



ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

INSTALLATION OF WASTE INCINERATION PLANT AT SINDH SMALL INDUSTRIES CORPORATION

Submitted by:

M/S Iqbal Enterprise



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List of Abbreviation

BOD	Biological Oxygen Demand
CO ₂ ,	Carbon Dioxide
CO	Carbon Monoxide
°C	Centigrade
COD	Chemical Oxygen Demand
CBD	Convention On Biological Diversity
DG	Director General
EHS	Environmental Health And Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPC	Environmental Protection Council
GoP	Government Of Pakistan
HSP	Health And Safety Plan
HCl	Hydrogen Chloride
IMC	Independent Monitoring Consultant
IEE	Initial Environmental Examination
IFC	International Finance Corporation
KDA	Karachi Development Authority
KMC	Karachi Metropolitan Corporation
KWSB	Karachi Water & Sewerage Board
kW	Kilo Watt
kg	Kilogram
km ²	Kilometer Square
LRS	Labour Room Suites,
LDO	Light Diesel Oil
CHA	Methane
MGD	Million Gallen Per Day
MOU	Memorandum of Understanding
MSW	Municipal Solid Waste
NEQS	National Environmental Quality Standards
NFEH	National Forum For Environment & Health
NOX	Nitrogen Oxides
NOC	No Objection Certificate
NGO	Non-Governmental Organizations

NO ₂	Oxides Of Nitrogen
O ₃	Ozone
PEPA	Pakistan Environmental Protection Act
PCC	Pakistan Penal Code
PPEs	Personal Protection Equipment
PAHs	Polycyclic Aromatic Hydrocarbons
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SEQS	Sindh Environmental Quality Standards
SBCA	Sindh Building & Control Authority
Sindh EPA	Sindh Environmental Protection Agency
SSWMB	Sindh Solid Waste Management Board
SCOPE	Society For Conservation And Protection Of Environment
SWEEP	Solid Waste Emergency And Efficiency Project
SOPs	Standard Operating Procedures
SO ₂	Sulfur Dioxide
SOX	Sulfur Oxides
SPM	Suspended Particulate Matter
SDG	Sustainable Development Goals
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UN	United Nations
UNDP	United Nations Development Program
UHI	Urban Heat Island Effect:
VOCs	Volatile Organic Compounds
WHO	World Health Organization

EXECUTIVE SUMMARY

1. This report outlines the findings of the Environmental Impact Assessment (EIA) study for the construction phase conducted by Indus Environmental Engineering Consultants for the proposed Waste Incineration Plant located at Sindh Small Industries Corporation in Karachi. M/S Iqbal Enterprises is proposing the project. The EIA has been performed for the mandatory requirements of Section 17 of the Sindh Environmental Protection Act, 2014, which states:

“No project proponent shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental impact assessment and has obtained approval from the Agency concerning thereof.”

2. The primary objective of this project is to construct an incineration facility that will, upon completion, provide services for the incineration of medical waste, thereby ensuring the safe disposal of such hazardous materials.
3. The TLFSP-100 incinerator is a high-efficiency waste disposal system designed to handle 100 kg of hazardous waste per hour, with an average calorific value of 1000 kcal per kg. It features an automated feeding system with a conveyor, manual ash removal, and a horizontal furnace design with automatic ignition. The waste undergoes multiple stages of treatment, including primary and secondary combustion, wet scrubbing, and dust removal, and is eventually released through a chimney. The furnace operates 650°C to 1300°C under micro-negative pressure, preventing backfire and ensuring complete combustion.
4. The incinerator's safety features are robust, with automatic shut-off if the burner fails and a cooling protocol during shutdown to safely lower the chamber's temperature. The system has leakage protection, ensuring insulation resistance above 2 MΩ under specified conditions. Electrical components are secured with metal hoses, and oil seals have passed pressure tests to prevent leaks, providing safe and reliable operation.
5. Key components of the system include the primary and secondary combustion chambers, a mixed combustion chamber, a wet scrubber, a cyclone dust collector, air blowers, and a chimney. The furnace's design ensures efficient fuel consumption and minimal pollution, using refractory materials to maintain stable temperatures and reduce nitrogen oxide emissions. The air supply system increases combustion efficiency, achieving up to 99.99% combustion and fully oxidizing waste without smoke or odour.
6. The incineration process ensures the complete decomposition of waste, with high-pressure air aiding combustion and secondary combustion burning gases at 1300°C or higher to eliminate harmful substances. The wet scrubber removes particulate matter from the flue gas, and the cyclone dust collector further filters out over 90% of large particles. With a power consumption of 3.25 kWh and fuel usage varying based on burner type, the system operates efficiently, requiring only one operator per shift. The key features of the project are as follows:

Project Details		
General		
Project Title	Installation of Waste Incineration Plant at Sindh Small Industries Corporation in Karachi	
Project Location	25°04'53.6"N 67°02'53.3"E	
Proponent	M/S Iqbal Enterprises	
Total Area of Plot	500 Sq Yard	
Status of the project	Design Phase	
Plant Specifications		
Waste Compatibility:	It is suitable for various waste types, such as clinical, treated, anatomical, cytotoxic, cytostatic, offensive/hygiene, medicinal, Industrial, and domestic waste.	
Cooling System	Through Natural Air	
Ignition System	Autopilot	
Operation System	Sequential Starting and Stopping with On/Off Control Depending on Furnace And Exhaust Gas Temperatures And Automatic Shut- Off For Safety	
Type of waste to be Incinerated	Multi Solid Waste	
Ancillary facilities (incinerator)	Storage area, Temporary Ash Storage area, admin,	
Component	Material/Specifications	Key Features
Primary Combustion Chamber	Q235 steel + refractory insulation material	
Attachments: feeding door, ash door, air supply system	Durable Construction: Designed to withstand high temperatures and thermal stress.	
Secondary Combustion Chamber	Q235 steel + refractory insulation material	Enhanced Efficiency: Facilitates complete combustion, reducing emissions.
Mixed Combustion Room	Q235 steel + refractory insulation material (100mm)	
Attachment: ash door	Optimized Design: Ensures effective mixing of combustion gases for improved performance.	
Chimney	Dimensions: φ300*4000mm	
Material: Q235 steel anti-corrosion material	Corrosion Resistance: Designed to withstand harsh environmental conditions.	
Air Blower	Model: DP-4	
Power: 0.25kw		
Attachments: motor, regulating valve, etc.	Efficient Air Supply: Ensures adequate air flow for combustion, enhancing efficiency.	
First Combustion Chamber Burner	Brand: Baltur	
Model: BTL14		

Project Details		
General		
Power: 0.2kw	Reliable Performance: Known for consistent operation and durability.	
Secondary Combustion Chamber Burner	Brand: Baltur	
Model: BTL14		
Power: 0.2kw	Uniform Heat Distribution: Promotes thorough combustion of fuel.	
Electrical Control System	Brand: Siemens	
Includes: control cabinet, electrical components, digital display, control buttons, indicators, alarms, etc.	Advanced Control: Provides precise monitoring and control of the combustion process.	
Wet Scrubber	Type: High pressure jet type	
Material: Q235	Pollution Control: Effectively removes particulates and pollutants from exhaust gases.	
Water Recycling Pump	Power: 1.1kw	Sustainable Operation: Supports water recycling, reducing waste.
Dust Removal Device	Type: Cyclonic	
Material: Q235	Efficient Filtration: Captures dust and particulates, improving air quality.	
Fan	Type: High pressure centrifugal	
Material: Q235, impeller and mild steel rubber lined casting		
Drive: Belt driven		
Power: 1.5kw	High Performance: Ensures optimal airflow and pressure for combustion efficiency.	
Fuel Oil Storage Tank	Material: Mild steel	Robust Storage: Safely stores fuel oil, ensuring reliability and safety.
Accessories	Change equipment to connect flue, bolt and nut, paint, asbestos rope, etc.	Comprehensive Setup: Includes all necessary components for installation and operation.
Remarks	Local sizes may change during design and production, but performance remains unaffected.	Flexible Design: Adaptable to specific installation requirements without compromising efficiency.

7. The baseline conditions of the project area were evaluated through investigations conducted by the field study team and by reviewing available materials and literature. Ambient air and noise level monitoring in the project area were performed by an EPA-approved laboratory. The results of the air and noise monitoring were found to be within the Sindh Environmental Quality Standards (SEQS). During the

construction phase, potential adverse environmental impacts may include soil degradation, erosion due to improper disposal of excavated materials and construction waste, spills of hazardous substances, pollution of groundwater and soil from construction runoff; the use of temporary construction sites (such as access roads, camps, machinery sites, and storage facilities); temporary air pollution resulting from increased truck traffic, dust release from excavation and heavy machinery operation; noise and vibration disturbances; and occupational hazards encountered during construction activities.

8. The likely adverse environmental impacts during the operation phase¹ include atmospheric emissions associated with waste incineration, dumper truck movements, and standby power generator operation due to pollutant emissions from fuel combustion, as well as negative impacts on water and soil from improper waste management practices, including inadequate ash management and untreated wastewater discharge. A comprehensive assessment during the operational phase is crucial to ensure that all potential impacts are identified and managed effectively. This includes accounting for indirect and cumulative impacts and implementing mitigation measures to address adverse effects. The process involves a multidisciplinary team of experts to assess diverse environmental and social impacts
9. Specific measures have been developed for the construction phase of the project, which include proper storage of construction materials, close monitoring of storage sites to prevent undue expansion, compacting the surfaces of access roads and worksites to facilitate water runoff and mitigate flooding, implementing dust suppression measures to reduce air pollution; using covered trucks for transporting loose construction materials; regularly checking the technical condition of machinery and equipment; disposing of excavated materials and construction waste at designated disposal sites; prohibiting waste disposal into water channels where feasible; restoring the landscape to its original condition post-construction; and ensuring that personnel involved in construction are equipped with appropriate safety gear.
10. Proposed mitigation measures for the operation phase include adhering to standard operating procedures for incinerator operations, focusing on the types of waste to be incinerated, ensuring that temperatures in the primary and secondary chambers meet specifications, effectively operating emission controls, utilizing wet scrubbers, regularly maintaining all machinery and equipment, and continuously monitoring air emissions to ensure compliance with SEQS. Proper ash management and wastewater treatment before disposal have to be enforced, ensuring the presence and functionality of firefighting equipment. Bottom ash will either be utilised in cement and road construction or disposed of at authorised sites. The project will establish a comprehensive platform for safely disposing of medical and hazardous waste. However, the operation phase impacts will be assessed in detail before the initiation of operation a separate study will be conducted and separate NOC for operation will be obtained.
11. The project is anticipated to have no significant or irreversible negative environmental impacts in the long term during either the construction or operation

¹ A more detailed assessment of the operational phase impacts will be provided following the project's construction, prior to the commencement of operations. This will be presented in a separate Environmental Impact Assessment (EIA) in accordance with the new guidelines set forth by the SEAP.

phases. Furthermore, the project area has no specially protected areas or endangered endemic species.

12. The potential adverse impacts can be effectively prevented or minimized, and additional burdens on natural resources can be alleviated through the timely and proper implementation of the mitigation measures outlined in the Environmental Management Plan (EMP). An environmental monitoring plan has also been developed to ensure the effective execution of the EMP.

CHAPTER - 1: INTRODUCTION

1.1 General

13. The Environmental Impact Assessment is a crucial planning instrument recognized as an essential part of informed decision-making. The EIA's objective is to ensure the environment is considered in decision-making by thoroughly assessing the environmental implications of proposed activities before implementation. Early detection and characterization of significant environmental impacts enable the public and government to form an opinion on the environmental suitability of the proposed development project and determine the necessary conditions to mitigate, reduce, or compensate for those risks and impacts.
14. A team from IEEC, comprising Socio-environmental experts, undertook field studies in the project area. Field data collection encompassed observational surveys, consultations, and meetings with government departments and communities, and verification of available secondary information. Secondary data was sourced from the proponent's in-house resources, Government Departments, and NGOs. The document preparation involved a thorough review of applicable international guidelines, conventions, and environmental assessment procedures provided by the Sindh EPA.

1.2 M/s Iqbal Enterprise – The Proponent

15. Iqbal Enterprise specializes in the safe and efficient collection, transportation, treatment, and disposal of garbage, sewage, and other waste products and substances, representing the essence of waste management. The introduction of the proponent is given in Annexure I. The growing adoption of proactive government measures aimed at reducing illegal dumping is driving the expansion of the global waste management market. Additionally, the rising volume of waste, fueled by population growth and increasing globalisation, contributes to this growth. However, the high costs of acquiring waste management solutions challenge market growth.
16. The global waste management market is segmented by type, service, and region. It also covers different categories, including municipal, industrial and hospital waste. By offering innovative solutions to address complex challenges in waste management, companies in this sector, like Iqbal Enterprise, aim to establish the highest levels of trust with their services, like other industries. This article lists some of the top waste management companies worldwide.

1.2.1 Services Offered

17. **Major Players in Global Waste Management:** , Iqbal Enterprises is one of the leading entities in the waste management sector. This company specializes in solid waste and provides comprehensive environmental services. They offer integrated solutions for non-hazardous solid waste collection, transfer, recycling, and disposal operations. Iqbal Enterprises operates a full range of services, including:
- Commercial Waste Services
 - Residential Waste Collection Services
 - Industrial Solid Waste Collection Operations

- Transfer Stations
 - Roll-Off Containers
 - Municipal Solid Waste Landfills
 - Recycling Facilities
 - Special Waste Management
18. In terms of environmental protection, Iqbal Enterprises adheres strictly to all local, state, and federal regulations. The company boasts strong management capabilities, operational expertise, a commitment to quality and environmental stewardship, and solid financial resources.

1.2.2 Types of Waste Collection

19. , Iqbal Enterprises' waste collection services encompass a variety of categories, including:
- Dry Mixed Recycling
 - Single Stream Recycling
 - Food Waste Recycling
 - Hazardous Waste Management
 - Environmental Services
 - Secure Waste & Recycling
 - Confidential Waste Disposal
 - Contaminated Land & Soil Management
 - Integrated Waste Management
 - Free Waste Audit
 - Waste Management Skips and Services
 - Junk Removal
20. Through these services, Iqbal Enterprises aims to provide adequate waste management solutions while promoting sustainability and environmental responsibility.

1.2.3 Project Proponent

21. M/s Iqbal Enterprise.

Iqbal Enterprise is located at Al-Karam Square, Block-4, Mezzanine Floor, Shop No. C-32, Federal B-Area, Karachi, Sindh, 74600. You can reach them at 0322-2690927 (WhatsApp) or 0333-2690927 (Phone). Their email address is ieenterprises@gmail.com,

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1.4 Objectives of The Project

23. The proposed project aims to establish a state-of-the-art waste management facility featuring constructing and installing a high-performance incinerator (TLFSP-100). This innovative solution will provide a consolidated platform for the safe and responsible disposal of a wide range of hazardous waste.
24. The main features of the project are outlined below:

Table 1.1 Project Details

Project Details		
General		
Project Title	Installation of Waste Incineration Plant at Sindh Small Industries Corporation in Karachi	
Project Location	25°04'53.6"N 67°02'53.3"E	
Proponent	M/S Iqbal Enterprises	
Total Area of Plot	500 Sq Yard	
Status of the project	Design Phase	
Plant Specifications		
Waste Compatibility:	It is suitable for various waste types, such as clinical, treated, anatomical, cytotoxic, cytostatic, offensive/hygiene, medicinal, Industrial, and domestic waste.	
Cooling System	Through Natural Air	
Ignition System	Autopilot	
Operation System	Sequential Starting and Stopping with On/Off Control Depending on Furnace And Exhaust Gas Temperatures And Automatic Shut- Off For Safety	
Type of waste to be Incinerated	Multi Solid Waste	
Ancillary facilities (incinerator)	Storage area, Temporary Ash Storage area, admin,	
Component	Material/Specifications	Key Features
Primary Combustion Chamber	Q235 steel + refractory insulation material	
Attachments: feeding door, ash door, air supply system	Durable Construction: Designed to withstand high temperatures and thermal stress.	
Secondary Combustion Chamber	Q235 steel + refractory insulation material	Enhanced Efficiency: Facilitates complete combustion, reducing emissions.
Mixed Combustion Room	Q235 steel + refractory insulation material (100mm)	
Attachment: ash door	Optimized Design: Ensures effective mixing of combustion gases for improved performance.	
Chimney	Dimensions: ϕ300*4000mm	

Project Details		
General		
Material: Q235 steel anti-corrosion material	Corrosion Resistance: Designed to withstand harsh environmental conditions.	
Air Blower	Model: DP-4	
Power: 0.25kw		
Attachments: motor, regulating valve, etc.	Efficient Air Supply: Ensures adequate air flow for combustion, enhancing efficiency.	
First Combustion Chamber Burner	Brand: Baltur	
Model: BTL14		
Power: 0.2kw	Reliable Performance: Known for consistent operation and durability.	
Secondary Combustion Chamber Burner	Brand: Baltur	
Model: BTL14		
Power: 0.2kw	Uniform Heat Distribution: Promotes thorough combustion of fuel.	
Electrical Control System	Brand: Siemens	
Includes: control cabinet, electrical components, digital display, control buttons, indicators, alarms, etc.	Advanced Control: Provides precise monitoring and control of the combustion process.	
Wet Scrubber	Type: High pressure jet type	
Material: Q235	Pollution Control: Effectively removes particulates and pollutants from exhaust gases.	
Water Recycling Pump	Power: 1.1kw	Sustainable Operation: Supports water recycling, reducing waste.
Dust Removal Device	Type: Cyclonic	
Material: Q235	Efficient Filtration: Captures dust and particulates, improving air quality.	
Fan	Type: High pressure centrifugal	
Material: Q235, impeller and mild steel rubber lined casting		
Drive: Belt driven		
Power: 1.5kw	High Performance: Ensures optimal airflow and pressure for combustion efficiency.	
Fuel Oil Storage Tank	Material: Mild steel	Robust Storage: Safely stores fuel oil, ensuring reliability and safety.

Project Details		
General		
Accessories	Change equipment to connect flue, bolt and nut, paint, asbestos rope, etc.	Comprehensive Setup: Includes all necessary components for installation and operation.
Remarks	Local sizes may change during design and production, but performance remains unaffected.	Flexible Design: Adaptable to specific installation requirements without compromising efficiency.

1.5 Location and Accessibility of the Project

25. The project site is proposed at Sindh Small Industries Corporation in Karachi.

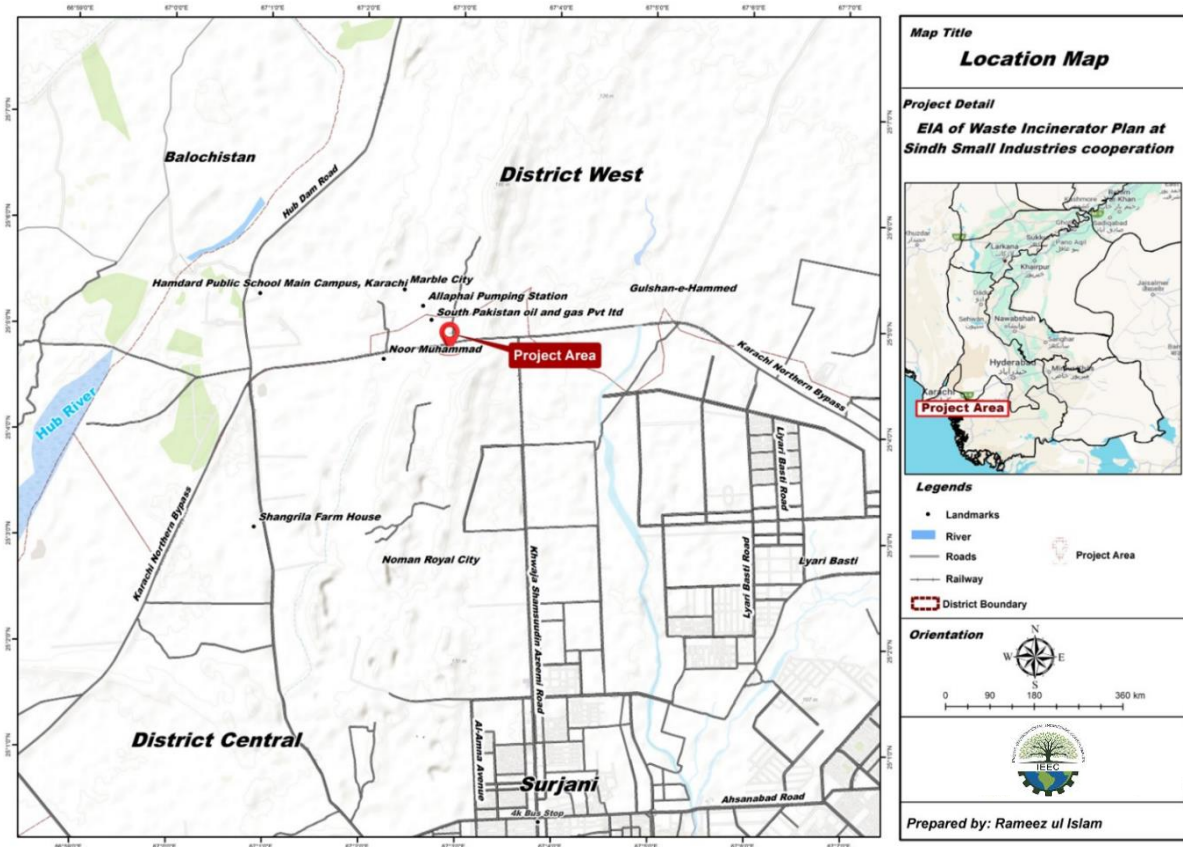


Figure 1-1 Project Location

1.6 Need for EIA Study

26. The proposed Incinerator (TLFSP-100) Plant project, with an operational capacity of 300 kg and a nominal burn rate of less than 75-100 kg/hr., has undergone a comprehensive Environmental Impact Assessment (EIA) for the construction phase to comply with the mandatory requirements set forth by the Sindh Environmental Protection Act (SEPA) 2014.

As per the SEPA Act, “No proponent can commence construction or operation of a project without first filing an Initial Environmental Examination (IEE) or an EIA and obtaining approval from the relevant agency”.

27. This comprehensive assessment will provide the necessary information and mitigation measures to enable the proponent to establish and operate the Incinerator Plant² in an environmentally responsible and sustainable manner. The EIA report delves into a detailed analysis of the potential environmental impacts, covering various aspects such as air quality, water resources, waste management, and the overall impact on the surrounding ecosystem. This thorough evaluation will guide the proponent in implementing appropriate measures to minimize the project's environmental footprint and ensure compliance with applicable laws and regulations.
28. By undertaking this comprehensive EIA process, the proponent demonstrates a strong commitment to environmental stewardship and sustainable development, paving the way for the successful implementation and operation of the proposed Incinerator (TLFSP-100) Plant project.

1.7 Project Categorization

29. Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021 categorize projects into three separate schedules depending on whether a project requires an Environmental Checklist (Schedule I), an IEE (Schedule II) or an EIA (Schedule III). The Regulations also require that all projects located in environmentally sensitive areas need submission of an EIA.
30. The Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021, categorize projects into three separate schedules based on the level of environmental assessment required. These categories include:
- Schedule I: Projects that require an Environmental Checklist
 - Schedule II: Projects that require an Initial Environmental Examination (IEE)
 - Schedule III: Projects that require a full Environmental Impact Assessment (EIA)
31. The Regulations also stipulate that all projects in environmentally sensitive areas must submit an Environmental Impact Assessment (EIA), regardless of the project's categorization under the other schedules.
32. based on the nature and scope of the project, it has been accordingly categorized into Schedule III
- **Schedule-III, (EIA Project)**
 - **Category H: Waste Disposal and Treatment**
 - **Subcategory: 1.** Facilities for handling, storage or disposal of hazardous or toxic wastes or radioactive wastes (including landfill sites, incineration units, etc.)

33. Therefore, an EIA has been undertaken for the proposed incinerator (TLFSP-100) Plant.

1.8 Scope and Objectives of the EIA Study

34. The primary goals of the Environmental Impact Assessment (EIA) study are to:

² A more detailed assessment of the operational phase impacts will be provided following the project's construction, prior to the commencement of operations. This will be presented in a separate Environmental Study in accordance with the new guidelines set forth by the SEPA.

- Describe the proposed project in detail, including all the activities to be carried out during the project's lifecycle, such as design, construction, operation, and any other relevant activities.
- Describe the key components of the micro and macro environment of the project area, providing a thorough understanding of the surrounding context.
- Identify, analyze, and evaluate the potential environmental and social impacts, both beneficial and adverse, that the proposed project is likely to have on the existing biological, physical, and socio-economic environments within the project area.
- Recommend appropriate mitigation measures and strategies to minimize or avoid any adverse environmental and social impacts during the construction phase and develop comprehensive monitoring plans to ensure the effective implementation of these mitigation measures for construction phase.
- Develop a detailed Environmental Management Plan outlining the project's sustainable construction practices, which will be a crucial component of the EIA report.
- Ensure that the EIA process and the resulting report fulfil the legal requirements outlined in Section 17 of the relevant Environmental Protection Act.
- Assist planners and decision-makers in evaluating the project's overall feasibility based on its potential environmental and social impacts, thereby supporting informed decision-making.

1.9 Methodology of EIA

35. Environmental Impact Assessment (EIA) is a systematic and comprehensive process that identifies and evaluates a proposed project's potential positive and negative impacts on the biophysical and socio-economic environment. The primary purpose of an EIA is to determine the appropriate mitigation measures that need to be implemented to avoid, minimize, or reduce any negative impacts, as well as to identify ways to enhance the positive impacts.
36. The EIA is not a linear, one-time exercise but a dynamic and iterative process. Several stages of the assessment are carried out in parallel, and the assumptions and conclusions are continuously revisited and modified as the project progresses. These stages are:

1.9.1 Obtaining Project-Specific Data

37. The first step in this environmental assessment study was to hold meetings with the officials of the project proponent. These initial meetings were crucial to establish the foundational understanding of the project. During these discussions, the project team aimed to clarify the nature and extent of the project from an environmental perspective. This allowed a clear understanding of the proposed project activities and their potential environmental implications. The basic information about the proposed project activities was collected directly from the proponent. The experts then thoroughly analyzed this information to comprehend the project and assess its potential influence on the surrounding environment.

1.9.2 Literature Review

38. Concurrent with acquiring the project details, a comprehensive desk-based study was also initiated—this desktop study aimed to draft the initial environmental

baseline information for the project area. The desktop study involved an extensive literature review, where the project team collected updated and authenticated published or printed data related to the focused project area's physical, ecological, and social environment. The information gathered through the desktop study was also used to delineate the scope and focus of the subsequent field surveys. This ensured the on-site assessments were well-informed and targeted to address the critical environmental and social aspects.

1.9.3 Stakeholder Consultation

39. Stakeholder consultations were an integral part of the environmental assessment process. They were held to actively involve the public in decision-making and ensure fair and transparent interactions with all community groups. These stakeholder consultations ensured the community that every effort would be made to minimize the project's negative impacts. The consultations also provided a platform to communicate the proposed remedial measures that would be implemented to compensate any affected individuals or groups, if necessary.

1.9.4 Reconnaissance and Detailed Surveys

40. The consultant has organized preliminary surveys of the project location. Subject matter experts visited the area during these surveys and assessed the physical environment to plan detailed studies. The relevant surveys were carried out under the close supervision of the environmental experts to ensure a comprehensive and accurate evaluation of the site conditions. In addition to the physical assessment, a preliminary socio-economic evaluation was undertaken to gain a holistic understanding of the project's context. Following the initial assessments, the team conducted detailed and comprehensive surveys across multiple environmental and socio-economic domains. These in-depth investigations aimed to identify the various issues and concerns that could lead to identifying relevant aspects and assessing potential impacts.
41. A detailed environmental baseline survey was conducted to collect primary data from the project's surrounding area. The purpose of this survey was to identify the sensitive receptors that the project may impact. The primary data collected during the survey was thoroughly examined and compared with the available secondary data from previous environmental studies conducted in the region. This approach ensured a comprehensive understanding of the existing environmental conditions.
42. The environmental baseline survey encompassed the collection of information on the following key aspects:
- Climate and Rainfall
 - Air Quality
 - Noise Quality
 - Land and Soil
 - Geology
 - Vegetation
 - Aspects Identification

- Fauna
- Administrative Division
- Nearby settlements
- Socio-Economic Activities
- Land use
- Infrastructure & Social Services

1.9.5 Aspects Identification

43. The EIA process necessitates the development of a comprehensive inventory of all potential environmental and socio-economic aspects associated with the project. This aspect of inventory serves as the foundation for the categorization and evaluation of the impacts, as well as the assessment of their likelihood of occurrence due to the implementation of the project. The identified aspects are the root causes of positive and negative impacts that may arise during the project's lifecycle. The factors are primarily associated with the activities and operations carried out during the construction and operational phases of the project.

1.9.6 Impact Assessment & Mitigation Measures

44. The experts utilized a well-developed aspects inventory to systematically analyze the potential impacts on the physical, ecological, and social environment. These potential impacts were identified, assessed, and evaluated for various construction and commissioning activities. Based on the impact assessment, the experts have proposed appropriate mitigation measures for the different activities and phases of the project. These mitigation measures are designed to minimize the potential adverse impacts throughout the project's lifespan.

1.9.7 Environmental Management & Monitoring Plan

45. a comprehensive Environmental Management Plan (EMP) has been developed based on the identified impacts and the proposed mitigation measures. The EMP plays a pivotal role in the successful implementation of the project by outlining the specific responsibilities and tasks assigned to personnel for environmental management and mitigation measure implementation. The EMP not only assigns roles and responsibilities but also provides detailed monitoring plans and procedures. These monitoring activities will be crucial in checking the effectiveness of the implemented mitigation measures and ensuring ongoing compliance with environmental quality standards and legal requirements throughout the project's lifecycle.

1.9.8 Structure of the Report

46. The Environmental Impact Assessment (EIA) report has been structured in accordance with the standard format prescribed by the Environmental Protection Agency (EPA). The report is organized into the following sections:
47. **Chapter 1, Introduction**, provides an overview of the project and objectives, scope, approach and methodology adopted for the study;
48. **Chapter 2, Legal and Regulatory Framework**, describes national laws applicable

- during the project's implementation. National and international guidelines must be complied with during the preparation of the EIA report and followed during the project's implementation. It also describes the need for inter- and intra-agency coordination.
49. **Chapter 3, "Description of the Project,"** provides a rather detailed account, particularly emphasising its essential environmental and social components.
 50. **Chapter 4, Environmental and Social Baseline Conditions** This chapter discusses various environmental and social entities, such as fauna and flora, water, the human environment, etc., before the project.
 51. **Chapter 5, Information Disclosure, Consultation and Participation,** deals with the outcome of the consultation/scoping sessions with the local communities, knowledgeable people, public representatives, etc. It discusses the concerns of various tiers of the people and provides an outline of how these have been addressed within the project.
 52. **Chapter 6, Project Impacts and Mitigation/Resettlement Actions,** analyze the project's environmental and social impacts and discusses measures to mitigate the adverse effects and enhance the environment of the project areas.
 53. **Chapter 7, Environmental Management and Monitoring Plan and Institutional Requirements** provides plans and costs for implementing environmental management and monitoring. It proposes an organizational setup for implementing mitigation/resettlement actions and identifies the need to strengthen institutional arrangements within SSWMB and allied departments.
 54. **Chapter 8, Conclusions& Recommendations,** summarizes the report and the study's conclusions and makes recommendations for making the project environmentally sustainable.

1.10 Details of Project Study Team

55. The following team of experts has been engaged in the proposed project to conduct/ update the EIA study.

Table 1.2: List of EIA Study Team Members

No.	Name	Expertise / Role
1.	Sameen Khokhar	Environment Specialist; Team Leader
2.	Dr. Abdul Fatah Soomro	Solid Waste Management Expert (Associate Expert) (Assistant Professor- Dawood University Department of Energy & Environment Engineering, Karachi.
3.	Vijay Kumar	Social Safeguard Specialist
4.	Engr Naeem Ali	Environment Specialist
5.	Rameez Ahmed	GIS Specialist
6.	Engr Nafees Ahmed	Environment Officer
7.	Engr. Imran Ali Memon	Environment Engineer
8.	Khalil Mehran	Water Specialist
9.	Naqeeb Shah	Field Officer,
10.	Mehtab Bhorani	Field officer,

CHAPTER - 2: LEGISLATIVE & ADMINISTRATIVE FRAMEWORK

2.1 Introduction

56. This chapter overviews the proposed project's relevant policies, legislation, and guidelines. The project proponent will comprehensively adhere to the requirements outlined in the applicable policy documents and legislative frameworks and the recommendations described in the national and international guidelines. Many of these guidelines have been incorporated into the mitigation measures, and the project has developed an Environmental Management Plan (EMP) to ensure adequate environmental management.
57. Following the 18th Amendment, the subject of the environment has been devolved to the provincial levels. All provinces have since enacted their environmental protection acts. The key legislation governing the current EIA study includes the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency (Review of IEE/EIA) Regulations 2014 and revised ones in 2021, the Sindh Environmental Quality Standards 2016, and various policies and laws related to the conservation of nature.
58. The project proponent is committed to fully complying with the relevant requirements outlined in the applicable policies and legislative frameworks during the installation and operational phases. The regulatory requirements have been carefully reviewed and incorporated into the project's comprehensive Environmental Management Plan (EMP).

2.2 National Environmental Policy & Plan

2.2.1 National Conservation Strategy

59. The National Conservation Strategy (NCS) is the Government of Pakistan's (GoP) primary policy document addressing national environmental issues. Approved by the Federal Cabinet in March 1992, the NCS was also recognized by international financial institutions, notably the World Bank. The NCS identified 14 core areas of focus, including biodiversity conservation, pollution prevention and reduction, soil and water conservation, and the preservation of cultural heritage. The strategy recommended immediate attention and action towards these core areas to preserve Pakistan's environment and natural resources.
60. However, a mid-term review of the NCS in 2000 concluded that the strategy's achievements were primarily limited to awareness-raising and institutional capacity building rather than meaningful environmental and natural resource management improvements. The review recognised the need for a more focused national environmental strategy that could practically improve the national environment, emphasising poverty reduction, economic development, and sustainable development.
61. In response to this need, the Pakistan Environmental Protection Council formulated and approved the National Environmental Action Plan (NEAP) in 2001. The NEAP now constitutes the national environmental agenda, with the core objective of

initiating actions to safeguard public health, promote sustainable livelihoods, and enhance the quality of life for the people of Pakistan.

