

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)
OF
**Construction of a Electronic Waste Management &
Recycling Unit by E-Waste Management Company Pvt.
Ltd. at Dullah – Thanil Kamal Road, District Chakwal**



August, 2023



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REPORT ON ENVIRONMENTAL IMPACT ASSESSMENT

■ QUALITY CONTROL SHEET						
DOCUMENT	Report on Environmental impact assessment (EIA)					
PROJECT	Construction of a Electronic Waste Management & Recycling Unit by E-Waste Management Company Pvt. Ltd.at Dullah – Thanil Kamal Road, District Chakwal					
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NOTES						

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List of Abbreviations & Acronyms:

CC:	Construction Contractor
E-waste:	Electronic waste
SC:	Supervisory Consultants
EMP:	Environmental Management Plan
EIA:	Environmental Impact Assessment
PEPA:	Pakistan Environmental Protection Act
NOC:	No Objection Certificate
PEQS:	Punjab Environmental Quality Standards
PCB:	Printed Circuit Board
NO _x :	Nitrogen Oxides
SO _x :	Sulfur Dioxide
CO:	Carbon Mono Oxide
PM:	Particulate Matter
WHO:	World Health Organization
ILO:	International Labor Organization
EMMM:	Environmental Management Mitigation Matrix
EPA:	Environmental Protection Agency
LAA:	Land Acquisition Act

STRUCTURE OF THE REPORT

This document is structured as follows:

- Chapter-1: Executive Summary
- Chapter-2: Introduction
- Chapter-3: Regulatory Framework for EIA
- Chapter-4: Project Description
- Chapter-5: Description of Environment
- Chapter-6: Potential Environmental Impacts
- Chapter-7: Environmental Management Plan
- Chapter-8: Stakeholder Consultation
- Chapter-9: Conclusion

Annex-I:	Master Plan of The Project
Annex-II:	Socio-Economic Performa
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1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

Electronic waste (e-waste), known to be hazardous to environment and human health is the fastest growing stream of waste in the world. E-waste generated in most of the countries is managed in three ways: (i) by dumping it to waste bins, (ii) through formal collection by government recognized bodies, and (iii) collection outside the formal system by individual waste dealers and companies (Chi et al., 2014). Electronic waste that's collected by official businesses or government services is typically recycled using modern technology and equipment at specialized facilities, ensuring multiple precious metals (e.g. gold, platinum, palladium, ruthenium, rhodium, iridium, copper, and silver) along with other valuable materials such as iron, aluminium, cobalt, indium, germanium, bismuth, and antimony are safely removed (formal recycling). On the other hand, e-waste that's thrown in landfills or sold to unauthorized sellers can harm the environment by releasing harmful substances into the soil, groundwater, and air, as well as contaminating surface water (Ahirwar et al., 2021; Cesaro et al., 2019; Man et al., 2013).

Toxic substances present in Electronic waste (e.g. heavy metals, brominated flame retardants, and polychlorinated biphenyls), or those produced during recycling activities (e.g. polycyclic aromatic hydrocarbons, polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans), and used for extracting metals (e.g. acids like HCl, H₂SO₄, HNO₃, HClO₄, NaClO) are often emitted in the local environment as primary, secondary and tertiary emissions, respectively from informal recycling, leading to an increase in the levels of toxic pollutants in the ecosystem (Kumar et al., 2019; Orlins and Guan, 2016; Quan et al., 2015; Zhang et al., 2015; Grant et al., 2013). A substantial amount of valuable resources are also lost through disposing or during recycling under inferior conditions. Thus, formal e-waste recycling is the safest way to manage e-waste. Most of the e-waste, specially in Asian and African countries is managed by the informal sector (Deubzer et al., 2019). Recent estimates suggest that only about 17.4 % (9.3 Mt) of the global e-waste generated in 2019 has been collected and recycled in the formal sector, leaving the flow of rest 44.3 Mt (82.6 %) e-waste undocumented (Forti et al., 2020).

Pakistan is at the receiving end and emerged as a major destination for large volume of electrical and electronic waste coming from the United States, EU, and Australia. This combined with the in-house generation is creating serious problem for their efficient management. In a latest report titled 'Waste Sector Inclusion in the Revised Nationally Determined Contributions of Pakistan', ADB revealed that Pakistan annually generates around 28 million tons of municipal waste.

E-Waste Management (Pvt) Ltd is a pioneer in Pakistan to deal in all types of Electronics and Electrical Waste materials and recycle them as per the Environmental Rules and Regulations of the Government of Pakistan. E-Waste Management (Pvt) Ltd offer full recycling services to organizations of any size as well as to the public. E-Waste Management (Pvt) Ltd is the leading provider of comprehensive e-waste management services and solutions ranging from collection and disposal of e-waste to recycling. E-Waste Management (Pvt) Ltd deliver world-class amenities to ensure discarded electronic items are efficiently managed, disposed of and recycled.

The Proponent has decided to Construct a Electronic Waste Management & Recycling Unit at Dullah – Thanil Kamal Road, District Chakwal The estimated cost of the project is approximately **Rs. 50 million including the land cost**. It has been planned to complete the project in **one year**. The Project site is geographically located at **33° 09'00.48" N, 72° 42'00.64" E**

The major **objectives** of the project are as under:

- Installation of a Electronic Waste Management & Recycling unit in to comply with PEQS.
- Zero e-waste and Re-usage.
- Provision of technology-driven platform (web portal & Integrated Mobile App) for e-waste operations and data management and end-to-end automated solution for collection, storage, and safer disposal.
- Engagement and Streamlining of Informal Sector
- Establishing formal recycling facility (e-waste recycling machine) to recover precious metals in e-waste through sustainable way with zero emissions.
- Plan for collection and channelization of e-waste on behalf of producers through Extended Producer Responsibility (EPR) system.
- Contribution to Sustainable Development Goals (SDGs) and Vision 2030.

1.1.1 PURPOSE OF REPORT

The purpose of the EIA study is to identify the possible beneficial and adverse environmental impacts of the project as presently envisaged and propose the applicable mitigation measures to be implemented during the construction and operational stages of the project to minimize the negative impacts and preparation of Environmental Management Plan (EMP).

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

- a. Punjab Environmental Protection Act (PEPA), 1997 (Amended 2012)
- b. Pakistan Environmental Protection Agency Regulations, 2022 for Review of IEE and EIA.
- c. Pakistan Environmental Impact Assessment Procedures, 2000.
- d. Guidelines for Preparation and Review of Environmental Reports.

1.2 NEED OF ENVIRONMENTAL ASSESSMENT

The preparation and submission of an Environmental impact assessment (EIA) Report for any development project is a statutory obligation under the Punjab Environmental Protection Act, 1997 (PEPA, 1997) amended 2012 in terms of Section 12 of the Act which states as under:

“No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency, an environmental impact assessment or where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof.”

Categorization of the Project

The current Project falls under **Schedule- II, Section B** (Manufacturing & Processing) Sub-section-21 (Resource recovery units) of IEE/EIA Regulation 2022 and thus requires Environmental Impact Assessment – EIA.

1.3 IDENTIFICATION OF PROJECT AND PROPONENT

The proposed Project consists of the Construction of a Electronic Waste Management & Recycling Unit at Dullah – Thanil Kamal Road, District Chakwal. A brief detail of the project and the proponent is given as under:-

1. Name of proponent	Shahbaz Gul (CEO) +92-332-5689380
2. Name of project	Construction of a Electronic Waste Management & Recycling Unit
3. Location of the site	Dullah – Thanil Kamal Road, District Chakwal
4. Nature of the project	E-waste recycling and management
5. Major process during construction	Excavations, Concrete Mixing, Construction, and Finishing
6. Estimated cost of the project	Rs. 50 Million
7. Land area of the project	27 Kanals
8. Electricity connection capacity	100 KVA
9. Production Capacity of plant	08 tons/days
10. Project start	Right after getting NOCs from all relevant departments
11. Project completion duration	1 Year

1.4 DETAILS OF CONSULTANTS

SEAL Consultancy Services is providing its services to conduct an Environmental Impact Assessment (EIA) for the project. The firm has vast experience and expertise in this field. The team of experts is given as under:-

Table 1.1: Details of Consultants

Sr. No.	Team Member	Position Held	Qualifications
1.	Mr. Adnan Khan	Chief Environmentalist Team Leader- IEE/EIA	M.Phil. Environmental Sciences (UVAS), M.Sc. Environmental Sciences (PU), NEBOSH
2.	Dr. Sajid Hassan	Geology/Hydrology/ Hydraulic Specialist	Ph.D. Combustion Engineering (Imperial College, London) Post-graduation Diploma of Environmental Pollution (Imperial College, London) BSc Chemical Engineering (UET, Lahore)
3.	Dr. Jabir Hussain Syed	E-waste specialist	Ph.D Environmental Biology (GIG-CAS China/Quaid-I-Azam University, Islamabad) M.Phil Environmental Biology (Quaid-I-Azam University, Islamabad) B.Sc. (Hons) Soil Sciences (Pir Mehr Ali Shah University of Arid Agriculture Rawalpindi)
4.	Mr. Arshad Ali	Chief Chemist	BS Chemistry, University of Punjab (PU)
5.	Mr. Naveed Ahmad	Sociologist	M.Sc. Sociology University of the Punjab, Lahore.
6.	Mr. Sheikh Obaid-ur-Rehman	Sr. Ecologist	M.Sc. Forestry

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Kot Lakhpat | Lahore | Pakistan

1.5 REGULATORY FRAMEWORK FOR EIA

The project will comply with all the national legislation relating to the environment as specified in the Pakistan Environmental Protection Act (PEPA), 1997. The national legislation relating to the environment in Pakistan to obtain the required regulatory clearances are listed below:

- The National Conservation Strategy, 1992
- Punjab Environmental Protection Act 1997 Amended 2017
- The Pakistan Environmental Protection Agency Regulations, 2000
- The National Environment Policy, 2005
- The National Forest Policy, 2001
- Punjab Environmental Quality Standards (PEQS) 2016
- The Forest Act of 1930
- The Provincial Wildlife Act 1974 (Amended 2007)
- The Factories Act, 1934
- Hazardous Substance Rules, 2003
- Punjab Hazardous Substances rules, 2018

The other provincial and departmental applicable laws and regulations include Pakistan Explosives Act. 1884, Pakistan Penal Code, 1860, etc.

1.6 PROJECT DESCRIPTION

The project development consists of a Construction of a Electronic Waste Management & Recycling Unit located at Dullah – Thanil Kamal Road, District Chakwal. The total project area is Approx. 27 Kanals. E-waste recycling and management involves the proper handling, disposal, and recycling of electronic waste

to minimize its environmental impacts and promote resource recovery. There are various modern day technologies to recycle e-waste as the current project is based on Printed Circuit Board (PCB) recycling process.

Printed Circuit Board (PCB) Recycling Machine:

Printed Circuit Board (PCB) recycling machine is applied to process all kinds of Waste Electrical and Electronical Equipment (WEEE). PCB recycling machine is designed especially for recycling e-waste circuit boards into metals and nonmetal materials. It can be used to recycle scrap printed circuit boards, CCL (copper-clad plate), the leftover materials from the PCB, computer boards, TV boards, and the waste motherboards generated from all kinds of electric appliance. This PCB recycling machine adopts dry type and physical crushing, separation and dedusting methods, which can keep no pollution to the environment. And the high-pressure electrostatic separation combined with air separation process, which can purify approximately 99% metal powder. The establishment of a formal PCB recycling plant in Pakistan is a critical step in addressing the country's e-waste problem and generating economic avenues by recycling as per the Environmental Rules and Regulations of Government of Pakistan. The plant will use state-of-the-art technology to extract valuable materials safely and efficiently from discarded PCBs, such as copper and gold, while ensuring the safe disposal of hazardous materials.

1.7 ANALYSIS OF ALTERNATIVES

No Project Alternative

No project option mean that the project is necessary and there is no other option. The present project is the 'Construction of a Electronic Waste Management & Recycling Unit located at Dullah – Thanil Kamal Road, District Chakwal". As the project site is already owned by the proponent so there is no other option for the project.

Site Alternative:

Site alternative was not considered as the Project of "Construction of a Electronic Waste Management & Recycling Unit located at Dullah – Thanil Kamal Road, District Chakwal" is already owned by the proponent.

Technology Alternatives

There exist many project alternatives as Conventional Mechanical Recycling, Pyrometallurgical Smelting and Hydrometallurgical Processes etc. Printed Circuit Board (PCB) Recycling process design was selected to recycle e-waste based on good of efficiency, resource recovery and less environmental impacts.

1.8 DESCRIPTION OF ENVIRONMENT

To work out the impacts and related mitigation measures, it is most important to prepare a database of Study Areas as well as Project areas. The detail is given below:

1. Physical environment

Topography & Geology: Chakwal District is located in the Punjab province of Pakistan. It is situated in the northern part of Punjab and is characterized by a diverse topography that includes hills, plains, and valleys. The geology of Chakwal is primarily composed of sedimentary rocks, with a range of formations representing different periods in Earth's history.

Seismology: The project site falls in the Punjab plain which shows a low to moderate level of seismicity. The project area lies in seismic Zone 2B. It is therefore recommended that the project structures should be designed to cater to the requirements of Zone 2B of the Building Code of Pakistan (2007).

Climate: District Chakwal has distinct seasons marked by wide variation in temperature. The coldest month is January in which the mean maximum temperature is 17 °C and the mean minimum temperature is 4 °C. June is the hottest month with the mean maximum temperature near 42 °C and the mean minimum temperature as 26°C. The average annual rainfall during the last 30 years period works out to be greater than 50 mm. Nearly 70% of it received in the form of high intensity showers during the monsoon (July, August, September) and the remaining in winter. On average, August is the most humid month, at 71% and May is the least humid month, at 38.0%.

Ambient Air Quality: The monitored parameters included Carbon mono-oxide (CO), Nitrogen oxides (NOx), Sulphur oxides (SOx), Particulate Matter

(PM10). Ambient air quality was monitored for this study at the proposed site for 24 hours. The quality of air complied with PEQS.

Noise Level: The major source of noise generation is vehicular traffic outside the society and during construction, the noise levels may be high due to civil works. Noise levels were meeting with PEQS.

Groundwater Quality: To determine the existing quality of groundwater, samples from the site were collected for laboratory analysis. Based on the laboratory test results, it was found that the TDS of groundwater was higher than PEQS limit and other chemical and biological parameters comply with the Punjab Environmental Quality Standards (PEQS). However, the groundwater can be used for bathing, washing, general purpose activities.

Solid waste: In the proposed project area the Town/Tehsil Municipal Administration (TMAs) are responsible for the solid waste collection, transportation and disposal. Solid waste that will be generated due to the implementation and operation of the project will be collected and disposed by the contractors.

Ecological

Fauna: The fauna of Chakwal located in Punjab, Pakistan, comprises a diverse array of wildlife species adapted to the region's varied habitats, including its semi-arid landscapes and hilly terrain. Some of the notable fauna found in the Chakwal region including

- **Mammals:** Indian crested porcupine, Indian pangolin, desert cat, mongoose, foxes, wild boars and jackals.
- **Birds:** Partridges, quails, larks, sparrows, doves, vultures, eagles, and kestrels.
- **Reptiles:** Geckos, agamas and snakes.
- **Insects:** Butterflies, bees, beetles and other insects.
- **Domesticated Livestock:** Cattle, goats, sheep, and poultry.

Flora: The flora of the Chakwal region, located in Punjab, Pakistan, showcases a variety of plant species adapted to the local climate, topography, and soil conditions. The region's vegetation can be broadly categorized as

- Dry Scrubland and Shrub Vegetation: *Acacia arabica* (babul), *Prosopis cineraria* (kikar) and *Ziziphus mauritiana* (ber).
- Grasslands and Pastures: *Cenchrus ciliaris* (dhaman), *Chrysopogon aucheri* (tharki), and *Aristida adscensionis* (phulai).
- Riparian Vegetation: *Populus euphratica* (sufaida) and *Tamarix indica* (jand).
- Cultivated Crops: wheat, barley, maize, millets, and various types of pulses being cultivated. Fruit trees like citrus, guava, and pomegranate are also grown.

2. Socio-economic

Neighborhood: On east side of project site Dullah Thanil Kamal Road is present. On north, west and south sides there is a agriculture land. The nearest population is Dullah village and Thanil Kamal village present near the project area is at the distance of 1 KM and 2.40 KM respectively. Through Dullah Thanil Kamal Road Project site has direct access to Motorway M2 that is located 4.7 KM.

Archeologist and Historical Treasures: The project site is mixed with agricultural, residential activities and there is no archeology or historical building near purposed project area Social and Cultural Resources

Quality of Life: The project area is situated on Dullah Thanil Kamal Road road that is mixed with agricultural, residential activities. The nearest population is Dullah village and Thanil Kamal village present near the project area is at the distance of 1 KM and 2.40 KM respectively. These communities have the facilities like metaled roads, sewerage, commercial area shops, water supply, public transport but deprived of big hospitals, colleges and universities. Mostly the people belongs to their own business, private and government jobs and farmers. There is a rising trend in the society to change their traditional socioeconomic pattern of life. Print and electronic media are playing key role in bringing tangible change in the old pattern of life.

Education and Literacy: The community that lived near the project site is mostly semi-educated. Government schools exist near the project site. The nearest school at a distance of 1.40 KM is Government High school Basti Abdullah in Dullah village.

Public Health: A rural health centre exist in Dullah Village that is about 2.50 KM from project site. A pharmacy can also be found in the Dullah village of the purposed project site. A veterinary dispensary is also present with rural health centre Dullah.

1.9 STAKEHOLDERS AND PUBLIC CONSULTATIONS

Under guidelines, the consultation process was carried out to share the information with the stakeholders/public on the proposed works and the expected impacts on the physical, biological, and especially socio-economic conditions of the project corridor.

