficial Impact: The impact, which improve/enhance the natural and socio economic environment.

6.5 MITIGATION AND IMPACT ASSESMENT

Purpose of mitigation is to evade, reduce or balance the expected antagonistic effects in suitable way, to integrate these into environmental managing strategy or plan. At every stage of the project, mitigation plan for all the adverse impacts should be predictable and coasted to find out the best alternatives. The objectives of mitigation are to:

- Invent best substitution, means of better alternatives and ways of doing things
- Improve the environmental and societal payback of the project
- Prevaricate, remedying or reduce, provocative impacts
- Certify that remaining adverse influences are kept within permissible limits

6.5.1 PURPOSE OF MITIGATION MEASURES

Purpose of mitigation measures includes that what is the problem, when the problem will occur, when, where and how the problem should be addressed. The answers to these questions are given below:

a. What is the Problem?

As the project is the incineration of hazardous & non-hazardous industrial as well as healthcare waste so the problem can be the impacts that could likely to cause from the activities involved in construction and operation phase of the project i.e. air pollution, noise pollution, solid waste, wastewater generation etc.

b. When Problem will occur and when it should be addressed?

Problem can occur during different phases when different activities are done through machinery or manual work. These problems may include noise, solid waste, liquid waste etc. These all problems should be addressed on the spot to avoid the adverse impacts.

c. Where Problem should be addressed?

As the problem is generating from the construction and operational of the project so it should be addressed on source i.e. site of the project.

d. How the Problem should be addressed?

Proper mitigations measures are being provided according to the nature of the impacts/ problems. Details of mitigation measures are further discussed in this chapter.

6.5.2 WAYS OF ACHIEVING MITIGATION MEASURES

a. Changing in Planning and Design

As the proposed project is planned as per feasibility assessment so there is no need of changing in planning and design of the Project.

b. Improved Management & Monitoring Practices

Improving activities will be carried out for betterment while monitoring will also be conducted to keep environment friendly throughout the operation of the project.

c. Compensation in Money Terms

There is no damage of fauna, flora or any other resource. So, compensation in money is not needed.

d. Replacement/ Relocation/ Rehabilitation

Project site is located where there is no sensitive area, population or natural resource. So, replacement, relocation and rehabilitation are not required.

6.6 ENVIRONMENTAL PROBLEMS DUE TO PROJECT LOCATION

A) CHANGE IN LANDUSE PATTERN

Any new intervention has its first and foremost impact of changing the land use pattern of the area. The impact of this nature is irreversible therefore site selection needs to have careful consideration of the impacts that may arise due to the changes in land use patterns.

The present land use of the area available for the installation of an incinerator is an open land. It would be changed after the construction of the project.

MITIGATION MEASURES

Prior to selection of site, the project proponent had careful consideration of the land use on the site. The project area is around industrial area and the land is already owned by the proponent. Another factor adding to the feasibility of the project site was that it is away from the residential areas so there will be no nuisance to the general public.

Mitigation measure will involve tree plantation along the boundary wall (inside and outside) and landscaping on the remaining land other than the built-up structures and parking areas.

B) PRESSURE OF RESOURCES

Another impact to be considered prior to site identification is the availability of already existing resources e.g. water, gas, electricity, etc. any new intervention can exert pressure and marginalize the existing community. This could eventually create a sense of deprivation among the already existing community and may eventually result in social unrest.

MITIGATION MEASURES

Considering this very important factor, the site identification was done after evaluating the extent of provision of resources. The water requirements, energy requirement, social services can be approached easily.

This situation will further be discussed in the mitigation measures proposed for project operations.

C) NATURAL HAZARDS

It is very important to assess the extent of damage any natural hazard e.g. earthquake, floods, landslides may cause.

MITIGATION MEASURES

The proposed site identified within environmentally /geologically safe and does not fall in any of the earthquake zones in which the capital territory is divided.

D) AVAILABILITY OF EXISTING INFRASTRUCTURE AND SERVICES

Unavailability of infrastructure can render the entire project void and impractical due to absence of important community infrastructure.

MITIGATION MEASURE

The project is well connected to the city through roads hence making the location ideal for the project.

E) DISPLACEMENT OF LOCAL COMMUNITY

Displacement of local community can tend to create social issues and aggravate negative feelings from the existing population towards the project.

MITIGATION MEASURES

The project is planned on a site which has already been acquired by the proponents after going through its socio-culture, environmental and economic considerations.

6.7 ENVIRONMENTAL PROBLEMS DUE TO PROJECT DESIGN

Impact significance: moderate to high or may be negative

Nature of impact: direct

Duration: Long-term

Timing: Constructional phase & Operation phase

Reversibility: NA

Likelihood: moderate to high

Consequences: moderate to high or may be negative

A) INCREASED ENERGY CONSUMPTION

The design of building plays a vital role in determining the energy demand. Unplanned design may lead to overall rise in energy demand.

MITIGATION MEASURE

Building of the project will be ventilated and environmental friendly in terms of more utilization of day light in order to conserve the energy resources. Project proponent is committed to provide all these provision in the design of the project.

B) TRAFFIC CONGESTION

Unplanned traffic management and traffic infrastructure development may lead to traffic related issues such as accidents and traffic congestion.

MITIGATION MEASURE

The project has included traffic management as integral part of its overall design. The project construction activities are planned within the boundary walls. Transportation of heavy construction materials will be done during less traffic hours. Also, the project site is away from any heavy traffic area.

Management of vehicle movement will be done to avoid traffic jam and long queues.

Parking of vehicles alongside the road should be prohibited at all time.

C) FIRE EXITS /EMERGENCY EVACUATION PLAN

Emergency evacuation plans is necessary to curb fire issues due to electric short circuit etc.

MITIGATION MEASURE

The project proposes Emergency Evacuation Plans in events of fire hazards. Quality of wiring work and gas lines will be ensured through installation of good quality wiring during construction and proper monitoring during operational phase. The site will be equipped with proper firefighting equipment to ensure increased safety. Water and foam fire extinguishers will be fixed vertically at 5 ft. height from the ground for easy access.

D) ACCESSIBILITY TO PUBLIC UTILITY / SERVICES

Inaccessibility to public utilities will render the project uninhabitable.

MITIGATION MEASURE

This is not going to create any issues since the proposed site is planning to develop an extensive network of utilities. Public utilities will not be used during any stage of the project life cycle.

E) CAREFUL PLANNING OF GREENBELTS/HORTICULTURE PLAN

Unavailability of greenbelts would create aesthetic nuisance.

MITIGATION MEASURE

The design of proposed project involves establishment of green belts and develop aesthetically crafted lawns around the project building to increase its aesthetic value.

F) UNDERGROUND SEWER /DRINKING WATER LINES

Wires and pipelines lay open and above surface may consequently give rise to leakages, contamination and short circuits in the lines.

MITIGATION MEASURE

There will be no any such issue at the proposed project site because the site is devoid of any such infrastructure. However, during the installation of underground pipe lines, the project engineer will make sure that the contractors and team of workers are well aware of precautionary measures needed to curtail any such issue.