2.2.2 National Environmental Policy 2005

62. The National Environmental Policy provides an overarching framework for addressing the critical environmental issues facing Pakistan, including:
- Pollution of freshwater bodies and coastal waters
 - Air pollution
 - Lack of proper waste management
 - Deforestation and loss of biodiversity
 - Desertification
 - Natural disasters and climate change
63. The policy also provides direction for addressing cross-sectoral issues and the underlying causes of environmental degradation and for fulfilling Pakistan's international environmental obligations.
64. While recognizing the goals and objectives of existing national policies, strategies, and action plans, such as the National Conservation Strategy and the National Environmental Action Plan, the National Environmental Policy provides broad guidelines to the federal, provincial, and local governments for addressing environmental concerns and ensuring the effective management of environmental resources.
65. The overarching aim of the National Environmental Policy is to protect, conserve, and restore Pakistan's environment to improve its citizens' quality of life through sustainable development. By establishing this comprehensive policy framework, the government is demonstrating its commitment to environmental stewardship and sustainable growth.
66. The policy is a guiding document for all stakeholders, including government agencies, private sector entities, and civil society, to align their actions and initiatives with the national environmental priorities and objectives. Through implementing this policy, Pakistan aims to achieve a balanced and sustainable approach to economic development while safeguarding the country's natural resources and ecological assets.

2.2.3 Biodiversity Action Plan, 2000

67. The protection and preservation of Pakistan's biological heritage are critically dependent on the involvement and support of local communities and the capacity of competent institutions to enable the conservation and sustainable utilization of natural resources. The government of Pakistan recognised the importance of these measures through the development of the National Conservation Strategy and by becoming a signatory to the Convention on Biological Diversity (CBD) in 1994. One of the most significant direct steps the government took to address the issue of biodiversity loss in the country was the development of the Biodiversity Action Plan

for Pakistan in 2000. This action plan is a comprehensive framework to guide the country's efforts in conserving its rich and diverse natural ecosystems, habitats, and species.

2.3 National Legislations

2.3.1 Pakistan Penal Code, 1860

68. The Pakistan Penal Code (PPC) addresses a range of offences that can impact public health, safety, convenience, decency, and morals. Specifically, Chapter XIV of the PPC (Sections 268 to 294A) covers these offences. Public Nuisance Offences Under the PPC, a person can be held guilty of committing a public nuisance if their act or omission causes common injury, danger, or annoyance to the public. This can include situations where the person's actions spread infectious diseases that are dangerous to life. Environmental Pollution Offences In addition, the provisions in Chapter XIV of the PPC also deal with offences related to environmental pollution.
69. Enforcement Landscape It is essential to note that after the promulgation of the Pakistan Environmental Protection Act (PEPA) in 1997, the enforcement of the environmental provisions under the PPC has diminished. The PEPA has become the country's primary legislation for addressing environmental protection and pollution control.
70. However, it is still possible for pollution offences to be tried under the relevant sections of the PPC, even though the PEPA is the predominant law governing environmental matters in Pakistan. This allows for a multi-pronged legal approach to addressing environmental crimes and public nuisances.

2.3.2 Antiquities Act, 1975

71. The Antiquities Act of 1975 in Pakistan aims to protect cultural resources. The Act protects antiquities from destruction, theft, neglect, unauthorised excavation, trade, and export. The law defines antiquities as ancient products of human activity, historical sites, places of anthropological or cultural interest, and national monuments, among other things.
72. The Antiquities Act also prohibits new construction near protected antiquities. It empowers the Government of Pakistan to ban excavation in any area that may contain articles of archaeological significance.
73. Based on the information provided, there are no structures of historical or cultural importance within or immediately adjacent to the project site.

2.3.3 Land Acquisition Act, 1894

74. The Land Acquisition Act provides the legal framework for acquiring land needed for public purposes and by companies and determining compensation for such acquisitions. The law outlines various aspects of the land acquisition process, including:
- Preliminary investigation
 - Objections to the acquisition

- Declaration of intended acquisition
- Inquiry into measurements, value, and claims
- Taking possession of the land
- Reference to the court and associated procedures
- Apportionment of compensation
- Payment of compensation
- Temporary occupation of land
- Acquisition of land for companies
- Dispute resolution mechanisms
- Penalties and exemptions

75. The Act has 55 sections addressing these different areas. For instance, Section 4(2) allows authorised officials to enter and survey the land, dig, and perform other necessary acts to ascertain whether the land is suitable for the intended purpose.

2.4 Provincial/ Local Legislation

2.4.1 Sindh Environmental Protection Act 2014

76. The Sindh Environmental Protection Act, 2014 (SEPA 2014), was passed by the Sindh Assembly on February 24, 2014. This Act serves as the primary legislative tool empowering the provincial government to frame regulations for protecting the environment.

77. The SEPA 2014 aims to protect, improve, conserve, and rehabilitate Sindh's environment through legal action against polluters and to promote environmental awareness among communities. It also emphasizes preserving Sindh's natural resources and adopting measures to restore the balance in its ecosystem by mitigating all types of environmental hazards. The Act's scope extends to a wide range of environmental issues, including air, water, industrial liquid effluent, marine, and noise pollution, as well as the handling of hazardous wastes.

- Article 11(1): 'Subject to the provisions of this Act and the rules and regulations therein, no person shall discharge or emit or allow the discharge or emission of any effluent, waste, pollutant, noise or any other matter that may cause or likely cause pollution or adverse environmental effects, as defined in Section 2 of this Act, in an amount, concentration or level which is in excess to that specified in Sindh Environmental Quality Standard.'
- Article 11(2): 'All persons, in industrial or commercial or other operations, shall ensure compliance with the Environmental Quality Standards for ambient air, drinking water, noise or any other Standards established under section 6(1)(g)(i); shall maintain monitoring records for such compliances; shall make available these records to the authorized person for inspection; and shall report or communicate the record to the Agency as required under any directions issued, notified or required under any rules and regulations.'

- Section 11(3): Monitoring and analysis under sub-section (1) and (2) shall be acceptable only when carried out by the Environmental Laboratory certified by the Agency as prescribed in the rules.
78. All stipulated tests will be regularly performed from designated laboratories approved by Sindh EPA.
- Article 14 (1): 'Subject to the provisions of this Act and the rules and regulations, no person shall cause any act, deed or any activity', including;
 - (b) disposal of solid and hazardous wastes at unauthorized places as prescribed;
 - dumping of wastes or hazardous substances into coastal waters and inland water bodies; and
 - (d) release of emissions or discharges from industrial or commercial operations as prescribed.
 - Article 15 (1): 'Subject to the provisions of this Act, no person shall operate or manufacture a motor vehicle or class of vehicles from which air pollutants or noise are being emitted in an amount, concentration or level which is more than the Sindh Environmental Quality Standards or, where applicable, the standards established under sub-clause (i) of clause (g) of sub-section (1) of section 6'.
 - Article 17(1): 'No proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental assessment, and has obtained from the Agency approval in respect thereof'
 - Article 17(2): The agency shall;
 - a) review the initial environmental examination and accord its approval, subject to such terms and conditions as it may prescribe, or require submission of an environmental assessment by the proponent; or
 - (b) review the environmental assessment and accord its approval subject to such terms and conditions as it may deem fit to impose or require that the environmental assessment be re-submitted after such modifications as may be stipulated or decline approval of the environmental assessment as contrary to environmental objectives.
 - Article 17(3): 'Every review of an environment impact assessment shall be carried out with public participation and, subject to the provisions of this Act, after full disclosure of the project's particulars'.
 - Article 17(4): 'The Agency shall communicate its approval or otherwise within two months from the date that the initial environmental examination is filed, and within four months from the date that the environmental assessment is filed complete in all respects by the regulations, failing which the initial environmental examination or, as the case may be, the environmental assessment shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations'.

- Article 20(1): 'The Agency shall from time to time require the person in charge of a project to furnish, within such period as may be specified, an environmental audit or environmental review report or environmental management plan containing a comprehensive appraisal of the environmental aspects of the project'.
- Article 20(2): The report of a project prepared under sub-section (1) shall include:
 - (a) analysis of the predicted qualitative and quantitative impact of the project as compared to the actual impact;
 - (b) evaluation of the efficacy of the preventive, mitigation and compensatory measures taken concerning the project; al(c) Recommendations for further minimizing or mitigating the adverse environmental impact of the project.
- Article 20(3): 'Based on its review of the environmental audit report, the Agency may, after giving the person in charge of the project an opportunity of being heard, direct that specified mitigation and compensatory measures be adopted within a specified period and may also, where necessary, modify the approval granted by it under section 17'.
- Section 31(1): The Agency shall cause relevant details of any proposed project regarding which an Environmental Assessment has been received to be published, along with an invitation to the public to furnish their comments within a specified period. (2) By such procedure as may be prescribed, the Agency shall hold public hearings to receive additional comments and hear oral submissions. (3) All comments received under sub-section (1) and (2) shall be duly considered by the Agency while reviewing the environmental assessment or strategic impact assessment, and decisions or actions taken thereon shall be communicated to the persons who have furnished the said comments.
 - Several rules and regulations have been promulgated under the SEPA 2014. These are:
 - Environmental Samples Rules, 2014
 - Pollution Charge for Industry (Calculation and Collection) Rules, 2014
 - Provincial Sustainable Development Fund Board (Procedure) Rules, 2001
 - The Sindh Environmental Quality Standard (Self-Monitoring and Reporting by Industry) Rule, 2014
 - Sindh Environmental Protection Agency (Review of IEE and EIA), Regulations 2021
 - Sindh Environmental Quality Standards.

2.4.2 Relevant Organization

79. The administration of environmental matters in Pakistan is divided between the federal and provincial governments:
80. Federal Government: The Ministry of Climate Change manages international environmental policy and regulations.

Provincial Government: The provincial governments are responsible for national environmental matters within their jurisdictions.

- In the Sindh province, the Sindh Environmental Protection Agency (Sindh EPA) is the responsible authority.

81. **Sindh EPA's Responsibilities:** The Director General of Sindh EPA oversees all environmental technical matters, including:

- Initial Environmental Examinations (IEEs) and Environmental Impact Assessments (EIAs)
- Environmental monitoring
- Enforcement of environmental laws and quality standards

82. The federal government handles international environmental issues. In contrast, the provincial governments, specifically the Sindh EPA in this case, are responsible for managing environmental matters within their provinces, including technical assessments, monitoring, and enforcement.

2.4.3 Sindh Environmental Protection Agency (SEPA)

83. A Director-General will head the Sindh Environmental Protection Agency (SEPA). SEPA will be tasked with exercising the powers and performing the functions assigned to it under the provisions of the relevant Act and the rules and regulations made thereunder. The Agency will have a technical and legal staff and may form advisory committees to assist in its work.

84. SEPA shall be responsible for administering and implementing the provisions of the Act, as well as the associated rules and regulations. This includes:

- Preparing environmental policies
- Taking measures to implement environmental policies
- Preparing the annual Sindh Environment Report
- Preparing or revising the Sindh Environmental Quality Standards (SEQS)

85. SEPA shall establish systems and procedures for:

- Surveys
- Surveillance
- Monitoring
- Measurement
- Examination
- Investigation
- Research
- Inspection
- Auditing

86. These activities will aim to prevent and control pollution, estimate the costs of

cleaning up pollution, and rehabilitate the environment to promote sustainable development.

87. SEPA will also have the power to:

- Promote research
- Issue licenses for dealing with hazardous substances
- Certify laboratories
- Identify the need for or initiate new legislation
- Specify safeguards
- Encourage public awareness and education on environmental issues

88. SEPA will have the power to enter and inspect any land or building at any time, under a search warrant issued by the Environmental Protection Tribunal or a Court, if there are reasonable grounds to believe that an offence under the Act has been, is being, or is likely to be committed. SEPA may also take samples, arrange for testing, or confiscate any article in the discharge of its duties.

2.4.4 Sindh EPA (Environmental Assessment) Regulations 2021

89. According to the SEPA Regulations 2021, projects are categorised into three separate schedules based on their environmental impact:

- Schedule-I projects require an Environmental Checklist.
- Schedule II projects require an Initial Environmental Examination (IEE).
- Schedule-III projects require a full Environmental Impact Assessment (EIA).

90. Additionally, the Regulations state that all projects in environmentally sensitive areas must submit an EIA, regardless of their schedule.

91. In the provided example, the project has been categorized into Schedule III based on its nature and scope, which means a full EIA is required.

Schedule-III, (EIA Project)

Category H Waste Disposal and Treatment

Subcategory: 1. Facilities for handling, storage, or disposal of hazardous or toxic wastes or radioactive wastes (including landfill sites, incineration units, etc.)

92. Therefore, an EIA has been undertaken for the proposed incinerator (TLFSP-100) Plant.

2.4.5 Sindh Environmental Quality Standards

93. On June 28, 2016, the Sindh Environmental Protection Agency (EPA) notified the following standards:

- Industrial Wastewater and Effluent Standards
- Domestic and Sewerage Standards
- Industrial Air Emission Standards

- Ambient Air Quality Standards
- Noise Standards for Vehicles
- Air Emission Standards for Vehicles
- Drinking Water Quality Standards

94. These standards, collectively known as the "Sindh Environmental Industrial Waste Water, Effluent, Domestic, Sewerage, Industrial Air Emission and Ambient Air, Noise for Vehicles, Air Emissions for Vehicles and Drinking Water Quality Standards, 2015", were put into effect by the Sindh EPA on the date of notification.

Table 2.1 Sindh Environmental Quality Standard for Ambient Air Quality

Pollutant	Time-weighted average	Concentration in Ambient Air	Method of Measurement
Sulfur Dioxide (SO2)	Annual Average*	80 µg/m ³	Ultraviolet Fluorescence Method
	24 hours**	120 µg/m ³	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m ³	Gas Phase Chemiluminescence
	24 hours**	40 µg/m ³	
Oxides of Nitrogen as (NO2)	Annual Average*	40 µg/m ³	Gas Phase Chemiluminescence
	24 hours**	80 µg/m ³	
Ozone (O3)	1 hour	130 µg/m ³	Non-dispersive UV absorption method
Suspended Particulate Matter (SPM)	Annual Average*	360 µg/m ³	High volume Sampling, (Average flow rate not less than 1.1m3/minute)
	24 hours**	500 µg/m ³	
Respirable Particulate Matter (PM10)	Annual Average*	120 µg/m ³	B Ray absorption method
	24 hours**	150 µg/m ³	
	Annual Average*	40 µg/m ³ ***	B Ray absorption method
Respirable Particulate Matter (PM2.5)	24 hours**	75 µg/m ³	
Lead (Pb)	Annual Average*	1 µg/m ³	ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	1.5 µg/m ³	
Carbon Monoxide (CO)	8hours**	5 mg/m ³	Non-Dispersive Infra Red (NDIR) method
	1hours	10 mg/m ³	
*Annual arithmetic mean of minimum 104 measurements per year taken twice a week, 24 hourly at uniform intervals.			
**24 hourly / 8 hourly values should be met 98% of the in a year. It may exceed 2% of the time but not on two consecutive days			
*** or 9 µg/m ³ plus baseline, whichever is low			

95. Table 2.2 shows the standards for motor vehicle noise.

Table 2.2 The Motor Vehicle Ordinance (1965) and Roles (1969)

Parameter	Standards (maximum permissible limit)	Measuring method
Noise	85dB(A)	Sound-meter at 7.5meter from the source

96. Table 2.3 shows the proposed national environmental quality standard for noise.

Table 2.3 Sindh Environmental Quality Standard for Noise

S. No.	Category of Area / Zone	Effective from 1 st January 2015	
		Limit it in dB(A) Leq*	
		Day Time	Night Time
1	Residential area (A)	55	45
2	Commercial area (B)	65	55
3	Industrial Area (C)	75	65
4	Silence Zone (D)	50	45
Note: 1	Daytime hours: 6.00 a.m. to 10.00 p.m.		
2	Night time hours: 10.00 p. m to 6.00p. m		
3	Silence zone: A zone declared as such by the competent authority—an area comprising not less than 100 meters around hospitals, educational institutions and courts.		
4	The competent authority may declare Mixed categories of areas as one of the four abovementioned categories.		
*dB(A)Leq	Time-weighted average of the sound level in decibels on scale A, which is relatable to human hearing.		

97. The SEQs for effluents are shown in Table 2.4.

Table 2.4 Sindh Environmental Quality Standard for Municipal & Liquid Industrial

S. #	Parameter	Into Inland Waters	Into Sewage Treatment	Into Sea	unit
1	Temperature or Temp. increase	<3	<3	<3	°C
2	pH value (H ⁺)	6-9	6-9	6-9	
3	Biological Oxygen Demand (BOD) ₅ at 20°C	80	250	80	mg/l
4	Chemical Oxygen Demand (COD)	150	400	400	mg/l
5	Total Suspended Solids (TSS)	200	400	200	mg/l
6	Total Dissolved Solids (TDS)	3500	3500	3500	mg/l
7	Oil and Grease	10	10	10	mg/l
8	Phenolic Compounds (as Phenol)	0.1	0.3	0.3	mg/l
9	Chloride (as Cl ⁻)	1000	1000	SC	mg/l
10	Fluoride (as F ⁻)	10	10	10	mg/l
11	Cyanide (as CN ⁻) total	1.0	1.0	1.0	mg/l
12	An-ionic detergents (as MBAS)	20	20	20	mg/l
13	Sulphate (SO ₄ ²⁻)	600	1000	SC	mg/l
14	Sulphide (S ²⁻)	1.0	1.0	1.0	mg/l
15	Ammonia (NH ₃)	40	40	40	mg/l
16	Pesticides	0.15	0.15	0.15	mg/l
17	Cadmium	0.1	0.1	0.1	mg/l

S. #	Parameter	Into Inland Waters	Into Sewage Treatment	Into Sea	unit
18	Chromium (trivalent and hexavalent)	1.0	1.0	1.0	mg/l
19	Copper	1.0	1.0	1.0	mg/l
20	Lead	0.5	0.5	0.5	mg/l
21	Mercury	0.01	0.01	0.01	mg/l
22	Selenium	0.5	0.5	0.5	mg/l
23	Nickel	1.0	1.0	1.0	mg/l
24	Silver	1.0	1.0	1.0	mg/l
25	Total toxic metals	2.0	2.0	2.0	mg/l
26	Zinc	5.0	5.0	5.0	mg/l
27	Arsenic	1.0	1.0	1.0	mg/l
28	Barium	1.5	1.5	1.5	mg/l
29	Iron	8.0	8.0	8.0	mg/l
30	Manganese	1.5	1.5	1.5	mg/l
31	Boron	6.0	6.0	6.0	mg/l
32	Chlorine	1.0	1.0	1.0	mg/l

98. The SEQs for drinking water are shown in table 2.5

Table 2.5 Sindh Environmental Quality Standards for Drinking Waters (mg/l)

S.#	Properties / Parameters	Standard Values for Pakistan	S.#	Properties / Parameters	Standard Values for Pakistan
Bacterial			Chemical		
1	All water intended for drinking (E. Coli or Thermo-tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Essential Inorganics (mg/litre)		
			3	Aluminum (Al) mg/l	≤ 0.2
			4	Antimony (Sb)	≤ 0.005
2	Treated water entering the distribution system (26xponenor thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	5	Arsenic (As)	≤ 0.05
			6	Barium (Ba)	0.7
			7	Boron (B)	0.3
3	Treated water in the distribution system (E.26xponenor thermo tolerant coliform and total coliform bacteria)	It must not be Detectable in any 100 ml sample. In the case of ample supplies, where sufficient samples are examined, they must not be resent in 95% of the samples taken	8	Cadmium (Cd)	0.01
			9	Chloride (Cl-)	< 250
			10	Chromium (Cr)	≤ 0.05
			11	Copper (Cu)	2
			Organic (mg/L)		
			12	Phenolic	<0.0002
			Toxic Inorganics (mg/ liter)		
			13	Cyanide (CN)-	≤ 0.05
			14	Fluoride (F)	≤ 1.5
			15	Lead (Pb)	≤ 0.05

S.#	Properties / Parameters	Standard Values for Pakistan	S.#	Properties / Parameters	Standard Values for Pakistan
		throughout any 12-month period.	16	Manganese (Mn)	≤ 0.5
Physical			17	Mercury (Hg)	≤ 0.001
4	Color	< 15 TCU	18	Nickel (Ni)	≤ 0.02
5	Taste	Non-objectionable/ Acceptable	19	Nitrate (NO ₃)-	≤ 50
6	Odor	Non-objectionable/ Acceptable	20	Nitrite (NO ₂)-	≤ 3
7	Turbidity	< 5 NTU	21	Selenium (Se)	≤ 0.01
8	Total Hardness as CaCO ₃	< 500 mg/l	22	Residual Chlorine	0.2-0.5 At the consumer end
9	TDS	<1000			
10	pH	6.5-8.5			0.5-1.5 at
Radioactive					
11	Alpha Emitters bq/L	0.1	23	Zinc (Zn)	5.0
12	Beta emitters	1			

2.4.6 Self-Monitoring and Reporting by Industry Rules, 2014

99. The Sindh Environmental Protection Agency (SEPA) has established rules for the monitoring and reporting of industrial liquid effluents and gaseous emissions, with the following key provisions:
- Industrial units are classified into three categories for liquid effluent monitoring and two categories for gaseous emissions monitoring.
 - For each category, the rules define the priority parameters that must be monitored and reported to SEPA.
 - The reporting frequency is based on the working conditions of the industrial unit.
 - This monitoring and reporting is in addition to the conditions specified in the approved Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) for the industrial unit.
 - Sampling for testing must be carried out according to the Sindh Environmental Samples Rules, 2014.
 - The samples must be analyzed at SEPA-certified environmental testing laboratories.
100. Through these rules, SEPA aims to strengthen the monitoring and reporting of industrial effluents and emissions, ensuring compliance with environmental standards and the protection of the local environment.

2.4.7 Hazardous Substance Rule, 2014

101. The Sindh Hazardous Substances Rules, 2014, were notified with the following key objectives:

Streamlining Procedures for Hazardous Waste Management: Establishing a

licensing system for industries and businesses that generate hazardous waste.

- Specifying safety precautions for workers handling hazardous waste.
- Prescribing environmentally friendly methods for the removal and disposal of hazardous waste.

Regulating Hazardous Waste Handling: Outlining procedures for importing, transporting, and disposing hazardous waste.

- Identifying 243 hazardous substances and synthetic chemicals that fall under the rules.

Licensing Requirements: Industries and businesses must obtain a license from the Sindh Environmental Protection Agency (EPA) for the import, transport, storage, and disposal of hazardous substances specified in the rules.

102. In summary, the Sindh Hazardous Substances Rules, 2014, aim to establish a comprehensive regulatory framework for managing hazardous waste in the province, ensuring the safety of workers and the environment.

2.4.8 The Sindh Hospital Waste Management Rules, 2014

103. Under Section 36 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency (EPA) published the Sindh Hospital Waste Management Rules in 2014. The key provisions of these rules that are relevant to the project are as follows:

104. **Responsibility for Waste Management:** Every hospital owner, occupier, or operator manages the hospital waste their facility generates.

- This responsibility extends from the waste generation to its final disposal by the provisions of the Sindh Environmental Protection Act, 2014 and the Hospital Waste Management Rules.

105. **Hospital Waste Management Plan:** The hospital is required to develop a Hospital Waste Management Plan.

- This plan must be based on internationally or nationally recognized environmental management practices and standards.
- The plan should efficiently and effectively address the hospital's waste management needs.
- The specific components that must be included in the Hospital Waste Management Plan are:
 - a) waste management points for every ward and department, indicating each point, location based on risk assessment;
 - b) the categories of waste being generated under Schedule I. c) quantity of each waste category;
 - d) details of the types numbers of containers, waste bags and trolleys required annually;
 - e) schedule and frequency of waste collection from each ward and department;

- f) adequate arrangements for onsite and off-site transportation of waste as provided in Schedule I and II;
 - g) contingency plans for storage or disposal of risk waste in the event of breakdowns of hospital waste facility or of maintenance or collection arrangements;
 - h) training courses and programmes on waste management;
106. **Monitoring and Updating the Waste Management Plan:** The Hospital Waste Management Plan must be regularly monitored, reviewed, revised, and updated.
- The updated plan must be submitted annually to the Sindh Environmental Protection Agency.
107. **Waste Segregation:** Risk waste must be separated from non-risk waste at the point of generation, as per the Hospital Waste Management Plan and Schedule I.
- Doctors, nurses, or other relevant personnel must carry out this segregation.
108. **Waste Collection:** Waste collection must be done by the requirements specified in Schedule I and Schedule II of the rules.
109. **Waste Storage:** As detailed in the Hospital Waste Management Plan, the hospital must establish a separate central storage facility for the stored waste.
110. **Waste Treatment:** Risk waste must be inactivated or rendered safe before final disposal using suitable thermal, chemical, irradiation, incineration, filtration, or other effective treatment methods.
- The treatment process must be guided by validated and monitored procedures.
111. **Waste Disposal:** Risk waste must be disposed of using the procedures provided in Schedule I.
- The operator, occupier, or owner of the hospital waste disposal and treatment facility must obtain approval from the Sindh Environmental Protection Agency under Section 17 of the Act.

2.4.9 Sindh Solid Waste Management Board Act, 2014

112. The Sindh Solid Waste Management Board (SSWMB) Act, 2014, established a board responsible for collecting and disposing of all solid waste in the province. The key objectives of the Act are:
- To establish an effective system for collecting and disposing of solid waste.
 - To arrange for the efficient delivery of sanitation services.
 - To provide a pollution-free environment.
 - To address other relevant matters on solid waste management.
113. The Chief Minister or their nominee heads the SSWMB, consisting of thirteen other ex-officio members from relevant government departments.
114. The Act was promulgated to centralise solid waste management in the province under a dedicated board and to improve sanitation services and environmental

conditions through effective solid waste collection and disposal.

2.4.10 Sindh Wildlife Protection, Preservation, Conservation and Management Act, 2020

115. The Sindh Wildlife Protection Act provides for the province's preservation, protection, conservation, and wildlife management. This is achieved through forming and managing protected areas and prohibiting hunting wildlife species declared protected under the Act.
116. Based on the primary and secondary data, the project site does not fall under any protected areas designated under the Sindh Wildlife Protection Act.

2.4.11 Sindh Cultural Heritage (Preservation) Act, 1994

117. The Sindh Cultural Heritage (Preservation) Act of 1994 is the provincial law in Sindh, Pakistan, protecting cultural heritage. The objectives of this Act are similar to those of the Antiquity Act, 1975.
118. Based on the available information, none of the sites protected under the Sindh Cultural Heritage (Preservation) Act, 1994 has been identified in the vicinity or microenvironment of the project site.

2.5 Environment-Related National and International Guidelines

2.5.1 Pakistan Environmental Assessment Procedures, 1997

119. The Pakistan Environmental Protection Agency (PEPA) prepared the Pakistan Environmental Assessment Procedures in 1997. These procedures are based on existing work done by international donor agencies and Non-Governmental Organizations (NGOs). The package of regulations prepared by PEPA includes:
- Policy and Procedures for Filing, Review and Approval of Environmental Assessments;
 - Guidelines for the Preparation and Review of Environmental Reports;
 - Guidelines for Public Consultation
 - Guidelines for Sensitive and Critical Areas; and
 - Sectorial Guidelines

2.5.2 World Bank Guidelines on Environment

120. The principal World Bank publications that contain environmental guidelines are listed below:
121. **Environmental Assessment Operational Policy 4.01**
- Washington, DC, USA. World Bank, 1999.
 - This policy outlines the World Bank's Environmental Assessment Sourcebook, which covers policies, procedures, and cross-sectoral issues.
122. **World Bank Technical Paper Number 139**

- Environment Department, the World Bank, 1991.
 - "Pollution Prevention and Abatement Handbook: Towards Cleaner Production", developed in collaboration with the United Nations Industrial Development Organization and the United Nations Environment Program, 1998.
123. **Environmental, Health, and Safety (EHS) Guidelines**
- International Finance Corporation (IFC), World Bank Group, 2007.
124. **The Environmental Assessment Sourcebook:**
- Identifies a number of areas of concern that should be addressed during impact assessments.
 - Provides guidelines for determining impacts.
 - Offers a checklist of tools to identify potential biodiversity issues.
 - Suggests possible mitigation measures.
 - Covers potential development project impacts on various ecosystems, such as wild lands, wetlands, and forests, and recommends appropriate mitigation measures.
 - Highlights concerns related to social impact assessment and emphasizes the need to incorporate socio-economic considerations in environmental impact assessment exercises.

2.5.3 IFC- Environmental, Health, and Safety Guidelines

125. The Environmental, Health, and Safety (EHS) Guidelines published by the International Finance Corporation (IFC) are technical reference documents that outline IFC's expectations regarding industrial pollution management performance for its projects. These guidelines are designed to assist managers and decision-makers by providing relevant industry background and technical information. This information supports actions aimed at avoiding, minimizing, and controlling EHS impacts during the construction and decommissioning phases of a project or facility.
126. The specific IFC guideline relevant to the proposed project is the EHS Guidelines for Gas Distribution Systems.
127. Environmental issues associated with the construction and maintenance activities for the proposed project may include, but are not limited to:
- Noise and vibration
 - Soil erosion
 - Threats to biodiversity, including habitat alteration and impacts on wildlife
 - Construction site waste generation;
 - Soil erosion and sediment control from materials sourcing areas and site preparation activities;
 - Fugitive dust and other emissions (e.g. from vehicle traffic, land clearing activities, and materials stockpiles);

- Noise from heavy equipment and truck traffic;
- Potential for hazardous materials and oil spills associated with heavy equipment operation and fueling activities.

128. Environmental issues during the construction phase include the following:

- Terrestrial habitat alteration.
- Hazardous materials.

2.5.4 IFC- Environmental, Health, and Safety Guidelines for Waste Management Facilities

129. The Environmental, Health, and Safety (EHS) Guidelines for Waste Management guide for managing municipal solid and hospital waste. This includes collecting and transporting waste and its receipt, unloading, processing, storage, landfill disposal, physico-chemical and biological treatment, and incineration.

130. Hazardous wastes are defined as such because they share the properties of hazardous materials, such as ignitability, corrosivity, reactivity, or toxicity. These physical, chemical, or biological characteristics can harm human health or the environment if the waste is not properly managed.

CHAPTER - 3: PROJECT DESCRIPTION

3.1 Project Overview

131. The Waste Incineration Plant at the Sindh Small Industries Corporation in Karachi is a significant initiative to address waste management challenges in the region. Spearheaded by **M/S Iqbal Enterprises**, the project is currently in the **design phase**, indicating that detailed planning and engineering work are underway to ensure the facility meets all operational and regulatory requirements.

3.2 Project Location and Specifications

132. The plant is strategically located at **25°04'53.6"N 67°02'53.3"E**, a site chosen for its accessibility and suitability for waste processing. The facility is designed to handle diverse waste types, including **clinical, treated, anatomical, cytotoxic, cytostatic, offensive/hygiene, medicinal, Industrial and domestic waste**. This versatility is crucial for effectively managing the various waste streams generated in urban environments.

3.3 The Plant Provider

133. Shandong Tianlang Environmental Protection Technology Co., Ltd. (the Plant Provider), based in Zhucheng City, Shandong Province, enjoys strategic proximity to two major seaports: Qingdao and Rizhao. The company operates from an expansive **80,000-square-meter** facility with advanced production technology and machinery. Specialising in environmental protection equipment, Tianlang focuses on integrating research, development, and manufacturing, emphasising custom-designed solutions.
134. The company's product portfolio includes sewage treatment systems, sludge dewatering equipment, waste gas treatment solutions, animal carcass degradation systems, manure fermentation equipment, and waste incinerators. These offerings cater to various industries, such as agriculture, aquaculture, petroleum, chemicals, pharmaceuticals, food processing, metallurgy, and more. Tianlang is a trusted name in China's environmental protection sector, upholding the principles of quality, innovation, and customer service to maintain a competitive edge. Dedicated to ongoing product development, Tianlang prioritizes innovation and quality in its mission to deliver dependable environmental solutions.
135. The company adheres to international standards with certifications including **ISO 9001, ISO 14001**, including **ISO 18001**, the company adheres to international standards. It is committed to providing high-quality, timely service to its customers, fostering long-term partnerships and success.

3.4 Salient Features

136. The design and operation standards of the TLFSP-100 incinerator (Refer to Figure 3-1) are centred around efficiency, safety, and environmental compliance.
137. **Primary Combustion Chamber:** Constructed from **Q235 steel** combined with **refractory insulation**, this chamber is designed to endure high temperatures while

- facilitating efficient fuel combustion. Including a **feeding door**, **ash door**, and **air supply system** enhances its functionality.
138. **Secondary Combustion Chamber:** Also made from **Q235 steel** with refractory insulation, this chamber plays a crucial role in ensuring that any unburned fuel is combusted, improving overall efficiency and reducing emissions.
139. **Mixed Combustion Room:** This component features **100mm of refractory insulation** and is designed to optimize the mixing of combustion gases, essential for achieving complete combustion and minimizing pollutants.
140. **Chimney:** With dimensions of **φ300*4000mm** and constructed from **anti-corrosion Q235 steel**, the chimney is engineered to withstand environmental challenges while effectively venting exhaust gases.
141. **Air Blower:** The **DP-4 model** air blower, with a power rating of **0.25kw**, is vital for maintaining the necessary airflow for combustion, ensuring that the system operates efficiently.
142. **Burners:** Both the **first** and **secondary combustion chamber burners** are from the **Baltur brand** (model **BTL14**) and are rated at **0.2kw**. They are known for their reliability and efficiency in providing consistent heat.
143. **Electrical Control System:** Utilizing **Siemens components**, this system includes a control cabinet and various electrical components, allowing for precise monitoring and control of the combustion process.
144. **Wet Scrubber:** This high-pressure jet-type scrubber, made from **Q235**, is essential for removing particulates from exhaust gases, contributing to environmental protection.
145. **Water Recycling Pump:** With a power rating of **1.1kw**, this pump supports water recycling within the system, promoting sustainability.
146. **Dust Removal Device:** The **cyclonic dust removal device** from **Q235** effectively captures dust and particulates, enhancing air quality.
147. **Fan:** The **high-pressure centrifugal fan**, constructed from **Q235** and mild steel, is belt-driven and rated at **1.5kw**, ensuring optimal airflow for combustion.
148. **Fuel Oil Storage Tank:** Made from **mild steel**, this tank is designed for safe and reliable fuel oil storage.
149. **Accessories:** Various accessories are included to facilitate installation and operation and ensure a comprehensive setup.
150. The design allows local size adjustments during production without compromising performance, providing installation flexibility.