At various locations along with the project site, stakeholders/public consultations were carried out along the project corridor. Most of the public was in favor of the project. The major concerns/issues raised by the stakeholders were re Company workers should take care of the culture of the area during the installation of the E-waste recycling plant and Employment should be given to local men etc.

1.10 IMPACTS AND MITIGATION MEASURES

1. Pre-construction

Land Acquisition:

No impact pertaining to land acquisition as the land is already owned by the proponent and there is no dispute exists relevant to the land acquisition.

Design

The design of the e-waste recycling plant will not affect the adjacent areas of the project site. The proposed e-waste recycling machine is specially designed for separating and recycling precious metals and resin fiber from scrap PCB boards (e-waste). Overall, the appropriate designing will pose positive impact on the environment.

2. Constructional Phase

Impacts

- Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the Project Site and its

nearby surroundings. Spillage from the generator or moving vehicle may cause contamination of soil at construction sites.

- The construction site will generate solid wastes from site camps and construction debris from construction activities. The inappropriate disposal methods may harm the physical environment of the project area.
- Sewage wastewater generated from the construction site may contaminate groundwater, if not disposed of properly.
- Construction activities like excavation, transportation of construction material, unloading and storage of material generate dust emissions. The particulate matter of PM₁₀ and PM_{2.5} are of major health concern. Moreover, the use of machinery like batching plants, excavators, dump trucks and other transport vehicles, is a source of exhaust emissions such as particulate- matter PM₁₀, PM_{2.5}, CO, NO_x and SO_x in the ambient air.
- During construction phase, a large number of equipment and construction machinery will be utilized that include excavators, concrete mixers, trucks, and other machinery and vehicles. The operation and movement of these equipment and machinery and vehicles will increase the noise and vibration in the Project Area and neighborhood may be disturbed by the noisy activities.
- During construction phase of the project, a small quantity of construction waste will be produced, the disposal of which, if not managed properly could have negative impacts on the site and surrounding areas.
- Due to the movement of large construction vehicles, there may be traffic congestion causing problems to the workers and the local community

Mitigations

- Soil contamination can be curtailed by reducing the oil spill at project construction areas by well maintaining the construction vehicles as well as generators.
- The Contractor is required to impart proper training to his workforce in the handling and proper disposal of solid waste.
- A proper drainage facility will be provided to avoid water accumulation, which will minimize soil contamination. Sewage from construction camp will be disposed of using septic tank which has been designed properly.

- Tuning of vehicles should be made mandatory to reduce the emissions of NO_x, SO_x, CO, and PM₁₀. Equipment and vehicles powered with diesel should be well maintained to minimize particulate emissions. Haul-trucks carrying, earth, sand, aggregate, and other materials should be kept covered during transportation of materials and storage at site, with tarpaulin. Sprinkling of water by water trucks will be done on roads and other dusty area.
- Temporary boundary wall will be made of wood will be constructed that will act as barrier for air emissions, noise and vibration going towards residential area. Enforcement of the use of PPEs where required.
- For the construction machinery generating noise level above that prescribed limits of PEQS, the Contractor will make arrangements to bring the noise level within applicable limits by arranging proper tuning of vehicles and ensuring the use of mufflers/silencers. Movements of the trucks and other construction machinery causing high noise levels must be restricted at night time to avoid disturbance to the nearby locality.
- A site waste management plan should be made the responsibility of the construction contractor to provide designated waste storage area on the site and a schedule for the timely collection and removal of construction debris to an approved dump site.
- The organic waste produced during site clearing can be mechanically mulched and composted at the site and used for landscaping. Arrangements should be made for regular garbage collection and its removal from the construction site.
- During the construction phase, traffic control measures will be implemented. All raw materials will not be transported at peak working hours in order to avoid traffic congestion and avoid accidents

3. Operational Phase

Impacts

- None of wastewater from any process of project will be produced. Only Sewerage wastewater from washrooms will be produced during the operational phase

- Only municipal solid waste from offices and kitchen waste will be produced. Sludge from septic tank will also be generated.
- There will be air emissions and noise of generators during the operation that will not impact the nearby residencies because that is far way but the noise may have impact on the workers and staff working close to the generators.
- The workers working on PCB recycling plant may expose to HSE hazards like generation of dust and particulate matter, release of volatile organic compounds (VOCs) or hazardous fumes, high levels of noise and vibration.
- There is a need for a vigilant security presence in and around the building around the clock permanently to guard against theft and terrorist activities. The security concerns will have to be addressed adequately. Any threat to security should be dealt with as a major challenge.

Mitigation

- All the wastewater after passing through the septic tank will be discharged into drain through contractor
- All of municipal solid waste and sludge from septic tank disposed off through contractor/TMA.
- To mitigate the noise impact the generator will be put in a separate generator room with sound proofing and it will be compulsory to use PPEs in case of Inspection and any other activity in generator room.
- Specific mitigation measures for OHS related to PCB recycling machine operations will be taken like use local exhaust ventilation systems, Isolate noisy equipment within soundproof enclosures or rooms and training of workers on safe operating practices.
- Provide workers with appropriate personal protective equipment (PPE), such as dust masks, respirators, earing protection (e.g., earplugs or earmuffs) and anti-vibration gloves and tools
- Conduct regular air quality, noise and vibration related monitoring to ensure compliance with occupational exposure limits
- A comprehensive Security Plan is already developed and in place for the industry which includes construction of a security check post on the entrance gates consisting of security guards.

1.11 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

A comprehensive, Environmental Management Plan (EMP) has been developed for the Project. An Environmental Mitigation Management Matrix (MMM) has been prepared considering impacts on different components of the physical, ecological, and socio-cultural environment. Also, a comprehensive monitoring program has been proposed. The EMP includes a Review of regulatory requirements and applicable standards, MMM Institutional Arrangements for Implementation of EMP, Roles, and Responsibilities of different agencies, Environmental Monitoring Plan, Training Program and Environmental Management and Monitoring Cost.

1.12 CONCLUSION

- The project aims in the Construction of a Electronic Waste Management & Recycling Unit at Dullah – Thanil Kamal Road, District Chakwal. According to the “Punjab Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2022” the project falls in schedule II. Accordingly, this EIA has been prepared for issuance of NOC/EA by the EPA, Government of the Punjab, Lahore before initiation of the project on ground.
- Based on the EIA report, it can be concluded that the project will give job opportunities to the locals and outsiders that come to Dullah – Thanil Kamal Road, District Chakwal for livelihood. Further, the implementation of the environmental mitigation measures, proper monitoring, and compliance with the environmental standards/legislations will make the Project environmentally more sustainable.
- Therefore, it is recommended that Environmental Approval may be issued to the Proponent for the Proposed Project by the Punjab Environmental Protection Agency, to protect the Environment, provided the Proponent adheres to EMP and monitoring Plan during construction and operational phases.

2. INTRODUCTION

Electronic waste (e-waste), known to be hazardous to environment and human health is the fastest growing stream of waste in the world. E-waste generated in most of the countries is managed in three ways: (i) by dumping it to waste bins, (ii) through formal collection by government recognized bodies, and (iii) collection outside the formal system by individual waste dealers and companies (Chi et al., 2014). Electronic waste that's collected by official businesses or government services is typically recycled using modern technology and equipment at specialized facilities, ensuring multiple precious metals (e.g. gold, platinum, palladium, ruthenium, rhodium, iridium, copper, and silver) along with other valuable materials such as iron, aluminium, cobalt, indium, germanium, bismuth, and antimony are safely removed (formal recycling). On the other hand, e-waste that's thrown in landfills or sold to unauthorized sellers can harm the environment by releasing harmful substances into the soil, groundwater, and air, as well as contaminating surface water (Ahirwar et al., 2021; Cesaro et al., 2019; Man et al., 2013).

Toxic substances present in Electronic waste (e.g. heavy metals, brominated flame retardants, and polychlorinated biphenyls), or those produced during recycling activities (e.g. polycyclic aromatic hydrocarbons, polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans), and used for extracting metals (e.g. acids like HCl, H₂SO₄, HNO₃, HClO₄, NaClO) are often emitted in the local environment as primary, secondary and tertiary emissions, respectively from informal recycling, leading to an increase in the levels of toxic pollutants in the ecosystem (Kumar et al., 2019; Orlins and Guan, 2016; Quan et al., 2015; Zhang et al., 2015; Grant et al., 2013). A substantial amount of valuable resources are also lost through disposing or during recycling under inferior conditions. Thus, formal e-waste recycling is the safest way to manage e-waste. Most of the e-waste, specially in Asian and African countries is managed by the informal sector (Deubzer et al., 2019). Recent estimates suggest that only about 17.4 % (9.3 Mt) of the global e-waste generated in 2019 has been collected and recycled in the formal sector, leaving the flow of rest 44.3 Mt (82.6 %) e-waste undocumented (Forti et al., 2020).

Pakistan is at the receiving end and emerged as a major destination for large volume of electrical and electronic waste coming from the United States, EU, and Australia. This combined with the in-house generation is creating serious problem for their efficient management. In a latest report titled 'Waste Sector Inclusion in the Revised Nationally Determined Contributions of Pakistan', ADB revealed that Pakistan annually generates around 28 million tons of municipal waste.

E-Waste Management (Pvt) Ltd is a pioneer in Pakistan to deal in all types of Electronics and Electrical Waste materials and recycle them as per the Environmental Rules and Regulations of the Government of Pakistan. E-Waste Management (Pvt) Ltd offer full recycling services to organizations of any size as well as to the public. E-Waste Management (Pvt) Ltd is the leading provider of comprehensive e-waste management services and solutions ranging from collection and disposal of e-waste to recycling. E-Waste Management (Pvt) Ltd deliver world-class amenities to ensure discarded electronic items are efficiently managed, disposed of and recycled.

The Proponent has decided to Construct a Electronic Waste Management & Recycling Unit at Dullah – Thanil Kamal Road, District Chakwal The estimated cost of the project is approximately **Rs. 50 million including the land cost**. It has been planned to complete the project in **one year**. The Project site is geographically located at **33° 09'00.48" N, 72° 42'00.64" E**

The major **objectives** of the project are as under:

- Installation of a Electronic Waste Management & Recycling unit in to comply with PEQS.
- Zero e-waste and Re-usage.
- Provision of technology-driven platform (web portal & Integrated Mobile App) for e-waste operations and data management and end-to-end automated solution for collection, storage, and safer disposal.
- Engagement and Streamlining of Informal Sector
- Establishing formal recycling facility (e-waste recycling machine) to recover precious metals in e-waste through sustainable way with zero emissions.
- Plan for collection and channelization of e-waste on behalf of producers through

Extended Producer Responsibility (EPR) system.

- Contribution to Sustainable Development Goals (SDGs) and Vision 2030.

2.1 PURPOSE OF REPORT

The purpose of the EIA study is to identify the possible beneficial and adverse environmental impacts of the project as presently envisaged and propose the applicable mitigation measures to be implemented during the construction and operational stages of the project to minimize the negative impacts and preparation of Environmental Management Plan (EMP).

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

- e. Punjab Environmental Protection Act (PEPA), 1997 (Amended 2012)
- f. Pakistan Environmental Protection Agency Regulations, 2022 for Review of IEE and EIA.
- g. Pakistan Environmental Impact Assessment Procedures, 2000.
- h. Guidelines for Preparation and Review of Environmental Reports.

2.2 NEED OF ENVIRONMENTAL ASSESSMENT

The preparation and submission of an Environmental impact assessment (EIA) Report for any development project is a statutory obligation under the Punjab Environmental Protection Act, 1997 (PEPA, 1997) amended 2012 in terms of Section 12 of the Act which states as under:

“No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency, an environmental impact assessment or where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof.”

Categorization of the Project: The current Project falls under Schedule- II, Section B (Manufacturing & Processing) Sub-section-21 (Resource recovery units) of IEE/EIA Regulation 2022 and thus requires Environmental Impact Assessment – EIA.

2.3 IDENTIFICATION OF PROJECT AND PROPONENT

The proposed Project consists of the Construction of a Electronic Waste Management & Recycling Unit at Dullah – Thanil Kamal Road, District Chakwal. A brief detail of the project and the proponent is given as under:-

1. Name of proponent	Shahbaz Gul (CEO) +92-332-5689380
2. Name of project	Construction of a Electronic Waste Management & Recycling Unit
3. Location of the site	Dullah – Thanil Kamal Road, District Chakwal
4. Nature of the project	E-waste recycling and management
5. Major process during construction	Excavations, Concrete Mixing, Construction, and Finishing
6. Estimated cost of the project	Rs. 50 Million
7. Land area of the project	27 Kanals
8. Electricity connection capacity	100 KVA
9. Production Capacity of plant	08 tons/days
10. Project start	Right after getting NOCs from all relevant departments
11. Project completion duration	1 Year

2.4 DETAILS OF CONSULTANTS

SEAL Consultancy Services is providing its services to conduct an Environmental Impact Assessment (EIA) for the project. The firm has vast experience and expertise in this field. The team of experts is given as Table 2.1:-

Table 2.1: Details of Consultants

Sr. No.	Team Member	Position Held	Qualifications
1.	Mr. Adnan Khan	Chief Environmentalist Team Leader- IEE/EIA	M.Phil. Environmental Sciences (UVAS), M.Sc. Environmental Sciences (PU), NEBOSH
2.	Dr. Sajid Hassan	Geology/Hydrology/ Hydraulic Specialist	Ph.D. Combustion Engineering (Imperial College, London) Post-graduation Diploma of Environmental Pollution (Imperial College, London) BSc Chemical Engineering (UET, Lahore)
3.	Dr. Jabir Hussain Syed	E-waste specialist	Ph.D Environmental Biology (GIG-CAS China/Quaid-I-Azam University, Islamabad) M.Phil Environmental Biology (Quaid-I-Azam University, Islamabad) B.Sc. (Hons) Soil Sciences (Pir Mehr Ali Shah University of Arid Agriculture Rawalpindi)
4.	Mr. Arshad Ali	Chief Chemist	BS Chemistry, University of Punjab (PU)
5.	Mr. Naveed Ahmad	Sociologist	M.Sc. Sociology University of the Punjab, Lahore.
6.	Mr. Sheikh Obaid-ur-Rehman	Sr. Ecologist	M.Sc. Forestry

The contact details of SEAL Consultancy Services are given as under: -

Adnan Khan (Chief Environmentalist)

Tel: +92 42 35922295-96 | Fax: +92 42 35922296 | Mobile: +92 333 4207609

E-mail: adnan@seal.com.pk

Address: Plot# 12, Asghar Industrial Estate, Green View Society, Off Kacha Jail Road,
Kot Lakhpat | Lahore | Pakistan

2.5 NATURE, SIZE AND LOCATION OF THE PROJECT

The project consists of Construction of a Electronic Waste Management & Recycling Unit. The total project area is 27 Kanals Details of the area are followed.

Description	Area
Covered Area	04 Kanals
Open Area	23 Kanals
Total Area	27 kanals

The total open area is 23 Kanals with vegetation of bushes and grasses having Indigineos trees species.

The nearest population is Dullah village and Thanil Kamal village present near the project area is at the distance of 1 KM and 2.40 KM respectively. Environmental sensitivity of the project includes the distance between the project area periphery from ecologically important features and socially significant infrastructures present in the study area. No ecology sensitive receptor such as; forest or reserved area is present within 10 km vicinity that could be impacted due to the installation and operation of the proposed project.

The site location map of the project is given as under:-



2.6 APPROACH ADOPTED TO CONDUCT THE STUDY

The following approach and methodology have been adopted for conducting the EIA studies:

I. REVIEW OF AVAILABLE DATA

A detailed review of the following available documents of the project was conducted:

- Desk Studies
- Geotechnical Investigations and Topographic Report
- Preliminary Design Report
- Construction Drawings
- Layout Plans

The basic objective of the review was to fully understand the project and the extent of the developmental activities. The review of studies helped to assess the nature and extent of the impacts related to the implementation and operation of the proposed project activities.

II. ENVIRONMENTAL BASELINE SURVEY OF THE PROJECT

Before the start of the baseline environmental survey, a checklist was developed. The major items, which were considered for the physical, ecological, and social environment, are discussed in the subsequent paragraphs.

Physical Environment

For collecting information on the physical environment, the following main parameters were considered:

- a) Land Resources (including land use, soil composition, topography, geology, contamination of soil and soil erosion, etc.)
- b) Water Resources (including available groundwater, surface water resources and natural streams, spring water, etc.)
- c) Climate (including temperature, rainfall, humidity, wind direction, etc.), Ambient Air Quality and Noise
- d) Existing solid waste management and effluents disposal practices and stormwater drainage

Ecological Environment

Under the ecological environment, the following main parameters were covered:

- a) Flora
- b) Fauna

Social and Cultural Environment

To assess the social and cultural baseline settings of the Study Area, a social survey was carried out to accomplish the following specific objectives:

- a) To establish the socio-economic conditions.
- b) To identify the potential disruption of private infrastructure.
- c) To identify poor and vulnerable groups and strategies to ensure that such groups should get benefit from the Project.
- d) To ensure adequate public/stakeholder consultations and their participation.

- e) To identify the effects on available common resources of the community due to the implementation of the Project.

III. ANALYSIS OF DATA

After the collection of the physical, ecological, environmental, and social data from both primary and secondary sources; a critical analysis was made to assess the existing baseline conditions and potential impacts.

IV. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

- Environmental positive and adverse impacts due to project location.
- Environmental positive and adverse impacts related to design.
- Environmental positive and adverse impacts resulting from project operations.
- Potential environmental enhancement measures.

V. PREPARATION OF ENVIRONMENTAL MANAGEMENT PLAN (EMP)

An EMP depicting the mitigation measures and monitoring plan has also been developed. Institutional capacity building of the Client has also been reviewed and enhancement was proposed for the effective implementation of the EMP.

3. REGULATORY FRAMEWORK FOR EIA

3.1 LEGAL STATUS

Notwithstanding the social and economic benefits, every development project interacts, in varying degrees, with physical, ecological, and human resources of the project area and its environmental assessment studies, therefore, form an essential part of the feasibility studies of every project to make it environmentally acceptable besides being technically and economically feasible. To ensure the achievement of these objectives, laws, regulations, and standards have been formulated by the relevant institutions at the respective national level and by international agencies.