6.8 ENVIRONMENTAL PROBLEMS DUE TO PROJECT CONSTRUCTION

6.8.1 IMPACTS ON PHYSICAL ENVIRONMENT

A. LOSS OF VEGETATION COVER / BIODIVERSITY

The site has minimal vegetation cover including the grass and shrubs. The proponent intends to clear part of the land to create room for developing the proposed incineration plant. On completion of the development it is recommended that the proponent should plant trees on the unoccupied land to attain aesthetic beauty.

Impact significance: Low

Nature of impact: Direct

Duration: Short-term

Timing: Constructional phase

Reversibility: NA

Likelihood: moderate

Consequences: Very Low

MITIGATION MEASURE

- After completion of the project the proponent will rehabilitate the land by planting trees and ornamental flowers on the disturbed and undisturbed areas.
- Project implementation will disturb as little area as possible in order to minimize potential impacts to biodiversity.
- Working should be in such a way that minimum excavation is involved.

B. AIR QUALITY

Air quality will be affected by fugitive dust emissions from construction machinery; dust from the unpaved surface and construction vehicles. The critical sources of dust pollution during the construction phase will be

- Unpaved road surface
- Transportation of materials and other construction activities that create dust emissions
- Air quality deterioration, particulate matter/dust emissions due to construction activities; stand by generator, equipment's and vehicle.

Impact significance: Low

Nature of impact: Direct

Duration: Short-term

Timing: Constructional phase

Reversibility: NA

Likelihood: moderate

Consequences: Very Low

MITIGATION MEASURE

- The construction materials e.g. soil, clay would be covered appropriately.
- Sprinkling of water on track will reduce dust pollution
- Provision of dust masks for workers.
- Air quality monitoring is recommended on regular base
- Proper paved road infrastructure is recommended
- All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions
- Blowing of dust and particulate matter from stockpiled loose materials (e.g.sand, soil) should be avoided either by sheeting them with tarpaulin or plastic sheets or by sprinkling them with light shower of water
- Open burning of solid waste from the Contractor's should be strictly banned

C. NOISE GENERATION

Noise is a by-product of human activity, and area of exposure increases as function of mobility and construction activities. Sources of noise during construction are heavy machinery such as bulldozers, excavators, stabilizers and other equipment. Noise emissions due to transportation, movement of heavy materials, generators may create health nuisance for the workers and local community.

Impact significance: Low

Nature of impact: Direct

Duration: Short-term

Timing: Constructional phase

Reversibility: NA

Likelihood: moderate

Consequences: Low

MITIGATION MEASURE

- Selection of up-to-date and well-maintained plant or equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices
- Confining excessively noisy work to normal working hours in the day, as far as possible
- Providing the construction workers with suitable hearing protection like ear cap, or earmuffs and training them in their use
- Preferably, restricting construction vehicles movement during night time
- Vehicles and equipment used should be fitted, as applicable, with silencers and properly maintained
- Use of low noise machinery, or machinery with noise shielding and absorption
- Contractors should comply with submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ strict implementation of operation procedures

D. WATER RESOURCES

There is no significant surface water resource of the project area so there will be no impact on surface water quality during the construction of the project area. Persistent and prolonged withdrawal of groundwater higher than the safe yield limits of the aquifer can initiate early depletion of aquifer. This situation can result in reduced water supplies for other users who share the same groundwater resource. Abstraction of the groundwater over and above the safe yield limit can produce serious hydrological and environmental consequences.

These impacts are temporary and minor negative in nature

Impact significance: Low

Nature of impact: Direct

Duration: Short-term

Timing: Constructional phase

Reversibility: NA

Likelihood: moderate

Consequences: Low

MITIGATION MEASURES

- Water required for construction is obtained in such a way that the water availability and supply to nearby communities remain unaffected
- Regular water quality monitoring according to determined sampling schedule
- Prohibit washing of machinery and vehicles in surface waters
- Continuous withdrawal and over pumping of groundwater should be avoided. Instead, intermittent pumping be carried out to conserve the groundwater resources

E. SOIL EROSION

Loss of vegetation cover and trees may lead to soil erosion hence resulting in dust emission and loss of fertile land cover.

Impact significance: Low

Nature of impact: Direct

Duration: Short-term

Timing: Constructional phase

Reversibility: NA

Likelihood: moderate

Consequences: Low

MITIGATION MEASURE

The construction activities shall be planned in a way that reduces the chances of vegetation cover loss and its consequent soil erosion issues. Soil erosions are due to wind and water. The proposed project is planned for construction during the coming months after Environmental Approval, which are dry and sunny. Hence, the probability of soil erosion due to natural factor will be negligible to none.

F. SOLID WASTE GENERATION

Unplanned dumping of solid waste generation during construction phase can lead to blockage of roads, waterways and also create unaesthetic sight of the proposed location.

Impact significance: Low

Nature of impact: Direct

Duration: Short-term

Timing: Constructional phase

Reversibility: NA

Likelihood: moderate

Consequences: Moderate

MITIGATION MEASURE

Solid waste generation quantity during construction phase shall be reused in construction activities rather than dumping. The solid waste during construction phase will consist most of soil, packaging materials, plastic bags, cloths, iron rods, and food leftovers. The organic portion of solid waste shall be collected by sanitary workers of that area. Training of working force in the storage and handling of materials and chemicals that can potentially cause soil contamination. Solid waste generated during construction and camp sites will be safely disposed in demarcated waste disposal sites or handed over to the contractor.

G. WASTEWATER GENERATION

Unplanned wastewater disposal may contaminate the surface water channels, surface soil and depending upon the quantity of wastewater generated, it has a potential to contaminate the ground water aquifers.

Impact significance: Low

Nature of impact: Direct

Duration: Short-term

Timing: Constructional phase

Reversibility: NA

Likelihood: moderate

Consequences: Moderate

MITIGATION MEASURE

Wastewater generated during construction and domestic activities will be stored temporarily in septic systems comprising of septic tanks from where it will be routed to local drain. Waste segregation measures will be employed to minimize entry of solid waste into the wastewater stream. An appropriately designed septic tank will be used to treat sewage/waste water to achieve PEQS. Periodic cleaning of the septic tank is recommended.

H. HEALTH AND SAFETY

Health risks and work safety problems may result at the workplace if the working conditions provide unsafe and/or unfavorable working environment and due to storage, handling and transport of hazardous construction material. Workers should be provided with safe and healthy working environment taking into account risks inherent to the particular sector and specific classes of hazards in project area. Mitigation measures will include:

Impact significance: Low to Moderate

Nature of impact: Direct

Duration: Short-term

Timing: Constructional phase

Reversibility: NA

Likelihood: moderate

Consequences: Moderate

MITIGATION MEASURES

- Providing basic healthcare training to specified work staff and basic healthcare service and supplies to workers
- Layout plan for site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents
- Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborer's
- Protection devices (ear muffs) should be provided to the workers doing job in the vicinity of high noise generating machines
- Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction
- Provision of protective clothing for laborers handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc.
- Ensure strict use of wearing these protective clothing during work activities
- Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites

- Adequate signage, lightning devices, barriers, yellow tLion and persons with flags during construction to manage traffic at construction sites, haulage and access roads.