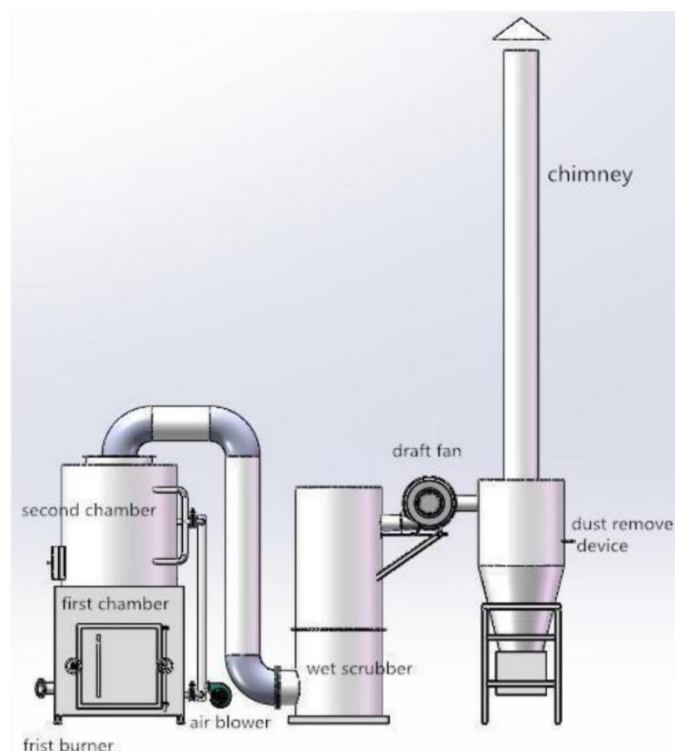


Figure 3-1: Typical Layout of the Plant

3.5 Design and Operation Standards

151. The incinerator (TLFSP-100) is designed to handle 100 kg of hazardous waste per hour, with an average calorific value of 1000 kcal per kg. The feeding process is automated using a conveyor system, while ash removal is done manually. The furnace itself is horizontal, and the ignition is automated. The waste undergoes

multiple stages of treatment, including primary and secondary combustion, a mixed combustion chamber, wet scrubbing, dust removal, and eventual emission through a chimney. The furnace operates at temperatures ranging from 650°C to 1300°C, ensuring complete combustion under micro-negative pressure, which prevents backfire.

3.5.1 Safety Indicators

152. The system is equipped with several safety mechanisms. An automatic safety shut-off prevents combustion if the burner fails to start properly. During shutdown, there is also a cooling protocol for the combustion chamber to safely lower temperatures before turning off the incinerator. Additionally, the system has a leakage protection feature, ensuring insulation resistance remains above 2 MΩ under specific temperature and humidity conditions. The electrical components are well-protected with metal hoses, and the oil seals have passed pressure tests to prevent leaks.

3.5.2 Device Components

153. The incinerator (TLFSP-100) consists of multiple integrated components. These include the primary and secondary combustion chambers, a mixed combustion chamber, a wet scrubber for particle filtration, dust removal systems, air blowers, and a chimney for flue gas emission. An electrical control system manages the temperature, pressure, and operation of the furnace, while a water recycling pump and fan further optimize the system's efficiency.

3.6 Furnace Body Characteristics

154. The furnace body is a horizontal grate furnace designed for efficient fuel consumption and minimal secondary pollution. It utilizes refractory materials to maintain a stable temperature, reducing nitrogen oxide emissions and avoiding secondary pollution, which is common in traditional furnaces. The air supply system inside the furnace is highly efficient, with air speeds ranging from 30 to 100 meters per second, significantly enhancing the combustion rate by ensuring adequate airflow. The combustion efficiency reaches 99.99%, with high incineration temperatures of 850°C to 1300°C, ensuring that waste is fully oxidized without emitting smoke or odor.

3.6.1 Air Blower, Chimney, and Electrical Control System

155. The air blower is a high-pressure centrifugal fan that facilitates the movement of flue gas through the purification system. The chimney stands 4 meters above the ground and is securely anchored to ensure stability. The electrical control system includes essential safety features such as overload protection, low-level alarms, and interlock controls to safeguard the motor and other vital components.

3.6.2 Wet Scrubber and Cyclone Dust Collector

156. The wet scrubber utilizes water or lime water to remove large particulate matter from the flue gas, effectively reducing the strain on downstream equipment. The scrubber also recycles water, eliminating water pollution. The cyclone dust collector works by separating dust particles from the flue gas through centrifugal force, ensuring that

the system remains efficient by removing more than 90% of large particles.

3.7 Process Technology

157. The incineration process begins by purging residual combustible gases before waste is loaded into the furnace. Once ignited, the waste burns using its own calorific value, with high-pressure combustion air ensuring complete decomposition. The secondary combustion chamber handles unburned gases, burning them at temperatures of 1300°C or higher for at least two seconds, which ensures full decomposition of harmful substances. After incineration, the high-temperature flue gas is cooled, and the wet scrubber and cyclone dust collector remove large particulate matter. Finally, the purified flue gas is safely discharged through the chimney.

3.8 Running Costs

158. The incinerator operates with an actual power consumption of 3.25 kWh, and fuel consumption varies depending on the burner, with oil usage ranging from 4 to 10 litres per hour or gas usage between 10 and 12 cubic meters per hour. The system requires only one operator per shift for efficient operation.

3.9 Fuel Compatibility

159. The facility is designed to be compatible with multiple fuel types, including **diesel, LPG, and natural gas**. This flexibility in fuel choice enhances operational efficiency and allows for adaptability in response to fuel availability and cost fluctuations.

3.10 Loading and Ash Management

160. The loading and de-ashing systems are ergonomically designed to ensure safe and efficient operation. Waste can be loaded manually or via hydraulic systems, catering to different operational needs. After each incineration cycle, ash is discharged through the loading door, facilitating easy maintenance and ensuring the plant operates smoothly.

3.11 Additional Features

161. The incinerator has a **venturi system** for effective flue gas treatment, which is crucial for minimizing environmental impact. The robust **mild steel casing** and premium paint finish contribute to the plant's thermal efficiency and durability, ensuring long-term operational reliability.

3.12 Cooling and Ignition Systems

162. Cooling is achieved through **natural air**, a cost-effective and environmentally friendly method. The **autopilot ignition system** enhances operational safety and efficiency, while the **sequential starting and stopping operation system** allows for precise control based on furnace and exhaust gas temperatures. An **automatic shut-off feature** is also included to ensure safety during operation.

3.13 Incineration Process

163. The incinerator project will handle waste from various sources, including medical and

- hazardous industrial waste. These wastes will be transported to the project site using covered trucks to ensure safe handling. If segregation is required, any liquid waste will be separated and may be mixed with sawdust to allow it to dry. Once the waste is dried, it will be collected in bags and trolleys and fed into the combustion chamber for complete incineration. A detailed process flow chart is provided below to illustrate the waste handling and incineration process.
164. The flowchart outlines the process of operating an incineration system, detailing each stage systematically.
165. **Initial Setup and Preparation:** The operation begins with closing air dampers, which regulate airflow within the system. Once the dampers are closed, power is activated, followed by turning on the induced draft fan one hour before operation. This fan helps to maintain the proper flow of air and gases by creating negative pressure, aiding the combustion process by drawing air through the system.
166. **Step 1 – Pre-Heating:** The secondary pilot LPG burner is activated at this stage. This burner runs for 30 minutes to preheat the incinerator to the necessary temperature before introducing waste. After the preheating phase, the air dampers are opened, allowing airflow to continue.
167. **Step 2 – Waste Feeding and Main Burner Operation:** After preheating, waste material is fed into the incinerator. Two primary pilot LPG burners are turned on for 20 seconds to initiate combustion. Once ignited, the two primary burners are fully activated, and excess air is introduced into the system to ensure complete combustion. Waste is fed into the incinerator in a batch system, with a 30-minute interval between each batch.
168. **Completion of Incineration:** All burners are turned off upon completing the incineration process. The incinerator doors are then opened to allow ventilation and cooling. Induced draft fans continue to operate for an additional hour to aid the cooling process and remove residual exhaust gases.
169. **Ash Recovery and Disposal:** The incinerated ash is recovered after cooling the system. Once cooled, the ash is sent to a landfill for final disposal, marking the conclusion of the incineration process.
170. The incinerator project will also recover recyclable waste materials from the incoming waste stream, such as empty drums, cartons, and packaging. These recyclable materials will be segregated and diverted from the incineration process to be properly recycled or reused.

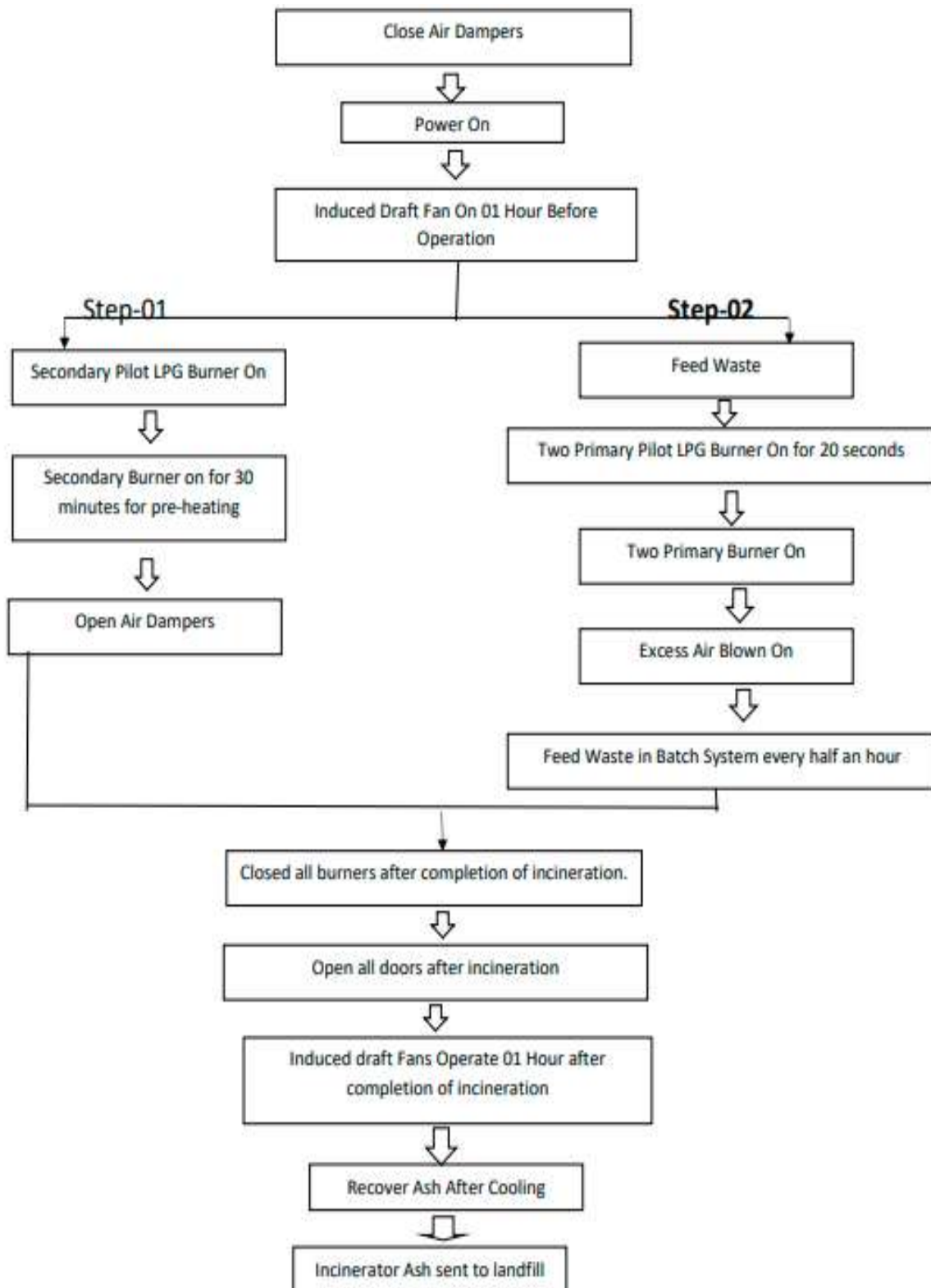


Figure 3-2 Incineration Process Flow Chart

3.14 Construction and Installation Activities

171. The construction and installation of the incinerator project will typically involve the following activities:

- Land clearance and leveling
- Excavation for foundation
- Boundary wall construction
- Office building construction
- Waste storage area development
- Masonry work for Incinerator plant installation
- Installation/construction of Incinerator plant and its ancillary facilities and Mechanical and electrical works
- Landscaping
- Restoration

3.15 Workforce

172. The project is expected to employ around ten people daily during construction. Once operational, the incinerator will require a workforce of 3-5 personnel for daily operations. The project will aim to hire local workers for general construction work. The technical staff responsible for installing the incinerator will utilise daily commute options, such as an "outback" option, to access the site.

3.16 Project Duration

173. The construction phase of the incinerator project is expected to be completed within a timeline of 16 to 20 weeks.

3.17 Water Consumption

174. The incinerator project will source water requirements from the local water authority, KWSB (Karachi Water and Sewerage Board). The estimated daily water consumption for the incineration plant is expected to be 600 to 1,000 gallons per day.

3.18 Approvals

175. The necessary approvals for the incinerator project are attached in the Annexure.

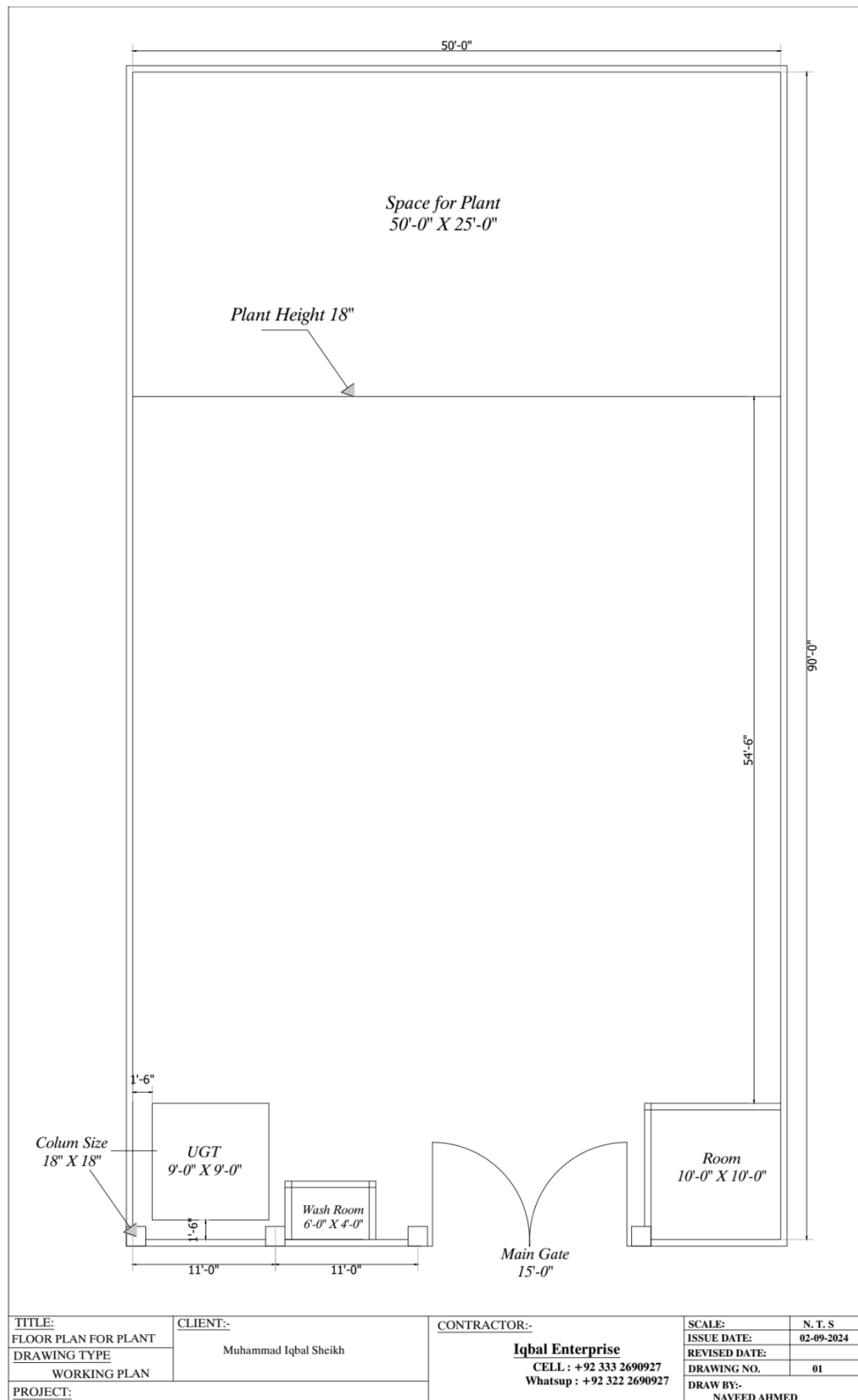


Figure 3-3 Layout plan of the Plot

3.19 Project Alternatives

176. A vital component of the Environmental Impact Assessment (EIA) process is the identification and assessment of feasible alternatives to the project's design and implementation. These alternatives illustrate and contrast the environmental implications and consequences of the options available to achieve the proposed objective. This approach ensures that both the project proponent and the authorizing authorities can make informed decisions, as all involved parties are provided with a comprehensive understanding of the environmental impacts associated with the various options under consideration.
177. The preferred alternative selection is based on evaluating numerous factors, including cost, delivery schedule, environmental and social impacts, and the associated costs for addressing those impacts. The key drivers that influence the potential alternative options and scenarios include the availability of project sites, current technologies, required design changes, operational considerations, capital and recurring costs, environmental and social issues, their potential impacts, and the costs of mitigation measures. The "No Project" alternative is also considered to demonstrate the project's necessity. Considering the various drivers, the potential alternatives within the project are limited to the following aspects:
- No Project Option
 - Project Alternatives
 - Technology selection
 - Availability of site and infrastructure
 - Availability of appropriate energy source

3.19.1 No Project Alternative

178. The "No Project" alternative would mean that the proposed project for waste incinerators and a material recovery and recycling facility is not executed. However, the safe disposal of hazardous industrial and medical waste remains a critical issue in Karachi. Without the implementation of this project, the growing demand for environmentally sound disposal of hazardous waste would not be adequately addressed. The "No Project" alternative is not a viable option, as it would leave the population exposed to the risks of toxic waste, without the proper incineration and waste recovery facilities being provided. Maintaining the status quo is not a sustainable solution, as it would fail to address the pressing need for effective hazardous waste management in the region.

3.19.2 Project Location

179. The project is strategically located within an industrial area, away from densely populated urban centres. This provides an optimal opportunity to efficiently incinerate the waste, as it minimises the distance and time required for transportation. By situating the facility in an industrial zone, the project can avoid additional environmental and social impacts from transporting the waste over long distances through populated areas. This site selection helps minimise the environmental

footprint and exposure of the surrounding communities to hazardous waste management activities.

3.19.3 Availability of Energy Sources

180. The selected industrial area for the project site has the necessary infrastructure and utilities in place, including access to electricity, gas, and water supply. This ensures that the project can efficiently utilise the allocated and sanctioned resources for the facility without requiring additional infrastructure development or overburdening the local utility networks. The availability of these essential utilities at the industrial site is a crucial advantage supporting the proposed project's viability and operational efficiency.

3.19.4 Technological Alternatives

3.19.5 Moving Grate Incinerator

181. The proposed incineration technology utilises a moving grate system, optimising waste movement through the combustion chamber. This optimisation allows for more efficient and complete combustion of the waste. A single-moving grate incinerator can handle up to 35 metric tons (39 short tons) of waste per hour. It can operate for up to 8,000 hours annually, with only one scheduled stop for inspection and maintenance, typically lasting around one month. The waste is introduced into the incinerator through a waste crane, which feeds the material onto the "throat" at one end of the grate. The waste then moves down the descending grate towards the ash pit at the opposite end, which removes the ash through a water lock system. The grate elements are designed with holes that allow the primary combustion air to be supplied from below. This airflow not only supports the combustion process but also helps to cool the grate itself, which is essential for maintaining the mechanical strength of the system. Some moving grate incinerators also feature internal water cooling for the grate. Moving grate incinerators are primarily used to incinerate Municipal Solid Waste (MSW), making this technology well-suited for the proposed project's objectives.

3.19.6 Pollution Control Technologies

182. Particulate matter will be collected using highly efficient particle filtration systems, such as electrostatic precipitators (ESPs) and/or baghouse filters. Baghouse filters, in particular, are known for their ability to capture fine particulate matter effectively.
183. Acid gas scrubbers will remove hydrochloric acid, nitric acid, hydrofluoric acid, mercury, lead, and other heavy metals. The efficiency of this removal process will depend on factors such as the specific equipment used, the chemical composition of the waste, the plant's design, the reagents' chemistry, and the plant operators' ability to optimize these conditions. It is important to note that the removal of certain pollutants, such as mercury, may be less efficient in wet scrubbers, with removal rates potentially below 50%.
184. Sulfur dioxide will be removed through a dry desulfurisation process, where limestone slurry is injected into the flue gas before the particle filtration stage. This process converts the sulfur dioxide into gypsum.

185. Nitrogen oxides (NO_x) will be reduced using selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) technologies. In the SCR process, ammonia is used as the reducing agent in a catalytic converter. In contrast, in the SNCR process, ammonia or urea is injected directly into the furnace at high temperatures to facilitate the NO_x reduction reaction. Heavy metals will be adsorbed onto injected activated carbon powder, which is then collected by the particle filtration system.

CHAPTER - 4: DESCRIPTION OF BASELINE

4.1 Introduction

186. To carry out an environmental assessment study, it is first necessary to restrict the existing environmental features in and around the proposed project and the existing environment. This section, therefore, describes the environmental and socioeconomic conditions of the project area, covering information on physical, biological and socio-economic aspects of the macro-environment as well as the microenvironment of the proposed project site. Information for this section was collected from various sources, including published literature, reports of other studies conducted in the area and archives of the experts, consultations with institutions, and field surveys conducted for this study by the consultant. The physical environment of the proposed site, including the airshed, watershed, geology, soil characteristics, and seismicity, has been described in this study. Baseline data on the airshed describe the climatic conditions and air quality in the microenvironment and macroenvironment and characterise the airshed in terms of pollution level, viz. unpolluted, polluted or grossly polluted. Similarly, baseline data on watersheds describe the hydrology and quality of surface, groundwater, and water availability. Data on Geology, geomorphology, soil characteristics and seismicity are needed to evaluate terrestrial resources concerning the quality of minerals and soil characteristics, particularly stability.

4.2 Physical Environment

187. The physical environment of the project site is described here, including the terrestrial environment, watershed, and air shed. A detailed description of the physical resources existing in the area is stated in the following sections. Major areas covered under physical resources are topography, geology, soil conditions, climate, surface and groundwater resources and seismology. Most of the information is collected from the secondary resources. Other studies and reports were referred to and reviewed for the verification of information. Karachi's climatic condition, geology and topography have been described as the macro-environment of the project site.

4.2.1 Meteorology and Climatic

188. The subtropical monsoon regime largely influences the coastal part of Karachi. The intense southwest monsoon period prevails from May to September, while the weak northeast monsoon period is restricted to December and January. The period between the two monsoons is considered transitional or calm with winds of variable speed and direction. The weather during the inter-monsoon periods is uncertain, and short spells of dust storms, dry weather, or a humid, cool breeze may prevail for short durations.

4.2.2 Temperature

189. The air temperature in Karachi Division and its coastal areas are generally moderate throughout the year due to the presence of the sea. Climate data generated by the Karachi Air Port meteorological station represents the region's climatic conditions.

The mean monthly maximum and minimum temperatures recorded during the last 20 years in Karachi to describe the weather conditions are shown in Table 41 and 4.2, respectively.

Table 4.1 Mean Monthly Maximum Temperatures (°C) in Karachi

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2001	27.2	29.6	33.1	34.6	35.1	34.9	32.2	32.3	33.1	36.0	33.5	30.4	32.7
2002	27.0	28.2	33.3	35.4	35.6	35.1	32.2	31.6	31.4	36.5	32.7	28.1	32.3
2003	27.6	28.5	32.4	36.6	35.7	34.9	34.1	32.6	32.5	37.0	32.2	28.3	32.7
2004	26.6	29.9	36.2	35.4	36.8	35.6	33.8	32.7	32.8	33.7	33.1	29.4	33.0
2005	24.9	26.3	31.5	35.3	35.4	36.0	33.2	32.2	34.2	35.2	33.1	28.4	32.1
2006	26.0	31.3	31.8	34.0	34.6	35.3	33.8	31.0	34.2	35.0	33.4	26.3	32.2
2007	26.9	29.4	31.4	37.7	36.0	36.4	N/A	N/A	N/A	N/A	N/A	N/A	33.0
2008	24.4	26.9	34.3	34.4	33.9	35.1	33.5	31.9	34.7	35.5	32.5	27.2	32.0
2009	26.2	29.8	33.0	36.0	36.8	35.7	34.5	33.0	32.8	35.9	33.0	28.6	32.9
2010	27.5	29.2	34	35.7	36.5	34.7	34.6	33.2	34.5	35.9	32.7	28	33.0
2011	26.9	28.5	33.2	35.8	35.3	35.3	34.2	32.8	32.9	N/A	N/A	N/A	N/A
2012	25.7	26.9	31.7	35.1	35.5	34.6	33.2	32.7	33.2	35.0	32.7	28.2	32.0
2013	26.7	28.0	33.3	34.0	35.1	36.5	33.8	32.1	33.0	35.7	32.3	28.3	32.4
2014	25.5	28.0	31.7	35.1	35.9	36.5	34.0	33.7	33.8	36.3	32.9	28.7	32.7
2015	26.3	28.9	31.5	35.9	36.0	37.7	34.1	32.3	34.6	35.8	33.0	28.6	32.9
2016	27.8	30.3	33.3	34.7	35.7	36.1	33.6	33.0	32.9	34.0	33.3	31.0	33.0
2017	25.4	30.2	32.8	35.5	36.2	36.3	33.1	33.8	33.4	36.6	32.3	28.2	32.8
2018	28.5	30.4	34.4	36.2	38.7	35.4	33.8	31.9	32.6	36.8	33.8	28.2	33.4
2019	26.3	26.8	31.3	35.4	36.0	37.2	34.7	32.5	35.7	35.8	31.5	27.1	32.5
2020	24.3	30.1	31.2	36.2	36.6	37.3	36.7	34.6	35.0	36.2	31.4	28.1	33.1
2021	26.6	31.3	34.6	37.3	37.5	36.1	34.5	32.6	36.3	34.8	34.0	27.6	33.6
2022	24.6	30.1	35.2	37.4	36.8	35.7	33.3	32.1	33.7	35.7	32.9	29.6	33.1

Source: Pakistan Meteorological Department

Table 4.2 Mean Monthly Minimum Temperatures (°C) in Karachi

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2001	11.5	14.9	19.6	23.8	28.1	29.0	27.1	26.5	25.9	24.4	18.6	15.8	22.1
2002	12.8	13.8	19.5	23.9	27.0	28.2	29.6	25.6	24.8	22.5	17.7	14.9	21.7
2003	12.7	16.9	19.8	24.2	26.5	28.2	23.6	27.0	25.3	20.9	15.2	12.0	21.0
2004	12.9	14.5	19.1	24.8	27.3	28.8	27.5	26.3	25.3	22.4	18.0	15.4	21.9
2005	12.3	11.3	20.3	23.0	26.4	28.3	27.2	26.6	26.6	22.9	18.9	13.0	21.4
2006	11.7	18.1	19.6	24.5	27.5	28.5	28.3	26.3	26.8	25.7	19.4	14.0	22.5
2007	13.0	17.3	19.7	24.7	27.6	28.6	N/A	N/A	N/A	N/A	N/A	N/A	21.8
2008	10.1	11.1	19.6	24.0	27.3	29.1	27.9	26.8	26.6	23.8	17.6	14.9	21.6
2009	14.7	16.5	20.8	23.8	27.6	28.7	28.1	27.5	26.5	22.6	17.0	13.9	22.3
2010	12.2	14.7	21.3	25.1	28	28.2	28.3	27.2	25.8	23.9	17.4	11.1	21.9
2011	11	14.5	19.7	23.1	27.1	28.8	27.8	28.6	26.5	N/A	N/A	N/A	N/A
2012	11.2	11.9	19.1	24.5	27.2	28.0	27.9	26.9	26.4	22.7	18.6	14.2	21.5
2013	11.6	15.1	19.2	24.2	27.1	29.3	28.0	26.6	25.5	25.4	18.1	13.0	21.9
2014	9.9	13.1	18.9	24.4	27.0	29.2	28.3	27.1	26.8	23.3	19.5	13.1	21.7
2015	12.6	16.4	19.2	25.7	27.7	29.8	28.4	26.9	26.3	24.9	18.6	12.6	22.4
2016	14.8	14.9	21.7	24.6	27.9	27.9	28.1	27.1	26.4	24.0	17.1	15.5	22.5
2017	12.5	18.2	20.3	24.4	27.8	29.2	27.7	27.0	26.2	23.5	16.8	13.0	22.2

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2018	12.9	15.8	20.9	25.3	27.7	28.8	28.1	26.3	25.5	23.0	19.3	13.1	22.2
2019	13.3	15.3	19.0	24.0	26.6	28.9	28.1	26.8	27.2	24.0	19.4	13.7	22.2
2020	10.8	15.3	19.1	24.7	27.7	29.7	29.4	28.1	27.3	22.7	16.0	12.5	21.9
2021	9.2	15.0	21.6	25.1	28.9	29.6	28.5	27.4	28.0	23.1	17.6	13.9	22.3
2022	12.8	15.9	21.6	25.5	28.1	28.6	27.4	27.1	26.8	22.7	19.3	13.2	22.4

Source: Pakistan Meteorological Department

4.2.3 Precipitation

190. The primary source of precipitation is rainfall, which is received mostly from July to September during SW monsoon winds. It is very erratic as some years are dry and others are wetter.
191. Occasional winter rains are also received in the months of December –February due to NE winds, which account for 15-25% of total rainfall.

Table 4.3 Monthly Amount of Precipitation (mm) at Karachi Airport

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2001	0	0	0	0	0	10.6	73.6	16.2	N/A	0	0	0	100.4
2002	0	2.4	0	0	0	N/A	N/A	52.2	N/A	0	0.5	0.4	55.5
2003	6.4	21.8	0	0	0	16.3	270.4	9.8	N/A	0	0.2	0	324.9
2004	13.7	0	0	0	0	N/A	3	5.6	N/A	39.3	0	4.3	65.9
2005	6.6	12.8	N/A	0	0	N/A	N/A	0.3	54.9	0	0	17.1	91.7
2006	N/A	0	N/A	0	0	0	66.2	148.6	21.9	0	3.1	61.3	301.1
2007	0	13.2	33.4	0	0	110.2	N/A	N/A	N/A	N/A	N/A	N/A	156.8
2008	8	Trace	1.1	0	0	0	54	37.5	Trace	0	0	21	121.6
2009	3	Trace	0	Trace	0	2.6	159.9	44	68.9	0	0	1.5	279.9
2012	0.2	0	0	0	0	Trace	Trace	8.1	121	0	0	22.8	152.1
2013	Trace	20	2.8	30	0	Trace	5.5	105.4	4	1.2	0	0	168.9
2014	Trace	0	12.4	0	1.3	Trace	1.1	9.9	1.4	0	4.6	0	30.7
2015	0.3	2.1	2.8	0	0	Trace	46.6	1.4	Trace	0	0	0	53.2
2016	3.1	0	Trace	0	0	65.8	1.9	96.9	Trace	0	0	0	167.7
2017	41.5	Trace	0	0	0	58.8	33.3	65.6	26.4	0	0	6.6	232.2
2018	Trace	Trace	0	0	0	Trace	Trace	0.8	Trace	0	0	Trace	0.8
2019	39.4	Trace	2.2	0	0	1.6	66.3	204	51.7	1.2	Trace	Trace	367.3
2020	Trace	2.6	0.5	0	0	Trace	101.2	366.8	Trace	0	3.1	0	474.2
2021	0	0	0	0	0	Trace	45.4	Trace	88.3	17.2	0	16.9	167.8
2022	28.5	0.4	0	0	0	21.6	348.3	127.9	43.4	0.0	2.6	0.0	572.7

Source: Pakistan Meteorological Department

192. The wet years have been found to follow a 3-year cycle during the first nine years of the 3rd Millennium. The year 2010 was among the wettest years since Karachi City witnessed more than five spells of 50 mm each during July, three significant spells of 60 to 100 mm in August and two spells of 25 and 10 mm each in September. In July and August 2011, there was heavy rainfall all over Sindh. Hyderabad received about 74 to 103 mm of rain in 24 hours, and the same amount poured in Karachi and the villages on its outskirts. Among the other, July 2020 was considered to be the wettest month among the others, and the total annual rainfall records in 2020 were higher than in the past 19 years. The torrential rains resulted in the flooding of several villages in the Karachi District. The ongoing monsoon season 2022 has brought more rains in Karachi than in the past twenty years.

4.2.4 Wind Speed & Direction

193. The wind direction and speed between the summer and winter monsoon seasons are somewhat unsettled and significant variations are noted both concerning speed and direction. The wind velocity record (2001-2022) indicates that the velocity varies and ranges between 1.0 m/s to 13.7 m/s. Tables 4.4 and 4.5 show the wind speed and direction, respectively.