Following environmental laws, standards and guidelines were referred to during the preparation of this EIA report:

3.1.1 NATIONAL CONSERVATION STRATEGY

The Pakistan National Conservation Strategy (NCS), which was approved by the federal cabinet in March 1992, is the principal policy document on environmental issues in the country (EUAD/IUCN, 1992).

The NCS outlines the country's primary approach towards encouraging sustainable development, conserving natural resources, and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment. The core areas that are relevant in the context of the proposed project are pollution prevention and abatement, restoration of rangelands, increasing energy efficiency, conserving biodiversity, supporting forestry and plantations, and the preservation of the cultural heritage.

3.1.2 NATIONAL ENVIRONMENT POLICY, 2005

The national environmental policy 2005 aims to protect conserve and restore Pakistan's environment to improve the quality of the life of citizens through sustainable development. The main objectives of the policy are;

- Conservation, restoration, and efficient management of environmental resources.
- Integration of the environmental considerations in policymaking and planning process.
- Capacity building of government agencies and other stakeholders at all levels for better environmental management.
- Meeting international obligations effectively in line with national aspirations.
- Creation of demand for the environment through mass awareness and community mobilization.

3.1.3 THE NATIONAL FOREST POLICY 2001 OF PAKISTAN

This policy covers the Renewable Natural Resources (RNR) of Pakistan i.e. Forests, Watersheds, Rangelands, Wildlife, Biodiversity, and their habitats. The policy seeks to launch a process for eliminating the fundamental causes of the depletion of RNR through the active participation of all the concerned agencies and stakeholders, to realize the sustainable development of the resources. It is an umbrella policy providing guidelines to the Federal Government, Provincial Governments, and territories for the management of their RNR. In consonance with it, the Provincial and District Governments may devise their policies under their circumstances.

The goal of this policy is to foster the sustainable development of the RNR of Pakistan, for the maintenance and rehabilitation of its environment and the enhancement of the sustainable livelihoods of its rural masses especially women, children, and other deprived groups.

The elements of the policy shall be as follows:

- Reducing the impact of socio-economic causes.
- Population planning in critical ecosystems.
- Providing substitutes to firewood in the wooded mountains.
- Reducing poverty, poverty of opportunity, and powerlessness.
- Reducing political interference in the Forestry and Wildlife Departments.
- Renovating and invigorating the institutions of RNR.

- Supporting Local Governments in the sustainable development of their RNR.
- Policies for fragile Eco-systems.
- Riverain forests.
- Irrigated Plantations.
- Preservation of relict and unique forests.
- Wildlife.
- Rangelands and desert eco-systems.
- Planting of trees and fodders on farmlands.

3.1.4 PUNJAB ENVIRONMENTAL PROTECTION (AMENDMENT) ACT (PEPA) 2012

Among many other salient features of the Punjab Environmental Protection (Amendment) Act, 2012 it empowers the Pakistan EPA to:

- Delegate powers, including those of environmental assessment, to its lower staff;
- Identify categories of projects to which the Environmental impact assessment (EIA) and Environmental Impact Assessment (EIA) provisions will apply;
- Develop guidelines for conducting EIA and/or EIA and procedures for the submission, review, and approval of the same;
- Develop environmental emission standards for parameters such as air, water, and noise and
- Enforce the provisions of the PEPA -2017 through environmental protection orders and environmental tribunals headed by magistrates with wide-ranging powers, including the right to fine violators of the Act.

The PEPA can frame environmental regulations tailored to the requirements of the province. They are also required to review and approve EIAs/EIAs of all the development projects undertaken in the Punjab province.

3.1.5 PAKISTAN ENVIRONMENTAL PROTECTION ACT, 1997

The promulgation of the Environmental Protection Ordinance, 1983 was the first codifying legislation to the issue of environmental protection. Later, the Government

passed the Pakistan Environmental Protection Act (PEPA), 1997, which is the basis of EIA/EIA studies carried out for the projects in Pakistan.

PEPA, 1997 is a fairly comprehensive legislation and provides protection, conservation, rehabilitation, and improvement of the environment. It contains concrete action plans and programs for the prevention of pollution and promotes sustainable development. The salient features of the law are:

- It covers the air, water, soil, marine and noise pollution including pollution caused by motor vehicles.
- The Act provides the National Environmental Quality Standards (PEQS) for wastewater, air emissions, and noise.
- Law provides clear-cut guidelines for EIA/EIA for various projects as per their magnitude and anticipated impacts.
- Law also empowers the Federal Government to issue notices and to enforce them for the protection of the environment.

For the effective implementation of the provisions of PEPA, 1997, Pakistan Environmental Protection Agency, headed by a Director-General was constituted. On the same pattern, Provincial Environmental Protection Agencies (EPA 's) were created in all the provinces. Environmental Tribunals were also constituted according to PEPA, 1997.

3.1.6 PAKISTAN ENVIRONMENTAL PROTECTION AGENCY REGULATIONS, 2022 FOR REVIEW OF IEE & EIA

Under Section 12 (and subsequent amendment) of the 1997 Act, a project falling under any category specified in Schedule II requires the proponent to file an IEE or EIA with the federal agency. Within ten working days of the IEE or EIA having been submitted, the federal agency will confirm that the document submitted is complete for review. During this time, should the federal agency requires the proponent to submit any additional information; the IEE or EIA will be returned to the proponent for revision, clearly listing those aspects that need further discussion. Subsequently, the federal agency shall make every effort to complete an IEE review within 45 days and an EIA review within 90 days of filing the complete information of the report.

Punjab EPA regulations - 2022 state that an EIA is required for federal or provincial projects provincial projects falling under schedule-II. EIAs are also required in cases where projects are to be implemented in environmentally sensitive areas or are likely to cause adverse environmental effects.

3.1.7 PAKISTAN ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURES

These guidelines are descriptive documents describing the format and content of EIA/EIA reports being submitted to Federal and Provincial EPA/EPD for obtaining NOC. Following are the major areas, which are covered by these guidelines:

- The Environmental Assessment report formation (scoping, type and category of project, description of the project, alternatives, site selection, baseline data).
- Assessing impacts (identification, analysis, and significance).
- Mitigation and impact management and preparing an environmental management plan.
- Reporting (format, main features, shortcomings, other forms of presentation).
- Review and decision making (role, steps, remedial options, checks, and balances).
- Monitoring and auditing (systematic follow-up, effective data management).
- Project Management (inter-disciplinary teams, programming, and budgeting).

3.1.8 GUIDELINES FOR PUBLIC CONSULTATION

The Federal EPA provides these guidelines to deal with possible approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures the incorporation of their concerns in any impact assessment study. These guidelines cover:

- Consultation, involvement, and participation of stakeholders
- Effective public consultation (planning, stages of EIA where consultation is appropriate)
- Facilitation involvement (including the poor, women, and Non-Governmental Organizations (NGOs))

3.1.9 PUNJAB ENVIRONMENTAL QUALITY STANDARDS (PEQS), 2016

The Punjab Environment Department had notified the relevant PEQS standards 2016 for:

- Ambient Air
- Drinking-Water
- Industrial Gaseous Emissions
- Motor vehicles exhaust and noise
- Noise
- Treatment of Liquid and Disposal of Bio-medical Waste by Incineration, Autoclaving, microwaving, and deep burial.
- Municipal and Liquid Industrial Effluents

3.1.10 NATIONAL RESETTLEMENT POLICY AND ORDINANCE

As referred above, at present the only legislation relating to land acquisition and compensation is the Land Acquisition Act (LAA) of 1894. Experience with large-scale infrastructure development projects implemented by institutions such as WAPDA has demonstrated the need for a cohesive national policy for resettlement. Following a national consultative process, a national resettlement policy and a related ordinance were drafted known as Draft Resettlement Policy, 2002 which still has to be approved by the government.

3.1.11 OTHER ENVIRONMENT RELATED STATUTES

This section outlines the other statutes apart from the Pakistan Environmental Protection Act, 1997, which are relevant to the project.

The Land Acquisition Act, 1894

At this point, the only legislation relating to land acquisition and compensation is the LAA of 1894. The LAA is, however, limited to a cash compensation policy for the acquisition of land and built-up property, and damage to other assets, such as crops, trees, and infrastructure.

The Project will involve the acquisition of proprietary land. The land will be acquired under the LAA 1894. In the Act, there are provisions for normal acquisition of land under Section 6 (4) or emergency acquisition under Section 17 (4).

[Pakistan Factories Act, 1934](#)

The clauses relevant to the project are those that concern the health, safety, and welfare of workers, disposal of solid waste and effluent and damage to private and public property. The Factories Act also provides regulations for handling and disposal of toxic and hazardous materials. Given that construction activity is classified as 'industry', these regulations will be applicable to the project contractors.

[Pakistan Explosives Act, 1884](#)

Under the Explosives Act, the project contractors are bound by regulations on handling, transportation, and using explosives during quarrying, blasting, and other purposes.

[The Forest Act, 1927](#)

The Forest Act empowers provincial governments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce; quarrying and felling, lopping, and the topping of trees, branches in reserved or protected areas.

[Pakistan Penal Code, 1860](#)

The Pakistan Penal Code deals with offenses where public or private property and/or human lives are affected due to the intentional or accidental misconduct of an individual or body of people. In the context of the environment, the Penal Code empowers the local authorities to control noise, noxious emissions, and disposal of effluents. The PEQS enforced by the EPAs supersedes the application of this legislation on industries and municipalities.

Provincial Wildlife Act, 1974 Amended 2007

In addition to empowering the provincial wildlife departments to establish game reserves, parks, and wildlife sanctuaries, this Act regulates the hunting and disturbance of wildlife.

Hazardous Substance Rules, 2003

Hazardous material imports and transportation from a federal or provincial agency will require a license under the Hazardous Substance Rules, 2003, created under PEPA 1997. A safety plan and an EIA report will also be submitted with the license application for each industrial operation that generates, collects, consigns, transports, treats, disposes of, stores, handles, or imports hazardous materials. Validity of license is 3 years.

Punjab Hazardous Substances rules, 2018

According to these rules, the hazardous substances in the province of Punjab for their collection, generation, handling, consignment, transport, treatment, disposal, production, and storage, the Schedules 1, 2, 3, and 4 contain a list of the substances and the threshold amounts that fall under these regulations. The concerned authorities are required to inspect the subject industrial activity once a year and submit an annual report to the Environmental Protection Agency on the occupiers' compliance with the rules.

4. DESCRIPTION OF PROJECT

4.1 TYPE AND CATEGORY OF PROJECT

Pakistan Environmental Protection Agency (PEPA), 1997 amendment in 2012 stipulates that an IEE/EIA is mandatory for Development Projects. Therefore, an IEE is required for projects for policy procedure, filing, review and approval of environmental assessments". As The current Project falls under Schedule- II, Section B (Manufacturing & Processing) Sub-section-21 (Resource recovery units) of IEE/EIA Regulation 2022 and thus requires Environmental Impact Assessment – EIA.

4.2 GENERAL DESCRIPTION

This section describes the details of the proposed Project "Construction of a Electronic Waste Management & Recycling Unit located at Dullah – Thanil Kamal Road, District Chakwal. The detail includes the salient features of the proposed project such as project categorization, location, layout, selection of alternatives, process in brief of Electronic Waste Management & Recycling etc.,

4.3 ELECTRONIC WASTE MANAGEMENT & RECYCLING PROCESS DESCRIPTION

E-waste recycling and management involves the proper handling, disposal, and recycling of electronic waste to minimize its environmental impacts and promote resource recovery. There are various modern day technologies to recycle e-waste as the current project is based on Printed Circuit Board (PCB) recycling process who's description is given below;

4.3.1 Printed Circuit Board (PCB) Recycling Machine:

Printed Circuit Board (PCB) recycling machine is applied to process all kinds of Waste Electrical and Electronical Equipment (WEEE). PCB recycling machine is designed especially for recycling e-waste circuit boards into metals and nonmetal materials, It can be used to recycle scrap printed circuit boards, CCL (copper-clad plate), the leftover materials from the PCB, computer boards, TV boards, and the waste motherboards generated from all kinds of electric appliance. This PCB recycling

machine adopts dry type and physical crushing, separation and dedusting methods, which can keep no pollution to the environment. And the high-pressure electrostatic separation combined with air separation process, which can purify approximately 99% metal powder. The establishment of a formal PCB recycling plant in Pakistan is a critical step in addressing the country's e-waste problem and generating economic avenues by recycling as per the Environmental Rules and Regulations of Government of Pakistan. The plant will use state-of-the-art technology to extract valuable materials safely and efficiently from discarded PCBs, such as copper and gold, while ensuring the safe disposal of hazardous materials.

The following process description outlines the steps involved in dismantling and recycling Printed Circuit Boards (PCBs) using specialized machinery and equipment. The process involves several stages including shredding, crushing, separation, and dust collection.

4.3.1.1 PCB Board Preparation:

PCB boards are collected and fed into the dismantling machine. These boards contain various electronic components, metals, resins, and fibers that need to be separated for recycling.

4.3.1.2 Shredding:

In the first stage, the PCB boards are fed into a shredder. The shredder's blades break down the boards into smaller pieces, increasing the surface area for subsequent processing.

4.3.1.3 Crushing:

The shredded PCB pieces then move to the crusher. This machine further reduces the size of the material, turning it into small particles. Crushing helps to liberate the components from the board.

4.3.1.4 Eddy Vibrating Screen:

The crushed material is directed to an eddy vibrating screen. This screen uses vibrations and magnetic fields to separate metal components from non-metal ones. Metals like copper, aluminum, and gold are separated from non-metallic materials.

4.3.1.5 Air Separator:

The material that comes out of the eddy vibrating screen is transferred to an air separator. This machine utilizes air currents to separate lighter materials like plastics and fibers from heavier metals.

4.3.1.6 Electrostatic Separator:

Next, the material moves to the electrostatic separator. This equipment uses electrostatic charges to further separate metals from non-metals. The different electrical properties of materials help in precise separation.

4.3.1.7 Pulse Dust Collection:

Throughout the shredding, crushing, and separation stages, there is the generation of dust. A pulse dust collection system is employed to capture and contain this dust. This step ensures a cleaner and safer working environment.

4.3.1.8 Material Outputs:

The separated materials are collected into different categories:

Mixed Metal: This category contains valuable metals like copper, gold, and aluminum. These metals can be reused after refining.

Resin: The plastic resin separated from the boards can be processed and repurposed for other applications.

Fiber: The fibers from the PCBs can be used for various industrial purposes, like insulation.

4.3.1.9 Further Processing:

The separated materials are usually sent to specialized facilities for further refining and processing. Metals go through refining processes to purify them, while plastics and fibers might undergo additional treatment for reuse.

4.3.1.10 Environmental Considerations:

Proper disposal of any waste generated during the dismantling and recycling process is crucial. Any hazardous materials or byproducts are managed according to environmental regulations to minimize negative impacts.

4.3.1.11 Conclusion:

The PCB dismantling and recycling process using the dismantling machine, shredder, crusher, eddy vibrating screen, air separator, electrostatic separator, and dust collection system help recover valuable resources from electronic waste while minimizing environmental harm. This process promotes sustainable practices and contributes to the circular economy by reusing materials from discarded PCBs.

4.4 FLOW DIAGRAM

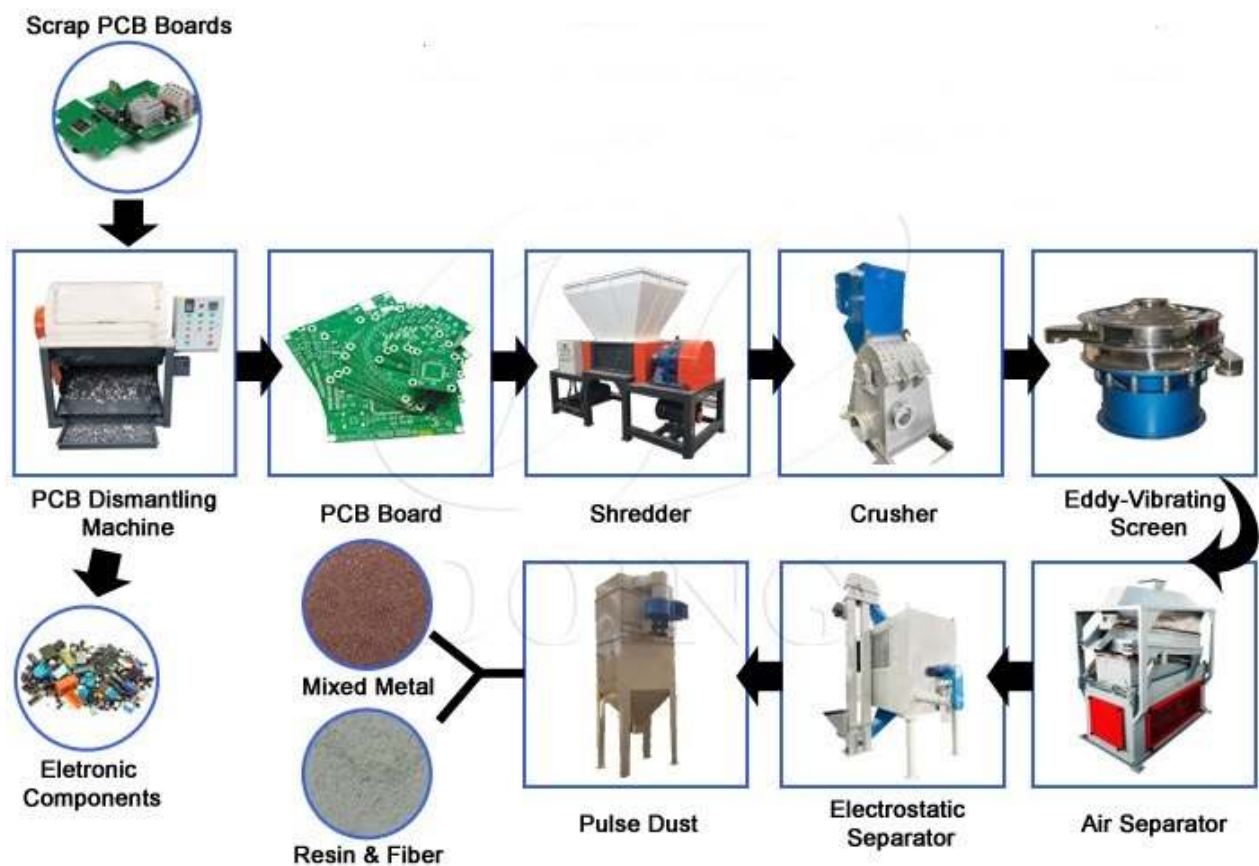


Figure 4.1 : E-Waste Recycling Flow Diagram by PCB Machine

4.5 STUDY OF ALTERNATIVES

4.5.1 ANALYSIS OF ALTERNATIVES

4.5.2 NO PROJECT ALTERNATIVE

No project option mean that the project is necessary and there is no other option. The present project is the 'Construction of a Electronic Waste Management & Recycling Unit located at Dullah – Thanil Kamal Road, District Chakwal". As the project site is already owned by the proponent so there is no other option for the project.