6.8.2 IMPACS ON SOCIO-ECONOMIC ENVIRONMENT

A. ECONOMIC ACTIVITY

Due to the construction of the proposed Project, economic activity will be generated in the project area as the laborers and semi-skilled staff will have an opportunity to work for the construction of the proposed project. This will help in developing their skills and capacities. This is a moderate positive impact.

B. LIFESTYLE AND CULTURE

There are chances of arising of issues related to cultural differences/conflict between the Contractor's workforce and the local inhabitants, conflicts arising due to the mix of local and migratory job seekers as the use of local resources and products will be increased. In this situation, local residents may resist contractor's workforce attitudes, cultural clashes particularly when local/international contractors are engaged, social disturbance and dissatisfaction with employing outsiders may arise. This impact is temporary and minor negative in nature.

MITIGATION MEASURES

- Timely public notification and announcement of mobilizing equipment
- Local labor should be employed for construction works

6.8.3 IMPACT ON BIOLOGICAL ENVIRONMENT

There is no any fauna or flora is present on the proposed project site. Few trees are there. On their behalf a complete plantation plan has been provided.

6.9 ENVIRONMENTAL IMPACTS DURING OPERATIONAL PHASE

The positive and negative impacts of subject project, during its operation are discussed below:

6.9.1 IMPACTS ON PHYSICAL ENVIRONMENT

A. AIR QUALITY/PARTICULATE MATTER (DUST)

Vehicular/ equipment engine exhaust emissions will be minor and temporary during construction. Air quality impacts will be temporary during construction. The project will not generate significant vehicle trips to the area. Vehicular and equipment exhaust emissions during project operations will, thus, have a minor incremental/cumulative impact locally and regionally. Particulate matter (dust) would be generated by grading, excavation and the movement of construction vehicles.

During the operations major potential point sources of particulate matter (chemical residuals, smoke and dust) and gaseous emissions in and around the proposed premises are expected to be as follows;

- Holding areas for the hazardous waste materials as received will likely be sources of dust, particularly from the transfer process to the sorting areas and into the incinerator. The hazardous wastes are obtained from a wide range of background with varying components and hence quality of related particulate matter discharged into the air. Particulate matter could contain chemical pollutants, organic pollutants, bacterial contaminants all of hazardous/toxic characteristics.
- The incineration will involve burning hazardous at very high temperatures (between 800°C –1,500°C). Particulate matter will comprise of ashes and flue gases from the burning process and smoke as a combustion product. Other emissions from this point are hydrocarbon residuals, carbon dioxide, carbon oxide, nitrogen oxides and sulphur oxides from fuels and related combustion processes.

ASSESSMENT OF IMPACT

DUST EMISSIONS:

Dust emissions can cause by vehicular traffic on dirt track will be an important concern, primarily when such traffic will pass near community settlements. Dust emissions will cause the amount of particulate matter in the air to increase, and can become a health concern. Dust clouds can also reduce road visibility.

GASEOUS EMISSIONS:

Emissions will be produced by incinerator activities and generator in terms of the resulting pollutants (SO₂, NOX, PM, etc.). However, the extent to which they can produce would keep considerably lower, since the incinerator is fitted with a scrubber and much smaller engines will use in vehicles and construction machinery.

Nature of impact: Direct

Duration: long term

Timing: operation

Reversibility: irreversible

Likelihood: moderate if mitigation measures will be ensured.

Consequences: moderate, if pollutant levels in the ambient air will be control within acceptable limits by adopting proper mitigations.

Impact significance: moderate, based upon low likelihood and mild to moderate consequence.

MITIGATION MEASURES:

- The temperature in the primary chamber will be around 600-850°C and in the secondary chamber 850-1200±50°C.
- Higher stacks should be designed to reduce ground level concentrations and to protect human health, agriculture, and native wildlife and vegetation.
- Primary Pollutants emitted from a major incinerator facility should be monitored on a continuous basis.
- The incinerator should be cleaned and all ash removed regularly. Free passage of air is essential for combustion as well as for the cooling process. Therefore the removal of deposits from within as well as underneath the combustion chamber is critical.
- Good combustion practices can control emissions by ensuring that the temperature in the combustion chamber and the time the Waste remains in the combustion chamber are kept at optimal levels.
- Dry Scrubber will be installed to filter the air before it will be emitted to the ambient air.
- Workers should wear dust masks and other respiratory PPEs before entering the processing halls.
- Water spraying should be practiced where required.

- Regular monitoring

B. EFFLUENT DISPOSAL

Discharging wastewater into open drainage system around the premises would subsequently be carried into public water sources through surface runoff. Wastewater will be generated due to the domestic activities.

Nature of impact: Direct

Duration: Short term

Timing: operation

Reversibility: Not applicable

Likelihood: Low

Consequences: Mild

Impact significance: Low.

MITIGATION MEASURES

- Wastewater that is finally disposed of, will be in limits of NEQS
- The domestic wastewater will be collected properly through a network of pipeline and then it will be discharged into municipal sewer treating through septic tank.

C. SOLID WASTE MANAGEMENT

STORAGE OF WASTE

The project site will be available for temporary storage of waste. This could create impacts of major significance if not properly handled and supervised. The tanks have inlet and outlet valves to dump and emptying the tank. There will be a need to prevent the waste from scavengers, sunlight and rain. Also there will be measures to prevent scattering of waste with wind and nuisance from smell and odor.

Nature of impact: Direct

Duration: Short term

Timing: operation

Reversibility: Not applicable

Likelihood: Low (unlikely) if mitigation measures will ensure that Solid waste management in efficient way.

Consequences: Mild, as it will be removed from site within few hours

Impact significance: Low, based upon low likelihood and mild to moderate consequence

MITIGATION MEASURES

- Identification of all waste streams.
- Quantify and characterize the waste streams.
- Recyclable materials should be separated at source.
- No waste should be dumped at any location outside the boundary.
- Separate, labeled dust bins should be placed within the premises to collect different nature of waste separately
- Record of all waste generated should be maintained. Quantities of waste, disposed, recycled or reused should be logged on.
- Training should be provided to personnel for identification, segregation and management of waste.
- Healthcare waste shall be incinerated on the day it is received, if not possible, the healthcare waste (yellow bag) won't be stored for more than 24 hrs.
- The tanks/rooms will be marked as hazardous storage facility.
- The workers will wear personal protective equipment like Gas mask, gloves, and safety shoes before entering the storage tank.
- Ensuring the housekeeping of area around the storage tanks and especially inside the facility.
- The storage tank must be marked as hazardous storage facility.
- The workers must wear personal protective equipment like Gas mask, gloves, overall and safety shoes before entering the storage tank
- Ensuring the housekeeping of area around the storage tanks and especially inside the storage tank

DISPOSAL OF ASH

The disposal of filter dust/ fly ash from waste incineration plants is a serious problem. Filter may contain very high concentrations of heavy metals and chlorinated organic compounds, which can cause cancer and other health problems.