Table 4.4 Wind Speed (m/s) at 12:00UTS

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2001	2.6	3.4	4.3	5.6	7.5	8.1	6.8	7.3	5.5	3.7	2.0	2.4	4.9
2002	3.6	3.9	4.0	6.5	8.5	8.2	9.8	7.3	7.7	3.3	2.9	3.2	5.7
2003	4.0	5.0	5.4	5.2	7.7	8.8	6.7	7.1	6.0	3.2	3.1	3.0	5.4
2004	3.4	3.7	4.0	6.0	8.0	9.0	10.0	9.5	7.3	3.8	1.0	2.5	5.7
2005	3.6	4.2	4.8	5.1	7.1	7.5	9.0	6.9	6.4	3.9	2.0	1.5	5.2
2006	2.0	3.0	3.0	6.2	8.0	7.7	8.3	6.2	4.7	4.2	2.2	3.0	4.9
2007	2.0	3.7	4.0	4.0	6.0	6.3	N/A	N/A	N/A	N/A	N/A	N/A	4.3
2008	4.3	7.6	8.2	10.5	12.6	7.6	11.0	9.3	8.7	6.6	5.1	3.9	7.9
2009	7.0	7.2	7.9	9.3	9.8	9.7	9.5	9.3	9.1	6.1	5.0	3.9	7.8
2012	5.8	6.6	9.3	9.8	12.3	12.8	13.1	11.2	8.4	7.1	5.7	5.8	9.0
2013	5.2	6.9	9.0	10.3	11.5	10.8	12.0	11.2	10.3	7.7	5.1	4.5	8.7
2014	5.9	8.9	8.6	11.5	12.4	13.4	12.8	11.6	11.7	8.3	6.0	4.5	9.6
2015	6.9	10.3	10.1	11.5	12.8	12.3	13.7	12.3	10.5	8.7	5.6	5.8	10.0
2016	7.5	8.7	4.8	1.1	13.0	11.7	11.8	10.5	12.1	9.2	5.5	5.2	8.4
2017	7.0	8.0	10.8	12.1	12.8	11.5	12.1	10.3	8.7	8.5	5.4	7.4	6.9
2018	6.3	7.0	9.5	10.2	10.8	11.1	12.3	12.4	12.2	8.7	6.1	6.8	9.4
2019	6.7	8.9	10.2	11.7	12.1	11.7	13.7	9.1	8.5	8.0	6.9	7.4	9.6
2020	9.0	9.4	9.0	10.5	13.3	10.9	10.1	8.9	9.4	7.3	6.2	5.5	9.1
2021	6.1	7.6	9.7	8.5	11.7	12.7	12.6	11.1	8.8	8.1	6.7	6.6	9.2
2022	6.8	7.9	8.9	9.9	12.5	12.5	9.5	7.0	8.8	7.0	6.1	4.8	8.5

Source: Pakistan Meteorological Department

Table 4.5 Wind Direction at 12:00UTS

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	S54W	S43W	S42W	S45W	S46W	S45W	N52W	S59W	S44W	N56W	S45W	S06W
2002	S67W	S52W	S51W	S55W	S51W	S42W	S54W	S45W	S48W	S56W	N54W	S41W
2003	S60W	N50W	S45W	S48W	S45W	S68W	S60W	S47W	S43W	S54W	S50W	S27W
2004	N27E	S46W	S53W	S49W	S52W	S54W	S54W	S62W	S56W	S47W	S45W	N86E
2005	N63E	S51W	S50W	S52W	S63W	S48W	S54W	S49W	S87W	S54W	S52W	N23W
2006	S48W	S62W	S50W	S57W	S64W	S60W	S67W	S78W	S51W	S53W	S49W	N79E
2007	S30W	S62W	S47W	S55W	S58W	S47W	S41W	S55W	S60W	S48W	S48W	N45E
2008	N45E	S47W	S54W	S51W	S52W	S39W	S50W	S52W	S46W	S39W	S38W	N
2009	N45E	S45W	S41W	S58W	S46W	S46W	S56W	S49W	S56W	S42W	S39W	S45E
2012	S3E	N56E	S62W	S46W	S61W	S51W	S66W	S51W	S53W	S41W	S41W	N9W

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	N39W	S54W	S56W	S54W	S61W	S40W	S53W	S52W	S55W	S47W	S17W	N50W
2014	S72E	S54W	S43W	S46W	S46W	S45W	S54W	S48W	S85W	S45W	S49W	S45E
2015	S72E	S54W	S43W	S48W	S50W	S40W	S54W	S55W	S50W	S41W	S	S58W
2016	S43W	S36W	S48W	S54W	S54W	S45W	S48W	S36W	S51W	S45W	S43W	S36W
2017	S83E	S56W	S51W	S45W	S45W	S44W	S66W	S57W	S48W	S51W	S59W	N45E
2018	S54W	S43W	S42W	S45W	S46W	S45W	N52W	S59W	S44W	N56W	S45W	S06W
2019	S67W	S52W	S51W	S55W	S51W	S42W	S54W	S45W	S48W	S56W	N54W	S41W
2020	N31E	S12W	S52W	S55W	S49W	S44W	S47W	S55W	S47W	S38W	S4E	N35E
2021	S21W	S38W	S44W	S42W	S52W	S53W	S55W	S48W	S40W	S41W	S22E	S40E
2022	N45E	S54W	S57W	S59W	S57W	S56W	S62W	S59W	S60W	S48W	S32W	S32W

Source: Pakistan Meteorological Department

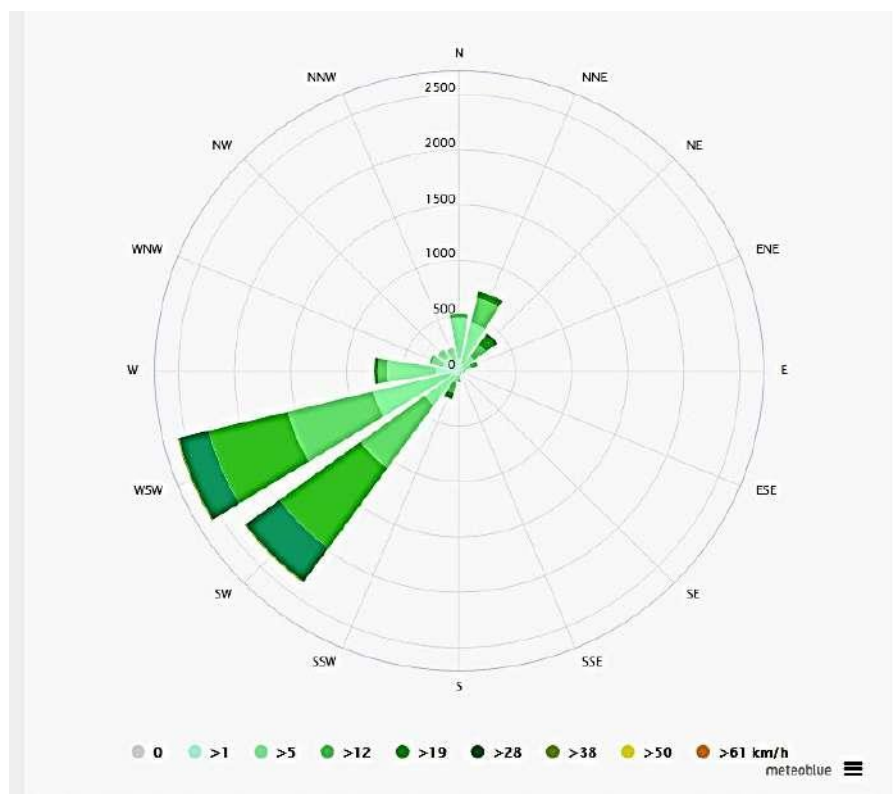


Figure 4-1 A wind rose for Karachi

4.2.5 Humidity

194. The relative humidity typically ranges from 25% (dry) to 70% (humid) over a year, rarely dropping below 20% (very dry) and reaching as high as 90% (very humid).

Table 4.6 Mean Monthly Relative Humidity (Mean) at 1200 UTC (%)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2014	25.0	27.0	35.0	47.0	57.0	61.0	64.0	61.0	60.0	36.0	36.0	31.0	45.0
2015	38.0	41.0	37.0	45.0	60.0	56.0	69.0	67.0	56.0	47.0	28.0	31.0	47.9

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2016	46.0	25.0	41.0	47.0	60.0	60.0	68.0	70.0	63.0	57.0	34.0	38.0	50.8
2017	38.0	25.0	36.0	44.0	59.0	62.0	70.0	67.0	63.0	44.0	29.0	20.0	46.4
2018	36.0	37.0	33.0	45.0	46.0	65.0	65.0	68.0	63.0	40.0	32.0	30.0	46.7
2019	40.4	33.9	36.6	48.0	55.6	58.8	64.8	72.6	67.6	41.1	34.6	29.7	48.6
2020	29.9	28.1	34.2	44.4	57.1	56.8	65.0	74.8	62.4	38.1	32.9	29.1	46.1
2021	31.3	34.1	41.2	43.3	54.3	60.3	67.5	64.5	63.0	46.5	27.6	38.7	47.7
2022	40.5	39.1	37.7	47.1	55.3	62.1	74.7	79.1	66.3	42.0	49.4	36.5	52.5

Source: Pakistan Meteorological Department

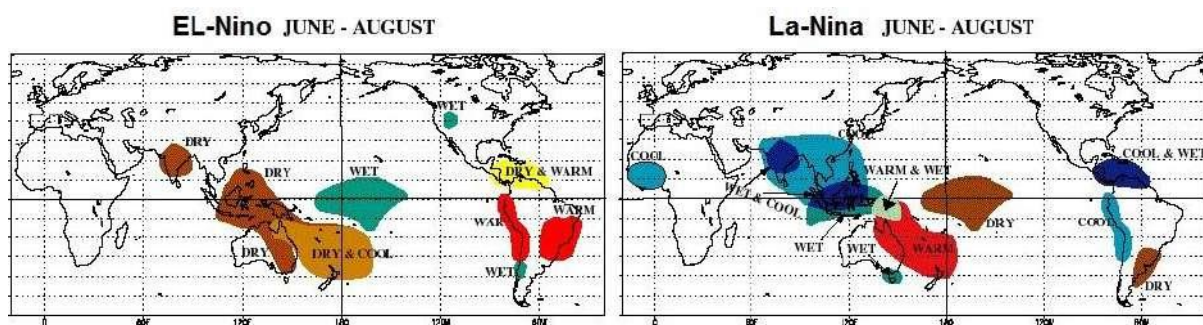
195. Urban Heat Island (UHI) Effect "The term "heat island" describes the built environments that is hotter than nearby natural areas. An urban heat island refers to a city or metropolitan area significantly warmer than its surrounding natural areas due to human activities. The temperature difference is usually more prominent at night than during the day and is most apparent when winds are weak. UHI is most noticeable during the summer and winter seasons. It is estimated that the annual mean air temperature of a city with 1 million or above inhabitants can be 1–3°C warmer than its surroundings. In the evening, the difference can be as high as 12°C. The heat island can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality.
196. The city of Karachi has been growing exponentially in terms of urbanisation and population growth. The city hosts a population of more than 22 million souls with a density of 4,115 persons per kilometre square (km²). The urban area density has increased from 233 km² in 1947, with a population size of 0.4 million, to 3,566 km² in 2004, with a population size of 14 million (Qureshi et al., 2008). Rapid urbanisation and global warming have initiated the UHI effect over the city. A substantial incidence of UHI is generally associated with a severe heat wave hazard in terms of sensible temperature. UHI effect is the unique feature of Karachi's June 2015 heat wave. It is expected that with growing global warming incidence and poor coping strategies, UHI will become a major health risk for the vulnerable segment of the population in mega-cities around the globe, such as Karachi.
197. Causes of Urban Heat Island Effect: The principal reason for nighttime warming is the retention of short-wave solar radiation absorbed during the daytime by building materials such as concrete and asphalt. These materials are commonly used in urban areas for pavement and roofs, and they have significantly different thermal and radiative properties compared to the surrounding rural areas. This causes a change in the energy balance of the metropolitan area, often leading to higher temperatures than surrounding rural areas. This energy is then slowly released during the night as a long wave radiation, slowing cooling. Because of this phenomenon, the minimum temperatures in Karachi remained high during the heat-wave event.
198. There are several causes of the urban heat island effect in Karachi.

- Reduced and slow process of evapotranspiration due to shrinking green areas and spaces in the city. With decreased vegetation, the city loses the shade, the cooling effect of trees and the removal of carbon dioxide.
- Geometric effects in terms of the rising number of tall buildings are a significant contributing factor to the urban heat island effect. Over the years, the number of tall buildings within the city has increased, providing multiple surfaces for the reflection and absorption of sunlight, thus increasing the efficiency with which the city is heated. This is called the "urban can" in effect". Another effect of the increased number of buildings is the blockage of wind, which inhibits cooling by convection and causes pollution to dissipate.
- Waste heat from automobiles, air conditioning, industry, and other sources also contribute to the UHI. High pollution levels in urban areas can also increase the UHI, as many forms of pollution change the atmosphere's radiative properties.

199. Aside from the effect on temperature, UHI can produce secondary effects on local meteorology, including altering local wind patterns and humidity, as discussed in the previous section. The UHI effect described above has been one of the major causes of an unprecedented large number of heat-related deaths in Karachi. Future climate scenarios suggest that the frequency of this kind of disaster may increase with the rise of temperature in future.

4.2.6 Impact of Climate Change - Karachi

200. Due to climate change, there could be an exceptional change in the temperatures in Pakistan as a whole in the coming years. Karachi may, however, face the threat of rising sea levels by the year 2100, at about 8 feet below sea level. Climate change could influence monsoon dynamics and cause summer precipitation levels to drop, as well as delays in the start of the monsoon season. The impact of climate change in Karachi will deepen by 2030. Due to global warming, the coastline of Karachi is likely to be flooded due to rising sea levels. Many seminars and public gatherings are held in the city to make the government and public fully aware of global warming; speakers at the seminar have urged the government to prepare long and short-term plans to reduce the impact of global warming on natural resources. Karachi also faces the threat of super cyclones, which are said to increase their intensity and momentum in the years to come.



201. List of cyclones that affected Karachi and the Sindh coast: Cyclones that form in the Arabian Sea do not usually hit Karachi or the Sindh coast. However, during 1902, 1907, 1944, 1964, 1985, 1999, 2007, and 2010, cyclones made landfall in the Sindh

coast, including Karachi. Other cyclones listed below caused rain as remnants.

- In May 1985, a cyclonic storm made landfall in the eastern direction of Karachi. The storm, which was moving towards Karachi, actually weakened over the sea while still a few hundred Kilometers south of Karachi.
- In November 1993, a category 1 cyclone approached the Sindh-Gujarat border but dissipated due to high vertical shear over open waters.
- In June 1998, remnants of the category 3 Gujarati cyclone (the 5th most robust cyclone of the Arabian Sea) killed 12 people near and in the city.
- In May 1999, another category 3 major cyclone (the fourth strongest cyclone in the Arabian Sea) hit near the city. This Cyclone killed 700 people in Sindh, including Karachi. It is the strongest cyclone recorded in Pakistan.
- In May 2001, the powerful category three cyclone (the 3rd most robust cyclone of the Arabian Sea) hit the Indian border of Gujarat. It caused rain along the Sindh coast, but no damage was reported.
- In October 2004, a severe cyclonic storm, Cyclone Onil, approached the Sindh coast but later recurved back to the sea. It caused heavy rain that killed nine people in Karachi.
- In early June 2007, supercyclonic storm Gonu (the strongest cyclone in the Arabian Sea) caused strong gusty winds in the metropolis and light rainfall as it moved towards Oman.
- In June 2007, a cyclonic storm, Cyclone Yemyin, passed near the city and killed 200 people before moving towards Balochistan, where it killed 380 people.
- In November 2009, remnants of Cyclone Phyan caused gusty winds along the Sindh coast, including Karachi. However, six Pakistani fishermen were trapped in the storm and later rescued by the Indian Navy.
- In June 2010, Cyclone Phet (the second strongest cyclone in the Arabian Sea), once a powerful category 4 cyclone, made landfall near the city as a weak tropical depression, with 14 casualties in and near the city.
- In November 2010, remnants of Cyclone Jal caused drizzle with dusty winds in Karachi while it caused light to moderate rainfall in southeastern Sindh.
- In November 2011, the outer bands of cyclone Keila brought drizzle to the city while moderate showers to the Makran coast.
- List of Notable floods in Karachi: Most of the flooding in Karachi occurs due to the monsoon season. However, due to the enhancement of the city's infrastructure, flooding has been controlled. However, excessive and irregular rains can still lead to significant flooding in the metropolis. Following are some of the major floods in the city;
- On 7 August 1953, the city received its record-breaking 24-hour rainfall, which caused widespread flooding. About 278.1 millimetres (10.95 in) of rain were recorded.

- On 1 July 1977, Karachi received its third-highest rainfall of 207 millimetres (8.1 in) in 24 hours; it caused massive flooding in the city and killed 248 people in the city.
 - In 2003, massive flooding during the monsoon season devastated Sindh. Two days of rainfall of 284.5 millimeters (11.20 in) created havoc in the city.
 - In 2006, after two years of drought period heavy rainfall lashed the city during the monsoon season, but the city came to a standstill on 17 August when widespread rainfall of 77 millimetres (3.0 in) created a flood-like situation in the city, killing 13 people and submerging roads, low-lying areas and underpasses with rainwater.
 - In 2007, almost all the rains that occurred in this monsoon season brought flooding with it. During the month of June, Cyclone Yemyin created havoc in the city from 21 June to 26 June 2007 110.2 millimetres (4.34 in) of heavy downpours were recorded which killed 228 Karachiites on 23 June, then from 9 August to 11 August a robust tropical depression brought massive flooding in the city with 191 millimetres (7.5 in) of rain killing 21 people and submerging low-lying areas and underpasses. On 22 August, a monsoon depression once again flooded the city with 80 millimetres (3.1 in) of rainfall, killing 10 people.
 - On 18 July 2009, severe flooding occurred due to a tropical depression. The city's second-highest rainfall, 245 mm (9.6 in), occurred in just four hours, killing 20 and injuring 150 people. Another flooding event occurred on August 31, 2009, when a well-marked low pressure was present over Sindh. The rainfall was recorded to be around 147 mm (5.7 in).
 - On September 13, 2011, life was crippled in the city due to heavy rainfall that caused urban flooding in the town. The rainfall was recorded to be around 145 mm (5.7 in).
 - In Aug & Sep 2019, life in the city was crippled due to multiple spells of heavy rain that caused urban flooding and loss of life and property.
 - 6 – 9 Jul 2020, spells of heavy rain caused urban flooding in several areas of the city, causing loss of life and property, mainly due to electrocution.
 - The hours-long spell, which began before sunrise and continued till night, broke previous records of rainfall recorded in the city during August 2020. The Met Department said that Karachi had received 345mm of rainfall in August, breaking the previous record of 298mm reported in August 1984.
 - Rains in September 2021 and July & August 2022 caused substantial urban flooding in Karachi.
202. List of droughts in Karachi: Drought-like conditions in the city are not common, but if the Monsoon season fails to deliver rains, then drought emerges. Following are some of the worst droughts in Karachi city.
- The major drought in Karachi as well as for the whole of Pakistan was from 1996 to 2002, peaking from

- 1998 till 2001. While in 2002 drought conditions started to dissipate. The drought of 1998-2001 was considered the worst in 50 years.
- In 2004, no rain occurred in the city as well as in Sindh province, but during the month of October, heavy downpours lashed different parts of Sindh due to Cyclone Onil.
- In 2005, the drought conditions continued, but a post-monsoon low pressure dumped heavy rains on 12 and 13 September.
- In 2009, drought conditions emerged during the summer season in suburban areas of Karachi due to the El Nino phenomenon, which caused drought during the winter season, but the monsoon rains of 2009 were above normal.

4.3 Geology and Sub-Surface Characteristics

203. Geology: Karachi is the part of major synclinorium stretching from Ranpathani River in the east to Cape Monze in the west, Mehar and Mole Jabal (Mountains) in the north. Within the synclinorium a number of structures such as Pipri, Gulistan-e-Jauhar, Pir Mango and Cape Monze are exposed. The presence of concealed structures under the Malir River valley, Gadap and Maripur plains can fairly be deduced.
204. Rock aggregates, sand, limestone and clay are some of the potentials for gainful utilization. Gulistan-e- Jauhar member of the Gaj formation offers groundwater potential for limited use. The area is underlain by rocks of sedimentary origin ranging in age from Eocene to Recent. Major structural trends and the basin axis strike generally south but with a “bulge” to the east also called Karachi Arc (Bender and Raza 1995).
205. Geomorphology of Karachi: Karachi is located in the south of Sindh, on the coast of the Arabian Sea. It covers an area of approximately 3,600 km², comprised largely of flat or rolling plains, with hills on the western and northern boundaries of the urban sprawl. The city represents quite a variety of habitats, such as the sea coast, islands, sand dunes, swamps, semi-arid regions, cultivated fields, dry stream beds, sandy plains, and hillocks. Classified according to physiographic features, Karachi City District can be divided into three broad categories: Hilly Region (Mountain Highland), Alluvial Plain (Piedmont Plain) and Coastal Areas (Valley Floor). The metropolitan area is divided by two non-perennial river streams namely Lyari and Malir Rivers. The Malir River flows from the east towards the south and centre, and the Lyari River flows from north to the southwest. Gujjar and orange are the two main tributaries of the Lyari River while Thaddo and Chakalo are the main tributaries of the Malir River. The dry weather flow of both rivers carries urban sewage that is ultimately drained into the Arabian Sea. Among the various physiographic features, low, flat-topped parallel hills devoid of vegetation, interspersed with widespread plains and dry riverbeds, are the main topographic characteristics of the city.
206. The greatest height of the region is 250 ft., which gradually decreases to 5 ft. above mean sea level along the coastline. The Karachi Harbor is a sheltered bay to the southwest of the city, protected from storms by the Sandspit Beach, the Manora Island and the Oyster Rocks.

207. The Arabian Sea beach lines the southern coastline of Karachi. Dense mangroves and creeks of the Indus delta can be found towards the south east side of the city. Towards the west and the north is Cape Monze, an area marked with projecting sea cliffs and rocky sandstone promontories.

4.3.1 Topography

208. Karachi may be broadly divided into two parts; the hilly areas in the north and west and an undulating plain and coastal area in the south-east. The hills in Karachi are the off-shoots of the Kirthar Range. The highest point of these hills in Karachi is about 528 m in the extreme north. All these hills are devoid of vegetation and have wide intervening plains, dry river beds and water channels. The topography of Karachi includes the large shallow intertidal and sub-tidal areas spreading out to 1-5 km with a very gentle surface gradient of about 1:50. The Cape Monze cliff that projects into the Arabian Sea is part of the 3 to 9-meter contour that characterizes the coastline up to the Rann of Kutch. In the sand mass along the coastline, there are 30 to 60m high cliffs that have been undercut by storm surges. Intense erosion resulted in cliffs, sea caves, arches and blow holes that can be observed on the coastline from Hawkes Bay to Manora Channel and onwards to Korangi Creek.
209. The coastal region of the synclinorium is seismically active and has been undergoing continuing uplift. The uplift has already resulted in the formation of rocky headlands and in exposing portions of the continental shelf. Protected pocket bays and lagoons between the nearly formed headlands have been rapidly filled by alluvial and fluvial deposits. The material brought to the coast was taken over by currents and wind for the formation of wide sandy beaches, and migrating sand dunes.

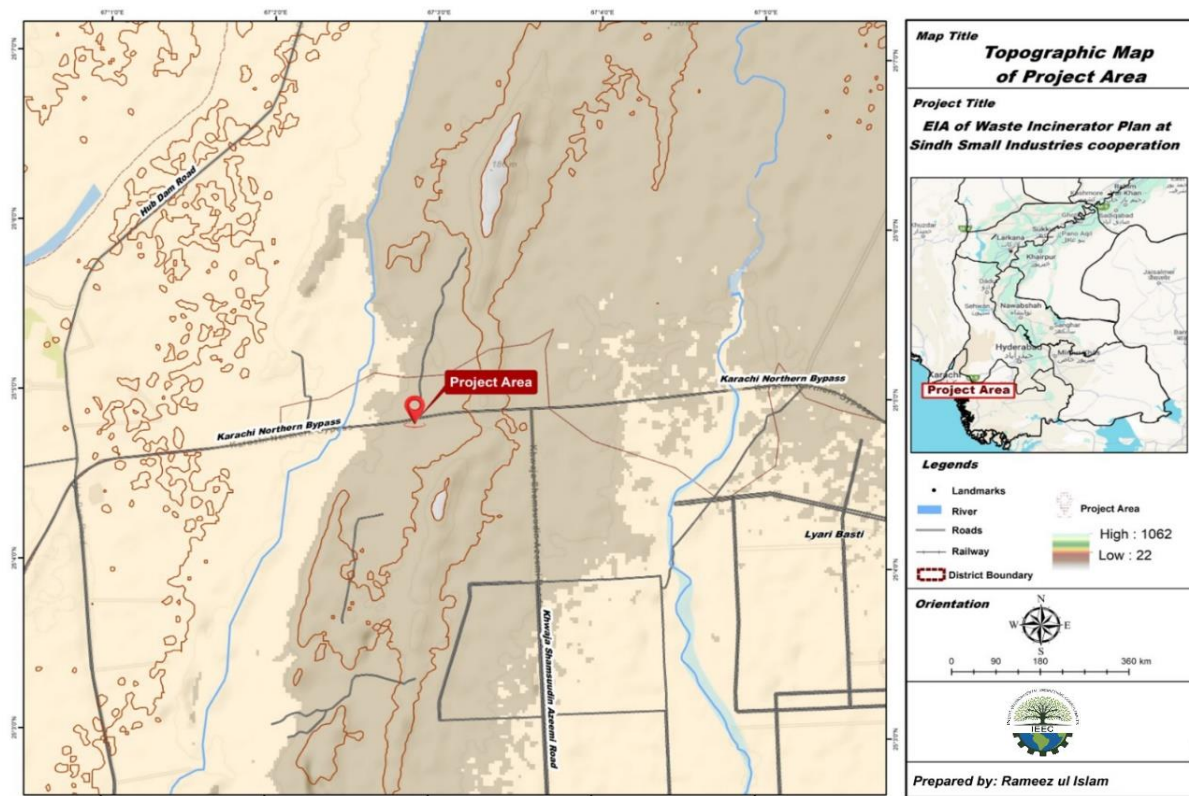


Figure 4-2 Elevation map of Project Area

4.3.2 Seismicity

210. The Seismic study for the Project site's macroenvironment aims to elucidate the impact of tectonic movement-induced seismicity on the microenvironment. Seismicity in the Karachi region is related to the pressure potential being built at the convergence of the three lithospheric plates, Indian, Arabian, and Eurasian, at the Triple Junction formed by the intersection of the Owen fracture zone, the Makran subduction zone and the Ornach-Nal fault. The Murray Ridge extends northward into Pakistan to unite the Ornach-Nal-Chaman Fault system onshore, displaying a strike-slip boundary between the major tectonic plates of India and Eurasia⁷.
211. Karachi and its environs fall in the synclinorium, described earlier as being part of Indus deltaic region. Recession of the delta and its retreat towards the southeast dried up its numerous channels, estuaries and creeks that characterize the synclines and are part of the active faults. Tectonic instability of this region can be attributed to this large number of reverse and tear faults and the recently described wrench faults.⁸
212. The first number refers to the list numbers, whereas the second number represents the depth of the hypocenter in kilometres. The Red Crosses represent neighbourhoods plagued by recurrent seismic activity, usually of low magnitude.⁹
213. Sarwar and Alizai compiled a list of earthquakes during the 1902-2013 period and produced the above map that gives a distribution of hypocenters of earthquakes during the same period. From the distribution of hypocenters, it has been inferred that the entire Karachi Arc and surrounding areas are seismically active with hypocenters ranging in depth from 0-500 kilometers. From the depth of hypocenters, it is inferred that active deformation has taken place at multi-levels ranging from shallow too deep in the basement. Quite a few of the recent epicenters are found within or in close proximity to parts of Karachi that have faced recurrent earthquake activity.
214. Seismic activity in the region is the result of the triple junction as well as the Karachi Arc, located in southeastern Pakistan, as a large fold and thrust belt that shows Neogene thin-skinned eastward movement (Sarwar and DeJong, 1979; Schelling, 1999). Seismic activity in and around the region shows that the Karachi Arc has been active since long in prompting the eastward movement of the delta. The movement may be related to the rebound that takes place after mass shift. Sarwar has suggested that the eastward creep of the Karachi Arc is directly related to active subsidence of the Hyderabad graben that underlies it and also defines the northern and southern limits of the Karachi Arc.¹⁰
215. It may be added that subsidence such as that on Southern coast of Sindh, occurs naturally as a result of plate tectonic activity above active faults, and in places where fluid is expelled from underlying sediments and is joint at river deltas that may have receded. Earthquakes arise and result from the release of the force along the growth fault plane. As a result, many different growth faults are created as sediment loads shift basinward and landward.
216. Earthquakes: Historically the coastal region has suffered a number of earthquakes. A list of earthquakes that have affected Karachi and its vicinity has been compiled

by the Meteorological Department and listed by Sarwar and Alizai.

217. Seismicity of the Site: According to the Uniform Building Code (1997), Karachi and its adjoining areas fall in Seismic Zone-2B.

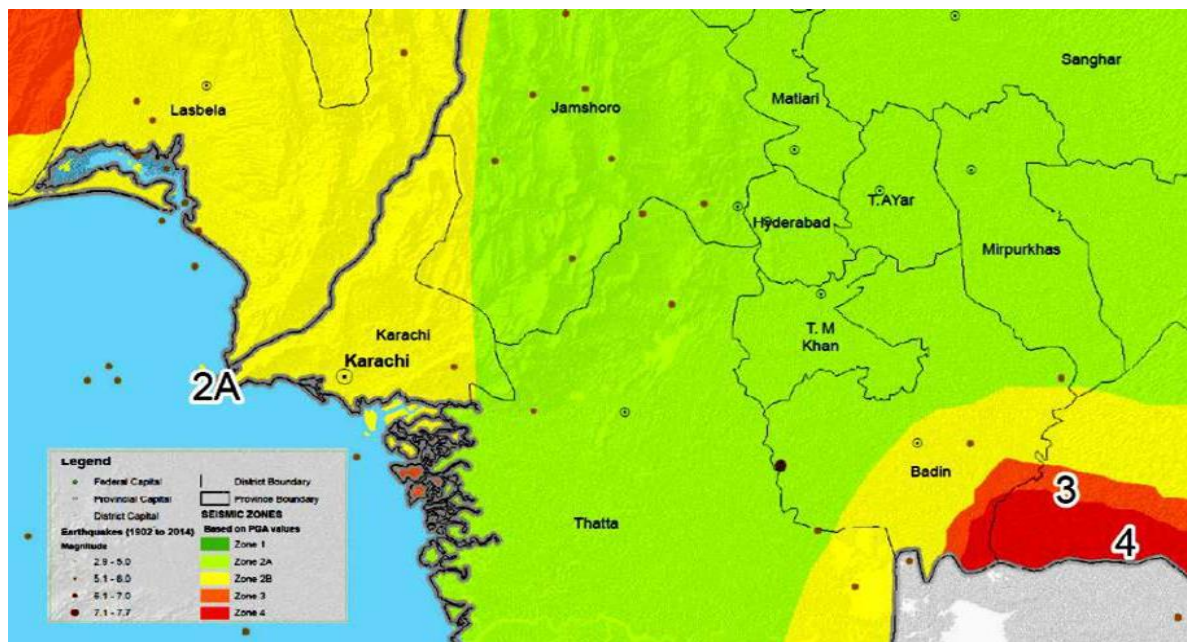


Figure 4-3 Seismic Zones in Karachi

4.3.3 Liquefaction Features Caused by Earthquake

218. Liquefaction is a total loss of strength due to undrained restructuring. Disturbance, by shearing or vibration, destroys soil skeleton, with loss of grain contact and decrease of porosity, soil load is transferred to pore water, water pressure > normal stress = 0, and soil acts as a liquid. Drainage reduces pore water pressure, allowing grain contact and thixotropic strength recovery (Waltham, 2002). Strong shaking produces liquefaction in the fine sands and silts during the earthquake. This causes the mineral grains to settle and expel their interstitial water to the surface. If the pore-water pressure rises to a level approaching the weight of overlying soil, the granular layer behaves as a viscous liquid rather than a solid and leads to the collapse of even engineered structures. Liquefaction has been abundant in areas, where groundwater lies within
219. 10 meters of the ground surface (Husain et al., 2004). Investigators typically have designated sites as “Liquefied” based on the presence of surficial liquefaction features, such as venting of sediment to the surface (i.e., sand boils), ground cracking associated with liquefaction (e.g., lateral spreading), or surface settlements. Other evidence of liquefaction includes tilting or settling overlying structures and floating underground structures (Olson et al., 2002). Mahmood and Shaikh (2008) investigated the “sinking” of a water tower in 2006 near the Clifton area and speculated about liquefaction due to mild earthquakes.

4.3.4 Hydrology of Karachi

220. Hydrogeologically, the city of Karachi lies in the Hub River Basin and the Malir River

Basin. The Malir River and the Lyari River drain the Malir River Basin. The aquifer of Karachi is, therefore, mainly recharged by seepage from the Hub River and Hub Dam, as well as the Malir and the Lyari Rivers. The Hub River lies on the western frontier of Sindh and, for some distance, the boundary between Sindh and the Baluchistan provinces. It is located about 30 km to the west of Karachi, along the Karachi- Lasbela boundary. It falls into the Arabian Sea near Cape Monze, with a total drainage course length of 336 km. During the past several years, a number of pumping wells have been installed to meet requirements for the irrigation-water supply (to raise vegetables, fruits, dairy and poultry) and drinking-water supply for Karachi. Excessive pumping of groundwater and continuous lowering of water-table is likely to result in intrusion of seawater into the Malir Basin under natural seepage conditions and under artificially induced conditions of recharge of saline seawater in the coastal aquifer(s) of Karachi.