4.5.3 SITE ALTERNATIVE

Site alternative was not considered as the Project of "Construction of a Electronic Waste Management & Recycling Unit located at Dullah – Thanil Kamal Road, District Chakwal" is already owned by the proponent.

4.5.4 TECHNOLOGY ALTERNATIVES

Comparing the Printed Circuit Board (PCB) recycling machine with other technology alternatives for e-waste recycling highlights its advantages in terms of efficiency, resource recovery, and environmental impact. Here's a comparison highlighting why the PCB recycling machine might be considered superior to other methods:

4.5.4.1 Printed Circuit Board (PCB) Recycling Machine

Efficiency: PCB recycling machines are designed specifically to process electronic waste with printed circuit boards. They employ advanced mechanical and chemical processes to efficiently separate and recover valuable metals and components from the boards.

Resource Recovery: These machines excel at recovering valuable metals like gold, silver, and copper from the complex circuitry of PCBs. The specialized nature of the machine ensures high levels of resource extraction.

Environmental Impact: PCB recycling machines use controlled processes that minimize the release of hazardous materials into the environment. They are equipped with safety measures to handle potentially harmful substances safely.

Specialization: The machine's focus on PCBs allows for precise extraction of valuable materials from these specific components, maximizing the return on investment in terms of resource recovery.

Innovation: PCB recycling machines often incorporate cutting-edge technologies, such as advanced mechanical separation techniques and chemical leaching processes, to enhance efficiency and reduce waste.

4.5.4.2 Conventional Mechanical Recycling

Efficiency: Conventional mechanical recycling methods might not be as efficient at targeting the intricate components of PCBs, potentially leading to lower resource recovery rates.

Resource Recovery: While mechanical recycling can be effective for bulk materials, it might struggle to extract valuable metals embedded in the complex circuitry of PCBs.

Environmental Impact: Depending on the methods used, conventional mechanical recycling might generate more waste and consume more energy compared to specialized PCB recycling machines.

Specialization: Mechanical recycling processes are generally less specialized and may not be optimized for the intricate components of PCBs, leading to suboptimal results.

4.5.4.3. Pyrometallurgical Smelting:

Efficiency: Pyrometallurgical processes involve high-temperature melting, which might lead to some material loss or incomplete recovery of valuable metals.

Resource Recovery: While effective for certain materials, pyrometallurgical smelting may not be as precise as a dedicated PCB recycling machine in recovering specific metals from complex electronic components.

Environmental Impact: Smelting processes can release pollutants and emissions, potentially posing environmental risks if not properly managed.

Specialization: Pyrometallurgical methods are not tailored to the intricate nature of PCBs and might not provide the same level of precision as a specialized recycling machine.

4.5.4.4 Hydrometallurgical Processes:

Efficiency: Hydrometallurgical methods can be effective for dissolving and recovering metals from e-waste, but they might require more extensive chemical treatment.

Resource Recovery: These processes can be efficient in recovering metals from certain materials but might not target PCBs' complex components with the same accuracy as a dedicated machine.

Environmental Impact: The use of chemicals in hydrometallurgical processes can pose environmental risks if not properly managed, and wastewater treatment is crucial.

Specialization: While versatile, hydrometallurgical methods might lack the precision and efficiency of a PCB recycling machine specifically designed for this purpose.

In summary, the Printed Circuit Board (PCB) recycling machine stands out due to its specialized focus on efficiently extracting valuable metals and components from electronic waste. Its design and innovation make it particularly effective in maximizing resource recovery while minimizing the environmental impact, especially in comparison to more general recycling methods that might not be optimized for the intricacies of PCBs.

4.5.5 SITE FEASIBILITY

Economic viability, investment limitations, market volume, ensured availability of costumers, availability of dependable energy source, availability of project basic support systems, and environmental management are the main considerations. All these factors were taken into consideration while selecting a suitable site for the project. The present place from all points of view was the most suitable. The major points are being taken into consideration and their summary discussion, for the site selection, is given as under:-

- **Easy access for everyone**

The present project will be installed by E-Waste Management company and land for present project is already purchased. Project site is also near to Motorway (M4) that will be helpful for transportation of materials.

– Environment

Among many other important factors to be considered for selecting a site for any construction environmental considerations are of utmost importance. This site is at such a place where the environment is quite well. Also, there are zero emissions from this project so, the site is perfect for such type of project.

4.6 ELECTRICITY ALTERNATIVES

The main supply of electricity is from WAPDA 100 KVA and Standby Diesel Generator 02 no. 30 KVA are available in case of any electricity short fall.

4.7 WATER ALTERNATIVES

Water is necessary to carry out daily routine work and some water is also necessary during Development. For construction activities, groundwater will be used. The WASA supply is difficult to reach during early construction activities therefore for construction purposes groundwater will be used. For this purpose, a turbine well will be installed in the project area.

4.8 LOCATION AND SITE LAYOUT

Construction of a Electronic Waste Management & Recycling Unit located at Dullah – Thanil Kamal Road, District Chakwal in Punjab province. The location of the project site is given as figure 4.2;



Figure 4.2: Project Location Map

The layout plans with detailed features of the project are attached as **Annex I**

4.9 LAND USE PLAN

The present project comprising of the following features:

Total Plot Area for the project	:	27 Kanals
Covered Area including all floors	:	4 Kanals
Open area	:	23 Kanals

4.10 ROAD ACCESS

The purposed project is located at located at Dullah – Thanil Kamal Road, District Chakwal in Punjab Province that as direct access to Motorway M2 that is located 4.7 km from project site. The Road accesses are given as figure: 4.3-:



:Figure 4.3: Road Access to the Site

4.11 VEGETATION FEATURE ON SITE

There will be no cutting of trees and vegetation in construction stage of the project and more plants and trees will be planted by the client to improve environment.

4.12 WATER REQUIREMENT AND WATER BALANCE

For construction stage the ground water will be used. About average 0.75 meter cube per day of ground water will be used for the construction phase of the project. About 2 meter cube per day of the waste water will be generated from this project during operational phase and will be treated through septic tank and later disposed off into drain. The water balance for the construction phase will be as follows

Total water extraction during construction phase = 0.75 meter cube per day

Wastewater production during operation of the project = 2 meter cube per day.

4.13 WASTEWATER DISPOSAL

No wastewater will be generated from any process of the project. The wastewater that will be generated from washrooms of offices and recycling unit will pass through the septic tank of capacity 5 m³ per day and that this water will be discharged in drain.

4.14 COST AND MAGNITUDE OF THE PROJECT

Main activities will be taken during construction phase are the transportation, little excavation works, foundation works, leveling, assembling the structures, installing. The total estimated cost of the project is approximately PKR 50 Million including the land and machinery cost.

4.15 SCHEDULE OF IMPLEMENTATION

The completion duration of this project is about 1 year. There will be a symmetrical process. The process is divided into 3 phases

Preconstruction phase

This phase includes:

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

Construction phase

This phase includes:

- Management team& Construction Crew
- Transportation of machinery on site
- Excavation (little)
- Foundation making
- Provision of mechanical equipment's
- Installation of machinery

- Mitigation process
- Managing safety
- Monitoring & Evaluation

Operational phase

This phase includes:

- Implementation of fire safety, emergency evacuation plans
- Security management
- Proper handling, disposal, and recycling of electronic waste

4.16 RESTORATION AND REHABILITATION PLAN

The main areas to be considered for the site restoration include the construction area along the existing roads. The restoration work comprises the removal of temporary construction works.

No individual will have to leave the area for this project so there will be no resettlement issues. There are no trees present on-site and no trees will cut down during construction. To enhance the environmental features of the site, the indigenous trees will be planted later. Land scape plan is attached as **Annexure-I**.

4.17 GOVERNMENT APPROVALS

The project is seeking Environmental Approval from the Punjab Environmental Protection Agency (Punjab-EPA).

5. DESCRIPTION OF ENVIRONMENT

This chapter describes the baseline conditions, which cover the existing physical, ecological, and socio-economic environment of the Project Area as well as the Study Area. Information on these aspects has been derived from the desk study of available data, field visits to the Project/Study Area, and information obtained through detailed consultation with the Government departments and other agencies.

5.1 PHYSICAL RESOURCES

Chakwal District is in Pothohar Plateau of Punjab, Pakistan. It is located in the north of the Punjab province, Chakwal district is bordered by Khushab to its south, Rawalpindi to its north east, Jhelum to its east, Mianwali to its west and Attock to its north west. The district was created out of parts of Jhelum and Attock in 1985. Chakwal district borders the districts of Rawalpindi and Attock in the north, Jhelum in the east, Khushab in the south and Mianwali in the west. The total area of Chakwal district is 6,609 square kilometres, which is equivalent to 1,652,443 acres (6,687.20 km²). Based on geography, topography and geology, the project area is briefly described below:

5.1.1 TOPOGRAPHY

Chakwal District is located in the Punjab province of Pakistan. It is situated in the northern part of Punjab and is characterized by a diverse topography that includes hills, plains, and valleys. Here's an overview of the topography of Chakwal District:

i. **Salt Range Hills:** The northern and western parts of Chakwal District are dominated by the Salt Range hills. These hills are part of the larger Salt Range mountain range that runs across Punjab and Khyber Pakhtunkhwa. The Salt Range is known for its distinct geological formations and mineral deposits.

ii. **Pothohar Plateau:** The central and southern parts of Chakwal District are predominantly located on the Pothohar Plateau, which is a relatively flat and elevated region. This plateau is characterized by its rocky terrain, with scattered vegetation and limited agricultural land. The terrain of the proposed project site is predominantly flat. The project site is approximately 0.5 m to 1.0 m below the adjacent road level.

5.1.2 GEOLOGY

District Chakwal is located in the Punjab province of Pakistan and is known for its diverse geological features. The geology of Chakwal is primarily composed of sedimentary rocks, with a range of formations representing different periods in Earth's history. Here's an overview of the geology of District Chakwal:

- i. **Salt Range Formation:** The Salt Range runs through District Chakwal, and its geological history dates back to the Cambrian period. The Salt Range Formation comprises a sequence of sedimentary rocks including sandstones, shales, limestone, and gypsum deposits. Fossils found in these rocks provide insights into the ancient marine life that existed during their deposition.
- ii. **Khewra Group:** The Khewra Group is a prominent geological unit in the Salt Range. It includes the famous Khewra Salt Mines, one of the largest salt mines in the world. The group consists of salt, gypsum, and clay layers that were deposited millions of years ago in a shallow marine environment.
- iii. **Tobra Formation:** This formation is a part of the Eocene-aged rocks found in the Salt Range. It primarily consists of limestone with some shale layers. Fossils found in the Tobra Formation reveal the presence of diverse marine life during its deposition.
- iv. **Dandot Formation:** The Dandot Formation is another significant geological unit in Chakwal. It comprises sandstone, shale, and coal deposits. This formation is of Paleocene to Eocene age and represents fluvial and deltaic environments.
- v. **Siwalik Group:** In the northern part of Chakwal, the Siwalik Group is present. This group consists of sedimentary rocks formed during the Miocene and Pliocene epochs. It includes sandstones, clays, and conglomerates that were deposited in terrestrial and shallow aquatic environments. Fossils of mammals and other land-dwelling creatures are commonly found in these rocks.
- vi. **Mineral Resources:** Apart from the extensive salt deposits, Chakwal also has deposits of gypsum, limestone, and coal, which have economic significance. Limestone is used in the production of cement, while gypsum is used in construction materials.

5.1.3 SEISMOLOGY

The project site falls in the Punjab plain which shows a low to moderate level of seismicity. The project region is part of the broader Himalayan seismic zone, which is prone to earthquakes due to the collision between the Indian and Eurasian tectonic plates. The epicenters of low to moderate magnitude earthquakes recorded in the Punjab Plain are associated with the subsurface fractures in the basement rocks which are concealed by the thick alluvial deposits. There are three main faults in the Salt Range:

- Kalabagh Fault (North South)
- Jhelum Fault (North South)
- Salt range thrust fault (East-West)

In the Region of Salt Range over all earthquake occurrence frequency trend is same and area representing the moderate seismicity. A probabilistic seismic hazard assessment recently carried out for the Chakwal region as part of the revision of seismic provisions of the Building Code of Pakistan shows that the project area falls in Zone 2B. The seismic zone of Pakistan is shown in **figure 5.1**. It is therefore recommended that the project structures should be designed to cater to the requirements of Zone 2B of the Building Code of Pakistan (2007). Based on the evaluation of the tectonic setting and seismicity of the project region, it is recommended that the important project structures should be designed to withstand a horizontal peak ground acceleration of 0.15g with a 10% probability of exceedance in 50 years.

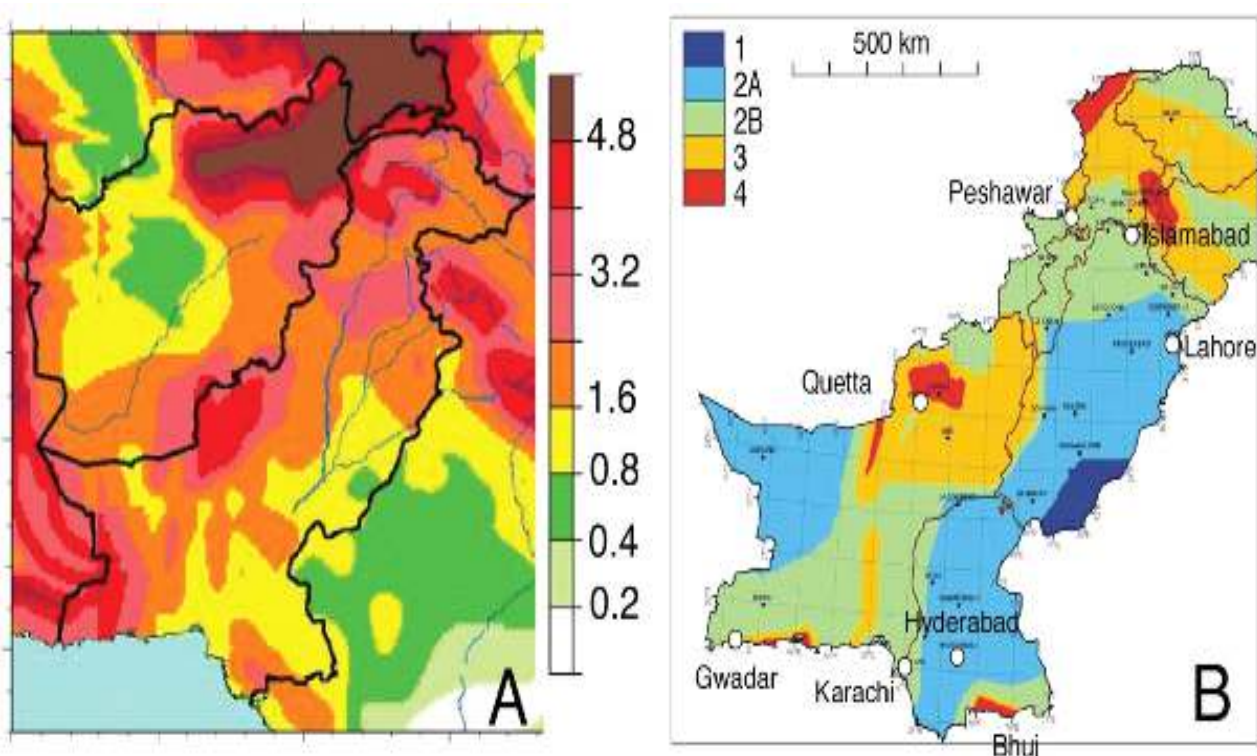


Figure 5.1: Seismic Zone of Pakistan (Geological Survey of Pakistan)

5.1.4 SOIL

Most of the soils in District Chakwal range from slit loam to loam with pH ranging from 7-9. Loamy soils are a mix of sand, silt, and clay, are also present and can support a variety of crops. These soils have good water retention and drainage properties, making them favorable for farming.

5.1.5 CLIMATE

District Chakwal has distinct seasons marked by wide variation in temperature. The coldest month is January in which the mean maximum temperature is 17 °C and the mean minimum temperature is 4 °C. June is the hottest month with the mean maximum temperature near 42 °C and the mean minimum temperature as 26°C. Mean temperature of the region during the last 30 years is given in **Figure 5-2**. The maximum temperatures diagram (**Figure 5-3**) for Chakwal displays how many days per month reach certain temperatures.