- Initially the ash would be collected properly in plastic bags/ covered & wetted heaps and stored in a confined and restricted location, limiting the

fugitive emissions. Thereafter the ash would be mixed with mortar and blocks shall be made which could be used for civil work.

- If to be landfilled, Ash would be stabilized and solidified by encasing in concrete prior to disposal. Faisalabad Waste Management Company approved landfill, thereby significantly reducing the potential for the contaminant to migrate.
- In addition to land filling, incinerator ash could also be used in the production of road bedding, concrete, brick, cinder block, and curbing.

D. ENERGY CONSERVATION

Excessive use of energy exerts more pressure on the already dwindling energy resources of the city/country.

MITIGATION MEASURE

The workers/employees will be encouraged to follow energy conservation strategies during operational phase. Daylight will be preferably used during day. Machineries and equipment will be maintained to avoid extra fuel consumption.

E. NOISE LEVEL

Noise is the major concern during the operation phase. It can be generated from the traffic on the road and from the machinery used for operations.

Nature of impact: Direct

Duration: long term

Timing: operation

Reversibility: Not applicable

Likelihood: low

Consequences: slightly significant

Impact significance: moderate, based upon low likelihood and mild to moderate consequence.

MITIGATION MEASURES

Any activity that leads to noise pollution will be restricted. There will be no noise due to operation of the project. Workers will be provided with the safety equipments to protect themselves. Ear plugs and ear muffs will be provided to the workers.

F. TRANSPORTATION

Transportation of raw material for safety stuff manufacturing to and from the project site creates a probability of accidental spills and fire.

MITIGATION MEASURE

- Transportation vehicles will be maintained in good conditions to avoid the chances of accidents.
- There will be a proper mechanical department where maintenance of machinery and vehicles will be monitored regularly.

G. EMERGENCY/FIRE HAZARDS

Emergencies e.g. fire incidents may lead to environmental, health and safety issues to the local residents.

MITIGATION MEASURES

Emergency exits in every department and certain points of plant will be installed. Firefighting equipments will be provided and adequate trainings will also be provided to tackle any situation of fire hazards. Contacts of concerned departments like fire brigades, police, first aid, etc. should be displayed at prominent places in the project's building.

H. TRAINING OF STAFF

Unskilled persons will not be able to tackle environmental, health and safety related situations which may further aggravate any such issues and cause loss of human life and property.

MITIGATION MEASURE

Regular training of the staff will be conducted. Proper monitoring and reporting mechanism will be developed where the team is responsible to communicate/report any illegal or hazardous situation to the team leader.

6.9.2 IMPACTS ON BIOLOGICAL ENVIRONMENT

A. FLORA

The project site is devoid of any significant vegetative cover. Only few bushes may be present. Nil impact is envisaged.

B. FAUNA

The fauna including wildlife species do not exist at the project site. The impact will be nil.

6.9.3 IMPACTS ON SOCIO-ECONOMIC ENVIRONMENT

A. SAFETY

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

- Electrical hazards
- Machine guarding
- Eye, head and foot protection
- Fire and explosion hazards
- Housekeeping Issues

MITIGATION MEASURES

- Care will be taken to properly ground and insulate all equipment.
- Standard procedures for confined space entries will be displayed in written form.
- 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.
- Emergency Eye wash equipment should be placed in chemical room.
- Firefighting equipment will be available in the form of ABC fire extinguishers as a minimum, and their locations will be clearly marked.
- Exits from work places will be well marked and visible in dim light.
- 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 healthcare and health facilities will be provided to all employees.
- Safety, health and educational drive should be given to residents living near the construction site.
- Safety and warning devices such as reflectors, lights, etc. shall be installed at designated spots.

B. LAND VALUE

Land value in the surrounding area will increase due to completion of the present project. Impact will be moderate positive.

C. RESETTLEMENT ISSUES

Dislocation of Population

The project does not involve dislocation of the people. There is no requirement of resettling a single person. Impact is nil. The nearby residential area named as Jagger Abbaspur is located 1km away, Basti Khokhran is located at an aerial distance of 2.1km and Tibbi Izzat is located at an aerial distance of 2.6km away from the proposed project site.

Loss of Property/Infrastructure

No movable or immovable property and infrastructure of public and private sectors will be lost or damaged during construction and operation stages. Impact will be nil.

Undertaking

The proponent has committed to comply with the relevant construction by-laws/safeguards and the environmental enactments for the environmental preservation. Project proponent has given Undertaking and Affidavit respectively.

6.10 IMPACTS ASSOCIATED WITH DECOMMISSIONING PHASE**6.10.1 IMPACT ON PHYSICAL ENVIRONMENT****A. SOIL DISTURBANCE**

Soil erosion may be caused by exposure of soil surfaces during site clearing, earth moving, and excavation activities. Soil disturbance will loosen the soil and make it exposed to the agents of erosion i.e. wind and water.

MITIGATION MEASURES

Following mitigation measures can be adopted:

- Scheduling to avoid heavy rain fall periods (i.e. during the dry season) to the extent practical.
- Mulching to stabilize exposed areas.

B. SOLID WASTE GENERATION

Solid waste will be generated in form of spoil soil, obsolete pumps, pipes, machinery etc.

MITIGATION MEASURES

Following mitigation measures can be adopted:

- Timely collection and disposal of solid waste.
- Recyclable waste should be sell out to the recycle market or any relevant customer.

C. HEALTH AND SAFETY IMPACTS

Health and safety risks may occur during decommissioning of infrastructure i.e. open pits hazard, fire hazard, fall hazard, noise and vibrations due to machinery used for dismantling of equipment.

MITIGATION MEASURES

- Following mitigation measures can be adopted:
- Employees should be provided with personal protective equipment and required to use impervious clothing, gloves, face shields and other appropriate protective equipment.

- Work permits to carry out dangerous works i.e. permit to work in confined spaces, work at heights and work with dangerous chemicals etc.
- Increased demand on health care services.
- Contact with local health service and cooperation established between both parties.
- Emergency preparedness plan in place.

5.11 POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

Several measures have been proposed for enhancing the environment and social aspects including planting of trees, green belt development, construction of retaining walls and guardrails, providing sign boards, preserving and landscaping cultural properties etc.