221. **Recharge Sources:** Five possible water sources contribute to groundwater recharge in Karachi. The first potential source is the rainfall. As Karachi suffers from a deficit of precipitation (only rainfall), the contribution to shallow groundwater storage from rain is very small. However, rainfall in the hinterlands and other areas surrounding Karachi may significantly contribute to the groundwater flow system. The two freshwater sources are the Hub Lake/Hub Dam and the Indus River. Water from Hub Dam and the Indus River is piped to various residential zones in Karachi for drinking and irrigation purposes. The spring water discharges into Malir River and Lyari River, and the municipal/industrial waste effluents added to these rivers contribute to groundwater storage as a fourth recharge source. Seawater intrusion along the Karachi coast is the fifth possible source.
222. **Water Supply and Sewerage System:** The Karachi Water Supply & Sewerage Board (KW&SB) manages the water supply and sewerage system. The present water supply system of Karachi City has a supply capacity of about 650 MGD. As of 2019, Karachi receives about 580 MGD, well below the demand of over 1,100 MGD.

Table 4.7 Description of Water Supply Schemes for Karachi Bulk Water Supply

S. No	Description of Water Supply Schemes	Rated Supply (MGD)	Actual Supply (MGD)
1	Haleji Scheme	30	-
2	Greater Karachi (GK) Bulk Water Supply Scheme Stages I to IV	280	280
3	K-II Scheme	100	100
4	Additional Water Supply from GK BWS System	40	40
5	(To) Pakistan Steel	26	26
6	(To) Port Qasim Authority	7.5	7.5
7	K-III Scheme	100	100
8	Hub Dam	10013	7014
Total		683	62315
Source: EA/KW&SB, Express Tribune, WAPDA			

4.4 Disposal of Solid Waste

223. Karachi is the largest and most populated city in Pakistan, located in South Asia. The daily MSW production in the city is over 12,000 tons, with about 52% organic fraction. Currently, there is no prevalence of proper waste management system in Pakistan. Particularly in large urban areas like Karachi, where a massive amount of MSW is produced and mishandled, resulting in critical environmental and public health problems. Overall, 60% of MSW generated in Karachi is being collected and openly dumped in so-called landfill sites out of the city. Meanwhile, the remaining 40% of the waste is left on the streets and roadsides, creating a detrimental environment for the public. Like other major cities in Pakistan, Karachi has industrial zones where a significant amount of MSW is generated, with a vast potential for energy production. However, this resource is being wasted due to the paucity of proper waste handling and control.²⁵
224. Waste is an unavoidable by-product of most human activity. Economic development and rising living standards in the city have led to an increase in the quantity and complexity of generated waste, whilst industrial diversification and the provision of expanded healthcare facilities have added substantial quantities of industrial hazardous waste and biomedical waste into the waste stream with potentially severe environmental and human health consequences. The city is unable to manage hospital waste by applying scientific methods. Hospital waste is mixed with municipal waste in roadside collection bins and disposed of similarly, which is unacceptable. Hazardous, hospital and industrial waste are being treated as ordinary wastes.²⁶
225. There is no scientifically designed sanitary landfill site for waste's safe and final disposal. Most garbage is dumped at the Jam Chakro site near Surjani Town, Gond Pass (Hub Chowki), and Mehran Town near Korangi. As no public health procedures are applied, open dumping causes enormous problems.
226. Financed by World and executed by the Sindh Solid Waste Management Board (SSWMB), the Solid Waste Emergency and Efficiency Project (SWEEP) aims to improve solid waste collection, transportation and disposal: one of the most acute service needs and a top priority for Karachi residents. By reducing the volume of waste openly dumped in Karachi, SWEEP will improve public health conditions and overall livability and reduce urban flooding and environmental degradation risks linked to inadequate handling of solid waste.

4.5 Incinerators in Karachi

227. A few incinerators are functional in Karachi. Two functioning incinerators are installed in the SITE area, owned by Karachi Metropolitan Corporation (KMC) and have an estimated capacity of 20 tons per day. The estimated capacity of the installed and upcoming incineration plant is 20 tons per day. It burns medical and other hazardous waste. Other incinerators mainly belong to private entities such as Geolinks in Port Qasim, Agha Khan University Hospital, etc. Medical waste incinerators of about 100 kg/hr capacity are to be installed at various Government hospitals in Karachi, such as Jinnah Post Graduate Medical Centre, National Institute of Child Health, etc., as planned by the Health Department, Government of Sindh²⁷. There are many other private incinerator plants which are under construction and operation in Karachi.

City.

4.6 Baseline Monitoring

4.6.1 Key Components of Ambient Air & Noise Monitoring:

Particulate Matter (PM): PM10 and PM2.5 often derive from different emissions sources, and have different chemical compositions. These particles can originate from sources like combustion, industrial processes, gasoline, and natural sources.

Gaseous Pollutants: Monitoring of gases such as sulphur dioxide (SO₂), carbon monoxide (CO), ozone (O₃) volatile organic compounds, and nitrogen oxides (NO_x) and others. These gases are often associated with combustion processes, industrial emissions, and vehicular traffic.

Toxic Substances: are dangerous chemicals that can harm living organisms and disrupt ecosystems. like heavy metal (e.g., lead.) They may enter the body through inhalation, ingestion, or skin contact, leading to adverse health effects and environmental impacts.

Noise Testing: Noise testing measurement typically involves assessing sound levels in decibels (dB) using a sound level meter. The measurement can determine the intensity of noise in various environments, ensuring compliance with regulations and identifying potential risks to hearing and health.

Sound level Measurements: Intensity of sound using decibels (dB) and assessing noise levels from various sources, including transportation, aircraft, railways, industrial operations, construction sites, and recreational activities etc.

Regulatory Compliance: Regulatory compliance for noise levels requires adherence to established limits based on the area and time of day, typically set by environmental or health authorities. Exceeding these limits can result in fines, mandatory noise control measures, and legal action.

Noise Reduction Measures: Noise reduction measures include installing acoustic insulation, such as soundproofing panels, and using noise barriers to shield areas from external sounds. Additionally, modifying noisy equipment and operational practices can further decrease noise levels.

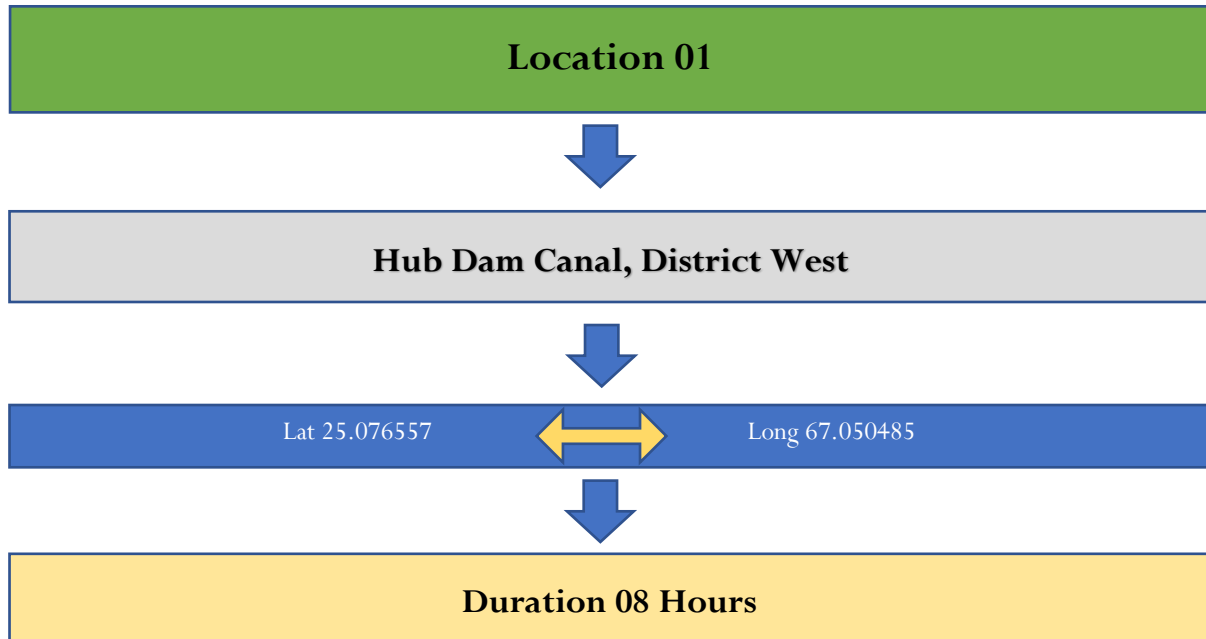
Imperial Environmental Research Laboratory awarded the contract to conduct air and noise quality monitoring at 01 location in the entire project area. The air quality test was run continuously for 08 hours at each location. The noise level was also run at the individual sites (The noise level shown by the laboratory is below permissible limits).

The monitoring values of Carbon monoxide (CO), Sulphur dioxide (SO₂), Nitrogen Oxide (NO), Particulate Matter (TSP, PM₁₀ & PM_{2.5}), Ozone (O₃), and lead (Pb) were compared with those set by Sindh Environmental Quality Standards (SEQS).

The review of the results reveals that all the air and noise quality test results fall well below the SEQS. It may be noted that most of the project is barren without any significant activities; hence, the overall air quality and noise will be similar to or better than the results reflected in the table below. It is also expected that the level of harmful gases and noise levels may increase due to vehicular and other heavy machinery exhaust and noise in aircraft, commercial

areas, etc, which can affect public health and the environment. It will all be short-lived and irreversible.

Imperial Environmental Research Laboratory Conducted Ambient Air, Noise & Drinking Water & Surface Water Sampling at the Site, Hub Dam Canal Coordinates of sites & location is given below, in Graphical presentation



Analytical Test Report of Ambient Noise Quality Monitoring

Sr. #	Sampling Site Location	Coordinates	Min dB(A)	Max dB(A)	Average dB(A)	SEQS Limit	Remarks
1.	Near Project Area	Lat 25.07975 Long 67.050618	53	58	55.5	65	Within Limit
2.	Near Project Area	Lat 25.07975 Long 67.050615	50	59	54.5	65	Within Limit
3.	Near Northern Highway	Lat 25.07987 Long 67.05066	54	63	58.5	65	Within Limit

Analytical Test Report of Ambient Air Quality Monitoring

Parameters	Test Methods	Unit	SEQS Limit	Results	Remarks
SO ₂	UV Fluorescence	µg/m ³	120	7.41	Within Limit
NO	Chemiluminescence	µg/m ³	40	16.87	Within Limit
NO ₂	Chemiluminescence	µg/m ³	80	25.20	Within Limit
CO	Gas Filter Correlation	mg/m ³	10	7.32	Within Limit
O ₃	UV Fluorescence	µg/m ³	130	6.11	Within Limit
PM _{2.5}	Gravimetric Sampling	µg/m ³	75	34.76	Within Limit
PM ₁₀	Gravimetric Sampling	µg/m ³	150	148.21	Within Limit
SPM	Gravimetric Sampling	µg/m ³	500	181.91	Within Limit
Lead	Spectrophotometer	µg/m ³	1.5	0.001	Within Limit

4.6.2 Drinking & Surface Water Analysis

Regulatory Compliance: To ensure that the water meets safety standards set by health and environmental agencies.

Public Health Protection: To detect contaminants that could pose health risks.

Operational Monitoring: To assess the effectiveness of water treatment processes.

Sampling Locations: Typically, samples are taken at various points in the distribution system, including source water, treatment plants, storage facilities, and consumers' taps.

Frequency: Sampling frequency is determined by regulatory guidelines and the specific parameters being tested.

Parameters: Commonly tested parameters include microbial contaminants (e.g., E. coli), chemical contaminants (e.g., lead, nitrates), and physical characteristics (e.g., pH, turbidity).

Grab Samples: A single sample collected at a specific point in time.

Composite Samples: Combined samples collected over a set period or from multiple locations, providing an average concentration of contaminants.

Sampling Containers: Clean, sterilized containers are used to avoid contamination. Some containers may have preservatives added depending on the type of analysis.

On-site Testing: Some parameters, like temperature, pH, and chlorine residuals, are measured directly at the sampling site using portable instruments.

Sample Preservation: Depending on the test, samples may need to be cooled, kept in the dark, or preserved with chemicals to maintain their integrity until laboratory analysis.

Transportation and Storage

Samples are typically transported to the laboratory under controlled conditions (e.g., cooled to 4°C) to prevent changes in composition.

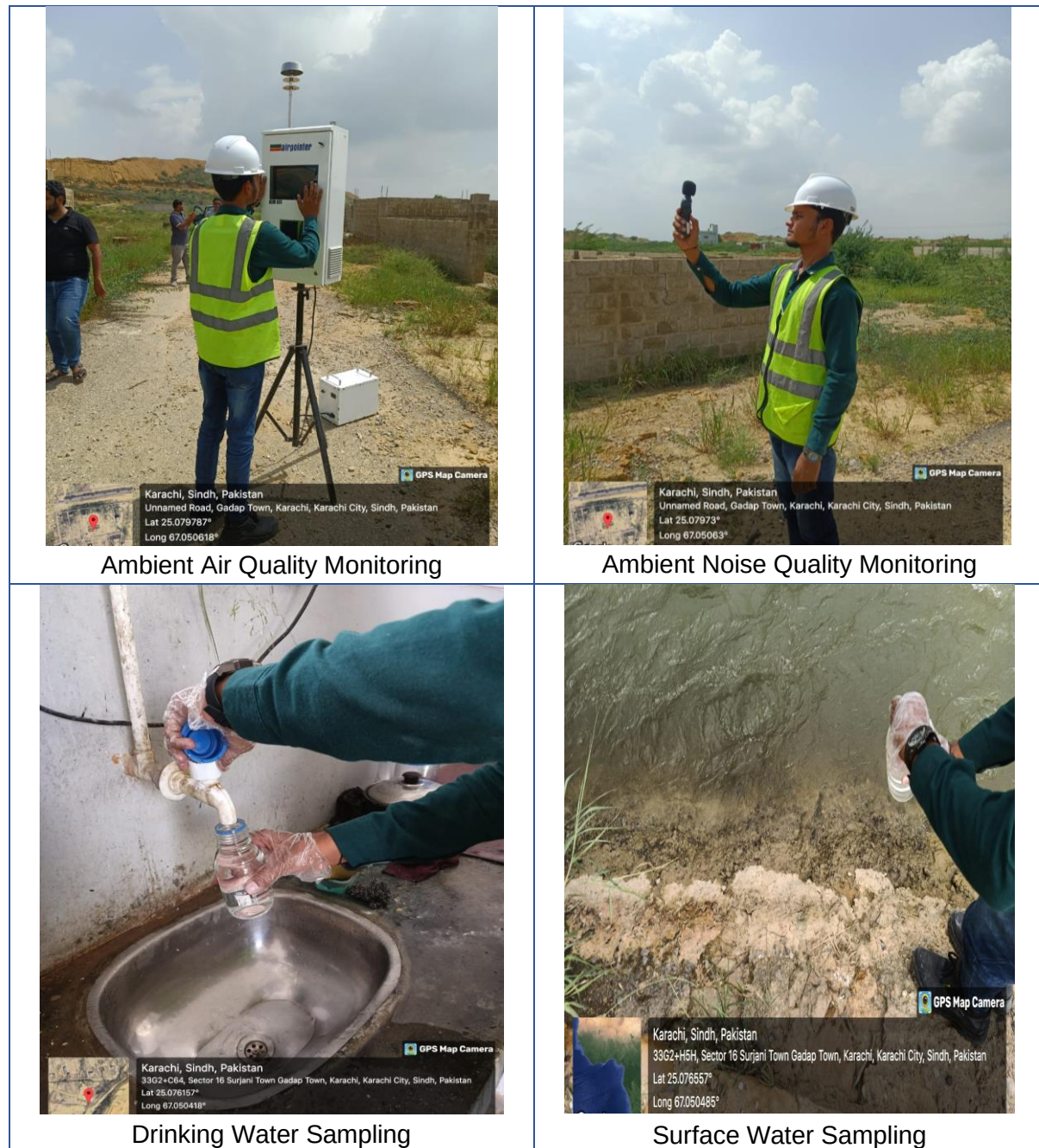
Time between sampling and analysis should be minimized to ensure accuracy, especially for parameters like microbiological contaminants.

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Reference Method	Unit	SEQS/WHO Limit	Result	Remarks
1.	Temperature	SMWW 2550 B	°C	40 ± 3	27.1	Within Limit
2.	pH	APHA 4500 H*B	-	6.5-8.5	8.16	Within Limit
3.	Odor	Organoleptic	-	Acceptable	Acceptable	Within Limit
4.	Color	Pt-Co Method	TCU	15	15	Within Limit
5.	Taste	Organoleptic	-	Acceptable	Acceptable	Within Limit
6.	Total Hardness	APHA	ppm	500	210	Within Limit
7.	Total Dissolved Solids	APHA	ppm	1000	442	Within Limit
8.	Turbidity	Nephelometric	NTU	<5	10.2	Out of Limit
9.	Chloride	ASTM-D512	ppm	<250	120	Within Limit
10.	Chlorine, Residual	HACH-8021	ppm	0.2 - 0.5	0	Within Limit
11.	Electrical Conductivity (EC)	APHA	µS/cm	NGVS	820	Within Limit
12.	Alkalinity	APHA	m.mol/l	NGVS	1.8	Within Limit
13.	Bicarbonate	APHA	ppm	NGVS	80	Within Limit
14.	Magnesium	APHA	ppm	NGVS	19.44	Within Limit
15.	Fluoride	HACH-8029	ppm	1.5	0.7	Within Limit
16.	Nitrate	HACH-8039	ppm	50	1.12	Within Limit
17.	Nitrite	HACH-8507	ppm	3	0.02	Within Limit
18.	Arsenic	Merck Test Kit	ppb	<0.05	0	Within Limit
19.	Potassium	APHA	ppm	NGVS	32	Within Limit
20.	Sodium	APHA	ppm	NGVS	80	Within Limit
21.	Copper	Lovibond-149	ppm	2	0.00	Within Limit
22.	Iron	Lovibond-156	ppm	0.3	0.01	Within Limit
23.	Lead	Lovibond-232	ppm	<0.05	0.00	Within Limit
24.	Manganese	Lovibond-242	ppm	0.5	0.08	Within Limit
25.	Mercury	Kit-Method	ppm	0.001	0.00	Within Limit
26.	Nickel	Lovibond-255	ppm	<0.02	0.00	Within Limit
27.	Carbonate	APHA	ppm	NGVS	Nil	Within Limit
28.	Sulfate	APHA	ppm	250	160	Within Limit
29.	Zinc	Lovibond-400	ppm	5	0.00	Within Limit
30.	Calcium	APHA	ppm	NGVS	52	Within Limit
31.	E-Coli	APHA 9222 D	Cfu	0/100ml	5	Out of Limit
32.	Total Coliform	APHA 9222 B	Cfu	0/100ml	18	Out of Limit

Analytical Test Report of Surface Water Quality Monitoring

S.No.	Parameter	Reference Method	Unit	SEQS/WHO Limit	Result	Remarks
1.	Temperature	SMWW 2550 B	°C	40 ≤ 3	27.1	Within Limit
2.	pH	APHA 4500 H*B	-	6.5-8.5	8.26	Within Limit
3.	Odor	Organoleptic	-	Acceptable	Acceptable	Within Limit
4.	Color	Pt-Co Method	TCU	15	20	Out of Limit
5.	Taste	Organoleptic	-	Acceptable	Acceptable	Within Limit
6.	Total Hardness	APHA	ppm	500	200	Within Limit
7.	Total Dissolved Solids	APHA	ppm	1000	426	Within Limit
8.	Turbidity	Nephelometric	NTU	<5	20.34	Out of Limit
9.	Chloride	ASTM-D512	ppm	<250	110	Within Limit
10.	Chlorine, Residual	HACH-8021	ppm	0.2 - 0.5	0	Within Limit
11.	Electrical Conductivity (EC)	APHA	μS/cm	NGVS	790	Within Limit
12.	Alkalinity	APHA	m.mol/l	NGVS	1.6	Within Limit
13.	Bicarbonate	APHA	ppm	NGVS	80	Within Limit
14.	Magnesium	APHA	ppm	NGVS	18.2	Within Limit
15.	Fluoride	HACH-8029	ppm	1.5	0.7	Within Limit
16.	Nitrate	HACH-8039	ppm	50	1.12	Within Limit
17.	Nitrite	HACH-8507	ppm	3	0.03	Within Limit
18.	Arsenic	Merck Test Kit	ppb	<0.05	0	Within Limit
19.	Potassium	APHA	ppm	NGVS	28	Within Limit
20.	Sodium	APHA	ppm	NGVS	70	Within Limit
21.	Copper	Lovibond-149	ppm	2	0.00	Within Limit
22.	Iron	Lovibond-156	ppm	0.3	0.01	Within Limit
23.	Lead	Lovibond-232	ppm	<0.05	0.00	Within Limit
24.	Manganese	Lovibond-242	ppm	0.5	0.06	Within Limit
25.	Mercury	Kit-Method	ppm	0.001	0.00	Within Limit
26.	Nickel	Lovibond-255	ppm	<0.02	0.00	Within Limit
27.	Carbonate	APHA	ppm	NGVS	Nil	Within Limit
28.	Sulfate	APHA	ppm	250	150	Within Limit
29.	Zinc	Lovibond-400	ppm	5	0.00	Within Limit
30.	Calcium	APHA	ppm	NGVS	50	Within Limit
31.	E-Coli	APHA 9222 D	Cfu	0/100ml	6	Out of Limit
32.	Total Coliform	APHA 9222 B	Cfu	0/100ml	38	Out of Limit



4.7 Biological Environment

228. The ecology of the microenvironment and macro environment of the project area has completely changed due to the continuous emergence of the urban regions. Ecological risk of high order has been induced by land clearance and removal of natural vegetation from the plains during the urban sprawl to make room for industrialisation and urbanization. This has degraded the physical environment as quantified in the above section & the biological environment in the sense that the entire macro environment has lost its biodiversity. No endangered or vulnerable faunal and floral species were found during the survey.

Vegetation around the Project Site



4.8 Socio-economic Status of the Macroenvironment

229. The social baseline chapter provides a detailed analysis of the socio-economic conditions in the project area. This analysis is based on both secondary research and primary data collection activities, including site visits, surveys of stakeholders, and consultations. The social baseline offers an overview of the socio-economic conditions of the people residing and working near the project. It also includes an assessment of public utilities and social services, such as education and healthcare facilities, in the area.
230. The proposed project should align with SDG Goal 03, which aims to ensure healthy lives and promote well-being for all. The social baseline chapter provides insights into the existing socioeconomic conditions of the project area. This data will be used to develop a Social Management Plan to mitigate or enhance the social impacts of the proposed development. The social baseline is divided into macro and microenvironmental aspects of the project area.
231. The micro-environment of a project refers to the immediate neighborhood and its characteristics, including land use, education, health, and utility services. In contrast, the macro-environment encompasses broader factors such as the administrative structure, demographics, education levels, and overall health profile of the region.

4.9 Historical Context of Karachi

232. Karachi city dates back to 1728-1729. Hindu fisherman and merchants established

the city at the northern coast of the Arabian Sea for fishing and trading purposes. Then tribes from Baluchistan and Makran settled and made a small fisherman village. Their first settlement was near the delta of the Indus River which they name Kolachi village. The local Sindhi population built a small fort, for the protection of the city from invaders. The fort had two main gateways: one facing the sea, known as Kharra Darwaaza (Brackish Gate) which is now known as Kharadar and the other facing the Lyari River known as the Meet'ha Darwaaza (Sweet Gate) now known as Mithadar.³

233. In 1839, when British Army occupied Karachi, they immediately identified the strategic and economic importance and declared it as first port of subcontinent. The three main reasons for developing Karachi were irrigation system, railway link, air and sea port to attract people from all over the world. For this, British Empire developed the irrigation system and later linked it to Punjab with railway link, to transport agricultural goods to the parts and within the country.
234. After the independence in 1947, Karachi was established as the first capital of Pakistan. As a result of independence, nearly 600,000 refugees came into Karachi from India as migrants and settled in the city which made Karachi so versatile and culturally rich. In 1958, it was decided to make Islamabad the capital of Pakistan, but Karachi still remains the capital of Sindh Province and never lost its industrial and financial status. Karachi's name has evolved over time. It started as Kolachi, made it way to Mai Kolachi, Kalachi jo Goth, and then Kalachi, but Karachi name got stuck to the city and its people.

4.10 Administrative Setup

4.10.1 Karachi

235. Karachi City and capital of Sindh is located on South-Eastern tip of the country. It is the country's largest city, principal seaport and major industrial area. There have been a lot of changes in the administration. Previously, there was The Karachi Division and each division had five districts. This Division system was abolished in 2000 and five districts of Karachi were merged in City District Karachi. The City District Karachi was divided into 18 Towns and 178 union councils. On 11 July 2011, Sindh Government restored 5 districts of Karachi division and abolished City District Government Karachi. In November 2013, a new District Korangi was formed by splitting District Karachi East. Furthermore, on 04 September 2020, a new district (7th) was formed by splitting District West. Now Karachi Division has District Central, District East, District Malir, District South, District Korangi, District West and District Kemari. These districts form the Karachi Division now. All districts have subdivisions. There are also six military cantonments, which are administered by the Pakistan Army. The Table-4.8 is provided area, density and population of Karachi's districts 2017.

Table 4.8 Area, Density and Population of Karachi's Districts (2017)

Name	Area (Sq. km)	Density (2017) Sq. km	Population Census (2017)
District Malir	2,160	891	1,924,346
District West	370	5,614	2,077,228
District East	139	20,686	2,875,315
District Korangi	108	23,866	2,577,556
District South	122	14,502	1,769,230
District Kemari	559	3273	1,829,837
Source: Finalized Census Results of Karachi 2017 – Pakistan Bureau of Statistics Govt. of Pakistan			

4.10.2 District Malir

236. Sixth district is Malir which is spread over 2635 Sq. Km. It includes 8 subdivisions as Airport, Bin Qasim, Gadap, Ibarhim Hyderi, Korangi Creek Contonment, Malir Cantonment, Murad Memon, and Shah Mureed.
237. District Malir is host to Karachi's first three constituencies, as per the sequence of National Assembly seats. With a population of 1,996,477, the district is the fifth-largest in terms of inhabitants. With respect to voters, however, Malir is the smallest among the six districts of Karachi, with only 751,526 people registered on the electoral roll.
238. The relatively less-developed district features mostly goths and villages, inhabited by Baloch and Sindhi tribes that have been living in the area for the past several decades at least. These include Jamot, Jutt, Jhokio, Gabol and Sheikh, among others.
239. In terms of employment opportunities, Malir is home to scores of large industrial units. Port Qasim, Bin Qasim Power Plant, the new Sabzi Mandi, Malir Cantonment and the Jinnah International Airport also fall within its boundaries. Yet, the living standards of its inhabitants are some of the lowest in the city. A huge blow for the district's residents came when the only government-run steel mill, set up during the tenure of Zulfikar Ali Bhutto, was shut down some time ago.
240. Several major development projects in the education and health sectors have been proposed for the district including The Zulfikar Ali Bhutto Engineering College, The Benazir Bhutto Medical Complex and The 50-bed Benazir Bhutto Maternity Home in Gulshan-e-Hadeed. This is also the only district in the city to house two 660-megawatt power projects initiated under the China Pakistan Economic Corridor project. The below Table-4.9 shows area and population of district Malir and Subdivisions.

Table 4.9 District Malir and Subdivisions with Area and Population

Subdivisions	Area Covered (Sq. km)	Population
Airport	41	195,143
Bin Qasim	447	248,098
Gadap	1,104	64,153
Ibarhim Hyderi	97	1,055,780

Subdivisions	Area Covered (Sq. km)	Population
Muraad Memon	195	331,326
Shah Mureed	276	29,846
Source: Finalized Census Results of Karachi 2017 – Pakistan Bureau of Statistics Govt. of Pakistan		

4.11 Demography

241. The district of Malir, located in Karachi, Pakistan, is a diverse area with a mix of ethnic groups including Sindhis, Punjabis, Pakhtuns, Urdu speakers, and Memons. It's known for its large size and rural character, with open green spaces and agricultural lands. The population is primarily middle and upper-middle class, with a smaller percentage belonging to the lower-middle class and working class.
242. The Table-4.10 depicts that the population of District Malir more than doubled from 914,765 in 1998 to 1,924,346 in 2017, with an annual growth rate of 4%. Within this district, Gadap sub-division grew from 35,883 in 1998 to 64,153 in 2017, reflecting a 3.1% annual growth rate. The Table-3 shows the census change data from 1998 to 2017.

Table 4.10 Census Change Data from 1998 Census to 2017 Census

1998 Census	2017 Census	%Change (1998-2017)
DISTRICT MALIR		
914,765	1,924,346	110
GADAP SUB-DIVISION		
35,883	64,153	78
Source: Pakistan Bureau of Statistics Final Census Results 2017		

243. Malir, once renowned for its fruit and vegetable farms, is facing a decline in agricultural production due to a severe shortage of groundwater. As a result, these farmlands are being transformed into residential areas, leading to increased urbanization and environmental degradation.
244. Malir District attracts migrants from other regions due to its development and opportunities. While older residential areas like Itehad Town and Surjani Town are already densely populated, the Malir Development Authority (MDA) was established in 1993 by the Government of Sindh in order to address the growing demand for housing. MDA focuses on providing affordable housing options through its development schemes. Another significant development is Bahria Town-Karachi, a large-scale project offering high-quality living with world-class amenities.

4.12 Transportation

245. As cities like Karachi expand, the demand for civic amenities, including transportation infrastructure, increases significantly. Due to rapid urbanization, Karachi faces severe traffic congestion, which is becoming a major issue for residents and commuters. The increasing traffic congestion in Karachi has become a serious problem that could severely disrupt economic activities if not addressed promptly.

246. The government's failure to provide adequate low-cost public transportation has led to a significant increase in vehicle ownership. Karachi now has over 4 million registered vehicles on its roads.
247. Malir District has a well-developed road network, including paved and spacious roads. It serves as a major entry point for heavy and light vehicles entering the city. Malir District acts as a connection between Karachi port and the transportation of commercial goods to various regions within Pakistan, as well as neighboring countries like Afghanistan, Central Asian Republics, China, Iran, and India. Malir District is connected to major road networks like the Super Highway (M-9) and National Highway (N5). The Super Highway is a 6-lane motorway connecting Karachi and Hyderabad, while the National Highway is a 4-lane road stretching across Pakistan.
248. Malir District also has several other important roads, including Jinnah Avenue, Liaquat Road, Malir Cantt Road, Model Colony Gadap Road, and Malir Link Road. Local buses and wagons provide affordable transportation within the district and connect to other areas of Pakistan, including Sindh, Punjab, Khyber Pakhtunkhwa, and the northern regions.

4.13 Economy

249. Geographically, Karachi forms an important economic corridor of manufacturing and trade employment with the world and rest of the adjacent cities. In 2019, World Bank reported Pakistan's GDP as \$278.22 billion out of which Karachi contributes 25% of Pakistan's total GDP. Karachi is generating of Pakistan's GDP and contributes 55% of the federal tax revenue. The World Bank identified Karachi as the most business-friendly city in Pakistan. In 2010, research by the global human resources company Mercer found Karachi to be the most inexpensive city in the world. A substantial chunk of Sindh's GDP, around 95% is contributed by Karachi. Karachi's high GDP is for its contribution of large industrial bases, and financial institutions. Textiles, cement, steel, heavy machinery, chemicals, food, banking and insurance are the major industrial sector contributions.
250. According to World Bank Analysis, 63% of overall employment in Karachi comes from manufacturing and trade. Other employment includes transportation, health, education and public administration. The below figure shows percentages of employment sectors occupied by residents.

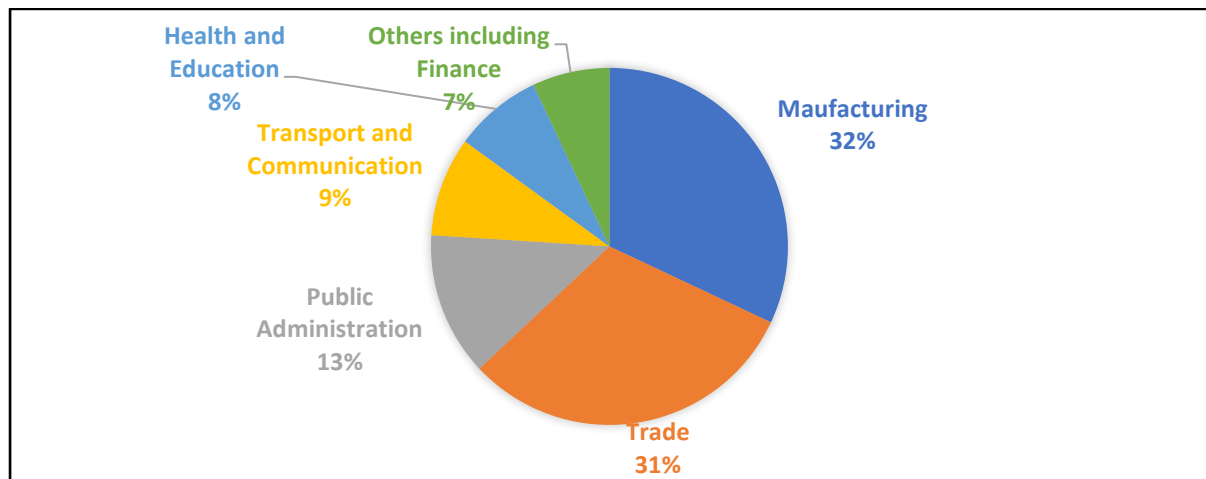


Figure 4-4 Employment Sectors of Karachi

Source: World Bank analysis, based on JICA 2010–11 Karachi Household Survey

4.14 Education Facilities

251. Baqai Medical College was established in 1988 and affiliated with the University of Karachi. In 1992, the Baqai Foundation added to its educational offerings by establishing the Baqai Dental College. It goes to the credit of Baqai's, which is the first ever Dental College to be set-up at Karachi. In July 1996, a bill was unanimously passed by the Sindh Assembly and subsequently approved by the Governor of Sindh, establishing the Baqai Medical University through the Baqai Medical University Act of 1996. The university offers the best services for undergraduate and postgraduate students. Some of the major degrees and courses cater the field of information technology and medicine. The courses and programs offered by the university totally covers the field of medical. MBBS, D-pharmacy, BDS, BBIT, MSIT, Special training and courses of army, Doctorate in veterinary.
252. FAST National University of Computer and Emerging Sciences (NUCES-FAST) was founded in July 2000 as a federally chartered university. It's a leading Pakistani university recognized for its high-quality education and the impact its students have on the local software and other industries. The university operates five campuses in Karachi, Lahore, Islamabad, Peshawar, and Chiniot-Faisalabad, providing world-class education and facilities to over 11,000 students, including around one-quarter female students, and over 500 skilled faculty members. For over three decades, NUCES-FAST has been instrumental in educating and preparing students for successful careers in computer science, electrical engineering, and management sciences.
253. Malir District has a significant number of schools, colleges, and technical training centers. Statistics indicate that it has the highest number of schools in the region, and student enrollment is encouraging. However, there is a gender disparity in both student enrollment and teacher composition, with a higher proportion of male students and male teachers. The Table-4 indicates the number of schools and its enrollment list.