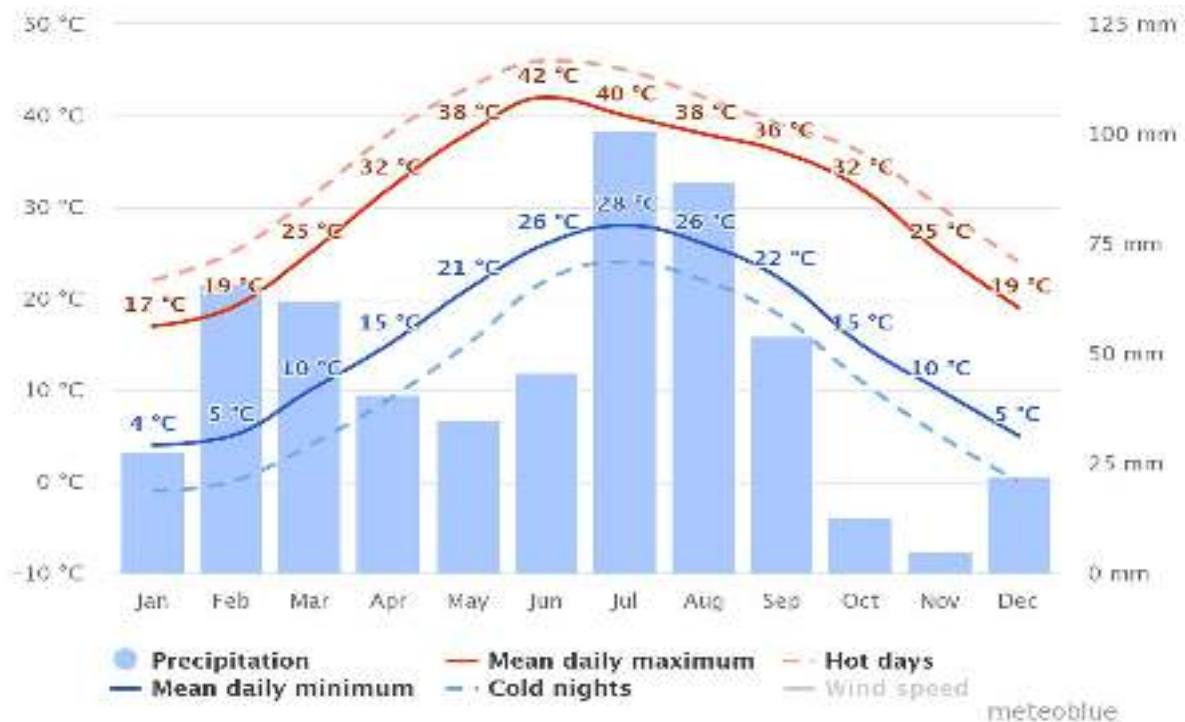


Figure 5.2: Temperature Data of Chakwal Region (Data Source: Meteoblue)

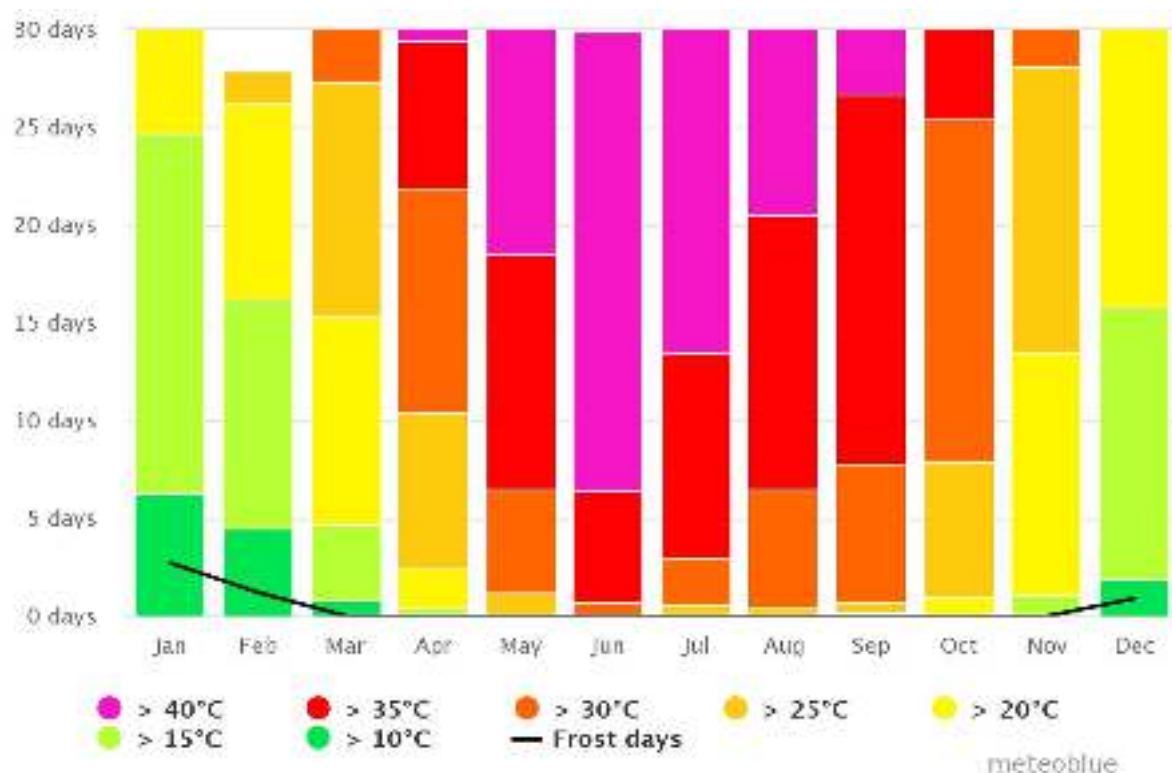


**Figure 5.3: Maximum Temperatures of Chakwal Region
(Data Source: Meteoblue Weather Monitoring Website)**

The average annual rainfall during the last 30 years period works out to be greater than 50 mm. Nearly 70% of it received in the form of high intensity showers during the monsoon (July, August, September) and the remaining in winter. The yearly variations are considerable. The average monthly rainfall at Chakwal during the last 30 years is also shown in **Figure 5-4**.

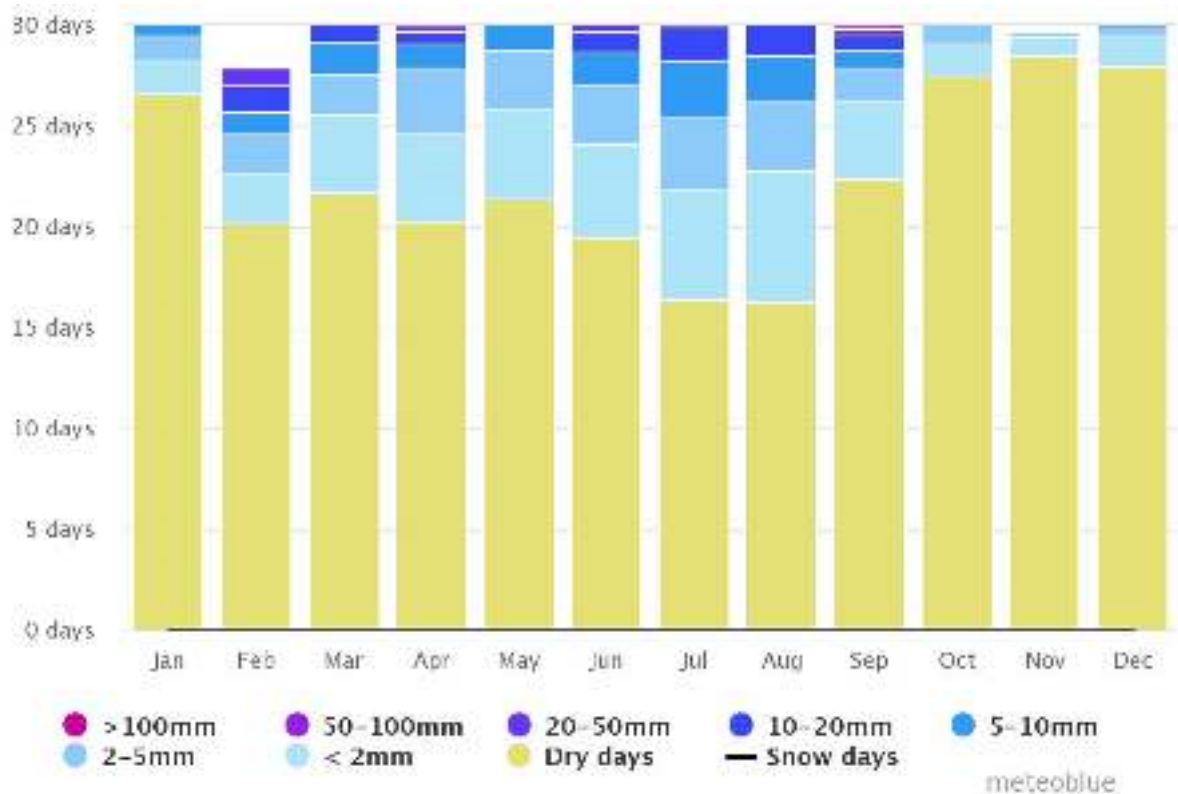


Figure 5.4: Average annual Rainfall of Chakwal Region
(Data Source: Meteoblue Weather Monitoring Website)

Figure 5-5 shows the monthly number of sunny, partly cloudy, overcast and precipitation days. Days with less than 20% cloud cover are considered as sunny, with 20-80% cloud cover as partly cloudy and with more than 80% as overcast.

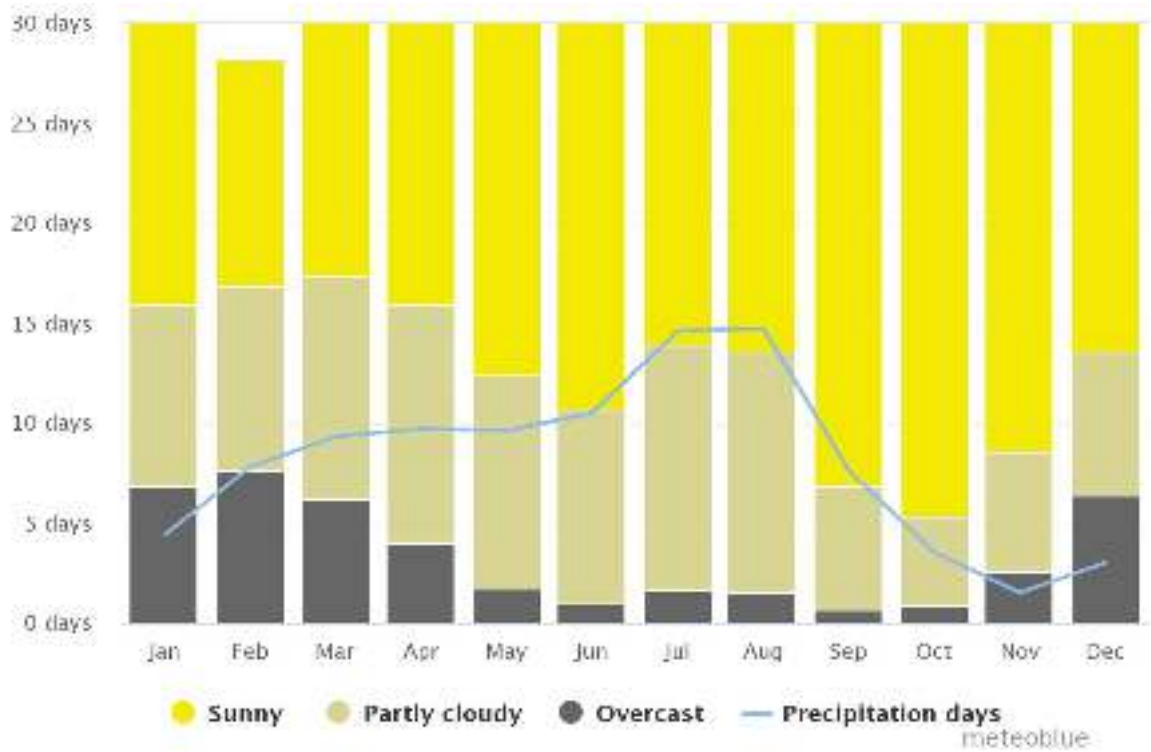


Figure 5.5: Monthly number of sunny, partly cloudy, overcast and precipitation days of Chakwal (Data Source: Meteoblue Weather Monitoring Website)

On average, August is the most humid month, at 71% and May is the least humid month, at 38.0%. The average annual percentage of humidity is: 55%. The average relative humidity of region is shown in **Figure 5-6**.

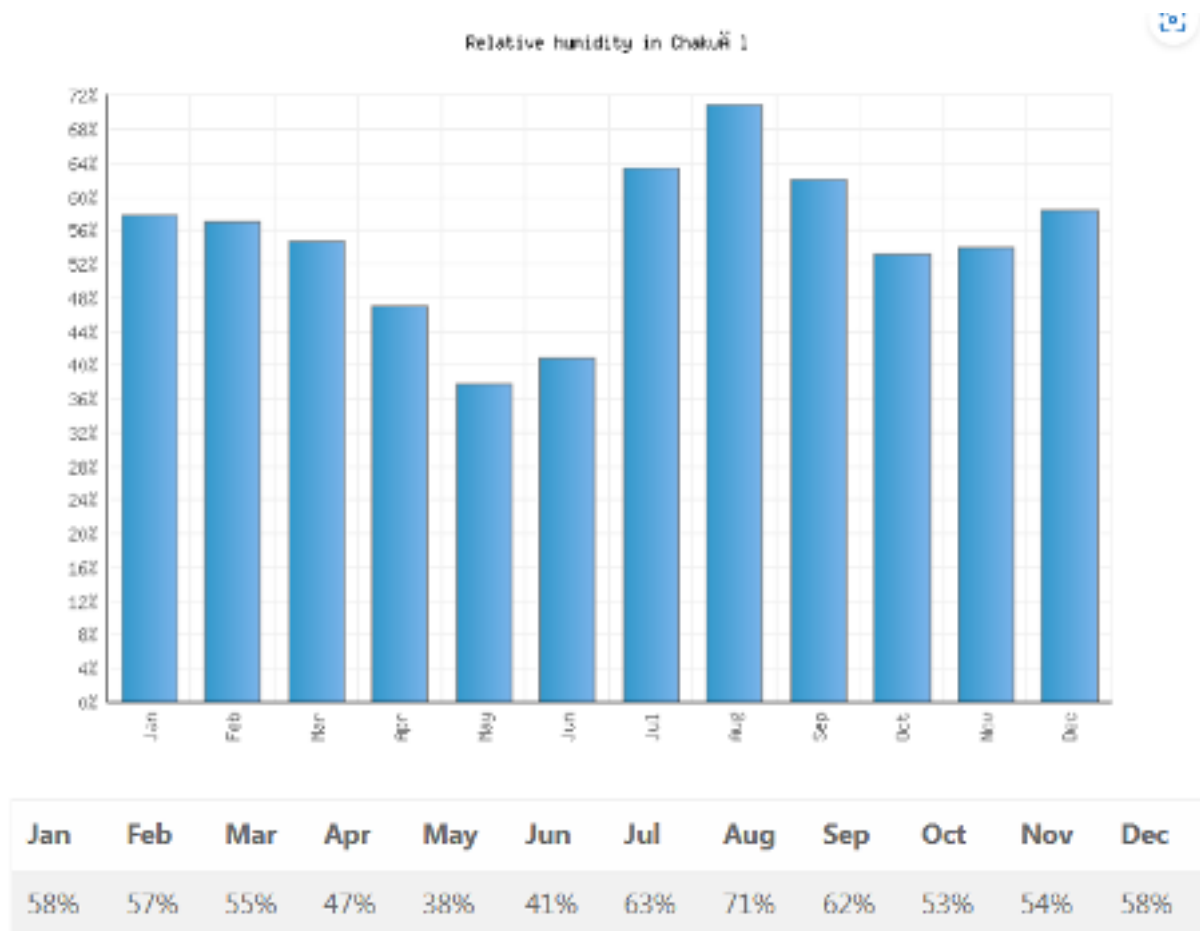


Figure 5-6: Average Relative Humidity of Chakwal
(Data Source: www.weather2visit.com)

During cold seasons of the year northern winds prevail and during hot seasons southern winds. **Figure 5-7** shows the days per month, during which the wind reaches a certain speed in Chakwal.

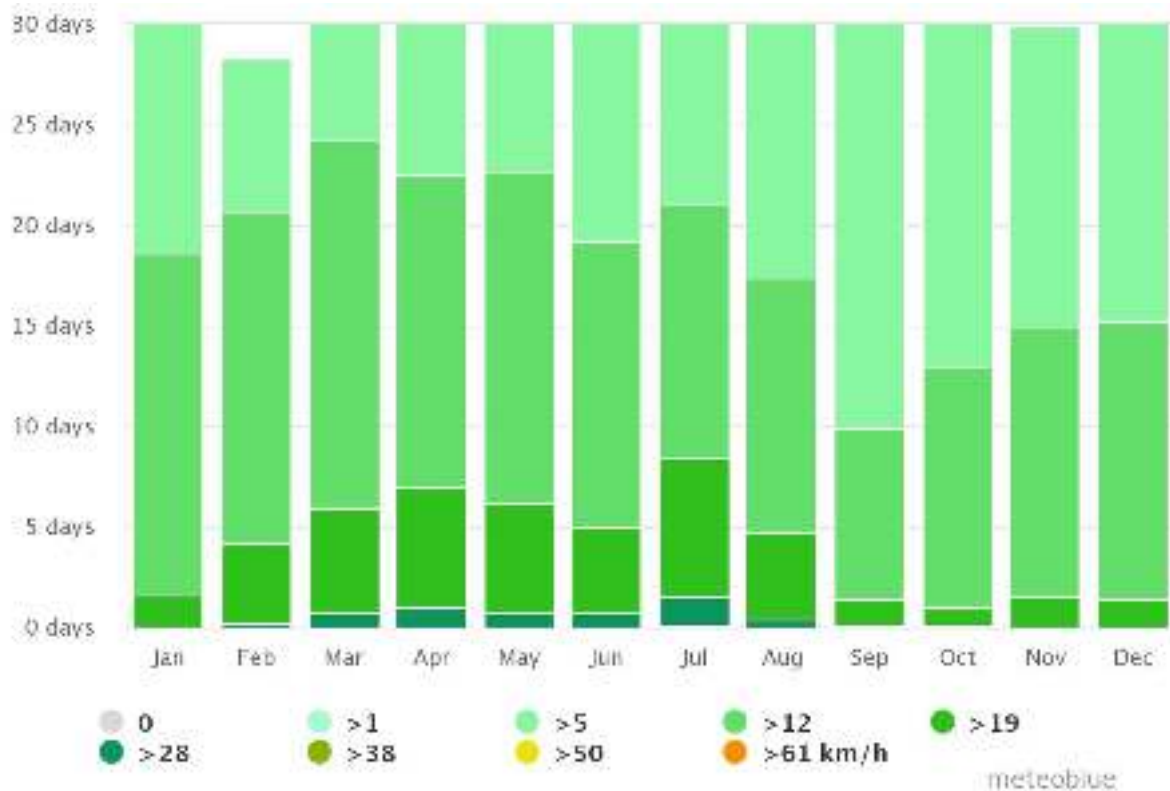


Figure 5.7: Average Wind Speed of Chakwal Region
(Data Source: Meteoblue Weather Monitoring Website)

The wind rose shows how many hours per year the wind blows from the indicated direction. Example SW: Wind is blowing from South-West (SW) to North-East (NE). The wind rose for Chakwal is shown in **Figure 5-8**.