Following necessary measures will be adopted during construction and operation:

- The design of the building will be planned in consultation with the Environmentalist, Geotechnical experts and building engineers, to mitigate the possible negative impacts related to the project design.
- Necessary provisions or enhancement measures will be incorporated in design of the building such as location and points of firefighting equipments, locations of assembly points & emergency exits with quantity, location of the waste water treatment facility, area of plantation, design of the building showing proper elevation & ventilation, properly marked sewerage system etc.
- Sprinkling of water will be done during constructional activities on dusty road and tracks.
- PPEs will be provided during every stage of project. Special PPEs will be provided to the workers for ensuring their health and safety from asbestos disposal. These include disposable protective clothing and coveralls, a head cover, and foot covers made of a synthetic fabric which does not allow asbestos fibers to pass through. This type of clothing is significant to prevent workers' regular clothing from becoming contaminated with asbestos fibers. SOPs for Asbestos sheet/material removal, Handling, Transportation and dumping are attached as annex-9 with this report.
- Constructional waste and domestic solid waste will be disposed-off or utilized properly.

- Machinery will never be left unattended.
- Efforts should also be made to discuss traffic conditions so that regular traffic is not disturbed. Transporters engaged for the project would be forced to adhere to the load specifications of the access road. No overloading would be allowed in any case.
- Safety signs and boards will be placed wherever required.
- Air pollution controlling devices will be installed within the project during operation (if required).
- Machinery will be kept maintained.
- Domestic waste water will be treated through septic tank that will be installed within the unit.
- Noise will be controlled by adopting proper measures.
- Firefighting equipments and system will be installed.
- Hygienic conditions will be ensured and proper quality will be maintained by quality control testing.
- First aid facilities will be made available.
- Precaution and safety measures will be adopted and followed for health & safety, filling.
- Any possible measure will be adopted to make the project safe and environmental friendly.
- Area will be restored with native plants. A proper tree plantation plan will be formulated to save the environment.

GREEN BELT DEVELOPMENT

- Adequate number of saplings will be planted all along the periphery of the plant, roadways and available open spaces. Apart from functioning as a pollutant sink, green belts provide other benefits like:
 - Green belt helps in noise abatement for the surrounding area.
 - Green belt increases the aesthetic value of the site.

TREE PLANTATION

Tree plantation and cropping within the premises have been planned by the proponent for environmental enhancement. The proponent will also make arrangements for protection and maintenance of trees. Tree plantation will be done around the boundary walls of the project site. Also, the open area will be planted with ornamental plants for

beauty having height of 6-7ft. Preferably native species will be planted in accordance with the quantity provided by the EPA in its Environmental Approval. Some native species that have been identified for this particular project are provided hereunder in the table.

Table 6.1: Trees to be Planted

Sr. No.	Scientific Name	Local Name
1	Acacia Karoo	Kikar
2	Erythrophleumsuaveolen	Tali
3	Eucalyptus Globus	Safaeda
4	Dalbergia Sissoo	Sheesham
5	Acacia nilotica	Babul

CHAPTER VII

ENVIRONMENTAL MANGEMENT AND MONITORING PLANS

7.1 GENERAL

The purpose of developing this Environmental Management and Monitoring Plan (EMMP) is to provide a dynamic guideline to the concerned stakeholders to define details of who, what, where and when environmental management and mitigation measures are to be implemented besides providing the contractors and proponents better on-site environmental management control over the life of the project. The scope of this Environmental Management and Monitoring Plan includes the activities during operational. However, to ensure the compatibility of the Environmental Management and Monitoring plan in accordance with the changing socio-cultural, economic and environmental factors, it would be used as a dynamic tool which means that the EMMP would undergo necessary modifications to keep catering to the changing environmental needs of the project.

Table 7.1: Users of this EMMP would include but not be restricted to the following:

Sr. #	EMMP Elements	End Users
1	Background	All stakeholders – internal and external Community groups Approval or consent authority e.g. EPA Punjab
2	Environmental Management	The management and supervisory staff of M/S Lion Waste Management Pvt. Ltd. EPA Punjab
3	Implementation	The management and supervisory staff of M/S Lion Waste Management Pvt. Ltd. Community groups, EPA Punjab
4	Monitor and review	The management and supervisory staff of M/S Lion Waste Management Pvt. Ltd.

		and EPA Punjab
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7.2 EMMP CONTEXT

Being an environment conscious and law abiding entity, M/S Lion Waste Management Pvt. Ltd. has decided to identify, develop and implement an EMMP that identifies the environmental aspects of their project besides providing them a guideline to tackle any environmental issues that may arise in the future. Under the Punjab Environmental Protection Act, 1997 (Amended, 2012), conducting an IEE/EIA prior to commencement of a project is obligatory. This is further reinforced through the IEE/EIA Rules 2000. A more elaborated guideline for Environmental Report Writing further provides a step by step procedure for drafting of an IEE/EIA report. An Environmental Management and Monitoring Plan have been made a compulsory part of the IEE/EIA report under the same guidelines. It is for this reason that M/S Lion Waste Management Pvt. Ltd. has planned to meet pre-requisite of the Environmental Approval by drafting a meticulously planned EMMP.

7.3 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

The objectives underlying the EMMP of M/S Lion Waste Management Pvt. Ltd. are:

- To provide guideline to the management and supervisory staff for conducting their activities in an environmentally responsible manner
- To mitigate potential risks during operational phase of the project
- To coordinate with the responsible approval authorities regarding the environmental efforts
- To identify roles and responsibilities for the implementation of EMMP
- To meet the regulatory obligation put forth by Punjab Environmental Protection Act, 1997 (Amended 2012).

7.4 ENVIRONMENTAL POLICY

M/S Lion Waste Management Pvt. Ltd. strives for environmental reverence which is why it has devised its environmental policy stating vision of the company towards environmental conservation. Our policy is:

- To provide a quality product yet sustainable and environmental friendly working condition to its employees
- Conserve natural resources through adopting less waste policy
- Energy conservation through promoting environment friendly plant designs
- To provide trainings to all employees to meet our environmental objectives

7.5 MANAGEMENT APPROACH

The overall responsibility for compliance with the environmental management plan rests with the project proponent.

The organizational roles and responsibilities of the key players are summarized below:

Proponent: The project proponent will undertake overall responsibility for compliance with the EMP. Concerned Departments will carry out verification checks to ensure that the contractors are effectively implementing their environmental and social requirements.

Contractors: The contractors will implement the majority of environmental and social mitigation measures. The contractors will carry out field activities as part of the project. The contractors are subject to certain liabilities under the environmental laws of the country, and under its contract with proponent.

7.6 COMPONENTS OF THE EMP

The EMP consists of the following:

- Management plan
- Monitoring Plan
- Communication and documentation
- Institutional capacity
- Environmental training

7.7 INSTITUTIONAL CAPACITY

Following functionaries are involved in the implementation of EMP.

- Project Proponent
- HSE/ Project Manager
- In-Charge Administration
- Supervisor of Project
- Environmental Engineer.