Table 4.11 District wise Number of Schools, Enrollment and Staff in Karachi (2016-17)

District	No. of Schools				Enrollment			Teacher		
	Boys	Girls	Mixed	Total	Boys	Girls	Total	Male	Female	Total
Central	117	141	348	606	44,822	58,510	103,332	1,803	4,996	6,799
East	51	64	163	278	23,022	29,106	52,128	870	2,271	3,141
South	70	87	173	330	26,122	35,824	61,946	1,079	2,496	3,575
West	128	101	340	569	38,562	45,454	84,016	1,443	1,909	3,352
Malir	136	113	414	663	34,548	32,333	66,881	1,540	1,148	2,688
Korangi	97	94	220	411	35,192	46,918	82,110	1,025	3,082	4,107

Source: Sindh Education Management Information System (SEMIS) Census 2016 – 2017

4.15 Health Facilities

254. Malir District has a range of public and private healthcare facilities, including Hassan general hospital, specialized hospitals like the Sindh Heart Hospital and TB Chest Hospital, and medical centers like the Agha Khan University Hospital Medical Centre. The district has 234 doctors and 25 paramedical personnel working in its government hospitals.
255. The Combined Military Hospital (CMH) is located in Malir Cantt, Karachi. It provides both in-patient and out-patient services, including emergency care, specialized OPDs, surgery, pediatrics, orthopedics, gynecology/obstetrics, ENT, eye, ICU, neonatal ICU, medical ICU, and more. The hospital has over 100 qualified consultants from various specialties and sub-specialties. The Table-5 is provided the detail of government medical and paramedical personnel district wise.

Table 4.12 District-wise Government Medical and Paramedical Personnel in Karachi 2017

District	Doctors	Nurses	L.H. V	Dispensers/ Dressers	X-Ray Technicians	Lab Technicians	O.T Technicians	X-Ray Assistants	Lab. Assistants	O.T. Assistants	Midwives
Central	579	207	15	82	12	17	25	0	3	12	26
South	324	115	4	51	14	23	33	0	8	8	2
East	245	18	22	26	4	0	3	0	4	1	6
West	356	83	19	67	12	14	22	5	12	15	19
Malir	234	25	14	53	9	4	6	0	10	5	18
Korangi	252	90	38	-	-	-	-	0	8	8	25

Source: - BOS, Government of Sindh (Development Statistics of Sindh – 2018)

4.16 Micro Environment

256. The proposed project site is located in Sindh Small Industrial Cooperation Industrial Area, Surjani Town, Karachi. This area is relatively underdeveloped, with nearby establishments such as a SS Engineering, Motorcycle industry, Abdul Ghani and Usmania Pickle Factories, Memon Color factory, Shrine Syeda Rashida Ifat Azeemt,

Shell petrol pump, Noorani hotel, and a Munishi Goth. The project is situated amidst these developments.

4.16.1 Social Services

257. The proposed project site is located in an industrial zone and lacks nearby educational institutions. Due to its industrial nature, there are no residential developments in the immediate area, and educational facilities are located outside the industrial zone.
258. The project site is located in an industrial zone without any on-site medical facilities. The nearest hospitals, Charitable Hospital, New Qatar Hospital Ghaziabad, and Kamal Hospital, are approximately 5 kilometers away. Factory workers often prefer to go to Murshid Hospital, which is about 10 kilometers away. The quality of healthcare services in these nearby hospitals is considered satisfactory.

4.16.2 Utilities

259. The water supply in the project area is managed by the Karachi Water & Sewerage Board (KWSB). While the water supply is generally sufficient for industrial use, industries may rely on water tankers during periods of shortage. The drainage and sewerage systems in the area are both considered satisfactory, with an open nala used for industrial waste disposal.
260. The solid waste management situation in the project area is unsatisfactory. There is no proper infrastructure for waste disposal, and industries often dump their waste directly in empty plots and burn it. Municipal authorities are responsible for waste collection and disposal but have failed to do so due to a lack of machinery, capacity, and expertise. The industries in the project area are satisfied with the electricity supply provided by K. Electric. However, gas supply is not available in the area.

4.16.3 Traffic Conditions

261. The project site is accessible via Karachi-Northern Bypass (M-10), but the road within the industrial zone is unpaved and has many potholes, making it unsuitable for heavy trucks. There is an urgent need to improve the roads within the industrial zone to facilitate the smooth movement of industrial traffic.

CHAPTER - 5: PUBLIC CONSULTATION

5.1 General

262. The participation of project stakeholders in planning, design, and implementation is now widely recognized as an integral part of the environmental and social impact assessment process. Local communities, their representatives, government departments, national and international NGOs, and the civil society at large can all contribute to and benefit from the dialogue aimed at identifying and resolving key project-related issues.
263. Stakeholder consultation has become an important requirement of the EIA study, following the enactment of the guidelines for public consultation under the Pakistan Environmental Protection Act (PEPA) 1997. Further, the Sindh Environmental Protection Act 2014, enacted after the 18th Amendment to the constitution, also emphasizes the importance of engaging with the concerned primary and secondary stakeholders during the EIA study.
264. While the project's impacts may initially be felt only at the microenvironment level, in the long term, they may also spread to nearby neighborhoods and affect various aspects, such as traffic management, emergency vehicle access, and the stress on existing utilities. To address these perceived impacts, meaningful engagement with the project stakeholders has been carried out to:
- Identify the potential positive and negative impacts of the project.
 - Assess the magnitude of these impacts from a social perspective.
 - Prescribe solutions for the construction phase of the proposed project.
265. This comprehensive stakeholder engagement process has allowed for a better understanding of the project's implications and the development of mitigation measures that address the concerns of the affected communities and other relevant stakeholders.
266. Sindh Environmental Protection Act 2014 requires the proponent to engage in public consultation with the project's relevant primary and secondary stakeholders to enable a comprehensive Environmental Impact Assessment (EIA) study. Primary stakeholders are those who have a direct interest in the project, including local communities/settlements and local social service providers in the project area. Secondary stakeholders include the relevant government agencies, NGO's and public interest groups, which indirectly influence the project's approval, design, successful implementation and monitoring.
267. Stakeholder consultation has become an important part of the EIA study since the enactment of the guidelines for public consultation under the Pakistan Environmental Protection Act (PEPA) 1997, which requires all projects to conform to sustainability principles.
268. The key objectives of stakeholder engagement for this Consultation chapter are:

- Obtain local knowledge about the micro environment that may be useful for the decisions regarding project design and identification of potential impacts.
 - Identify and address the concerns of all interested and affected stakeholders;
 - Facilitate consideration of alternatives, mitigation and compensatory measures
 - Ensure that important impacts are not overlooked and benefits are maximized.
269. The proposed project involves the install a waste incineration plant at Plot No. 539, which measures 500 square yards. The location is situated in the Sindh Industrial Estate, Northern Bypass, with coordinates 25.07939405588778 latitude and 67.05045940856563 longitude.
270. While in the short-term, the impacts might be felt only in the micro environment of the project, in the long-term, the impacts may also spread to other nearby neighborhoods and activities, including traffic management, swift passageway for fire tenders and ambulances and stress on existing utilities. Instead of these perceived impacts, meaningful engagement with the project stakeholders has been carried out to identify the potential positive and negative impacts, assess the magnitude of these impacts from a social perspective and prescribe solutions that identify Best Management Practices (BMPs) in the construction of the proposed project. This chapter gives an overview of the various stakeholders, the engagement interventions carried out with the stakeholders, and their concerns and suggestions.

5.1.1 Stakeholder Groups and Interests

271. The initial step in stakeholder engagement involves identifying stakeholders through a reconnaissance survey of the project area. This process includes documenting their interests, dependencies, influence, and potential impact on the project. Stakeholders are individuals, groups, or organizations that may be affected by the project's decisions, activities, or outcomes.

5.1.2 Primary and Secondary Stakeholders

272. Primary stakeholders are those who have a direct interest in the project, including residents, commercial entities, and institutions falling in the immediate environs of the project area. Secondary stakeholders include the relevant government agencies and public interest groups, which may indirectly influence or be influenced by the project. The concerns and input from both primary and secondary stakeholders are important in identifying the issues arising from the project's construction phase and proposing mitigation measures that minimize the negative project impacts and enhance the positive ones.
273. In the project vicinity, the primary stakeholders include nearby factories, small industries, and hotels. Key stakeholders are SS Engineering Pvt Ltd, the motorcycle industry, Abdul Ghani and Usmania Pickle Factories, Memon Color Factory, Shrine Syeda Rashida Ifat Azeemt, Shell Petrol Pump, Noorani Hotel, and Munishi Goth.
274. Secondary stakeholders for the project include utility companies responsible for water supply and solid waste management, specifically KWSB and SSWMB. Additionally, regulatory authorities involved are the Sindh Environmental Protection

Agency (SEPA), which oversees environmental protection, and the Sindh Building Control Authority (SBCA), which enforces building and construction laws. Moreover, NOGs are involved include Tear Fund, Pakistan Poverty Alleviation Fund, SCOPE, and Urban Resource Centre. A complete list of both primary and secondary stakeholders is provided in the Table-5.1.

Table 5.1 Primary Stakeholders for M/S Iqbal Enterprises Waste Incinerator Facility

Neighbourhood	<i>Commercial Interests</i> • SS Engineering Pvt Ltd. • Motor Cycly Factory • Abdul Ghani Pickle Factory • Usmania Pickle Factory • Memon Color Factory • Shell Patrol Pump • Noorani Hotel • Residential Interests • Munishi Goth
Proponent	• M/S Iqbal Enterprises
Government Agencies & Other Service Providers	• Sindh Environmental Protection Agency (SEPA) • Karachi Water & Sewerage Board (KWSB) • Sindh Solid Waste Management Board (SSWMB) • District Municipal Corporation, Malir
NGOs/Interest groups	• Shehri-CBE • Tear fund • Urban Resource Center • Pakistan Poverty Alleviation Fund (PPAF) • Environment (SCOPE)

5.2 Consultation Approach & Methodology

5.2.1 Consultation with Primary Stakeholders

275. A neighbourhood survey was conducted to identify commercial interests in the surrounding area that may face direct impacts from the proposed development of this waste incinerator plant (TLFSP-100). The survey was conducted in two stages. In the first stage, a site visit was made to identify all stakeholders that either reside or work in the project environs, and an initial identification of potential positive and negative effects was conducted. Relevant public service institutions directly involved in service provision in the ranges were also identified.
276. During the second stage, a social survey field team from Indus Environmental Engineering Consultants (IEEC) used a pre-designed semi-structured template to engage the commercial interests, and public service institutions. Those stakeholders who were unavailable at the first attempt were re-visited on the same day or followed-up for their comments during the next few days. During each meeting, the project team introduced the project to the stakeholders, recorded their concerns, and

provided contact details to enable stakeholders to share further comments over email or in writing. A 'Project Brief' providing the salient features of the project were also handed over to the available stakeholders as part of the information disclosure process.

277. Moreover, the team inquired about the area's current situation such as the status of utilities, security and law and order situation in the project area from the residents near the project site. The questionnaire also included several open-ended questions to ensure that the respondents could openly share their opinions and suggestions relevant to the study. Table 7 reflects the stakeholders that were approached during the Neighbourhood Survey.

Table 5.2 Consultations with Primary and Secondary Stakeholders

S. No	Respondents	Stakeholder	Stakeholder Type	Date
1	Mr. Yaqoob Ali, Mr. Asad Baloch (Workers)	SS Engineering Pvt Ltd .	Commercial	01-09-2024
2	Mr. Dilbar Khan (Watch Man)	Motorcycle industry		
3	Mr. Noor Khan (Worker)	Abdul Ghani Pickle Factory		
4	Mr. Wali Muhammad , Mr. Yaqoob , Mr. Awais (Workers)	Usmania Pickle Factorie		
5	Mr. Muneer Ahmed (Worker)	Memon Color factory		
6	Mr. Osman (Take care)	Shrine Syeda Rashida Ifat Azeemt		
7	Mr. Kher Muhammad , Mr. Gul Muhammad (Residence)	Munishi Goth	Residential	
8	Mr. Tufail Ahmed (M&E Manager)	Pakistan Poverty Alleviation Fund (PPFA)	NGO	04/09/2024
9	Iqbal Sahito (Stakeholder Engagement Coordinator)	Tear Fund	NGO	10/09/2024
10	Sajid Nizamani- Program Officer	SCOPE	NGO	10/09/2024

5.3 Consultation Feedback

278. This section summarizes feedback from stakeholders gathered in a neighborhood survey. Their comments were useful for assessing the project's environmental and social impacts. The social team from IEEC began consultations in the project area during the first week of September 2024. The primary stakeholders raised the following major issues and concerns:

- Workers in the area reported to the consultation team that there is inadequate electricity, no gas supply, and security issues. Over the past three years, many industrialists have bought property to set up industries, and new development projects are increasing. The proposed incineration plant would be the fifth such facility in the surrounding area.
- The respondents shared favorable opinions about the proposed project, noting that such developments could attract more industrialists to the area and generate job opportunities
- The respondents raised concerns that the proposed incinerator (TLFSP-100). might emit harmful gases and cause noise pollution in the area.
- The respondents said that the transportation moment should be in the evening, not the day, because it is a busy road in the daytime. They said, trucks should be loading properly and fully covered.
- There is no hospital in the project area, so workers have demanded a well-equipped hospital with well-trained staff should be established in project vicinity.

Consultation Pictures of Primary Stakeholders	
	
Consultation with Workers, Abdul Ghani Pickle Factory	Consultation with Worker, Memon Color Factory
	
Consultation with Workers, SS Engineering	Consultation with Worker, Motorcycle industry

	
Consultation with worker, Usmania Pickle Factory	Consultation with take care, Shrine Syeda Rashida Ifat Azeemt
	
Consultation with visitors at Shrine Syeda Rashida Ifat Azeemt	Consultation with villager, Munishi Goth
	
At the entrance of an unused Industrial plot	At the doorstep of a locked industrial plot
	
'Consultation with PPAF representative	



Representative of NGOs

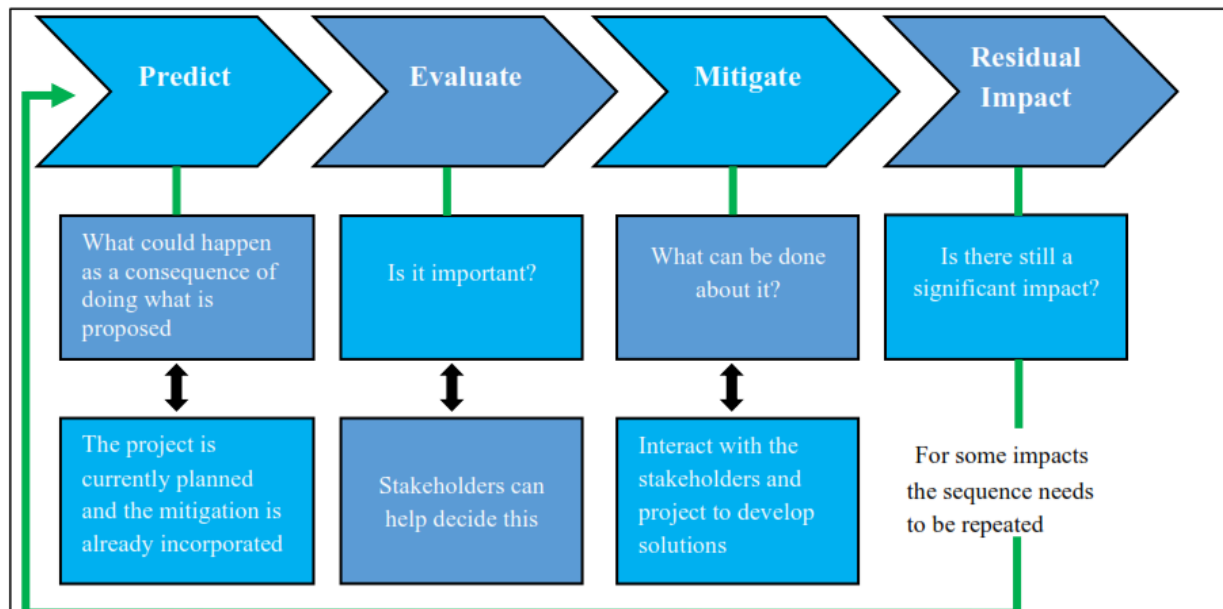


Representative of SCOPE

CHAPTER - 6: ENVIRONMENTAL IMPACTS & MITIGATION

6.1 General

279. This section of the report evaluates the potential impacts of waste generated by the project on the physical, biological, and socio-economic environments during the design phase. Parameters determining the project's possible environmental impact, including biodiversity effects, are assessed. The operational phase impact is further elaborated after construction, focusing on monitoring and managing environmental impacts during the project's operation.
280. .The assessment was conducted through a comprehensive literature review alongside primary and secondary baseline data and expert judgment. This thorough screening process aims to identify the potential effects of the project activities on the various environmental facets.
281. The guidelines have been reviewed for classifying polluted and unpolluted sites, taking into account their airshed, watershed, and land use. Additionally, the assessment considers the sensitivity of ecosystems, including flora, fauna, wildlife, and aquatic life, and the significance of historical and archaeological sites.
282. The screening assesses the impacts of various activities before, during, and throughout machinery installation. It also generally addresses the emissions of gases, solid waste, and wastewater discharges during the operation of the Incinerator (TLFSP-100). Plant. The impacts assessed include regional and local effects (macroenvironment) and those specific to the project site (microenvironment).
283. Chapter 4 of this report has previously classified the macroenvironment and microenvironment of the site based on the assessment of impacts from emissions of pollutants, solid waste, and wastewater discharges arising from the Incinerator (TLFSP-100). Plant. The hazards identified during the project implementation will be a foundation for proposing suitable mitigation measures. These measures have been recommended to reduce, minimize, or offset the identified potential negative impacts. The enforcement of these mitigation strategies is crucial to minimising and eliminating adverse effects, particularly in cases where emission levels exceed the Sindh Environmental Quality Standards (SEQS), while also promoting positive outcomes such as sustainable development.
284. The sources of pollution have been identified, and their impacts have been analysed at each stage of the proposed project, including the pre-construction and construction phases. The project's impacts can be categorised as short-term or long-term, temporary or permanent, acute or chronic, and may have positive or adverse effects.



6.2 Impact Assessment Methodology

285. The proposed project's potential environmental impacts on various microenvironment and macroenvironment features are closely associated with the construction phase.
286. The screening begins by identifying the potential environmental aspects of the project's siting. It involves assessing the potential impacts during the pre-construction and construction stages and evaluating the residual impacts that may remain after implementing necessary mitigation measures. The proposed project's anticipated impacts on environmental resources are expected to be short-term and temporary.
287. A systematic strategy has been developed to assess the likely impacts on the project site's microenvironment and macroenvironment. This strategy encompasses:
- Review of General Guidelines;
 - Identification of potential environmental impacts by conducting surveys and public consultation;
 - Assessment of the intensity and significance of potential impacts by obtaining expert opinion and carrying out environment analysis;
 - Defining mitigation measures to reduce impacts to as low as practicable;
288. The environmental aspects of the project were identified by situation analysis related to present land use, damage to vegetation, noise and other forms of nuisance during construction at the site, air pollution due to fugitive dust emission and operation of equipment during construction, air pollution due to burning of wastes.
289. Site Visits were conducted before the impact assessment to understand the area better.
290. Assessment of the impact of different activities and the resulting emission gases and wastewater discharges during construction and subsequent operation of the proposed project are addressed in this section. The entire screening procedure was designed in such a way as to provide a complete assessment of the impacts on the

macro-environment and of the project. The project site has no protected area such as a game reserve, wildlife, national parks, archaeological sites or cultural heritage in its neighbourhoods. Impacts may arise during different stages of the project, which are described below.

6.3 Screening of Potential Impact during the Pre-Construction Phase

6.3.1 Facility Siting and Layout

- The proposed location is in an industrial area, consistent with the existing land use patterns.
- The site is positioned at Surjani Town, just off the Karachi Northern bypass, ensuring convenient access from various parts of Karachi while remaining distanced from the city's densely populated regions.
- Essential utilities, including electricity, are readily available in the proposed project area to support the energy needs of the new plant.
- The proponent has already secured the land designated for the proposed project.

6.3.2 Safe Design

291. National standards for equipment design and operation should be implemented wherever applicable and subjected to inspection by management. Additionally, the facility's equipment design should adhere to industry best practices and incorporate lessons learned from relevant incidents.
292. The design of the proposed incinerator (TLFSP-100). will ensure compliance with environmental exhaust emission standards, specifically the Sindh Environmental Quality Standards (SEQS).

6.4 Screening of Potential Impact during Construction/Installation Phase

293. During the project's construction phase, activities will include site levelling, building construction, and the erection of structures such as trusses and shades, along with the installation of associated equipment. The potential primary and secondary environmental impacts resulting from these activities, as well as their corresponding mitigation measures, are outlined below:

6.4.1 Creation of Employment Opportunities

294. During the construction phase of the project, it is anticipated that job opportunities will be generated for construction workers.

Mitigation Measures

- Preference should be given to hiring unskilled labor from the local community to minimize potential community issues.
- Project management should exercise caution in selecting construction staff, taking into account the behavioural aspects of workers as well.

6.4.2 Provision of Market for Supply of Construction Materials

295. The project will necessitate a significant supply of construction materials, most of which will be procured locally. This creates a market for material suppliers, including brickworks, hardware stores, and individuals offering such materials. Additionally,

this aspect of the project positively contributes to local economic activity.

6.4.3 Soil Erosion

296. Excavation activities for the construction and installation of the proposed project will expose soils in the affected areas, making them susceptible to erosion from surface runoff during moderate to heavy rainfall. It is crucial to conserve the topsoil whenever possible for future restoration. However, since the excavations are not anticipated to be profound, the potential for soil erosion is expected to remain low.

Mitigation Measures

297. To mitigate potential impacts that may occur during the construction phase, the following measures will be implemented:
- Limit the area of exposed soil at any given time, and ensure that disturbed areas are wetted, compacted, and resurfaced during the construction phase.
 - Remove topsoil along with the vegetation, rather than cutting the vegetation, to allow it to help stabilize and enrich the soil.
 - Regularly wet, exposed surfaces to effectively minimize airborne dust levels.
 - Cover stockpiles of fine materials with tarpaulin or wet them down, especially during windy conditions, until concreting and landscaping are completed.

6.4.4 Soil Contamination

298. Soil contamination may occur during construction due to uncontrolled chemical or fuel spills during handling, transportation, and storage.
299. Potential sources of spills include:
- During refuelling, the transfer of fuel from one container to the other
 - Maintenance of vehicle and machinery
 - Filling of fuel to Generator sets
 - Leakage from the container
 - Vehicular Accident

Mitigation Measures

300. The actions required to manage the risk of soil contamination will depend on various factors, including the extent and location of the contamination, the type and associated risks of the affected media, and the planned land use. Nevertheless, a fundamental management strategy will encompass:
- Vehicle and equipment washing should be conducted in designated areas.
 - Maintenance of vehicles and equipment will occur in specified locations.
 - Construction vehicles and equipment will undergo regular maintenance checks.
 - Removing oil and contaminated soil around fuel and oil storage areas will be facilitated by providing appropriate tools, such as shovels, plastic bags, and absorbent materials.

- Contaminated media will be managed to ensure the safety and health of on-site workers, surrounding communities, and the environment.
- Plans and procedures will be developed to address the discovery of contaminated media, aiming to minimize risks to health, safety, and the environment.

6.4.5 Construction Waste

301. A certain amount of construction waste will be generated during the construction phase, including concrete, metal cuttings, rejected materials, surplus materials, surplus oil, excavated materials, paper bags, empty cartons, paint and solvent containers, broken glass, steel, wooden scaffolding, cement bags, and excavated soil. Most of this waste is expected to be non-hazardous. Improper disposal of this waste could lead to clogged drains, negatively impact the aesthetic appeal of the surrounding environment, and create nuisances.

Mitigation Measures

302. The following mitigation measures are designed to address and reduce the impacts associated with the construction phase of the proposed project:
- A comprehensive waste disposal plan will be established to manage construction waste effectively.
 - Construction waste designated for recycling will include damaged pipes, leftover steel, and wooden and plastic scraps. The remaining non-hazardous waste will be transported to approved dumping sites for disposal.
 - Various waste containers will be deployed to separate different types of waste at the source.
 - Waste bins will be clearly labelled to indicate the type of waste generated during construction activities.
 - Materials with minimal packaging will be utilized to reduce excessive packaging waste.
 - Durable, long-lasting materials will decrease the frequency of replacements, minimizing waste generation over time.
 - Hazardous waste will be disposed of through an EPA-certified waste contractor.

6.4.6 Impact on Water Quality, Consumption & Conservation

303. Water tankers will supply water needs during construction to ensure adequate quantities. The following are potential sources of impacts on hydrology and groundwater quality during this phase:
- Soil runoff from the site may lead to off-site contamination, especially during the rainy season.
 - Improper disposal of construction debris can result in the contamination of nearby water sources.
 - Spills of oil and grease from vehicles and wastewater generated from on-site activities such as vehicle washing and workshops pose additional contamination risks.

Mitigation Measures

304. To mitigate these impacts, precautions and preventive measures will be implemented at the site during construction to prevent any contamination of ground and surface water. The following conservation measures will be adopted:
- Establishing sufficient stormwater diversion channels to redirect runoff away from construction areas.
 - Conducting regular monitoring of water consumption.
 - Utilizing leak-proof storage tanks for safe containment.

6.4.7 Dust Emissions

305. The primary source of dust generated during construction activities is fugitive dust. Temporary dust nuisance, measured as total suspended particulates and respirable suspended particles, may occur due to various construction activities throughout the construction phase.
306. Among all construction activities, excavation and foundation laying pose the most significant potential for causing dust nuisance.

Mitigation Measure

307. To address the impacts above, the following mitigation measures have the potential to reduce dust formation:
- Implement regular water sprinkling at construction sites or as needed, which can reduce or suppress dust formation by approximately 50% when done up to three times a day.
 - Designate specific times during regular daytime working hours to move earth-moving equipment.
 - Create a schedule for the movement of dump trucks to haul or excavate soil.
 - Utilize appropriate roads for transportation during construction activities.
 - Wet stockpiles of acceptable materials or cover them with a tarp, particularly during windy conditions.
 - Ensure that site workers and drivers wear dust masks and safety goggles, especially during dry and windy weather, to minimize health risks and injuries related to dust exposure.
 - Maintain good housekeeping practices to reduce dust emissions further.

6.4.8 Exhaust Emissions

308. The primary sources of exhaust emissions include standby diesel generators, vehicles, and exhaust from construction machinery and earth-moving equipment. These emissions include CO, CO², SO_x, NO_x, and particulates.
309. In high concentrations, these emissions can harm human health and damage vegetation by obstructing the photosynthesis process in plants. Additionally, emissions of greenhouse gases from fossil fuel combustion contribute to global warming, which in turn accelerates climate change.

Mitigation Measures

310. Managing exhaust emissions through implementing preventive measures is the most effective way to reduce their presence in the ambient air. The following measures can help management and construction contractors minimize exhaust emissions during construction activities:

- Whenever feasible, opt for newer generators that produce lower emissions.
- Position generators away from pedestrian areas and where worker access is restricted.
- Regularly tune, service, and monitor equipment, vehicles, and generators for optimal performance.
- Ensure that the generator's exhaust vent is positioned at an appropriate height.
- Utilize low-emission fuel for generators to further reduce emissions.

6.4.9 Wastewater Generation

311. During construction, wastewater generated at the project site primarily arises from municipal activities, runoff during precipitation, and the washing of construction vehicles. If released untreated, this wastewater can severely impact the nearby groundwater resources, as it may contain oil and grease.

Mitigation Measures

312. Here are the recommendations for reducing and managing wastewater produced during construction activities:

- Wastewater will be treated in a septic tank before being discharged into designated drains rather than disposed directly into the environment.
- The generation of wastewater will be minimized by managing pollutants at the source.
- Regular monitoring of wastewater generation will be implemented.
- Sufficient portable or permanent sanitation facilities will be provided for all workers.

6.4.10 Noise

313. Noise is essential during construction, as persistently high levels can adversely affect workers' hearing in construction activities. However, since the construction period is expected to be short, the associated noise impacts are anticipated to be temporary and minimal. The following are the primary activities that may generate noise:

- Construction and installation activities include earth-moving equipment, piling, welding, cutting, drilling, and grinding.
- Diesel generators utilized for power supply during construction operations.
- Vehicles are used for loading and unloading materials and transportation for employees.
- The use of pressure horns.

- During construction, noise levels may pose health risks to workers who do not wear appropriate personal protective equipment (PPE). Prolonged exposure to high noise levels can lead to hearing impairment or hypertension.

Mitigation Measures

314. The following measures will be implemented to ensure that noise levels remain within the limits set by the SEQS:
- Noise control measures, such as temporary noise barriers and deflectors, will be employed for high-impact activities.
 - Construction equipment will be maintained in optimal condition to minimize noise generation.
 - Generators and other equipment will be installed in enclosures to reduce ambient noise.
 - Regular monitoring of generators and other noisy equipment will be conducted.
 - A schedule will be developed for the movement of trucks initially used for hauling excavated soil.
 - Nighttime activities will be minimized wherever feasible.
 - Noise monitoring will be performed regularly, particularly during the operation of heavy machinery.
 - Workers in high-noise areas, where levels exceed 90 dB (A), will be required to wear earmuffs.

6.4.11 Biodiversity

315. The project area survey indicated that no significant flora or fauna of biological importance are present, as the site is situated in a designated developing industrial zone at the Northern Bypass. Consequently, there are no substantial threats to the flora and fauna within the proposed project area.

6.4.12 Traffic Flow

316. The site is positioned at a distance from Northern Bypass, which serves as the primary access point to the project. The potential for increased traffic on M10 during construction is minimal, as the proposed activities are limited and will not result in a significant traffic increase during the construction phase.

Mitigation Measures

- The proponent will implement measures to address these concerns by scheduling material deliveries from construction vehicles, preferably during off-peak hours when traffic is lighter.
- Traffic flow impacts will be minimized through effective planning of material transportation, ensuring that vehicle loads are maximized to decrease the number of trips and reduce the overall number of vehicles on the road.
- Truck drivers will be educated to refrain from unnecessary revving of engines at loading and unloading areas and to turn off or keep their engines running only when necessary at the construction site.

6.4.13 Occupational Health & Safety Issues

317. Overexertion and ergonomic injuries, including repetitive motion, excessive strain, and manual handling, are some of the most frequent causes of injuries on construction sites. Overexertion significantly contributes to joint and ligament inflammation, which occurs due to excessive physical effort.

Mitigation Measures

318. Suggested measures for prevention and control include:
- Workers will receive training on lifting and material handling techniques before the project's construction, including guidelines on weight limits that necessitate mechanical assistance or two-person lifts.
 - The work site layout will be designed to minimize the need for manually transferring heavy loads.
 - Tools will be carefully chosen, and workstations will be designed to reduce force requirements and holding times, promoting better posture; where applicable, adjustable workstations will be utilized.
 - Administrative controls, such as job rotations and scheduled breaks for rest or stretching, will be incorporated into the work processes.

a) Slip and fall

319. **Slips and falls at the same elevation**, often linked to inadequate housekeeping practices, such as the accumulation of waste debris, scattered construction materials, liquid spills, and the careless use of electrical cords and ropes on the ground, are among the leading causes of lost time accidents on construction sites.

Mitigation Measures

320. Proposed strategies for preventing slips and falls at the same elevation include:
- Effective housekeeping practices will be implemented, including sorting and storing loose construction materials in designated areas away from footpaths.
 - Regularly cleaning excess waste debris and liquid spills will be conducted to maintain a safe work environment.
 - Electrical cords and ropes will be organized in clearly marked areas to prevent tripping hazards.
 - Slip-resistant footwear will be utilized to enhance safety on the job site.

b) Work at Height

321. Falls from elevation related to the use of ladders and scaffolding are among the leading causes of fatal or permanently disabling injuries on construction sites. When fall hazards are present, a fall protection plan will be implemented, incorporating one or more of the following elements based on the specific nature of the hazard. Many construction activities require working at height, with ladders, scaffolds, and platforms being typical examples.

Mitigation Measures

322. Training on and using temporary fall prevention devices, such as rails or other barriers capable of supporting a weight of 200 pounds, will be required when working

at heights of two meters or more. This requirement also applies at any height with a risk of falling into operating machinery, water or other liquids, hazardous substances, or through openings in the work surface.

- Training on and implementing personal fall arrest systems, including full body harnesses, energy-absorbing lanyards, and fall rescue procedures to assist workers whose falls have been successfully arrested.
- Establishment of control zones and safety monitoring systems to alert workers when they are nearing fall hazard areas.

c) Struck by Objects

323. Construction activities for the project may present considerable hazards, including the potential for materials or tools to fall and the ejection of solid particles from abrasive or other power tools. These risks can lead to injuries to the head, eyes, and extremities.

Mitigation Measures

324. Methods for preventing and managing these hazards include:
- Ensuring clear traffic routes to avoid heavy equipment from driving over loose scrap. Temporary fall protection measures on scaffolds and the edges of elevated work surfaces, such as handrails and toe boards, will be utilized to prevent dislodging materials.
 - Wear appropriate personal protective equipment (PPE), including safety glasses with side shields, face shields, hard hats, and safety shoes.

d) Moving Machinery

325. The movement of machinery and materials on a construction site, including vehicle traffic and lifting equipment, can present temporary hazards such as physical contact, spills, dust, emissions, and noise.
326. Heavy equipment operators often have restricted visibility near their equipment, making it difficult to see pedestrians nearby. Additionally, centre-articulated vehicles create a considerable impact or crush hazard zone on the outer side of a turn while in motion.