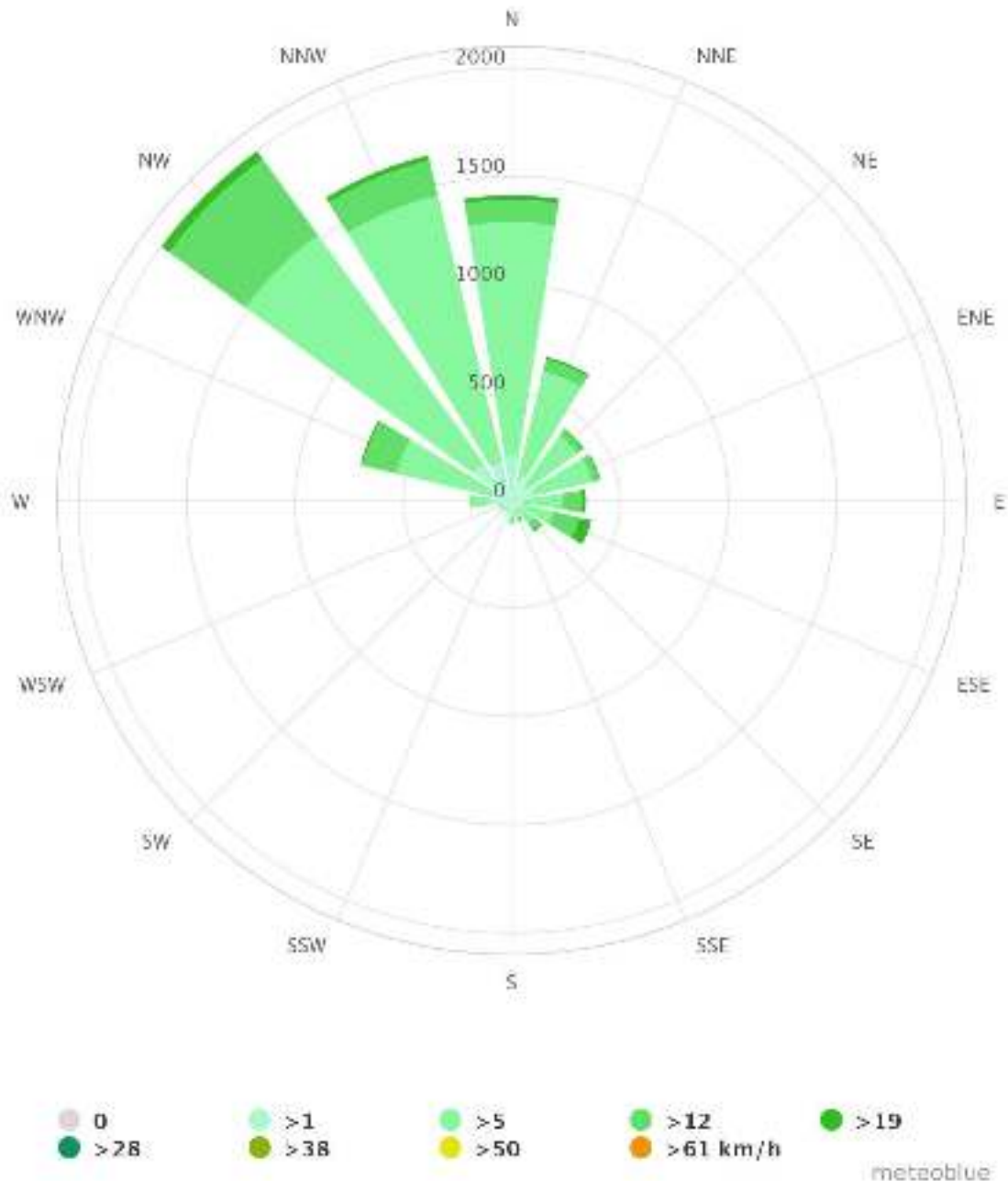


Figure 5-8: Wind rose of Chakwal
(Data Source: Meteoblue Weather Monitoring Website)

5.1.6 WATER RESOURCES

Surface water

Chakwal is mainly a Barani area. There are no irrigation canals or rivers. The only major rivulets and seasonal channels that run through Chakwal are the Soan, and the Soj Nullah. A number of small dams have been constructed in the district through which some irrigation takes place. There are some storm water channels, which are mostly active during rainy season. The only storm water channel passing near project site is Soj Nullah that is about 0.50 km from project site.

Groundwater

The project area lies in the district Chakwal where the groundwater table normally exists approximately 5 feet to more than 20 feet below the ground surface level. The chemical quality of groundwater in the district varies area-wise and depth-wise. The local population is generally reliant on installed hand pumps, electric motors, and supply from tube wells. Generally, the groundwater quality parameters i.e. chemical and biological are within permissible limits.

5.1.7 SOLID WASTE

In the proposed project area the Town/Tehsil Municipal Administration (TMAs) are responsible for the solid waste collection, transportation and disposal. Solid waste that will be generated due to the implementation and operation of the project will be collected and disposed by the contractors and reused.

5.2 ECOLOGICAL RESOURCES

5.2.1 WILDLIFE, FISHERIES AND AQUATIC BIOLOGY

The fauna of Chakwal located in Punjab, Pakistan, comprises a diverse array of wildlife species adapted to the region's varied habitats, including its semi-arid landscapes and hilly terrain. Some of the notable fauna found in the Chakwal region include:

Mammals: The region is home to various mammal species such as Indian crested

porcupine, Indian pangolin, desert cat, mongoose, and foxes. Larger mammals like wild boars and jackals are also present.

Birds: Chakwal boasts a rich avian diversity due to its varied habitats. Species such as partridges, quails, larks, sparrows, and doves are common. Raptors like vultures, eagles, and kestrels can also be spotted soaring in the skies.

Reptiles: The semi-arid environment of Chakwal is conducive to various reptiles. Lizards like geckos and agamas are prevalent, and snakes such as cobras, vipers, and rat snakes inhabit the region.

Insects: The insect diversity in Chakwal is significant and plays a crucial role in pollination and maintaining ecosystem balance. Butterflies, bees, beetles, and other insects are part of the local biodiversity.

Domesticated Livestock: Due to the region's agricultural and pastoral activities, livestock such as cattle, goats, sheep, and poultry are integral to the local economy and play a vital role in the livelihood of the residents.

Conservation Efforts: Efforts are being made to conserve and protect the local fauna. Conservation projects focus on raising awareness about endangered species, preserving habitats, and promoting sustainable practices. Chakwal's diverse fauna reflects its ecological complexity and highlights the delicate balance between human activities and wildlife conservation. Protecting and conserving the local fauna is crucial for maintaining biodiversity and ensuring the health of the region's ecosystems.

5.2.2 VEGETATION COVER AND TREES

The flora of the Chakwal region, located in Punjab, Pakistan, showcases a variety of plant species adapted to the local climate, topography, and soil conditions. The region's vegetation can be broadly categorized as follows:

Dry Scrubland and Shrub Vegetation: Given Chakwal's semi-arid climate, much of the vegetation consists of drought-resistant shrubs and bushes. Species like *Acacia arabica* (babul), *Prosopis cineraria* (kikar), and *Ziziphus mauritiana* (ber) are commonly found. These plants have adapted to conserve water and thrive in the region's arid conditions.

Grasslands and Pastures: The region supports grasslands and open areas, which are essential for grazing livestock. Native grass species like *Cenchrus ciliaris* (dhaman), *Chrysopogon aucheri* (tharki), and *Aristida adscensionis* (phulai) provide forage for animals and play a crucial role in the local economy.

Riparian Vegetation: Along water bodies and seasonal streams, you may find trees and shrubs that are adapted to these wetter conditions. Species such as *Populus euphratica* (sufaida) and *Tamarix indica* (jand) are often found in these areas.

Cultivated Crops: Agriculture is a significant activity in the Chakwal region, with crops like wheat, barley, maize, millets, and various types of pulses being cultivated. Fruit trees like citrus, guava, and pomegranate are also grown.

Afforestation Efforts: In recent years, there have been efforts to promote afforestation and reforestation to counter the effects of deforestation and degradation. Various tree species, both native and non-native, are being planted to restore ecosystems and enhance green cover.

Chakwal's flora has evolved to adapt to the region's arid to semi-arid conditions, with various plant species playing important roles in providing resources for local communities, supporting biodiversity, and contributing to the overall ecosystem health.

Some of plants found in project areas are given below:

	
Mesquite (<i>Prosopis juliflora</i>)	Salix sp.

	
Parthinium hystiophorus	Phragmites karka
	
Solanum species	Acacia modesta

	
Wild ficus	Shehtoot (Morus alba)

5.2.3 SOCIO-ECONOMIC AND CULTURAL FEATURES

To assess the present socio-economic and socio-cultural conditions of the project area, a survey was conducted. For this purpose, baseline data were collected from a few commercial and areas adjoining the purposed site. Interviews and social surveys were conducted to assess the present socio-economic and cultural features of the area. The Performa which was used for interviews is attached in **Annexure-II**.

5.2.4 NEIGHBORHOOD

On east side of project site Dullah Thanil Kamal Road is present. On north, west and south sides there is a agriculture land. The nearest population is Dullah village and Thanil Kamal village present near the project area is at the distance of 1 KM and 2.40 KM respectively. Through Dullah Thanil Kamal Road Project site has direct access to Motorway M2 that is located 4.7 KM.

5.2.5 POPULATION COMMUNITIES AND EMPLOYMENT

At the time of the 2017 census the district had a population of 1,495,463, of which 723,178 were males and 772,166 females. Rural population is 1,211,855 (81.03%)

while the urban population is 283,608 (18.96%). The literacy rate was 74.64% for the population 10 years and above: 84.64% for males and 65.57% for females. Muslims made up almost the entire population with 99.67%, with the minorities being 3,700 Christians and 960 Ahmadis. Hindus number around 190. A joint family, as well as a separate family system, exists in the area. Major occupations are farming, business, service, and labor.

5.2.6 LANGUAGES

As per 2017 census of district Chakwal, 93.35% of the population spoke Punjabi, 4.40% Pashto and 1.63% Urdu as their first language. The local Punjabi dialects are Dhani and Awankari.

5.2.7 EDUCATION AND LITERACY

Chakwal has a total of 1,199 government schools out of which 52 percent (627 schools) are for female students. The district has an enrollment of 181,574 in public sector schools. Educational institutions in the Chakwal District include:

- Government Post Graduate College (Chakwal)
- University Of Chakwal

The community that lived near the project site is mostly semi-educated. Government schools exist near the project site. The nearest school at a distance of 1.40 KM is Government High school Basti Abdullah in Dullah village.



Figure 5-9: Govt. High School Dullah

5.3 QUALITY OF LIFE VALUES

5.3.1 SOCIOECONOMIC VALUE

The project area is situated on Dullah Thanil Kamal Road road that is mixed with agricultural, residential activities. The nearest population is Dullah village and Thanil Kamal village present near the project area is at the distance of 1 KM and 2.40 KM respectively. These communities have the facilities like metaled roads, sewerage, commercial area shops, water supply, public transport but deprived of big hospitals, colleges and universities. Mostly the people belongs to their own business, private and government jobs and farmers. There is a rising trend in the society to change their traditional socioeconomic pattern of life. Print and electronic media are playing key role in bringing tangible change in the old pattern of life.

5.3.2 PUBLIC HEALTH

A rural health centre exist in Dullah Village that is about 2.50 KM from project site. A pharmacy can also be found in the Dullah village of the purposed project site. A veterinary dispensary is also present with rural health centre Dullah.



Figure 5-10: Rural Health centre in Dullah Village



Figure 5-11: Veterinary Dispensary in Dullah Village

5.3.3 ARCHEOLOGIST AND HISTORICAL TREASURES

The project site is mixed with agricultural, residential activities and there is no archeology or historical building near purposed project area Social and Cultural Resources

5.3.4 LAB REPORTS OF ENVIRONMENTAL ANALYSIS

The environmental analysis reports are attached as **Annex III**.

5.3.5 WATER QUALITY

To determine the existing quality of groundwater, one sample from the site was collected for laboratory analysis. Groundwater is near the project site. The only sample of groundwater was collected from the motor pump present on site. Groundwater samples were tested for 28 different selected parameters as per Punjab Environmental Quality Standards (PEQS).

Based on the laboratory test results, it was found that the TDS of groundwater was higher than PEQS limit and other chemical and biological parameters comply with the Punjab Environmental Quality Standards (PEQS). However, the groundwater can be used for bathing, washing, general purpose activities. Reports are attached as **Annex-III**.

Table 5-1: Ground Water Analysis Results

Sr. No.	Parameter	Method	Unit	Result	PEQS
1	pH	APHA 4500-H ⁺ B	--	7.16	6.5-8.5
2	Total Dissolved Solids (TDS)	APHA 2540 C	mg/l	1870	1000
3	Chloride	4500- APHA Cl ⁻ B	mg/l	227.33	250
4	Fluoride	APHA 4500-F ⁻ D	mg/l	0.14	1.5
5	Taste	APHA 2120 B	Object. /unobj.	Non-object.	Unobject.
6	Odour	APHA 2120 B	Object. /unobj.	Non-object.	Unobject.
7	Colour	APHA 2120 B	TCU	0.9	15
8	Nitrate (as NO ₃ ⁻)	APHA 4500-NO ₃ ⁻ E	mg/l	4.76	50
9	Nitrite (as NO ₂ ⁻)	APHA 4500-NO ₂ ⁻ B	mg/l	1.12	3
10	Lead	APHA-Pb B	mg/l	0.01	0.05
11	Total Hardness as CaCO ₃	APHA 2340 C	mg/l	337.12	500
12	Turbidity	APHA 2130 B	NTU	0.1	5
13	Zinc	APHA 3500-Zn B	mg/l	0.45	5
14	Aluminum	APHA 3111 D	mg/l	0.12	0.2
15	Chromium	APHA 3500-Cr B	mg/l	BDL	0.050
16	Cadmium	APHA 3500-Cd D	mg/l	BDL	0.01
17	Copper	APHA 3500-Cu C	mg/l	BDL	2

18	Boron	APHA 4500-B C	mg/l	0.014	0.300
19	Barium	APHA 3111 B	mg/l	0.020	0.700
20	Antimony	APHA 3114 C	mg/l	BDL	0.020
21	Arsenic	APHA 3114 C	mg/l	0.014	0.050
22	Cyanide	APHA 4500-CN- D	mg/l	0.016	0.05
23	Mercury	APHA 3112	mg/l	BDL	0.001
24	Nickel	APHA 3111 B	mg/l	0.005	0.020
25	Residual Chlorine	APHA 4500-Cl2	mg/l	0.39	0.2 – 0.5
26	Total Coliform	APHA 9222 B	Number/100ml	0	0/100 ml
27	Thermo Coliform	APHA 9222 B	Number/100ml	0	0/100 ml
28	E. coli	APHA 9222 C	Number/100ml	0	0/100 ml

Note:

PEQS = Punjab Environmental Quality Standards

BDL = Below Detection Limit

APHA = American Public Health Association

5.3.6 AMBIENT AIR QUALITY

The monitored parameters included Carbon mono-oxide (CO), Nitrogen oxides (NO_x), Sulphur oxides (SO_x), Particulate Matter (PM₁₀). The monitoring was carried out for 24 hours and results are attached as **Annex-III**.

Table 5-2: Ambient Air Quality Results of project site

Sr. No.	Parameter	Method	Unit	Results	PEQS
1	Particulate Matter (PM ₁₀)	40 CFR Part 50, App J (US-EPA)	µg/m ³	121.52	150
2	Carbon monoxide (CO)	40 CFR Part 50, App. C (US-EPA)	mg/m ³	3.12	5
3	Oxides of Nitrogen NO _x (NO & NO ₂)	40 CFR Part 50, App F (US-EPA)	µg/m ³	37.25	120
4	Sulphur dioxide SO _x (SO ₂)	EQSA-0197-114 (US-EPA)	µg/m ³	45.14	120
5	Particulate Matter (PM _{2.5})	40 CFR Part 50, App J (US-EPA)	µg/m ³	17.54	35

- **PEQS: Punjab Environmental Quality Standards**
- All parameters of ambient air quality are well within PEQS.

5.3.7 NOISE

The major source of noise generation is vehicular traffic outside the society and during construction, the noise levels may be high due to civil works. Reports are attached as **Annex-III**.