7.8 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN STRUCTURE AND RESPONSIBILITY

Table 7.2: Roles and Responsibilities

Sr. #	Positions	Significance	Stage	Environmental Responsibilities
1	Proponent / Owner	Critical	Operations	Oversee Environmental Policy and EMMP Serve as primary contact to the regulatory authorities Commit resources to achieve environmental objectives
2	All Employees	Critical	Operation	Attend training and understand their roles in the implementation of EMMP Understand the Environmental Policy / Objectives and act accordingly Participate in the review of EMMP Coordinate with the responsible authorities within the project to report any noncompliance to their Environmental Policy
3	Operational Supervisor	Critical	Operational	Understand the environmental policy of the project Operate in accordance with the environmental policy Ensure reducing solid waste generation Reduce water and energy wastage

				<p>Ensure all machineries /equipment are in good conditions</p> <p>Ensure health and safety of the workers during construction phase</p> <p>Ensure safe transportation of good/materials to and from the project site</p>
4	Maintenance Manager	Critical	Operation	<p>Understand the environmental policy of the project</p> <p>Operate in accordance with the environmental policy</p> <p>Ensure reducing the chances of increased solid waste</p> <p>Reduce water and energy wastage</p> <p>Ensure all machineries /equipment are in good conditions</p> <p>Ensure health and safety of the workers during operational phase</p> <p>Provides health, safety and environmental awareness trainings to the staff</p>
5	Administrative Person Deal with	Critical	Operational	<p>Understand the environmental policy of the project</p> <p>Operate in accordance with the environmental policy</p> <p>Ensure reducing the chances of increased solid waste</p>

	Environment Issues			Reduce water and energy wastage Ensure all machineries /equipment are in good conditions Ensure health and safety of workers during operational phase Receive health, safety and environmental awareness trainings Prepare and maintain accidents/environmental risk records Timely coordination with the responsible authority
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7.9 TRAINING SCHEDULES

Training and orientation programs shall be organized by the Environmental Experts, PSC and Management of M/S Lion Waste Management Pvt. Ltd. for the contractors, laborers, and technical/ office staff of the contractors, site engineers of DSC and the relevant staff or building their capacity with regards to principles and procedures of environmental management, pollution abatement measures, public consultation and participation, health and safety measures and implementation of EMMP.

Table 7.3: Personnel Training Program/ TA Services

Provided By	Contents	Trainees/Events	Duration
TA consultants/ organizations specializing in Environmental Management and Monitoring	Short seminars and courses on: Environmental Laws and Regulations, daily monitoring and supervision	Seminars for Project Proponent and contractor project staff	3 days
TA consultants/ organizations specializing in Environmental Management and Monitoring	Short seminars and courses on social awareness	Seminars for project staff dealing in social/lands matters.	3 days
TA consultants/ organizations specializing in Occupational, health and safety issues	Short lectures relating to occupational safety and health.	Seminars for contractor's staff	3 days

7.10 ENVIRONMENT MANAGEMENT PLAN

It lists all the mitigation measures identified in the EIA and the associated environmental or social aspect in line during operational phase with the administrative framework involving all the responsible implementing authorities who are required to take the planned actions/measures. It enhances project benefits by reducing its impacts and making it environmental friendly.

7.10.1 ENVIRONMENTAL MANAGEMENT PLAN FOR M/S LION WASTE MANAGEMENT PVT. LTD.

M/S Lion Waste Management Pvt. Ltd. believes in sustainable resource management which is why it has developed a comprehensive Environmental Management and Monitoring Plan for its operational phase.

Table 7.4: Environmental Management Plan

Project activities	Type of impact	Potential impacts on environment	Extent / Magnitude	Mitigation Measure	Institutional Responsibility	
					Implementing body	Supervision
PRE-CONSTRUCTION						
Land acquisition and land use	Physical , Social and Aesthetical	Positive use of land but proper planning will be required that is fencing and Signalization is put in place in accordance with best practices.	More	Land is owned by proponent and there is no settlement so no impact will be there. Land will be improved from open land to industrial land.	Contractor	Proponent*
Use of local manpower	Social	Employment Generation	Less / Adjacent area	Local people will be hired for less technical work or non-skilled work	Contractor	Proponent*

Site establishment	Physical	Site cleaning and leveling of the waste	Less / Adjacent area	All the waste that has been created during this phase should be transported by the contractor or a company that has been specifically contracted to send the waste in the authorized sanitary landfill.	Contractor	Proponent*
Site Housekeeping	Physical, Social and Aesthetical	Construction activities shall avoid causing unnecessary disruption and nuisance to adjacent landowners and the public as a whole	Less / Adjacent area	The site where the construction is taking place should be organized using the standard schemes for organizing construction sites, in order identifying: <ul style="list-style-type: none"> • Equipment used in the construction; • Dynamics of the construction works; • Safety conditions for the workers hired by the contractor and the conditions of public safety, 	Contractor	Proponent*
Emergency Response	Physical /Social	Disasters such as earthquakes, flooding and other manmade disasters such as fires may occur	Less/ Within area	Complete equipment control system, fire exits and secured access system supplemented with close circuit surveillance equipment/alarms.	Contractor	Proponent*
CONSTRUCTION PHASE						
Civil works	Physical,	Soil Erosion,	More/	Minimization:	Contractor	Proponent*

	Social, Biological Aesthetical	Emissions, Water Contamination, Noise & Vibration, Wildlife affected, Employment, Health & Safety of Workers	Adjacent area	Dust emission from soil piles and aggregate storage stockpiles will be reduced by keeping the material moist by sprinkling of water at appropriate frequency Avoidance: Covering the pile, for example with tarpaulin or thick plastic sheets, to prevent emission. Noise control measures will be implemented Use of water only from designated wells Wildlife protection rules will be included in the Camp Rules Off-road driving will be minimized in order to avoid accidental killing of fauna.		
Waste	Physical & Aesthetical	Solid waste generation	More/ Adjacent area	Dedicated waste segregation units will be provided. Recycling items will be provided to recycling contractors.	Contractor	Proponent*
Movement and fueling of vehicles	Physical & Aesthetical	Soil & Water Contamination due to Fuel Leakages & Spillage, Emissions, Noise & Vibration	Moderate/ at the site	Avoidance: Periodic maintenance and inspection of vehicles Vehicles with leaks will not be operated. Vehicles should not be washed or serviced in the field. No vehicle-related waste, such as oils, filters, old tires or parts, will be left in the field All vehicles will be maintained in good working condition All vehicles will have properly functioning silencers (mufflers).	Contractor	Proponent*