Mitigation Measures

327. Strategies for preventing and managing these impacts include:
- Careful planning of vehicle movement, equipment operation, and pedestrian areas will be implemented to control vehicle traffic effectively.
 - Personnel visibility will be enhanced by requiring the use of high-visibility vests in areas where heavy equipment operates. Additionally, workers will be trained to establish eye contact with equipment operators before approaching any operating vehicle.
 - Lifting devices that are thoroughly inspected and well-maintained will be utilized, ensuring they are suitable for the load, such as cranes, and that loads are secured when lifted to higher elevations on the job site.

6.5 Impact Associated with the Operational Phase of Incinerator (TLFSP-100). Plant⁴

328. The project's operation is anticipated to generate the following impacts, which should be carefully considered:

- Air Quality
- Noise level
- Soil Contamination
- Waste Water
- Transporting, Storage and Handling of Incinerable Hazardous Waste
- Odor Management
- Impact due to Waste Disposal
- Fire Hazard
- Occupational Health and Safety
- Natural Disaster
- Occupational Health and Safety
- Social Impact

6.5.1 Air Emissions

329. The primary source of air pollution during the proposed project's operation will be emissions from incineration of medical and hazardous waste. Additionally, emissions from standby generators and vehicles may also contribute to air pollution, albeit to a lesser extent. Potential pollutants emitted from waste incinerators include:

- Various organic compounds may be produced during combustion and post-combustion processes, including dioxins and furans, chlorobenzenes, chloroethylene, and polycyclic aromatic hydrocarbons (PAHs).
- Hydrogen chloride (HCl), fluorides, and other halogen hydrides, such as bromine and iodine, may also be emitted.
- Heavy metals, including mercury, lead, and cadmium, are potential pollutants.
- Common combustion byproducts encompass sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (including non-methane VOCs), particulate matter, methane (CH₄), and carbon monoxide (CO).

330. The proposed technologies include complete combustion of waste in the primary chamber, destruction of hazardous chemicals in exhaust gases through elevated temperatures and appropriate retention times, air dilution, and cooling of exhaust gases. The chimney is designed to be approximately 35 feet tall, and an end-of-pipe treatment system, specifically a wet scrubber, will be an integral part of the project. It is anticipated that the impact on air quality will be minimal when the incinerator

⁴ A comprehensive assessment during the operational phase is crucial to ensure that all potential impacts are identified and managed effectively. This includes accounting for indirect and cumulative impacts and implementing mitigation measures to address adverse effects. The process involves a multidisciplinary team of experts to assess diverse environmental and social impacts

operates according to design specifications. Nevertheless, several measures are recommended in this section to ensure environmentally safe operations.

331. Pollutants released into the atmosphere will disperse downwind. The concentration at ground level will be influenced by the strength of the emission source as well as the micrometeorological conditions of the area.

Mitigation measures

- Implement waste segregation and presorting to prevent the incineration of materials containing metals and metalloids, such as mercury and arsenic, which may volatilize during combustion and are challenging to manage with air emission technologies.
- Ensure the removal of specific items from waste designated for incineration, including halogenated plastics (e.g., PVC), pressurized gas containers, significant quantities of active chemical waste, silver salts, photographic and radiographic waste, waste with high heavy metal content (e.g., broken thermometers, batteries), and sealed ampoules containing heavy metals.
- Adhere to applicable national regulations and internationally recognized standards for the design and operating conditions of the incinerator.
- Waste will be introduced into the incinerator only after the optimal temperature has been achieved in the final combustion chamber.
- Minimize uncontrolled air ingress into the combustion chamber during waste loading or through other pathways.
- Optimize furnace geometry, combustion air injection, and any NO_x control devices by utilizing flow modelling techniques.
- Regularly check and maintain pollution control equipment to ensure their efficiency.
- Employ a flue gas treatment system to manage acid gases, particulate matter, and other air pollutants.
- Reduce the formation of dioxins and furans by ensuring that particulate control systems do not operate within the 200 to 400 degrees Celsius temperature range, controlling the composition of incoming waste, implementing primary (combustion-related) controls, utilizing designs and operational conditions that limit the creation of dioxins, furans, and their precursors, and employing flue gas controls.
- Ensure that flue gases from the primary chamber are entirely combusted in the secondary chamber, which will be heated to over 1100 °C by adding auxiliary fuel or high calorific value liquid waste. The design will allow a minimum residence time of 2 seconds in the secondary chamber and ducting to ensure complete combustion, with refractory materials capable of enduring temperatures around 1400 °C.
- Maintain an adequate stack height to disperse gas emissions effectively.

Other mitigations for Air Emission Control

- Regular maintenance and tuning of the incinerator and generators are conducted to ensure optimal operation.
- To control VOCs, dioxins, and furans, flue gas should be directed through the secondary combustion chamber, where these pollutants are incinerated at temperatures ranging from 700°C to 1,300°C.
- Staff operating the refractory-lined dual chamber incinerator must wear appropriate personal protective equipment (PPE) and receive training to operate the facility by standard operating procedures (SOPs) and environmental impact assessment (EIA) requirements.
- Limit materials burned in the incinerator to those specified in the incineration manual.
- Develop and maintain an incinerator operations guide, including protocols for bypass operations.
- Keep and maintain daily records of waste processing activities.

6.5.2 Noise Level

332. During incinerator operations, noise will primarily originate from moving components such as blowers and pumps, which will essentially be contained within the incinerator room.

Mitigation Measures

333. The following measures will be implemented during the operational phase to mitigate noise level impacts.
- All equipment, including standby generators, will be regularly managed and maintained.
 - Truck drivers will be encouraged to turn off their engines when vehicles are idling.
 - Truck drivers will be required to follow proper maintenance procedures for their vehicles.
 - Measures will be implemented to reduce noise at the source.
 - Insulating caps and noise-reducing aids will be installed at the exit points of machinery noise sources.
 - Earmuffs will be provided to workers, and adherence to their use will be strictly enforced.

6.5.3 Soil Contamination

334. During the operational phase, accidental spills of hazardous waste at the facility could contaminate the soil. To mitigate this risk, dangerous materials will be stored in designated areas that are adequately lined to minimize the potential for spills.
335. Other activities during the operational phase include the storage of solid waste, fuel, and material spills, which may have the following potential impacts:
- During the transfer of materials between containers or when lifting waste using forklifts and front-end loaders.

- During the maintenance of the facility and vehicles.
- Due to improper handling of waste, including its transfer and management, it is often resulting from inadequate housekeeping practices.

Mitigation Measures

- All spills will be promptly cleaned and removed from the site, restoring the area to its original condition.
- Oils, lubricants, chemicals, and other hazardous materials must be securely stored in designated areas away from potential fire sources.
- Ash generated from incineration operations will be disposed of at approved disposal sites, with temporary storage in lined pits on-site.
- Regular testing of ash contents is recommended.
- The proponent also intends to establish a Memorandum of Understanding (MOU) with SSWMB for ash disposal at the Gond Pass disposal site.

6.5.4 Wastewater

336. Wastewater will be produced from the incinerator flue gas scrubbing process as well as from domestic sources. Domestic wastewater will be managed using a septic tank. The scrubber wastewater will be collected and recycled as much as feasible, and it is proposed to be treated in a packaged-type Effluent Treatment Plant (ETP). Treated water may be reused for wet scrubbing or for enhancing facility aesthetics.

Mitigation Measures

- Wastewater discharged into the industrial drain must meet SEQS limits.
- Regular monitoring of wastewater is essential to ensure compliance with SEQS standards.

6.5.5 Transporting, Storage and Handling of Incinerable Hazardous Wastes

337. Improper handling and transportation of hazardous waste can lead to soil and water contamination, negative aesthetic impacts, unpleasant odors, health and safety risks, and potentially mixing hazardous and non-hazardous waste.

Mitigation Measures

- Wastes will be packaged to ensure safe handling, storage, and transportation.
- Packaging must have visible labelling, and the materials used should be resilient to physical and climatic conditions. The waste generator must provide information on the waste characteristics, particularly regarding corrosivity, reactivity, ignitability, or toxicity on the label.
- Upon collection from the waste generation site or receipt at the facility, the labelling and packaging of waste will be inspected, and an inventory of received and incinerated waste will be maintained.
- All hazardous and medical waste will be managed, transported, and stored by the Hazardous Substances Rules, 2014, and the Sindh Hospital Waste Management Rules, 2014.

- Transport vehicles will be specifically designed to handle and transport hazardous wastes with various characteristics.
- Wastes will always be transported in closed containers, ensuring delivery to designated points.
- Regulatory authorities will be informed immediately of spills, leaks, or other accidents during transportation.
- Solid waste storage facilities will be adequately lined with waterproof materials.
- A third-party contractor will be engaged for the disposal of solid waste.

6.5.6 Odour Management

338. The primary odor-causing compounds from incinerators are volatile organic acids and methyl mercaptan, which can be detected at low concentrations. Typically, the waste combustion process does not frequently result in odor issues. However, other potential odour sources include waste storage areas and transportation vehicles.

Mitigation Measures

- The waste combustion facility will draw air from the waste receiving and storage areas to supply oxygen for the combustion process. This will create negative air pressure in these areas, preventing the escape of odour-causing pollutants into the surrounding environment. If odours are detected, air pressure can be managed by sealing any unused openings to the outside.
- All leakages should be regularly inspected and promptly repaired.
- Effective treatment of flue gas through a scrubber will be ensured.
- Appropriate masks will be provided to workers for their protection.
- Strict adherence to good housekeeping practices will be maintained.

6.5.7 Impacts due to Waste Disposal

339. During the project operation phase, the waste generated will consist of bottom ash from the incinerator and sludge resulting from scrubber operations and subsequent wastewater treatment. The bottom ash will be collected and either repurposed for use in cement and road construction or disposed of at approved disposal sites. Temporary storage for the bottom ash may be necessary on-site. An EPA-approved contractor will dispose of sludge, and onsite incineration may also be considered an option.
340. Incinerator ash, which may contain heavy metals such as lead and cadmium (if not adequately removed from the charged waste) and toxic compounds like dioxins, is typically disposed of in landfill sites. These pollutants can leach out, posing a significant risk to groundwater and rivers if the landfill sites are not adequately designed and managed. Additionally, ash residues from the gas cleaning filters of incinerators are classified as hazardous waste and must be disposed of in specialized landfills.

Mitigation Measures

- A site-specific waste management plan must be developed.

- Stringent waste selection procedures should be implemented to ensure that only wastes that can be effectively managed are accepted.
- All wastes must be stored separately.
- Incinerator ash and sludge from the scrubber will be collected and stored in a covered, designated area sent for environmentally friendly disposal at regular intervals, following testing for their constituents.

6.5.8 Fire Hazard

341. Fire poses a significant hazard due to its potential to severely impact the health and safety of nearby individuals and the environment. Fires can lead to loss of life and property. Although the risk of fire during the operation of the proposed incinerator (TLFSP-100) is low, the following measures will be implemented to prevent and control any emergencies that may arise.

Mitigation Measures

- Clear and visible labelling must be placed on any ignitable wastes.
- Material Safety Data Sheets (MSDS) for any chemicals used should be obtained from the waste generator and displayed in the respective waste area.
- A hydrant system will be installed to cover the entire facility, with hydrant points located in all areas at risk of fire.
- Fire extinguishers will be strategically placed throughout the facility and on all vehicles.
- Firefighting equipment, including fire extinguishers and hydrant systems, will be maintained at critical locations within the premises.
- A reputable service provider will conduct regular inspections and servicing of fire extinguishers, with records of these inspections kept on file.
- Firefighting training and drills will be carried out regularly.
- The facility will have an emergency response plan practised routinely to ensure that the responsible staff remains adequately trained at all times.
- Proper grounding procedures will be implemented to prevent static electricity buildup and mitigate lightning hazards, including formal protocols for using and maintaining grounding connections.

6.5.9 Natural Disaster (Earthquake)

342. The Geological Survey of Pakistan has classified the Karachi region as falling within a Seismic Zone 2B. This classification indicates a potential for moderate to significant seismic hazards, with the likelihood of earthquakes reaching intensities of VI to VIII on the MM scale and magnitudes of 5.6 to 6.6 on the Richter scale. According to published charts, this zone's peak ground-level acceleration (PGA) is 28%. A seismic risk factor of 0.2 is recommended. It should be integrated into construction and installations in the coastal area to address operational basis earthquakes (OBE) associated with damage from moderate-level earthquakes (MM-VI to VIII).

Mitigation Measure

343. To prevent a catastrophic situation in the event of an earthquake, it is expected that the management of the proposed project will take zoning requirements into account for the construction of buildings and the installation of machinery. All project structures must be designed and built by the structural and material standards applicable to Zone 2B projects.

6.5.10 Occupational Health and Safety

344. Workers and incinerator operators may be exposed to hazardous wastes, heat, elevated noise levels, and emissions resulting from project operations. The most notable occupational health and safety impacts commonly associated with employees at industrial waste management facilities arise during the operational phase and include:

- Accidents and injuries
- Exposure to hazardous and medical waste

Mitigation Measures

- A comprehensive Health and Safety Management Plan should be implemented, with regular training provided to workers on health, safety, and waste management.
- A hazardous materials management plan must be integrated into facility operations and maintained for consistency.
- Standard operating procedures should be documented and readily accessible.
- Health and safety risks associated with onsite processes will be addressed through procedures designed to safely handle materials and waste.
- Workers should be equipped with appropriate protective gear, including clothing, gloves, respiratory masks, slip-resistant shoes for waste transport personnel, and hard-soled safety shoes for all employees to prevent foot puncture wounds. Noise protection should be provided for those near loud equipment, while hard hats are necessary for workers close to heavy mobile equipment, buckets, cranes, and collection truck discharge locations.
- Incoming waste should be controlled and properly characterized.
- Adequate personnel facilities, including washing stations and areas for changing clothes before and after work, must be provided.
- Annual health screenings for workers should be conducted to ensure their well-being.

6.5.11 Social Impacts

345. No direct negative impacts on the income generation of the local population are anticipated. The project is expected to influence the socioeconomic conditions of the area by Positively.

- Increased job opportunities for the local community.

Facilitate waste management in the surrounding area, improving environmental conditions by reducing open dumping and pit burning of waste.

CHAPTER - 7: ENVIRONMENTAL MANAGEMENT & MONITORING PLAN

7.1 Introduction

346. This section of the Environmental Impact Assessment (EIA) study provides an overview of the Environmental Management Plan (EMP) for the proposed incinerator (TLFSP-100) project, encompassing the stages of project siting, construction/installation.
347. Environmental Management is essential for the successful development of any project, ensuring that all phases are conducted in an environmentally sustainable manner. The EIA has identified potential impacts during the various stages—siting, construction/installation and recommends specific mitigation measures, management strategies, and monitoring practices to control and effectively minimize adverse impacts within acceptable limits.
348. An Environmental Management Plan (EMP) has been developed to promote environmentally responsible development and is detailed in this section. The EMP outlines the necessary management measures and site monitoring to identify and mitigate potential impacts. This plan is tailored to the proposed project's pre-construction and construction/installation phases.
349. The factors requiring management and monitoring will be elaborated upon in the subsequent sections.



7.2 Need for EMP

350. The Environmental Management Plan (EMP) is designed to provide a comprehensive framework for managing and monitoring environmental issues and outline the institutional structure necessary for its implementation.
351. The earlier sections of this document have highlighted the environmental impacts

associated with various activities throughout the design, pre-construction, construction, phases of the proposed project, along with mitigation measures to lessen these impacts. A crucial requirement of the SEPA 2014 is the development of an EMP to guide both management and employees in the organization towards continuous improvement in environmental practices. The implementation of this EMP will be the responsibility of the project proponent. Top management must uphold the principles of the EMP in both letter and spirit and make necessary adjustments while keeping the Responsible Authority informed.

352. The EMP aims to accomplish the following objectives:

- Establishing measures to be implemented during the project's execution and operation to eliminate or mitigate adverse environmental impacts or to reduce them to acceptable levels.
- Identifying the necessary actions for implementing these measures, including defining the roles and responsibilities of the project proponent, as well as recognizing opportunities for collaboration with other stakeholders.
- Specifying the communication, documentation, training, and management requirements related to implementing mitigation measures.
- Outlining the actions needed to assess the effectiveness of the mitigation measures, including guidance on the monitoring mechanisms and identifying relevant parameters necessary to confirm the successful implementation of these measures.

7.3 EMP Process

353. The EMP comprises the following areas & defining the methods and procedures of implementation.

- Organizational structure along with the roles and responsibilities of project personnel.
- Specific requirements are necessary for the effective implementation of the EMP.
- A matrix for managing mitigation efforts or addressing impacts.
- A monitoring plan highlighting key parameters for observation.
- The development of this plan involved a comprehensive investigation into the relevant processes and consultations on pertinent issues. This framework will provide the necessary structure to facilitate the effective implementation of the management plan.
- The project proponent will establish an Environment, Health, and Safety (EHS) department to address all environmental concerns and related issues. The EHS manager will oversee the department and report directly to the Managing Director. The department will appoint An EHS officer to coordinate with the contractor during the construction phase and monitor operations during the incinerator's functioning.

7.4 Management Approach

354. Management will ensure compliance with the Environmental Management Plan (EMP). They will ensure that all activities align with positive environmental considerations and work collaboratively with relevant regulatory agencies, including the Sindh Environmental Protection Agency (SEPA). The proactive strategies outlined below will support the successful implementation of the environmental management plan:

- Ensuring adherence to all relevant legislative and regulatory requirements associated with the project.
- Establishing suitable monitoring indicators to evaluate both performance and the extent of environmental impact.
- Conducting regular reviews of project activities to assess their environmental effects.
- Identify critical environmental concerns of the project and address them through public engagement, awareness initiatives, and transparent progress reporting.
- Facilitating effective communication with both internal and external stakeholders regarding environmental issues.

7.5 Health, Safety and Environment Management System

355. The Health, Safety, and Environment (HSE) Management System is a crucial component of the environmental management system, aimed at ensuring a safe and secure working environment that supports sustainable development, which is reliant on the health-related performance of human resources. The EMP outlines EHS issues and aspects, incorporating mitigation measures based on best management practices. The HSE management system is responsible for conducting comprehensive assessments, evaluating, monitoring, identifying, and implementing control measures (mitigation) for all potential hazards and risks during the proposed project's construction phases.

356. Establishing, documenting, and enforcing a Health and Safety Plan (HSP) alongside the Health and Safety Rules is vital. This plan delineates the roles, responsibilities, and expected outcomes associated with effective implementation concerning various project phases' environmental, health, and safety management. These measures must be executed to ensure that no significant adverse health and safety impacts arise from the proposed project activities.

7.6 Risk Assessment

7.1.1 Identification of Environmental and Social Aspects of Project

357. The potential environmental and social impacts resulting from the development of the proposed project encompass the following key activities:

- Location selection for the proposed project
- Construction and installation of the project
- Water usage and wastewater production

- Generation and disposal of construction waste
 - Operations of the incinerator
 - Air emissions from the incinerator
 - Management and handling of garbage during operations
 - Response to emergencies
358. The project's risk assessment above activities has identified several environmental liabilities that necessitate implementing mitigation and control measures to minimize environmental impacts to an acceptable level.
- Air and noise pollution
 - Potential contamination of water, soil, and land due to effluent discharge, including oily waste and seepage
 - Solid waste generation, including excavated materials and both hazardous and non-hazardous waste
 - Traffic concerns during the construction
 - Resource consumption
 - Emergency scenarios
 - Fire hazard
 - Occupational safety hazards
 - Natural disasters
 - Socioeconomic impacts
359. Workers face safety hazards during construction activities, including accidents related to working at heights, inadequate ergonomic conditions, and exposure to toxic and explosive materials.

7.7 Legislations & Guidelines

360. The proposed project's Environmental Impact Assessment (EIA) provides a comprehensive discussion of the relevant national and international legislation and guidelines in Chapter 2 of the report.
361. The project proponent will ensure that all activities comply with national laws and applicable international conventions while also seeking guidance from national and international guidelines. Furthermore, it will be assured that crucial project management personnel and all assigned contractors are familiar with these laws and guidelines before commencing project activities.

7.8 Roles & Responsibilities

362. Environmental management should be an essential component of the proposed project's policies. Therefore, a commitment to minimizing environmental impacts will reflect the management's philosophy, emphasizing that excellence in this area is crucial for effectively operating well-managed and efficient project operations. During

the construction phase, the primary responsibility for environmental performance will rest with the Environmental Health and Safety (EHS) officer, who will oversee these aspects daily.

363. In the normal operational phase, the site manager will supervise the overall environmental performance, while the site officer will handle daily management related to environmental issues. Under their oversight, environmental management will adhere to the mitigation and monitoring plans detailed in this EIA during operations. A brief outline of roles and responsibilities is provided below:

7.8.1 Management of Incinerator (TLFSP-100) Plant

364. The Environmental Management Plan (EMP) will be governed by the top management of the proposed Incinerator Plant, making it a crucial element of the project. Below are some of the critical roles and responsibilities associated with this management:

- Collaborate and engage with relevant environmental agencies to enhance performance.
- Assess the progress of the development and implementation of this management plan.
- Approve any changes in decision-making in consultation with the respective managers when appropriate.

7.8.2 Project Manager

365. The Project Manager plays a crucial role in the success of the Environmental Management Plan (EMP). The effective management of the EMP primarily relies on the Project Manager's efforts. Below are some key roles and responsibilities assigned to the Project Manager:

- Ensure the contractor is fully informed about all specifications, legal requirements, standards, and procedures related to the project, particularly concerning environmental aspects.
- Confirm that all provisions outlined in the EMP are effectively communicated to and followed by the contractor(s).
- Oversee the implementation of the EMP throughout the project by conducting site inspections and meetings, with documentation included in the minutes of the site meeting records.
- Be familiar with the project's Environmental Impact Assessment, the conditions outlined in the EIA approval, and all relevant environmental legislation.
- Ensure that staff perspectives are considered and integrated into the EMP as appropriate.
- Identify potential issues and, where feasible, suggest solutions for consideration in the management plan review process.

- Enhance coordination and information exchange among top management, employees, contractors, and other stakeholders.
- Contribute to the actions necessary for delivering the management plan and support its ongoing development.
- Monitor the progress of the development and implementation of this management plan.
- Hold overall responsibility for the successful implementation of the EMP.

7.8.3 Contractor(s) for Construction

366. The primary responsibilities for all environmental matters on behalf of the contractor will rest with the chief of the assigned contractor. The contractor's roles and responsibilities will include the following key points:

- Conduct construction activities in an environmentally responsible manner.
- Propose measures to mitigate environmental impacts during construction and submit them to the Environmental Officer.
- Notify the Project Manager promptly of any environmental impacts to receive guidance on the appropriate next steps.
- Adhere to all environmental management specifications.
- Submit mandatory Method Statements for approval by the Project Manager before commencing any work.
- Provide a report documenting all incidents since the previous meeting at each site meeting.
- Maintain a public complaint register.
- Ensure that all employees and subcontractors receive training before the start of construction.

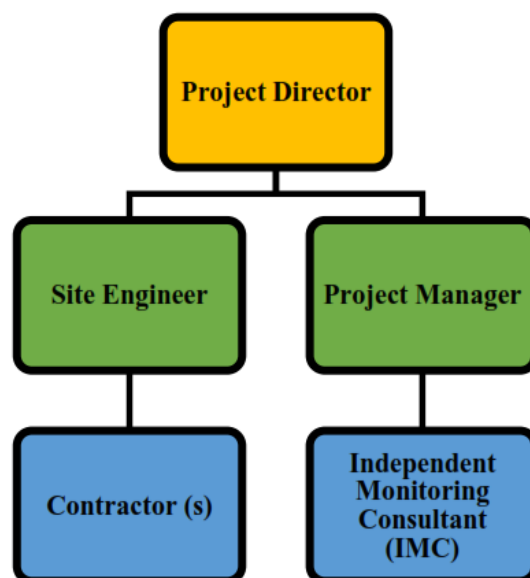


Figure 7-1 Suggested Organogram for Environmental Management for Proposed Incinerator

7.8.4 Independent Monitoring Consultant

367. The proponent will appoint an Independent Monitoring Consultant (IMC) to ensure that construction activities comply with the conditions specified in the EIA approval. The IMC will compile the results of periodic monitoring into reports, which will be submitted to project management for review and appropriate action. Additionally, the consultant will keep detailed monitoring records, noting any deviations or changes to the contract plans.

7.9 Environmental Management Program

368. The following sections outline the current plans for environmental management throughout the proposed project's development, design and construction phases.

7.9.1 Design of Facility

369. This section covers the location of the proposed project site, the extended area, the facilities to be installed within the designated project space, and the machinery and related operations. Should there be a need to alter design parameters after receiving environmental approval, the proponent will evaluate the potential environmental impacts resulting from these changes. If the impacts differ significantly from those outlined in the report, appropriate mitigation measures will be developed to minimize these impacts of the modifications.

7.9.2 Approvals

370. Obtaining a No Objection Certificate (NOC) from SEPA does not exempt the proponent from fulfilling other obligations. Therefore, the proponent and the contractor must secure all relevant clearances and necessary approvals from the Government of Sindh before commencing the proposed operations.

7.9.3 Environmental Training

371. Essential training on environmental and safety matters will be provided to the technical and support staff before the commencement of activities. This training ensures that all personnel know their job responsibilities, inherent risks, hazards, safety requirements, and the Environmental Management Plan (EMP). The Project Manager will assess and define the specific training needs.
372. During the training, the following areas of knowledge and experience will be deemed crucial:
- Awareness of early warning signs, hazard and risk identification, and recognising potentially dangerous situations.
 - Familiarity with engineering controls designed to prevent hazardous situations from occurring.
 - Understanding the use and maintenance of emergency response equipment and routine equipment for health and safety monitoring and protection.
 - Knowledge of methods and procedures for decontaminating equipment and facilities following potential chemical contamination.
373. Records of all training sessions should be maintained. It is advisable that, in the event of any undesirable incident or emergency, a follow-up session be conducted to assess the weaknesses and gaps in the current system, as well as to identify the possible causes of the event. This approach will help management implement additional and more effective controls to prevent similar occurrences in the future.

7.9.4 Communications

374. To ensure effective management and monitoring of environmental performance throughout the construction and operation phases, communication will be maintained between the Site Supervisor and the Project Manager. They will coordinate with project management and regulatory agencies on all pertinent matters.
- Construction Phase: The Site Supervisor will coordinate project progress with the Project Manager during construction. They will oversee the construction activities to ensure compliance with the provisions of the Environmental Management Plan (EMP) and Environmental Impact Assessment (EIA) at all stages. In the event of any undesirable incidents, such as work-related injuries, fatalities, or emergencies, the Site Supervisor will promptly report these to the Project Manager. Any issues that require higher management's attention will be communicated to the EHS Manager for action. The Site Supervisor will provide weekly updates to the Project Manager throughout the construction phase.
 - Kick-off Meeting: A kick-off meeting will define environmental responsibilities and ensure that managing staff knows the EMP. This meeting will also streamline the work plan per the EMP and will be scheduled before the commencement of any activities.
 - Quarterly Meetings: Quarterly meetings will be conducted to review the progress of activities and assess the effectiveness of pollution control measures. During these meetings, deadlines will be re-evaluated, and the project program will be adjusted if necessary. Minutes will be documented at the end of each quarterly

meeting, summarizing the outcomes, issues discussed, and decisions made. These minutes will be shared with the Project Manager and the contractor for their records.

- Peer Review: A peer review will be conducted to obtain professional opinions and evaluations of project performance and recommendations for innovations such as new pollution control methods and waste minimization strategies.

7.9.5 Fire Protection System

375. The fire-fighting facilities listed below should be provided based on the specific nature and risk associated with the installation:

- Fire water system (for mixed installations)
- Foam generation system
- Fixed fire-fighting equipment
- Mobile fire-fighting equipment
- Fire detection and alarm system
- Communication systems
- The design of the fire protection system facilities will adhere to the following criteria, aligning with the recommendations outlined in NFPA 30.
 - a) Fire-protection facilities are designed around the single largest potential emergency scenario.
 - b) Hydrant and monitoring systems comprehensively cover All areas with potential fire risks.
 - c) Water spray systems will be implemented in hazardous locations and around equipment within process unit areas.

7.10 Construction Phase

7.10.1 Construction Work Management

376. All construction-related activities, including campsite establishment, waste stream management, and the mobilization of equipment and materials, must comply with (1) the agreed-upon procedures provided by the proponent to the contractor and (2) the provisions of the NOC. Contractors are required to adhere to the pertinent contractual obligations regarding environmental considerations.

377. The contractor and subcontractors' performance will be monitored periodically by the IMC, while the Site Supervisor will oversee operations continuously. All construction crew members, particularly technical staff, will receive the necessary personal protective equipment (PPE) and safety gear. The Site Supervisor and contractor will ensure that all work is conducted safely and using established safety procedures.

378. Solid waste generated during construction will be removed daily, either by a local waste contractor or the construction contractor, who will assign workers to remove and dispose of construction waste at designated facilities.

379. Appropriate drainage systems will be implemented at the construction camp and site, particularly near excavations. Wastewater will undergo initial treatment using sedimentation techniques to remove suspended solids and will be reused if it meets quality standards. If the effluent cannot be reused, it will be discharged into local sewers after confirming that it is free of solid debris that could obstruct sewer lines. Whenever feasible, wastewater will be utilized to irrigate nearby vegetation.
380. The type of construction materials used for the project must comply with seismic design requirements for buildings located in seismic zone 2B. The design consultant should also consider other safety considerations for cyclones and tsunamis.
381. The Site Supervisor must ensure that the construction and operation of the project do not adversely affect nearby businesses. During the construction phase, this includes managing potential obstructions to routes, the location of the campsite, noise emissions, and resource consumption (e.g., water). In the operational phase, logistics will be overseen through a traffic management plan, and any complaints from neighbouring industrial units will be addressed promptly and effectively.

7.10.2 Site Restoration

382. The Site Supervisor will ensure that site restoration following the completion of construction activities is conducted according to the requirements outlined in the EIA and EMP.

7.10.3 Construction Monitoring

383. An independent monitoring consultant will be engaged to oversee the construction work and ensure compliance with the EMP, including the monitoring of waste management practices.

Table 7.1 Mitigation Matrix for Proposed Incinerator (TLFSP-100) Project

S. No.	Affected Areas	Mitigation Measures	Responsibility
Construction Phase			
1.	Employment Opportunities and workforce	- Preference should be given to hiring unskilled labor from the local community to mitigate potential neighborhood issues. - Project management should exercise caution when selecting construction staff, considering the workers' behavioural traits.	Contractor
2.	Soil Erosion	- The contractor should minimize the amount of exposed soil at all times and wet, compact, and resurface disturbed areas throughout the construction phase. - Topsoil containing vegetation should be removed rather than simply cutting off the vegetation, allowing the plants to help retain and enrich the soil. - Exposed surfaces will be routinely wetted to maintain low airborne dust levels effectively. - Stockpiles of fine materials will be either wetted or covered with tarps, especially during windy	Contractor

S. No.	Affected Areas	Mitigation Measures	Responsibility
		conditions, until the concreting and landscaping are completed.	
3.	Soil Contamination	- Vehicle washing will be conducted exclusively in designated areas. - Maintenance for vehicles and equipment will occur at specified locations. - Regular inspections of construction vehicles and machinery will be implemented to prevent leaks. - The removal of oil and contaminated soil around fuel and oil storage areas will be facilitated by the availability of appropriate tools, such as shovels, plastic bags, and absorbent materials. - Management of contaminated materials will be prioritized to ensure the safety and health of workers on-site, residents, and the environment. - Plans and procedures will be developed to address the discovery of contaminated materials, aiming to minimize health, safety, and environmental risks.	Contractor
4.	Construction Waste	- A comprehensive waste disposal plan will be developed to manage significant quantities of waste effectively. - Construction waste, such as damaged pipes, leftover steel, wood, and plastic pieces, will be sent for recycling while remaining waste will be transported to approved dumping sites for disposal. - Construction materials will be stored in a covered area, particularly during the rainy season, to protect them from the elements. - Excavated soil will be reused through various methods as filling material for construction purposes. - Different types of waste containers will be deployed to ensure proper disposal and recycling based on waste type. - Waste bins will be clearly labelled for each type of waste generated during construction activities. - Building materials with minimal packaging will be utilized to reduce excessive packaging waste. - Durable and long-lasting materials will be chosen to minimize the frequency of replacements, thereby decreasing overall construction waste.	Contractor
5.	Impact on Water Quality, Consumption	- Stormwater diversion channels will be constructed to redirect storm runoff away from construction areas. - Water consumption will be monitored regularly to ensure efficient usage. - Leak-proof storage tanks will be utilized to prevent spills and leaks.	Contractor

S. No.	Affected Areas	Mitigation Measures	Responsibility
6.	Dust/ Particulate Matter	- Water will be sprinkled at predetermined intervals to suppress dust emissions effectively. - Specific time slots will be designated during regular daytime working hours to move heavy earth-moving equipment. - A schedule will be developed for the movement of dump trucks primarily used for hauling or excavating soil. - Appropriate roads will be utilized for transportation during construction activities. - Stockpiles of fine materials will be either wetted down or covered with tarpaulin, particularly during windy conditions. - Site workers and drivers must wear dust masks and safety goggles during dry and windy weather to mitigate health risks associated with dust exposure. - Implementing good housekeeping practices will further contribute to reducing dust emissions.	Contractor
7.	Exhaust Emission	- Where feasible, the use of new diesel generators may help to lower emissions. - Generators should be positioned away from pedestrian areas and in locations with minimal risk of human interference. - Generators must be appropriately tuned, serviced, and regularly monitored for optimal performance. - Ensure that the generator's exhaust vent is installed at an adequate height. - Low-sulfur fuel should be used for all generators to minimize environmental impact.	Contractor
8.	Wastewater Generation	- Vehicle and construction machinery washing will be limited to a designated area. - Wastewater will not be discharged directly into water bodies; instead, it will be treated in a septic tank before proper disposal. - Any oily waste will be contained before the wastewater is disposed of in the sewer system. - Monitoring of wastewater generation will be implemented to ensure compliance and efficiency. - Sufficient portable or permanent sanitation facilities will be provided for all workers at every construction site.	Contractor
9.	Noise	- Activities with the highest potential for generating noise should be scheduled primarily during daytime hours. - Noise control measures, such as temporary noise barriers and deflectors, will be employed during impactful activities. - Truck drivers will be encouraged to turn off their	Contractor

S. No.	Affected Areas	Mitigation Measures	Responsibility
		vehicle engines while unloading materials whenever feasible. - Construction machinery will be maintained in optimal condition to minimize noise production. - Generators and heavy-duty equipment should be placed in enclosures to reduce ambient noise. - Regular monitoring of generators and other noisy equipment will be conducted to ensure compliance with noise regulations. - Nighttime activities will be minimized as much as practically possible. - Site workers operating in high noise areas, where noise levels exceed 90 dB (A), must wear earplugs or earmuffs for hearing protection.	
10.	Flora	- Tree cutting will be avoided whenever possible. - Any vegetation that is removed during the construction phase will be replanted.	Contractor
11.	Traffic Flow	- The proponent will implement measures to address concerns by scheduling construction vehicle deliveries during off-peak hours when traffic volume is lower. - Caution signs will be placed along the access road to inform users of ongoing construction activities and help prevent accidents. - Traffic flow impacts will be minimized through effective planning of material transportation, aiming to increase vehicle loads and reduce the number of trips or vehicles on the road. - Truck drivers will be educated to avoid unnecessary revving of engines at loading and unloading areas and to switch off or keep engines idling to a minimum while at the construction site.	Contractor
12.	Occupational Health & Safety Issues	- Before the construction project begins, workers will receive training on lifting and materials handling techniques, including guidelines on weight limits that necessitate mechanical assistance or two-person lifts. - The work site layout will be carefully planned to minimize the need to manually handle heavy loads. - Tools and workstations will be chosen to reduce force requirements and holding times, promoting better posture, and adjustable workstations where applicable. - Administrative controls, such as job rotations and scheduled rest or stretch breaks, will be incorporated into the work processes.	Contractor

7.11 Environmental Monitoring Plan

384. Monitoring activities during the construction phase is essential for evaluating their

environmental impacts. To facilitate this, the proponent will hire an Independent Monitoring Consultant (IMC) to implement a comprehensive monitoring program that will:

- Monitor the:
 - Air Emissions
 - Wastewater
 - Solid waste management
 - Occupational health and safety
- Adhere to the monitoring frequency for selected parameters as specified in the tables below.
- Document all observed non-conformities and report them to Project Management, including recommended actions for resolution.
- Please notify us of any anticipated impacts and suggestions for further action.