Table 5-3: Noise Levels at Project Site

Sr. No.	Time	Noise dB(A)	Day/Night	PEQS
1	12:00 PM	58.4	Day Time	65
2	01:00 PM	54.2		
3	02:00 PM	56.6		
4	03:00 PM	60.4		
5	04:00 PM	62.8		
6	05:00 PM	57.7		
7	06:00 PM	55.2		
8	07:00 PM	52.4		
9	08:00 PM	50.2		
10	09:00 PM	48.5		
11	10:00 PM	51.1		
12	11:00 PM	46.2	Night Time	55
13	12:00 AM	44.8		
14	01:00 AM	47.5		
15	02:00 AM	44.2		
16	03:00 AM	46.4		
17	04:00 AM	48.5		
18	05:00 AM	50.7		
19	06:00 AM	48.3		
20	07:00 AM	52.7	Day Time	65
21	08:00 AM	54.5		
22	09:00 AM	58.8		
23	10:00 AM	56.6		
24	11:00 AM	60.5		
Average Noise Level		51.98 dB(A) Leq		

PEQS: Punjab Environmental Quality Standards

5.3.8 SOIL

Soil sampling of project site was also carried out in order to find out the impacts of construction and operation of the project. Reports are attached as **Annex-III**.

Table 5-4: Soil sampling at Project Site

Sr No.	Parameters	Units	Results
1	pH	---	7.60
2	Phosphorous	mg.kg ⁻¹	6.1
3	Sulphur	mg.kg ⁻¹	101.4
4	Chloride	mg.kg ⁻¹	223
5	Sodium	mg.kg ⁻¹	41.1
6	Potassium	mg.kg ⁻¹	34.4
7	Calcium	mg.kg ⁻¹	37.8
8	Magnesium	mg.kg ⁻¹	1.21
9	Nickel	mg.kg ⁻¹	0.02
10	Copper	mg.kg ⁻¹	0.24
11	Zinc	mg.kg ⁻¹	BDL

PEQS: Punjab Environmental Quality Standards

5.3.9 TESTING TEAM

These all lab tests and noise test was by the expertise of SEAL (Solution environment and analytical Labs). The team of experts is:

Table 5.1: Details of Monitoring & Testing Team

1	Arshad Ali	Chief Chemist	BS (Hons), Chemistry, University of The Punjab
2	Muhammad Ramzan	Lab Analyst/ Chemist	BS (Hons), Chemistry, UMT Lahore.
3	Saad Malik	Lab Analyst/ Chemist	BS (Hons), Chemistry, University of Education, Lahore.

6. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATIONS

This chapter identifies the potential impacts related with Preconstruction, construction and operation phases of the Project on the physical, ecological and socio-economic domains of the environment. Accordingly, mitigation measures have been proposed to mitigate the negative impacts and to enhance the positive impacts..

6.1 IMPACT ASSESSMENT METHODOLOGY

During the preparation for the project construction phase the future contractors must be notified and prepared to co-operate with the executing agency, project management, supervising consultants and local population in the mitigation of impacts. Furthermore the contractor must document to implement the EMP in full and be ready to engage trained environmental management staff to audit the effectiveness and review mitigation measures as the project proceeds. The effective implementation of the EMP will be prepared and must be audited and this will be considered as the most important part of planning. In this regard the proponent must fulfill the requirements of the law and guidance prepared by EPA on the environmental aspects of power projects and the recommendations already made for projects in this IEE and under EIA/IEE regulation 2022 and Punjab Environmental Protection Act 1997 (amended 2012).

For impact identification, various EIA methodologies are available including the checklists, interaction matrices, networks and overlays. Among these four methods, following three are used in EIA of Construction of a Electronic Waste Management & Recycling Unit located at Dullah – Thanil Kamal Road, District Chakwal in Punjab.

- Project Interaction Matrix
- Checklists
- Overlays

Interaction matrix is a two-dimensional matrix wherein the project actions are placed along one axis (i.e. along y-axis) and on the other axis there are different environmental parameters likely to be affected by the proposed project actions

grouped into categories i.e. Physical, Ecological & Socio-economic Environment. Interaction matrix is used in this project due to the following reasons:

- It provides cause-effect relationship between the project actions and resulting consequences impacts.
- It provides nature (+ve or –ve) and weighting of different impacts.
- It provides cumulative impacts of a project.

Matrix grouped project actions into temporal phases. For the impact assessment, project interaction matrix is used by dividing the project action into different phases (Preconstruction, construction and operation). The environmental impacts are divided into three main categories including physical, ecological and socio-economic domains. The environmental impacts of the project actions are identified and weighed into the following categories:

+3	=	Extremely Beneficial
+2	=	Potentially Positive
+1	=	Slightly Positive
0	=	Insignificant
-1	=	Slightly Negative
-2	=	Potentially Negative
-3	=	Extremely Negative

The assignment of significance is based on the previous knowledge and professional judgment of EIA team experts. The project impact matrix has been developed and attached as **Annex IV**. It may be noted that the environmental parameters, which are not related to the implementation of the projects, have not been considered in the matrix.

Checklist

The assignment of significance is based on the previous knowledge and professional judgment of EIA team experts. The project Checklist has been developed for “without” and “with mitigation” is attached as **Annex V**. It may be noted that the environmental parameters, which are not related to the implementation of the projects, have not been considered in the matrix.

Overlays

In order to identify spatial based impacts, overlays were used. An overlay is based on a set of transparent maps, each of which represents the spatial distribution of an environmental characteristic (for example, susceptibility to erosion). Information for an array of variables is collected for the standard geographical units within the study area, and recorded on a series of maps, typically one for each variable. These maps are overlaid to produce a composite. The resulting composite maps characterize the area's physical, social, ecological, land use and other relevant characteristics, relative to the location of the proposed development.

Consultations

Public, Stakeholders and relevant bodies consultation is a systematic process, which provides an opportunity for planners, citizens, managers and selected representatives to share their experience, knowledge and concerns and perceptions about any proposed development. The objectives of the public consultation for the proposed Project are to:

- Share information with the stakeholders' on the proposed Project works and their expected impact on the socio-economic environment of the Study Area.
- Understand the stakeholder's concerns regarding the various aspects of the Project, including the existing condition of the Study Area, upgrade requirements, and the likely impacts of the construction related activities and operation of the Project.

6.2 CHATARCTRISATION OF THE IMPACTS

The predicted impacts have been characterized; various aspects of the impact characterized include:

- Nature (direct/indirect)

- Duration of impact (Short term, medium term, Long term)
- Geological extend (local, regional)
- Timing (Project phase)
- Reversibility of impact (Reversible/Irreversible)
- Likelihood of the impact (certain, likely, unlikely, rare)
- Impact consequence severity (major, moderate, minor)
- Significance of impact (High, medium, low)

The above aspects of environmental characterization are defined in Table below:-

Table 6-1: Impact Characterization

Nature	Direct: The environmental parameter is directly changed by the project. Indirect: The environmental parameter changes as a result of change in another parameter
Duration of Impacts	Short-term: lasting only for the duration of the project such as noise from the construction activities. Medium-term: Lasting for a period of few months to a year after a the project before naturally reverting to the original condition such as loss of vegetation due to clearing of campsite, contamination of soil or water by fuels or oil. Long-term: lasting for a period much greater than medium term impact before naturally reverting to the original condition such as loss of soil due to soil erosion.
Geographical Extent	Local, regional (spatial dimension)
Timing	Construction and Operation
Reversibility of Impact	Reversible: when a receptor resumes its pre-project condition. Irreversible: when a receptor does not or cannot resume its pre-project condition.
Likelihood of the Impact	Almost Certain: Impact expected to occur under most circumstances. Likely: Impact will probably occur under most circumstances. Possibly: Impact may possibly occur at some time. Unlikely: Impact could occur at some time. Rare: Impact may occur but only under exceptional circumstances.
Impact Consequences severity	Major: When an activity causes irreversible damage to a unique environmental feature; causes a decline in abundance or change in distribution over more than one generation of an entire population of

	species of flora and fauna: has long term effects (period of years) on socioeconomic activities of significance on regional level. Moderate: When an activity causes long-term (period of years), reversible damage to a unique environmental feature; causes reversible damage or change in abundance or distribution over one generation of a population of flora or fauna: have short-term effects (period of years) on socioeconomic activities of significance on regional level. Minor: When an activity causes short-term (period of a few months), reversible damage to a unique environmental feature; slight reversible damage to a few species of flora or fauna within a population over a short period; has short-term (period of months) effects on socioeconomic activities of local significance. Negligible: when no measurable damage to physical, socioeconomic, or biological environment above the existing level of impact occurs.
Significance of Impact	Categorized as High, Medium, Low Based on the consequence, likelihood, reversibility, geographical extent, and duration: level of public concern: and conformance with legislative of statutory requirements.

The impact characterization during construction and operational phase is given as under:-

Table 6-2: Impact Characterization during Construction Phase

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Physical Environment							
Soil Erosion	Direct	Long term	Local	Irreversible	Unlikely	Moderate	Medium
Soil Contamination	Direct	Long term	Local	Reversible	likely	Major	Low
Air Quality Deterioration	Direct	Short term	Local	Reversible	likely	Minor	Low
Surface Water Contamination	Indirect	Medium Term	Regional	Reversible	Rare	Negligible	Low
Ground Water Contamination	Direct	Medium Term	Regional	Irreversible	Rare	Negligible	Low

Construction and Solid Waste	Direct	Medium Term	Local	Reversible	Likely	Moderate	High
Biological Environment							
Loss and Damage of Natural Vegetation	Direct	Medium Term	Local	Irreversible	Likely	Moderate	Medium
Loss and Damage to wild life	Direct	Medium Term	Local	Irreversible	Likely	Minor	Low
Socio Economic Issues							
Noise and Vibration	Direct	Short term	Local	Reversible	Possibly	Minor	Low
Dust Issues	Direct	Short term	Local	Reversible	Likely	Moderate	Medium
Labor HSE Issues	Direct	Short term	Local	Reversible	Possibly	Moderate	Medium

Table 6-3: Impact Characterization during Operational Phase

Impact	Nature	Duration	Geo Extend	Reversibility	Likelihood	Consequence	Impact Significance
Air Quality Deterioration	Direct	Short term	Local	Reversible	Rare	Negligible	Low
Surface Water Contamination	Indirect	Medium Term	Regional	Reversible	Rare	Negligible	Low
Ground Water Contamination	Direct	Medium Term	Regional	Irreversible	Rare	Negligible	Low

Sludge Waste	Direct	Medium Term	Local	Reversible	Likely	Moderate	High
Noise and Vibration	Direct	Medium term	Local	Reversible	Likely	Minor	Low
Public Health and Nuisance Issues	Direct	Short term	Local	Reversible	Rare	Negligible	Low

6.3 ENVIRONMENTAL IMPACTS ASSOCIATED DURING PRE-CONSTRUCTION PHASE

Land Acquisition:

No impact pertaining to land acquisition as the land is already owned by the proponent and there is no dispute exists relevant to the land acquisition.

Design

The design of the e-waste recycling plant will not affect the adjacent areas of the project site. The proposed e-waste recycling machine is specially designed for separating and recycling precious metals and resin fiber from scrap PCB boards (e-waste). The following are the main characteristics of e-waste machine.

- Above 98-99% high recovery and separation rate.
- Dry type separation method without any water or chemical process to cause pollution and hence zero emissions.
- Easy to operate with high automation.
- Adopt sealed wind conveyor and pulse dust collector, collect the dust in an automatically and high efficiency way to make the factory clean.
- Reuse of all waste material as the processed material or product is mixed metal powder and resin powder which is raw material of different industries.

- It guarantees compliance with all the Punjab Environmental Quality Standards (PEQS).
- Relevant Building Codes shall be used
- Contribution to Sustainable Development Goals (SDGs) and Vision 2030.

Overall, the appropriate designing will pose positive impact on the environment.

6.4 ENVIRONMENTAL IMPACTS AND THEIR MITIGATION DURING CONSTRUCTION PHASE

PHYSICAL IMPACTS

6.4.1 SOIL CONTAMINATION

- Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the Project Site and its nearby surroundings. Spillage from the generator or moving vehicle may cause contamination of soil at construction sites.
- The construction site will generate solid wastes from site camps and construction debris from construction activities. The inappropriate disposal methods may harm the physical environment of the project area.

– Mitigation

Good engineering practices will help in controlling soil erosion at construction sites. Following measures will be adopted as per site conditions:

- Soil contamination can be curtailed by reducing the oil spill at project construction areas by well maintaining the construction vehicles as well as generators.
- The Contractor is required to impart proper training to his workforce in the handling and proper disposal of solid waste.
- A proper drainage facility will be provided to avoid water accumulation, which will minimize soil contamination.

- The proper **solid waste management** plan adopting 3R strategy (should be developed by the Contractor and implemented to avoid litter and any other waste problems.
 - Workers should be trained on spill prevention and response plan.
 - Fuels, lubricants and chemicals should be stored in covered areas, underlain with impervious lining.
 - Maintenance and washing of vehicles and equipment should be carried out at designated areas.
 - Regular inspections should be carried out to detect leakages in construction vehicles and equipment. Their scheduled maintenance should be carried out.
 - Appropriate arrangements, including shovels, plastic bags and absorbent materials, should be available near fuel storage areas.
 - Document all related accidents of spillage to take corrective actions and to avoid recurrence.

6.4.2 CONTAMINATION OF SURFACE AND GROUNDWATER RESOURCES

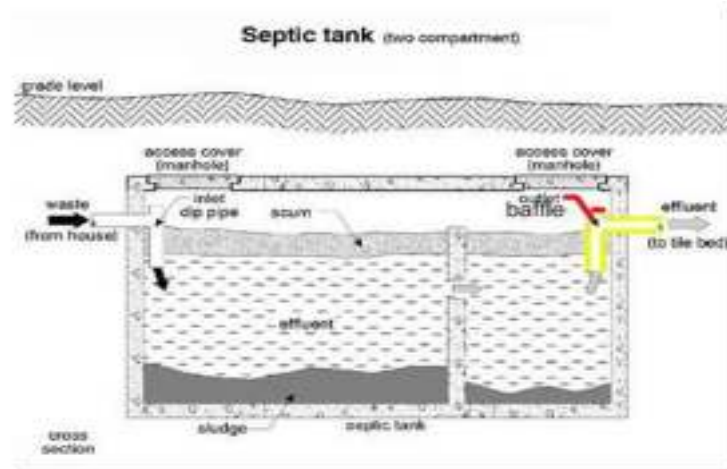
Sewage wastewater generated from the construction site may contaminate groundwater, if not disposed of properly.

– Mitigation

Sewage from construction camp will be disposed of using septic tank which has been designed properly keeping in view the following parameters:

- Soil stratigraphy at the site
- Depth of groundwater table
- Discharge of sewage from the construction camp
- Avoid accidental spills of oils and lubricants through good practice. Prepare and implement Emergency Response Procedures in case of any spill hazard.
- Construction site effluent drainage should be established in areas with adequate natural drainage channels to facilitate the flow of the effluents.

The septic tank has been designed by the Design Consultant according to the relevant standards. The example of the septic tank is shown in Figure below;



6.4.3 IMPACT ON AMBIENT AIR QUALITY

Construction activities like excavation, transportation of construction material, unloading and storage of material generate dust emissions. The particulate matter of PM₁₀ and PM_{2.5} are of major health concern. Moreover, the use of machinery like batching plants, excavators, dump trucks and other transport vehicles, is a source of exhaust emissions such as particulate- matter PM₁₀, PM_{2.5}, CO, NO_x and SO_x in the ambient air. The possibility of exhaust emissions increases when vehicles and equipment are utilized without scheduled maintenance. The movement of heavy machinery and vehicles on the dirt tracks is also causing dust emissions. Wind during construction shift th dust to neighboring area and make the situation worse.

– Mitigation

- ✓ Tuning of vehicles should be made mandatory to reduce the emissions of NO_x, SO_x, CO, and PM₁₀.
- ✓ Equipment and vehicles powered with diesel should be well maintained to minimize particulate emissions.
- ✓ Haul-trucks carrying, earth, sand, aggregate, and other materials should be kept covered during transportation of materials and storage at site, with tarpaulin.

- ✓ Sprinkling of water by water trucks will be done on roads and other dusty area.
- ✓ As well as the temporary boundary wall made of wood will be constructed that will act as barrier for air emissions going towards residential area.
- ✓ Enforce the use of PPEs where required.

6.4.4 AMBIENT NOISE LEVELS AND VIBRATION

During construction phase, a large number of equipment and construction machinery will be utilized that include excavators, concrete mixers, trucks, and other machinery and vehicles. The operation and movement of these equipment and machinery and vehicles will increase the noise and vibration in the Project Area and neighborhood may be disturbed by the noisy activities. The impact can be significant if not properly mitigated.

– Mitigation

- For the construction machinery generating noise level above that prescribed limits of PEQS, the Contractor will make arrangements to bring the noise level within applicable limits by arranging proper tuning of vehicles and ensuring the use of mufflers/silencers. Movements of the trucks and other construction machinery causing high noise levels must be restricted at night time to avoid disturbance to the nearby locality.
- As well as the temporary boundary wall made of wood will be constructed that will act as barrier for noise and vibration.

6.4.5 DISPOSAL OF CONSTRUCTION DEBRIS AND GARBAGE

During construction phase of the project, a small quantity of construction waste will be produced, the disposal of which, if not managed properly could have negative impacts on the site and surrounding areas.

– Mitigations

- A site waste management plan should be made the responsibility of the construction contractor to provide designated waste storage area on the site and a schedule for the timely collection and removal of construction debris to an approved dump site.
- The organic waste produced during site clearing can be mechanically mulched and composted at the site and used for landscaping.
- Arrangements should be made for regular garbage collection and its removal from the construction site.

6.4.6 TRAFFIC ANNOYANCE

Due to the movement of large construction vehicles, there may be traffic congestion causing problems to the workers and the local community.

– Mitigation

During the construction phase, traffic control measures will be implemented. All raw materials will not be transported at peak working hours in order to avoid traffic congestion and avoid accidents.