Transportation of construction material	Bio-physical	Dust and Particulate Emissions, Noise Generation, Safety and Health Effects, slow movement of vehicles	Moderate/ Adjacent area	<p>Minimization: Excessive use of horns will be avoided PPE's will be provided to workers</p> <p>Avoidance: Covering of transporting material trucks Nighttime driving of project vehicles will be limited where possible Low speed limit will be maintained on the section of the access road that is adjacent to the community and site. The fence surrounding the site will be put in on during the construction to prevent access to the construction site</p>	Contractor	Proponent*
Construction of campsites	Biological and physical	Damage to Topsoil, Drawn of Water from Local Resources	Moderate/at the site	<p>Photographs will be taken to record the conditions before setting-up camp. Camps will not be established within a 300-m radius of any water body. Camps will be established in the existing clearings. Camps will be kept as small as possible. Water will only be taken from designated wells.</p>	Contractor	Proponent*
Instrument installation	Physical & Social	Noise & Vibration, Spillage & Leakages, Health & Safety	Moderate/ adjacent area	<p>Reduction: Use of PPE's</p> <p>Avoidance: Proper maintenance and inspection of equipment's and machinery. Warning signs will be provided to assure</p>	Contractor	Proponent*

				safety.		
Laying of Transmission lines	Physical	Effects on scenic beauty, Disturbance to birds, noise, safety	More/ adjacent area	Reduction: Planting vegetative screens to block views of the transmission lines Provision of proper safety measures and tools Signs for bird's protection will be provided	Contractor	Proponent*
Use of local water resources	Physical, Social & Biological	disturbance to local community	Less/ adjacent area	Avoidance: Initiation of water conservation program Reduction: Where possible, water should be recycled	Design engineer & Contractor	Proponent*
OPERATIONAL PHASE						
Collection of waste	Physical	Air quality, Odor, destroy aesthetic beauty	Local	Segregation of waste will be done prior the collection. Waste will be collected in closed containers to avoid spillage of hazardous waste.	Contractor	Proponent*
Transportation of wastes	Physical	Traffic management	Local	Waste will be transported during daytime when there will be less traffic load. Good quality fuel (EURO II) will be used in transportation vehicles for environmental safety.	Contractor	Proponent*
Storage of waste	Physical	Air quality/ soil and water quality	local	Hazardous waste will not be stored for more than 24 hours to avoid decomposition of waste. Each type of waste will be stored separately to avoid mixing of waste. Properly tiled floor will be provided to avoid	Contractor	Proponent*

				accidental seepage of liquids from the waste. The storage room will be kept cleaned to avoid rodents and scavengers in the room.		
Incineration	Physical	Air quality	localized	Dry Scrubber will be provided with proper functioning to avoid air emissions. Higher stacks should be designed to reduce ground level concentrations Good combustion practices can control emissions by ensuring that the temperature in the combustion chamber and the time the Waste remains in the combustion chamber are kept at optimal levels.	Contractor	Proponent*
Odor control/ reduce concentration of pollutants	Physical	Air quality	Severe/ local	Dry materials shall be kept dump or covered at all time, Install gadgets to intercept the particulate matter as well as controlling gaseous emissions.	Contractor	Proponent*
Greening the compound and landscape	Physical	Vegetation cover	Less/ adjacent area	Introduction of vegetation (trees, shrubs and grass) on open spaces within and around the site. Indigenous species would be preferred.	Contractor	Proponent*
Social acceptability and co- existence	Social	Enhance socially acceptable procedures/ Public satisfaction	Less/ adjacent area	Involve more independent interested parties (waste collectors) in establishing options for waste recycling.	Contractor	Proponent*
Heavy equipment operation	physical	Particulate Matter, Emission of GHG, Noise,	Moderate/ Local	Avoidance: Noise control plans No machinery will be left unattended, particularly in running	Contractor	Proponent*

		Vibration		<p>condition</p> <p>All vehicles, generators and other equipment used during the construction and operation will be tuned and maintained in good working condition in order to minimize emission of pollutants</p> <p>Reducing equipment noise at source by proper design, maintenance and repair of construction machinery and equipment,</p> <p>Minimizing noise from vehicles and power generators by use of proper silencers and mufflers</p> <p>Reduction:</p> <p>PPE's provision</p>		
Solid Waste Generation/ Ash Disposal	Physical, Biological, Social	Soil Contamination, effecting GW Quality, Emission of GHG, Biological, Particulate Matter, Health, Economy, Welfare	Severe/ local and global	<p>Separation of recyclable material</p> <p>Training will be provided to personnel for identification, segregation, and management of waste.</p> <p>Provision of Separate waste bins</p> <p>The solid waste generated in house will be treated in house through incineration.</p> <ul style="list-style-type: none"> Ash and residues from incineration will be placed in non-combustible containers and will be removed from site by a suitable vendor. Ash will be temporarily stored in designated storage area with impermeable flooring packed in sealed suitable bags with 	Contractor	Proponent*

				<p>no leakage on site with minimal risk of pollution of groundwater and soil.</p> <ul style="list-style-type: none"> • Access to the site will be restricted to authorized personnel only. Suitable vendor will be responsible for its sale for further use or ultimate disposal at government approved dumping site or landfill site. The operators will be properly trained especially in safe handling procedures, use of protective equipment and hygiene and emergency response procedures. • Final disposal of solid waste from proposed incinerator facility will be very much low as compared to initial amount of waste entering in the incinerator. 		
Spillage from vehicles and machinery	Physical, Biological	Soil Contamination, Effecting GW Quality, Emission of GHG,	Moderate/local	<p>Avoidance:</p> <p>On-site maintenance of construction vehicles and equipment will be avoided as far as possible</p> <p>Emergency plan for spill management will be prepared and inducted to the staff for any incident of spill</p>	Contractor	Proponent*
Handling of wastewater	physical, biological, social	Soil contamination, effect on GW quality, GHG emission, effect on vegetation,	severe/ local and global	<p>Reduction:</p> <p>Provision of septic tank for domestic waste water.</p> <p>Avoidance:</p> <p>Handling and storage of fuels and lubricants in areas of impervious floors</p>	contractor	Proponent*

		fisheries, health, economy, welfare				
Disaster Planning	physical , social	reduction of biodiversity, community grievance, economy, welfare	severe/local	Avoidance: Proper disaster planning will be done to meet any emergency situation arising due to fire, explosion, sudden leakage of gas etc. Firefighting equipment and other safety appliances will be kept ready for use during disaster/emergency situation including natural calamities like earthquake/flood	contractor	Proponent*
Fuel Management	Physical, Biological	Spillage, Soil Contamination, Degradation of Water quality	Severe/local	Avoidance: Proper electrical grounding will be provided for loading and off-loading equipment. Smoking should not be permitted within 10 m of the fuel storage area. Fuel storage areas should be clearly marked to ensure that moving vehicles does not damage them.	contractor	Proponent*
Hazardous waste management	Physical	Safety hazard, spills		Avoidance: Labeling will be placed on all storage vessels/containers as appropriate to national and international standards. The labeling will clearly identify the stored materials Storage areas for fuels and liquid chemicals will be designed with secondary containment to prevent spills and contamination of soil and groundwater	Contractor	Proponent*

7.11 ENVIRONMENTAL MONITORING PLAN

Environmental monitoring is being followed and will be strictly undertaken in accordance with the requirements of the environmental authority (EPA, Punjab) to ensure compliance to the Punjab Environmental Quality Standards (PEQS) as and when required. Proponent has decided to spend 1.1 million PKR annually for sake of Environmental Budget.

Environmental monitoring is including parameters that are mentioned in the Environmental Approval accorded by the Environmental Protection Agency, Punjab for getting approval under section 12.