The Contractor shall acknowledge the recommendations regarding the issues highlighted in the construction monitoring report. Likewise, the proponent will consider the concerns the Independent Monitoring Consultant (IMC) identified during the monitoring. Tables 7.2 and 7.3 outline a proposed monitoring plan to assess various environmental aspects during Construction. The proponent may also enhance this monitoring plan to increase its effectiveness if necessary.

Table 7.2 Environmental Monitoring Plan (Construction Phase)

Environmental Concern	Parameters to be Monitored	Monitoring Location	Frequency	Responsibility
Ambient air quality	Ambient air quality parameters as per SEQS	Construction site	Quarterly	- Contractor - IMC
Exhaust emissions from generators and other construction equipment	Gaseous emissions include CO _x , NO _x , SO _x and PM from generators and other equipment	selected equipment at the construction site	Quarterly	- Contractor - IMC
Vehicular emissions	Vehicular emissions include Smoke, CO and Noise from vehicle exhaust vents.	selected vehicles at the construction site	Quarterly	- Contractor - IMC
Noise level	Noise level Leq dB(A) Monitoring	Construction site as well as the generators, equipment and vehicles.	Quarterly	- Contractor - IMC
Soil Erosion	Visual inspections and photographic evidence	Construction site and its immediate surroundings	periodically	- Contractor - IMC

Solid Waste Management	Record and logging of daily generated waste. Hazardous and non-hazardous waste quantity	Construction site	periodically	- Contractor - IMC
Occupational Health and Safety	EHS compliance	Construction site	periodically	- Contractor - IMC

Table 7.3 EMP Implementation Cost

Activity	Cost (Rupees PKR)	Remarks
Training Program	200, 000	refer section 7.10.8
Environmental Monitoring		
Ambient Air (Construction)	$(40,000 \times 1 \times 4) = 160,000$	Cost for monitoring at 01 location @Rs.40,000/per location.
Noise Levels (Construction)	$(1,000 \times 4 \times 4) = 16,000$	Cost for 1-year monitoring at 04 locations @Rs.1,000/location
Gaseous Emissions (Construction)	$(1,500 \times 2 \times 6 \times 4) = 72,000$	Cost for 1-year monitoring at 1 location for 06 parameters @Rs.1,500/ parameter.
Mitigation Measures (Construction)	300,000	Initial estimates
Reporting	200,000	Initial estimates
Sub-total	678,000	-
Contingencies (5% of EMP cost)	339,000	-
Grand Total	1,017,000	-

8 CONCLUSION

8.1 General

385. The Environmental Impact Assessment (EIA) study for the proposed Incinerator (TLFSP-100) Plant has identified potential impacts that are likely to arise during the construction phases of the project. These potential environmental impacts are associated with various aspects, including:

- Air quality
- Solid waste management
- Wastewater
- Water quality
- Soil quality
- Terrestrial ecology
- Health and Safety
- Socio-economic factors

386. The TLFSP-100 incinerator efficiently processes 100 kg of hazardous waste per hour, with an average calorific value of 1000 kcal per kg. It features automated conveyor feeding, manual ash removal, and a horizontal furnace with automatic ignition. The system treats waste through primary and secondary combustion, wet scrubbing, and dust removal, operating at temperatures between 650°C and 1300°C under micro-negative pressure to prevent backfire and ensure full combustion.

387. Safety measures include automatic burner shut-off, a cooling protocol for shutdown, and leakage protection, ensuring insulation resistance above 2 MΩ. Electrical components are protected by metal hoses, and oil seals have passed pressure tests, guaranteeing safe operation.

388. Key components include the combustion chambers, wet scrubber, cyclone dust collector, air blowers, and chimney. The furnace design promotes fuel efficiency and reduces nitrogen oxide emissions, achieving 99.99% combustion without smoke or odor. The wet scrubber and cyclone dust collector remove over 90% of large particles.

389. The system efficiently decomposes waste, aided by high-pressure air and secondary combustion at 1300°C. It consumes 3.25 kWh of power, with fuel use depending on the burner, and requires only one operator per shift.

390. The impacts of the operational phase will be further detailed after construction, emphasizing the monitoring and management of environmental effects during the project's operational period.

391. The project is expected to positively impact the area's socio-economic setup, as it will create short to medium-term employment opportunities and provide a suitable waste disposal option for the city.

392. The impact predictions are based on the consultants' previous experiences with similar projects, professional judgment, field data collection, and discussions with local communities, government officials, and relevant technical specialists. Many of the proposed mitigation measures relate to good design practices and practical construction management practices.
393. A comprehensive set of mitigation and monitoring measures have been included in the Environmental Management Plan (EMP) to address the identified concerns. Assuming the effective implementation of these mitigation measures and monitoring requirements, the proposed project's adverse environmental and social impacts are envisaged to be within acceptable limits.
394. Implementing the mitigation measures and monitoring plan outlined in the EIA report and EMP will provide a basis for ensuring that the potential positive and negative impacts associated with establishing the incinerator (TLFSP-100) facility are enhanced and mitigated to a level deemed adequate for the development to proceed.
395. In summary, based on the findings of this comprehensive assessment, there is no reason why the proposed incinerator facility should not be authorized, subject to the effective implementation of the mitigation and monitoring measures as detailed.

ANNEXURE I INTRODUCTION - M/S IQBAL ENTERPRISES



Iqbal Enterprise

INTRODUCTION

Iqbal Enterprise provide collection, transportation, treatment and disposal of garbage, sewage, and other waste products and substances safely and efficiently is the best definition for waste management. The Increase in the adoption of proactive government measures to reduce illegal dumping drives the growth of the Global waste management market. Also, an increase in the overall waste volume is led by the surge in population and increased globalization. However, the high cost of procuring and waste management solutions is expected to hamper the market growths the waste management market is segmented globally based on waste type, service, and region. The Market is further divided into municipal and industrial I Hospital waste based on the waste type. By providing Innovative solutions to the pressing and challenging dilemmas in managing waste materials, the waste Management companies in the world just like in any other industry, strive hard to have the highest trust rates With their services. In this article, we have listed out the top waste management companies in the world.



Iqbal Enterprise

SERVICES OFFERED

The Major players listed in the waste management globally include –

A) Advanced Disposal Services

The Advanced Disposal is a solid waste and full-service environmental services company that provides Integrated, non-hazardous solid waste collection, transfer, recycling, and disposal operations. It owns and Operates a full range of services including –

- Commercial Waste Services
- Residential Waste Collection Services
- Industrial Solid Waste Collection Operations
- Transfer Stations
- Roll-Off Containers
- Municipal Solid Waste Landfills
- Recycling Facilities and Special Waste.

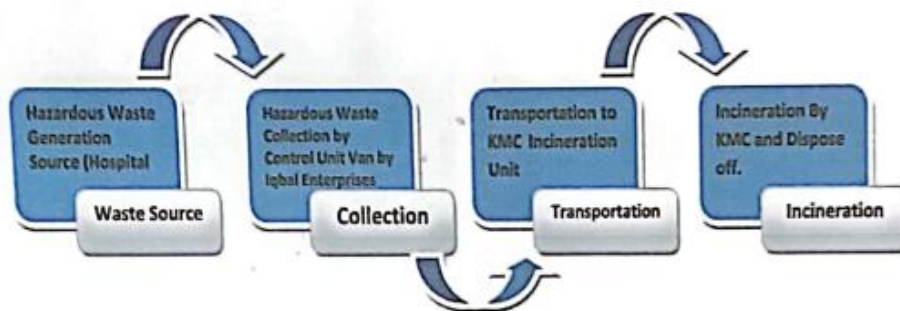
Regarding environmental protection, Advanced Disposal follows all local, state and federal laws. The Company has the management strengths, operational expertise, commitment to quality and the environment, and financial capabilities.

TYPE OF WASTE COLLECTION

- Dry Mixed Recycling
- Single Stream Recycling
- Food Waste Recycling
- Hazardous Waste
- Environmental Services
- Secure Waste & Recycling
- Confidential Waste
- Contaminated Land & Soil
- Integrated Waste Management
- Free Waste Audit, Waste Management
- Skips and Waste Services
- Junk Removal



Iqbal Enterprise Hazardous Solid Waste Collection and Disposal Layout



Iqbal Enterprise Non-Hazardous Solid Waste Collection and Disposal Layout





Iqbal Enterprise



Waste Transportation
To LANDFILL SITE

INCINERATION
PLANT



CHEMICAL WASTE

HAZARDOUS WASTE



Iqbal Enterprise



FOOD WASTE COLLECTION



SCRAP COLLECTION



Iqbal Enterprise



COMPANY TRANSPORTATION





Iqbal Enterprise

REGISTERED BY

- IPO (Intellectual Property Organization).
- Sindh Environmental Protection Agency.
- Sindh Solid Waste Management Board.
- Karachi Metropolitan Corporation.
- Federal Board of Revenue. (FBR)





Iqbal Enterprise

CONTACT DETAILS

Address:

Al-Karam Square Block-4 Mezzanine Floor Shop No C-32 Federal
B-Area Karachi, Sindh, 74600.

Ware House Address:

Main Super Highway Ahsanabad Road, Aligarh Commercial Society
Block-1, Karachi, Sindh.

Contact No:

 0322-2690927

 0333-2690927

Email Address:

ieenterprises@gmail.com

Complain No:

0315-3295097

IQBAL ENTERPRISES

Date: 2-8-2018

بخدمت جناب ایم۔ ڈی۔ صاحب،
سندھ سولید ویسٹ منیجمنٹ بورڈ کراچی۔

درخواست برائے اجازت

عنوان:

السلام علیکم۔!

جناب عالی۔

گزارش عرض یہ ہے کہ اقبال انٹرپرائزز لینڈ پل سائینڈ پلان جام چھانڈو پر کھراڈا لٹا چاہتا ہے۔ اقبال انٹرپرائزز ایک پراڈیٹ کمپنی ہے جو کہ مختلف کمپنیوں کے سٹینڈن خدمات فراہم کرنا چاہتی ہے۔ ہوری آپ سے گزارش ہے کہ اقبال انٹرپرائزز کو لینڈ فل کرنے کی اجازت دی جائے۔ اور اس کام کے لئے آپ کے ادارے کی جو بھی قوانند و ضوابط ہیں اقبال انٹرپرائزز ان کو پورا کرنے کے لئے تیار ہے۔ میں آپ کا شکر گزار ہوں گا۔

IQBAL ENTERPRISES

عین نوازش ہوگی۔

Dr. Iqbal
Director
اقبال انٹرپرائزز

for
me
meenu aalam

DD(LF)

فون: 0333-2690927

0322-2690927

Address:

Shop No. C-32,
Al-Karam Square,
Block-4, Mezzanine Floor, Karachi.

Contact:

0322-2690927

Email:

ieenterprises@gmail.com

IQBAL ENTERPRISES Reg. 437472045

Ref: _____ Date: 2-2-2021

To: Addl;
Sho, District (SWM)
K.Y.C.

DISTRICT OFFICE
Karachi
11/2/2021
2021

R/Sir!

This is to bring into your knowledge that our company (Iqbal Enterprises) is working as Environmental management services for solid waste management and applied for the work at EPA. Hence kindly approved us at your office incineration plant and register our company. Thanking you.

DEPUTY DIRECTOR
SOLID WASTE MANAGEMENT
SINDH SMALL INDUSTRIES CORPORATION

24/2/2021

Yours faithfully.

Signature: Iqbal
1/2/2021

Address: Shop No. C-32,
Al-Karam Square,
Block-4, Mezzanine Floor, Karachi.

Contact: 0322-2690927 Email: ieenterprises@gmail.com

Proprietor
IQBAL ENTERPRISES



GOVERNMENT OF SINDH
No.DP/LFS/SSWMB/237/1719
DATED: 15-05-2019

NO OBJECTION CERTIFICATE

✓ M/s Iqbal Enterprises has requested to dump the organic waste of canteen at SSWMB Landfill Site explaining in his letter, the company is providing genitorial service to different canteens and companies.

Sindh Solid Waste Management Board is still providing free services to all civil agencies and private vendors involve in lifting and dumping of municipal waste at landfill sites.

Therefore, M/s Iqbal Enterprises is allowed to dump the only municipal waste at landfill sites without any charges.

Director (L.F.S.)
S.S.W.M.B

Copy to:

1. Deputy Director L.F.S. (SSWMB).
2. Assistant Director L.F.S. (SSWMB).
3. P.S to Managing Director (SSWMB).
4. Master File.

Bungalow No.13, Al Hamra Housing Society, Shaheed-e-Millat Road, Karachi.
Phone: (+92 21) 9933 3704-6 Fax: (+92 21) 9933 3707 URL: www.sswmb.gov.pk Email: info@sswmb.gov.pk



KARACHI METROPOLITAN CORPORATION
OFFICE OF THE DIRECTOR SOLID WASTE MANAGEMENT
GROUND FLOOR OLD KBICA ANNEXE BUILDING ADJACENT TO SBICA OFFICER CLUB CIVIL CENTRE
GULSHAN-E-IQBAL KARACHI 75231341-2

NO. KMC/DIR/SWM/MS/ 0118 /2023

Dated: 22.02.2024

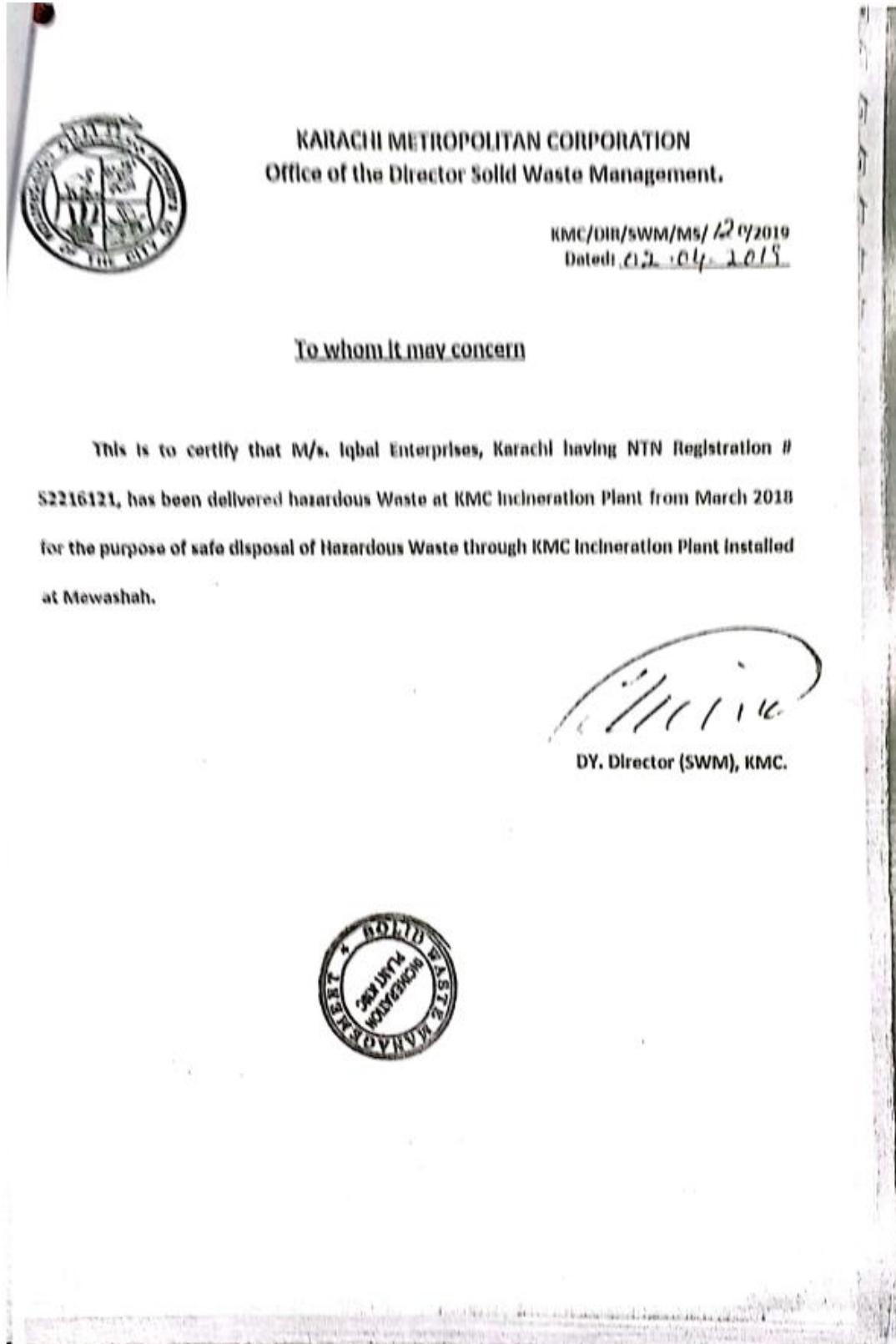
TO WHOM IT MAY CONCERN

It is stated that M/s. Iqbal Enterprises having Sindh Environmental Protection Approval regarding collection and transportation of waste (Hazardous, Non-hazardous), and he has requested for permission disposal of such waste at corporation incineration plants as a private entrepreneur. In this regard this department has no objection to dispose of such waste at corporation plants, subject to completion of all codal formalities of environmental regulation as well as guideline of KMC

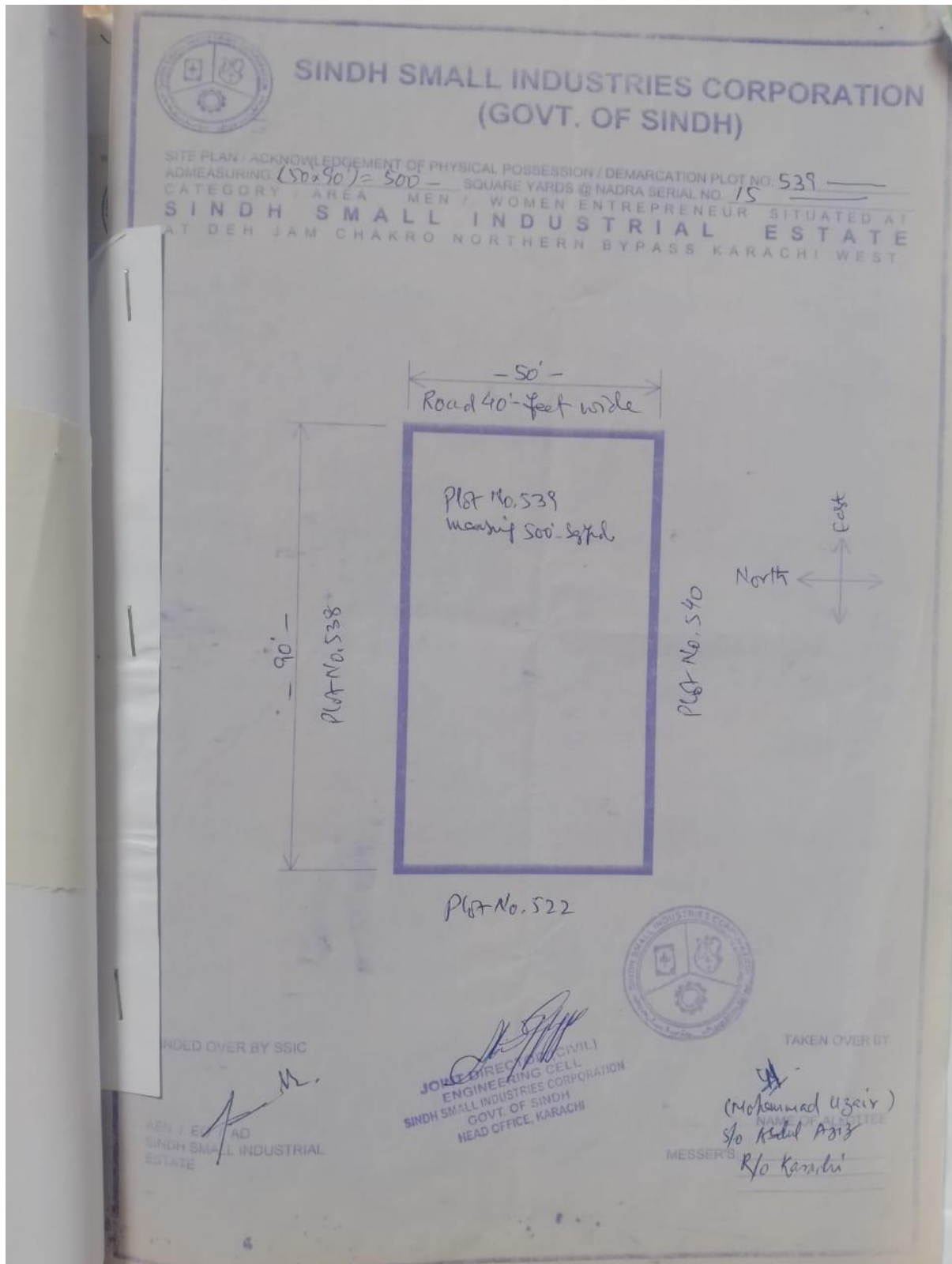


[Signature]
Director
Solid Waste Management
KMC

All concerned



ANNEXURE II LAND DETAIL DOCUMENTS



ANNEXURE III ENVIRONMENTAL TESTING REPORTS



Imperial Environment Research Laboratory
 Suite# 302, 3rd Floor, Al-Rehman Centre, K.C.H.S.U.
 Shahrah-e-Faisal, Karachi.
 Cell: 0341-8000614, 021-3438770
 Email: imperialeri@hotmail.com

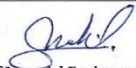
Lab Report Ref. No.	IERL/District West/IQ/09/2024	Invoice No.	IERL/IQ/EIA/09/2024
Sample ID:	Ambient Noise	Project ID.	Baseline, EIA Iqbal Enterprises, Waste Incinerator
Report to:	M/S Iqbal Enterprises	Reporting Date	06/09/2024
Sampling Date:	01/09/2024	Sampling Duration:	Spot Monitoring
Sample Type	Ambient Noise Quality	Location	Iqbal Enterprises, Sindh Small Industries
Sample Collected/Submitted by:	IERL Representative	Coordinates	Lat 25.07971 Long 67.050618

Analytical Test Report of Ambient Noise Quality Monitoring

Sr. #	Sampling Site Location	Coordinates	Min dB(A)	Max dB(A)	Average dB(A)	SEQS Limit	Remarks
1.	Near Project Area	Lat 25.07975 Long 67.050618	53	58	55.5	65	Within Limit
2.	Near Project Area	Lat 25.07975 Long 67.050615	50	59	54.5	65	Within Limit
3.	Near Northern Highway	Lat 25.07987 Long 67.05066	54	63	58.5	65	Within Limit

❖ Sindh Environmental Quality Standards for Noise
 ❖ SEQS= Sindh Environmental Quality Standards


Sample Analyzed by


Head of Imperial Environment Research Lab

Terms & Conditions:
 Report is valid for current batch (sample).
 This Report is not valid for any other certification, or court matters.





Imperial Environment Research Laboratory

Suite# 302, 3rd Floor, Al-Rehman Centre, K.C.H.S.U,
Shahrah-e-Faisal, Karachi.

Cell: 0341-8000614, 021-3438770

Email: imperial.erl@hotmail.com

Lab Report Ref. No.	IERL/District West/IQ/09/2024	Invoice No.	IERL/IQ/EIA/09/2024
Sample ID:	Air Quality (Baseline)	Project ID.	Baseline, EIA Iqbal Enterprises, Waste Incinerator
Report to:	M/S Iqbal Enterprises	Reporting Date	06/09/2024
Sampling Date:	01/09/2024	Sampling Duration:	Spot Monitoring
Sample Type	Ambient Air Quality	Location	Iqbal Enterprises, Sindh Small Industries
Sample Collected/Submitted by:	IERL Representative	Coordinates	Lat 25.07971 Long 67.050618

Analytical Test Report of Ambient Air Quality Monitoring

Parameters	Test Methods	Unit	SEQS Limit	Results	Remarks
SO ₂	UV Fluorescence	µg/m ³	120	7.41	Within Limit
NO	Chemiluminescence	µg/m ³	40	16.87	Within Limit
NO ₂	Chemiluminescence	µg/m ³	80	25.20	Within Limit
CO	Gas Filter Correlation	mg/m ³	10	7.32	Within Limit
O ₃	UV Fluorescence	µg/m ³	130	6.11	Within Limit
PM _{2.5}	Gravimetric Sampling	µg/m ³	75	34.76	Within Limit
PM ₁₀	Gravimetric Sampling	µg/m ³	150	148.21	Within Limit
SPM	Gravimetric Sampling	µg/m ³	500	181.91	Within Limit
Lead	Spectrophotometer	µg/m ³	1.5	0.001	Within Limit

❖ Sindh Environmental Quality Standards for Air Quality

❖ SEQs= Sindh Environmental Quality Standards

 Sample Analyzed by	 Head of Imperial Environment Research Lab
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Shahrah-e-Faisal, Karachi.

Cell: 0341-8000614, 021-3438770

Email: imperial.eri@hotmail.com

Lab Report Ref. No.	IERL/District/West/IQ/09/2024	Invoice No.	IERL/IQ/EIA/09/2024
Sample ID:	Drinking Water Quality	Project ID.	Baseline, EIA Iqbal Enterprises, Waste Incinerator
Report to:	M/S Iqbal Enterprises	Reporting Date	06/09/2024
Sampling Date:	01/09/2024	Grab/Composite	Grab
Sample Type	Drinking Water Quality (Tanker Water)	Location	Iqbal Enterprises, Sindh Small Industries
Sample Collected/Submitted by:	IERL Representative	Coordinates	Lat 25.076157 Long 67.050418

Analytical Test Report of Drinking Water Quality Monitoring

S.No.	Parameter	Reference Method	Unit	SEQS/WHO Limit	Result	Remarks
1.	Temperature	SMWW 2550 B	°C	40 ≤ 3	27.1	Within Limit
2.	pH	APHA 4500 H ⁺ B	-	6.5-8.5	8.16	Within Limit
3.	Odor	Organoleptic	-	Acceptable	Acceptable	Within Limit
4.	Color	Pt-Co Method	TCU	15	15	Within Limit
5.	Taste	Organoleptic	-	Acceptable	Acceptable	Within Limit
6.	Total Hardness	APHA	ppm	500	210	Within Limit
7.	Total Dissolved Solids	APHA	ppm	1000	442	Within Limit
8.	Turbidity	Nephelometric	NTU	<5	10.2	Out of Limit
9.	Chloride	ASTM-D512	ppm	<250	120	Within Limit
10.	Chlorine, Residual	HACH-8021	ppm	0.2 - 0.5	0	Within Limit
11.	Electrical Conductivity (EC)	APHA	μS/cm	NGVS	820	Within Limit
12.	Alkalinity	APHA	m.mol/l	NGVS	1.8	Within Limit
13.	Bicarbonate	APHA	ppm	NGVS	80	Within Limit
14.	Magnesium	APHA	ppm	NGVS	19.44	Within Limit
15.	Fluoride	HACH-8029	ppm	1.5	0.7	Within Limit
16.	Nitrate	HACH-8039	ppm	50	1.12	Within Limit
17.	Nitrite	HACH-8507	ppm	3	0.02	Within Limit
18.	Arsenic	Merck Test Kit	ppb	<0.05	0	Within Limit
19.	Potassium	APHA	ppm	NGVS	32	Within Limit
20.	Sodium	APHA	ppm	NGVS	80	Within Limit
21.	Copper	Lovibond-149	ppm	2	0.00	Within Limit
22.	Iron	Lovibond-156	ppm	0.3	0.01	Within Limit
23.	Lead	Lovibond-232	ppm	<0.05	0.00	Within Limit
24.	Manganese	Lovibond-242	ppm	0.5	0.08	Within Limit
25.	Mercury	Kit-Method	ppm	0.001	0.00	Within Limit
26.	Nickel	Lovibond-255	ppm	<0.02	0.00	Within Limit
27.	Carbonate	APHA	ppm	NGVS	Nil	Within Limit
28.	Sulfate	APHA	ppm	250	160	Within Limit
29.	Zinc	Lovibond-400	ppm	5	0.00	Within Limit
30.	Calcium	APHA	ppm	NGVS	52	Within Limit
31.	E-Coli	APHA 9222 D	Cfu	0/100ml	5	Out of Limit
32.	Total Coliform	APHA 9222 B	Cfu	0/100ml	18	Out of Limit

❖ Sindh Environmental Quality Standards for Drinking Water

Sample Analyzed by

Head of Imperial Environment Research Lab

Terms & Conditions:

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Imperial Environment Research Laboratory

Suite# 302, 3rd Floor, Al-Rehman Centre, R.C.H.S.U.
Shahrah-e-Faisal, Karachi.
Cell: 0341-8000614, 021-3438770

Lab Report Ref. No.	IERL/District/West/IQ/09/2024	Invoice No.	IERL/IQ/EIA/09/2024
Sample ID:	Drinking Water Quality	Project ID.	Baseline, EIA Iqbal Enterprises, Waste Incinerator
Report to:	M/S Iqbal Enterprises	Reporting Date	06/09/2024
Sampling Date:	01/09/2024	Grab/Composite	Grab
Sample Type	Surface Water Quality	Location	Hub Dam Canal, District West
Sample Collected/Submitted by:	IERL Representative	Coordinates	Lat 25.076557 Long 67.050485

Analytical Test Report of Surface Water Quality Monitoring

S.No.	Parameter	Reference Method	Unit	SEQS/WHO Limit	Result	Remarks
1.	Temperature	SMWW 2550 B	°C	40 ± 3	27.1	Within Limit
2.	pH	APHA 4500 H ⁺ B	-	6.5-8.5	8.26	Within Limit
3.	Odor	Organoleptic	-	Acceptable	Acceptable	Within Limit
4.	Color	Pt-Co Method	TCU	15	20	Out of Limit
5.	Taste	Organoleptic	-	Acceptable	Acceptable	Within Limit
6.	Total Hardness	APHA	ppm	500	200	Within Limit
7.	Total Dissolved Solids	APHA	ppm	1000	426	Within Limit
8.	Turbidity	Nephelometric	NTU	<5	20.34	Out of Limit
9.	Chloride	ASTM-D512	ppm	<250	110	Within Limit
10.	Chlorine, Residual	HACH-8021	ppm	0.2 - 0.5	0	Within Limit
11.	Electrical Conductivity (EC)	APHA	µS/cm	NGVS	790	Within Limit
12.	Alkalinity	APHA	m.mol/l	NGVS	1.6	Within Limit
13.	Bicarbonate	APHA	ppm	NGVS	80	Within Limit
14.	Magnesium	APHA	ppm	NGVS	18.2	Within Limit
15.	Fluoride	HACH-8029	ppm	1.5	0.7	Within Limit
16.	Nitrate	HACH-8039	ppm	50	1.12	Within Limit
17.	Nitrite	HACH-8507	ppm	3	0.03	Within Limit
18.	Arsenic	Merck Test Kit	ppb	<0.05	0	Within Limit
19.	Potassium	APHA	ppm	NGVS	28	Within Limit
20.	Sodium	APHA	ppm	NGVS	70	Within Limit
21.	Copper	Lovibond-149	ppm	2	0.00	Within Limit
22.	Iron	Lovibond-156	ppm	0.3	0.01	Within Limit
23.	Lead	Lovibond-232	ppm	<0.05	0.00	Within Limit
24.	Manganese	Lovibond-242	ppm	0.5	0.06	Within Limit
25.	Mercury	Kit-Method	ppm	0.001	0.00	Within Limit
26.	Nickel	Lovibond-255	ppm	<0.02	0.00	Within Limit
27.	Carbonate	APHA	ppm	NGVS	Nil	Within Limit
28.	Sulfate	APHA	ppm	250	150	Within Limit
29.	Zinc	Lovibond-400	ppm	5	0.00	Within Limit
30.	Calcium	APHA	ppm	NGVS	50	Within Limit
31.	E-Coli	APHA 9222 D	Cfu	0 / 100ml	6	Out of Limit
32.	Total Coliform	APHA 9222 B	Cfu	0 / 100ml	38	Out of Limit

❖ Sindh Environmental Quality Standards for Drinking Water

Sample Analyzed by Head of Imperial Environment Research Lab

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ANNEXURES