Environmental monitoring is a vital component of the Environmental Management Plan. It is the mechanism through which the effectiveness of the environmental management Plan in protecting the environment is measured. The feedback provided by the environmental monitoring is instrumental in identifying any problem or lapse in the system under implementation and planning corrective actions. The main objectives of the environmental monitoring are:

- To provide a mechanism to determine whether the project construction contractors are carrying out the project in conformity with the EMP.
- To identify areas where the impacts of the project are exceeding the criteria of significance and, therefore, require corrective actions.
- To document the actual project impacts on physical, biological, and socio-economic receptors, quantitatively where possible, in order to design better and more effective mitigation measures.

Following environmental record should be maintained:

- Periodic inspection reports of the site
- Audit reports
- Incident record of all moderate and major spills and other incidents and accidents.

The record will include:

- Location of spill or battery limit of the accident
- Estimated quantity or the amount of injury (as may be reported in LTI or LWI)
- Spilled material or nature of injury or loss (temporary or permanent)
- Restoration measures

- Photographs
- Description of any damage to vegetation, water resource, or community asset.
- Corrective measures taken, if any
- Waste Tracking Register that will hold records of waste generated during the construction period. This will include quantities of waste disposed, recycled, or reused.
- Records of water consumption with use wise breakdown
- Survey reports, in particular, the following:
 - Vehicle and equipment noise.
 - Ambient noise survey reports.
 - Ambient level of PM
 - Vendor data—all vendors disturbed by the project and compensation paid
 - Public infrastructure: Record of all damages and repair work undertaken.
 - Employment
 - Total number of unskilled, semi-skilled, and skilled jobs offered during Construction.
 - Name and domicile of the employed staff.
 - Project and Community Interface
 - Record of community complains and the measures taken to address them.
 - Number of meetings held in various communities and data of persons who attended.

a) Construction phase

Table 7.5: Environmental Monitoring Plan						
Components	Objective of Monitoring	Parameter to be Monitored	Measurement	Frequency	Location	Responsibility
Noise Levels	To determine the effectiveness of the noise abatement measures on the sound level	Noise level on the site and adjacent area on dB(A) scale	Noise level reading will be taken	Twice a year	At least three locations on the unit boundary	Consultant / HSE
Workers safety	To check and evaluate the effectiveness of the workers' safety plan	Injuries and accidents	Recording injuries	daily	Onsite	HSE/contractor
Water conservation	To determine the effectiveness of the Water	leakages, spills and wastages	Visual inspection and record	On monthly basis	at all points of use	Environmental officer/manager

	Conservation Techniques in Practice		tracking			
Dust emissions	To confirm the ambient air quality	Air quality at different points	Readings will be taken	Twice a year	At least three points on mine and site	Consultant / Environmental manager
Property value	Access to public and private properties	Monitoring impact of project on business in the project area	Using questionnaire s	After 2-3 months	2-3 surrounding area	Consultant / Environmental manager

b) Operation Phase

Monitoring Category	Type of Monitoring	Monitoring Responsibility
Operation and Maintenance System		
Noise and air emissions due to generators and vehicles	Monitor proper maintenance of the equipments	Proponent
Solid waste segregation, recycling and final disposal	Monitor adequacy of measures undertaken to collect and dispose of solid waste	Proponent

Sewage and wastewater disposal	Monitor disposal of wastewater according to the proposed mitigation	Proponent
Environment and Landscape		
On site wastage material's minimization	Monitor waste minimization activities	Proponent
Creation of landscape by tree planting, appropriated to local conditions	Monitor and implement site restoration and landscaping	Proponent

7.12 EQUIPMENT MAINTENANCE DETAIL

All work equipment will be maintained in an efficient state, in efficient order and in good repair. All machinery has a maintenance log, the log is kept up to date; and that maintenance operations on work equipment are carried out safely. The detail of equipment maintenance log is given in Annexure.

7.13 ENVIRONMENTAL BUDGET

The total cost for the environmental management is estimated as 01 million PKR both during construction and its regular operation. The estimations are as followings;

Table - 7.6: Environment Management Cost

Sr. #	EMP Parameters	Unit Cost	Before Construction		During Construction		After Construction		Total (m PKR)
			Times	Cost	Times	Cost	Times	Cost	
1	Environmental Monitoring	0.050	0	0	1	0.050	2	0.050	0.1
2	Social Cost (meeting, visit, tour etc.)	0.01	1	0.01	0	0.01	0	0.01	0.01
3	Environmental Training	0.05	1	0.05	0	0	1	0.05	0.1
4	Tree Plantation Plan	0.0005	0	0	0	0	1000	0.0005	0.5
5	Environmental reporting & review	0.3	1	0.3	0	0.3	0	0	0.3
Total									1.01
Contingencies (10%)									0.101
Grand Total									1.1

CHAPTER VIII

CONCLUSION AND RECOMMENDATIONS

The EMMP will guide the environmentally-sound construction of the project and ensure efficient lines of communication between the DSC (Engineer), contractors and EE. The EMMP will

- Ensure that the activities are undertaken in a responsible non-detrimental manner;
- Provide a pro-active, feasible and practical working tool to enable them and monitoring of environmental performance on site;
- Guide and control the implementation of findings and recommendations of the environmental assessment conducted for the project;
- Detail specifications deemed necessary to assist in mitigating the environmental impact of the project; and
- Ensure that safety recommendations are complied with.

8.1 CONCLUSION

The following are the main conclusions drawn from the study:

- The project adverse impacts are minimal than that of the benefits, which will be attained because of the implementation of the project.
- The possible mitigation measures to minimize/ or reduce the environmental and social impacts are listed in the EMMP.
- No endangered or threatened species found in the project area.
- The project does not involve any land acquisition, as the requisite land is already owned by the project proponent.
- There are no nearby residence communities. The nearest residential area is about 4 km away from the project site. The residents have no issue with the implementation of the project rather it is highly supported project because of present infrastructural development situation in the country.
- An EMMP has been developed to address the environmental issues associated with this project.

8.2 RECOMMENDATIONS

Based on the potential impacts, the project falls in the category of high beneficial and low adverse. The project potential impacts will be mitigated by adopting all suggested technical/ engineering best practices and measures.

The following are the major recommendations:

- The EMMP developed needs to be fully implemented during the both construction and operation stage of the project.
- Environmental monitoring to ensure the proper implementation of EMMP will be required
- A copy of the EMMP must be kept onsite during the construction/ rehabilitation period at all times. The EMMP will be made binding on all contractors operating on the site and will be included within the Contractual Clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.
- The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.
- All types of storage including fuels should be cemented to prevent the percolation of contaminants.
- The rainwater collection pond should be kept covered to avoid spread of any water borne disease.

In addition to above, there would be temporary impact of dust pollution during construction and operation stage, so sprinkling of water on regular basis especially during dry climatic conditions should be done in order to limit pollution from dust and other windblown materials.

An adequate number of trees will need to be planted at project site to increase the aesthetic value of the project area.

Proper technical design to minimize accidents and chances of possible failure of the structure.

All parameters especially noise, ambient air, waste water should remain within the permissible limit of PEQS.