IMPACTS ON ECOLOGICAL ENVIRONMENT

6.4.7 IMPACT ON FLORA

There are no trees inside the premises of the project area that will be affected due to the implementation of the project. All the project activities will be carried out within the premises of the project area so there will be no effect on trees outside the boundaries.

6.4.8 IMPACT ON FAUNA

The avifauna associated with the trees will not be affected by the construction activity.

– Mitigations

Almost significant amount of open area will be used for the landscaping, so it will enhance the natural features of the area.

IMPACTS ON SOCIO-ECONOMIC ENVIRONMENT

6.4.9 IMPACTS ON LOCAL POPULATION

The population residing in and the surroundings of the Project Area will be affected during the construction phase as follows:

- Insecurity problems may arise for the local population due to the Contractor's workers during the construction phase
- The community may face noise and dust problems during construction activities.
- Theft problems to the community by the Contractor's workers and vice versa.
- Because of the presence of security guards round the clock the security at the project site will improve as well as in its vicinity. The impact will be moderate positive.
- Land value in the surrounding area will increase due to the completion of the present project. The impact will be moderate positive.
- The project does not involve the dislocation of the people. There is no requirement of resettling a single person. There is no impact due to resettlement.
- No movable or immovable property and infrastructure of public and private sectors will be lost or damaged during construction and operation stages. The impact will be nil.

– Mitigations

- The contractor should select specific timings for heavy machinery operation to cause the least disturbance to the population considering their peak movement hours.
- Effective construction controls may be made by the Contractor to avoid inconvenience to the population due to noise, smoke, and fugitive dust.
- Haul-trucks carrying concrete, aggregate, and sand fill materials will be kept covered with tarpaulin to help contain the construction materials being transported to the specific site.

- The Contractor should warn the workers not to involve in any theft activities and if anyone would involve in such type of activities, he will have to pay a heavy penalty and would be handed over to the police. Similarly, at the time of hiring labor/workers, the Contractor has to ensure that the workers should be of good repute/character.

IMPACTS ON PUBLIC HEALTH AND SAFETY

- Construction activities, particularly excavation and movement of haul trucks and machinery may prove dangerous for the safety of the workers as well as for local residents.
- The contractor's staff while working on height, transoms, etc. may slip and get injured. Similarly, working at excavated areas may also cause injuries due to the failure of side slopes of excavation.
- The inappropriate storage of solid waste may cause breeding of insects or rodents, that may cause harm to public health or which create safety hazards, odors, or public nuisance.
- The condition of the vehicle is a big threat to the driver and other public as a bad condition of vehicle which if not maintained properly may cause accident.

– Mitigations

- The contractor will ensure the provision of medicines, first aid kits, emergency vehicles, etc. at the workplace. Compliance with the safety precautions for construction workers as per the International Labor Organization (ILO) Convention No. 62 will be ensured by the Contractor.
- Health safety procedures will be prepared and implemented. Training of workers in the construction safety procedures, environmental awareness, and equipping all construction workers with safety boots, helmets, gloves, earplugs, and protective masks, and monitoring their proper and sustained usage.
- Fire extinguishers will be provided at different locations of project site during construction phase

6.5 IMPACTS ASSOCIATED WITH PROJECT OPERATIONAL PHASE

6.5.1 GROUND WATER

As there will not be any wastewater production during the process of the operations of the project and waste from human source so there will not be any impact on ground water quality.

– Mitigations

- Wastewater produced from human source will be treated through septic tank and then will be discharged in drain.

6.5.2 SOLID WASTE AND SLUDGE WASTE

- Only municipal solid waste will be produced..
- Sludge from septic tank will also be generated.

– Mitigation

- All of municipal solid waste disposed off through contractor.
- The sludge from septic tank will also be disposed off through a contractor.

6.5.3 WASTEWATER

None of wastewater from any process of project will be produced. Only Sewerage wastewater from washrooms will be produced during the operational phase.

– Mitigation

- All the wastewater after passing through the septic tank will be discharged into drain through contractor.

6.5.4 AMBIENT AIR AND NOISE EMISSIONS

There will be air emissions and noise of generators during the operation that will not impact the nearby residencies because that is far way but the noise may have impact on the workers and staff working close to the generators.

– Mitigation

To mitigate the noise impact the generator will be put in a separate generator room with sound proofing and it will be compulsory to use PPEs in case of Inspection and any other activity in generator room.

6.5.5 OCCUPATIONAL HEALTH AND SAFETY

The workers working on recycling plant may expose to following hazards:

- The shredding and crushing of PCBs can generate dust and particulate matter, which may contain hazardous materials.
- PCBs may release volatile organic compounds (VOCs) or hazardous fumes when subjected to high temperatures or chemical processes.
- PCB recycling machines, especially crushers and shredders, can produce high levels of noise, which can lead to hearing damage over time.
- Workers who operate vibrating equipment, such as crushers or grinders, can experience hand-arm vibration syndrome (HAVS) or if exposed to excessive vibration levels.
- Whole-body vibration can occur when workers are exposed to continuous, low-frequency vibrations from heavy machinery.

– Mitigation

Specific mitigation measures for OHS related to PCB recycling machine operations includes:

- Use local exhaust ventilation systems to capture and contain dust at its source.
- Implement dust collection systems with filters to capture and remove airborne particles. Installation of proper emission control systems like thermal oxidizers or scrubbers to treat exhaust gases.
- Isolate noisy equipment within soundproof enclosures or rooms
- Provide workers with appropriate personal protective equipment (PPE), such as dust masks, respirators, earing protection (e.g., earplugs or earmuffs) and anti-vibration gloves and tools.

- Conduct regular air quality, noise and vibration related monitoring to ensure compliance with occupational exposure limits
- Train workers on safe operating practices and ensure that workers are aware of the specific hazards associated with PCB recycling, such as chemical exposure, sharp edges, and electrical risks.
- Schedule regular breaks for workers to reduce prolonged exposure.
- Conduct regular health assessments for workers and ensure the availability of first-aid kits, eyewash stations, and emergency showers in the work area.
- Regularly inspect and maintain PCB recycling machine to identify and address potential hazards, such as worn-out components, loose wiring, or malfunctioning safety features.
- Develop and communicate clear emergency response procedures for potential incidents, such as chemical spills, fires, or injuries.
- Foster a safety culture where all workers are encouraged to report safety concerns, near-miss incidents, and potential hazards. Recognize and reward safe behavior and participation in safety programs.
- Conduct regular audits and inspections of the workplace to identify and rectify potential safety hazards. Encourage workers to participate in safety inspections and provide feedback.

6.5.6 SECURITY ISSUE

There is need for vigilant security presence in and around the recycling plant round the clock on a permanent basis to guard against theft and terrorist activities. The security concerns will have to be addressed adequately. Any threat to the security should be dealt with as a major challenge.

– Mitigation

A comprehensive Security Plan is already developed and in place for the industry which includes construction of a security check post on the entrance gates consisting of security guards. E-Waste recycling company has security guards and a control room which manages all security related issues and is functional 24/7. CC TV cameras

installed all over the recycling unit which are being monitored 24/7 in control room. The aim of the security is to check out the in and out movements of vehicles and to monitor all the security related issues. The walk through gates also installed for checking of the visitors

6.5.7 EFFECT ON FLORA

There will be no effect on flora.

- **Mitigation**

There are no mitigatory measures required. Almost significant amount of open area will be used for the landscaping, so it will enhance the natural features of the area.

Tree plantation plan is attached as **Annexure-I**.

6.5.8 EFFECT ON FAUNA

There will be no effect on fauna.

- **Mitigation**

So there will be no mitigatory measures are required for them. But use of native trees will welcome the local and migratory birds for nesting and shelter.

6.6 ASSESSING IMPACTS

Planning for environmental assessment depends upon reliably predicting project impacts on resources and managing those impacts to achieve the greatest gain or the smallest loss. The basis of the prediction is the knowledge of the proposed project and of local resources with which it is expected to interact. Two types of information are, therefore, needed: a comprehensive description of all resources likely to be affected by each of the project components, and an understanding of the project component itself. The baseline information given in the previous section includes all resources, natural and human and all aspects of those resources that may be expected to be touched, directly or indirectly, by the project. Conversely, project information will include all aspects of construction or operation that might affect the environment.

6.7 APPROACH TO ASSESSMENT

Various components of the project will interact with local resources in different ways. Therefore, it is useful to divide the project into units small enough that the interactions may be examined individually as well as collectively. For the project as a whole a matrix has been prepared to identify project's environment interaction. The main construction components of the project are Excavations, Concrete, Mixing, and Finishing. Each of these is in effect a project itself. Various aspects of each component are treated separately. They are examined both in terms of construction period and much longer period of project operation.

Some component of the project have positive and some have negative impact on environment and on the different factors like socio-economy of the community.

Negative impact

This construction development activity has no significant potential negative impacts on environment as well on the socio-economic feature of community. Anyhow it has some impacts which have discussed as well as their mitigatory measures have well defined in the previous section.

Positive impacts

The positive impacts of the project are given as under-:

- The project is located on main Dullah – Thanil Kamal road there will be demand for workers, both skilled and unskilled. This will include opportunities for local people, both directly on the construction site and also indirectly in related service work. After the construction there will be the manpower required for operational phase of the project as well
- This project will be helpful in reducing and recycling of e-waste of the country.

6.8 RISK ASSESSMENT

Risk assessment is done for construction phase which will describe the potential impacts/hazards so that the precautions/control may adopt accordingly.

Risk Magnitude/ severity	Assigned Values	Probability/ Likelihood	Assigned Values
Low	1	Highly Unlikely	1
Medium	2	Unlikely	2
High	3	Possible	3
Extreme	4	Likely	4
Catastrophic	5	Very likely	5

Table 6-4: Risk assessment during construction and operational phase of the project

Hazard	Source	Duration Hours/day	Severity (S)	Likelihood (L)	Risk amount (S*L)
Noise	Foundation, transportation and installation of machinery	8	2	4	8
Dust	Excavation and transportation of construction materials and machinery	8	3	4	12
Vibration	Installation, assimilation	8	2	3	6
Falling objects	Construction, assimilation activities	8	4	2	8
Ergonomics	No proper posture for Work	8	3	3	9
Work load	Continues work	8	2	3	6
Temperature	Sunlight during summer	8	3	4	12
Fire	Flammable materials, electrical short circuit	8	3	4	12
Air pollution	Vehicles and generator	During their working	3	5	15

Likelihood →	1	2	3	4	5
Severity ↓					
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Green color boxes (1-5): Low risk and unlikely to cause health impact.

Yellow color boxes (6-12): Noticeable risk. It has potential to cause medium impacts.

Red color boxes (15-25): High risk & cause high level health impacts.

6.8.1 CONTROLS

Almost all the risks which can occur in this project during both construction and operational phase not fall in high risk area except air pollution. But there is still need of controls which are given below:

- Regular tuning of construction vehicles
- To avoid the dust water should sprinkle after specific duration.
- PPE should be provided to workers.
- Job rotation to avoid work pressure.
- Proper holdings, controls and use of PPEs for safe work at height.

6.8.2 POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

Besides the concrete measures to be adopted as described above, the quality of environment will further be enhanced through the running of project in complete accordance with the 5RS Principles- Reduce, Reuse, Recycle, Refurbish and Retrofit. Good housekeeping practices will be the order of the day.

6.9 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

In this section, the mitigation measures that are required, for construction and operation of project, to reduce residual impact to acceptable levels and achieve the expected outcomes of the project, are discussed. The Environmental Management

program is based on the type, extent and duration of the identified environmental impacts for construction and operation of project.

It is important that the recommendations and mitigation measures are carried out according to the spirit of the environmental assessment process and in line with the guidelines. The impact prediction has played a vital role in reconfirming that typical mitigation measures and approaches will achieve the necessary environmental controls based on the feasibility and detailed design assumptions available at this stage.

6.9.1 ENVIRONMENTAL MANAGEMENT DURING CONSTRUCTION PHASE

In order to facilitate the implementation of the EMP, during construction phase the contractor must co-operate with consultant and proponent and mitigates the impacts. Furthermore the contractor must be primed through the contract documentation and ready to implement all the mitigation measures. Proponent will make provision to recruit, engage retain and replace trained environmental management staff and these staff should audit the effectiveness and review mitigation measures as the subprojects are rolled out. Proponent will also need to confirm that contractors and their suppliers have complied with all statutory requirements and have appropriate and valid licenses and permits for all powered mechanical equipment and to operate in line with local authority conditions.

6.9.2 ENVIRONMENTAL MANAGEMENT DURING OPERATIONAL PHASE

In order to achieve good compliance with environmental assessment principles during operation the environmental staff must be appointed included fire fighters as well as environmental engineers to monitor the environmental aspects, to ensure compliance with the statutory obligations under the PEPA. It is recommended that the HSE unit of plant should engage directly with EPA to address all environmental aspects in the detailed design and contracting stages. The environmental staff will cover the implementation of environmental mitigation measures in the project.

6.9.3 MONITORING PROGRAMS

The monitoring program is always a basis of information in identifying environmental and socio-economic impacts for use in informed decision-making. During the study socio -environmental issues as well as mitigation measures during planning phase have been identified. Some area, however, will require monitoring during construction and operation of the project. It, therefore, becomes necessary to include a monitoring program as part of the project. The land resources would require monitoring. In particular landscaping of the area to be used for spoil disposal would require monitoring during project construction and project operation phase. Water resources monitoring will include the ground water and wastewater produce from the site. This will involve both quantitative and qualitative aspects of water resources.

Development projects bring social change in their wake. Much of this is beneficial, particularly that which promotes economic and social development. But there is always another side to development: of wage earners, families, or skill groups left behind by new methods of production, of micro-economics destroyed by new technologies, or the disintegration of village communities by population growth and a capitalizing economy. Some of this can be foreseen in a general way. Much of it would occur, even in the project area, whether or not Project is built. It seems clear that longer a project is in place, the more difficult it becomes to separate the social effects of that project from the wider processes of social change already at work in a region. Monitoring of social impacts may therefore be of value for similar project in future.

The monitoring staff will be consisting of environmental engineers and environmental analysts. Their responsibilities will be:

- To ensure all statutory environmental submissions under PEPA and other environmentally related legislation are thoroughly implemented.
- To ensure all environmental requirements and mitigation measures from the environmental assessment of project.
- To execute any additional EIA requirements needed due to fine tuning of the projects and that environmental performance targets are included in the contracts prior to project commencement;

- To ensure all environmental requirements and mitigation measures from the EIAs and environmental performance criteria are incorporated in the project.
- Work with management (consultants), supervising consultant and contractors to manage and monitor the implementation of the project EMP.

6.9.4 MONITORING SCHEDULE

The project falls in schedule-II, section B of EIA/IEE regulation 2022. This project falls in category of ‘Resource recovery units’ because of this reason schedule of monitoring is self-defined.

Table 6-5: Monitoring Schedule of Implementation during Construction Phase

Parameter	Frequency	Remarks	Responsibility
Solid waste	Fortnight	Visual check to access the disposal methods	Contractor and supervisor
Particulate matters	Monthly	Instrumental measurement	Contractor and supervisor, Reporting to EPA
Exhaust gases	Monthly	Instrumental measurement	Contractor and supervisor, Reporting to EPA
Ground water quality and wastewater	Monthly	Monitoring of water and wastewater parameters	Contractor and supervisor, Reporting to EPA
Noise and vibration	Monthly	Measurement of noise and vibration due to construction activities and vehicle movement	Contractor and supervisor, Reporting to EPA
Health and safety	Monthly	Monitoring of health and safety of workers	Contractor and supervisor

Table 6-6: Schedule of monitoring during the operational phase

Parameters	Frequency	Remarks	Responsibility
Air Quality	Annually	Ambient air quality	Administration of project and Reporting to EPA
Air emissions	Monthly	Air emissions from project units and generators	Administration of project and Reporting to EPA
Noise	Monthly	Noise by activities in the multi-purpose building	Administration
Wastewater	Monthly	Monitoring of water and wastewater parameters defined by EPA	Administration and Reporting to EPA
Solid waste	Monthly	Waste generation	Administration of the project
Traffic survey	Annually	Increasing load of traffic	Administration of the project

6.9.5 HEALTH AND SAFETY PLAN

E-waste recycling company will make every effort to provide a safe, healthy work environment. All employers, supervisors and workers must be dedicated to the continuing objective of reducing risk of injury. Supervisors will be held accountable for the health and safety of workers under their supervision. Supervisors are subject to various duties in the workplace, including the duty to ensure that machinery and equipment are safe and that workers work in compliance with established safe work practices and procedures. Every worker must protect his or her own health and safety by working in compliance with the law and with safe work practices and procedures established by the employer. Workers will receive information, training and competent supervision in their specific work tasks to protect their health and safety. It is in the

best interest of all parties to consider health and safety in every activity. Commitment to health and safety must form an integral part of this organization, from the president to the workers. In addition,

- E-waste recycling company has a dedicated EHS Department looking after the Environment and Occupational health and safety related matters of the company.
- It has its fully implemented Safety Policy.
- It has its fully implemented Road Safety Policy.
- It has its fully implemented Smoking Policy.
- It has its fully implemented PPEs Policy.
- It has a detailed Emergency Response Plan established and implemented.
- Firefighting arrangements are also present and implemented.

6.9.6 INSTITUTIONAL CAPACITY

The main institutions involved in environmental management and monitoring program will be as follows:

- HSE department E-waste recycling company
- Supervisory Consultants (SC)
- Construction Contractor (CC)
- Punjab Environmental Protection Agency (Punjab-EPA)

These key organizations will have the following roles and responsibility during the construction and operation stages:

6.9.7 CONSTRUCTION STAGE

During the construction stage, Construction Contractor (CC) will be mainly responsible for the execution of the mitigation measures. Supervisory Consultants (SC) will be responsible for the monitoring of the compliance of environmental management plan (EMP) and PEQS defined by EPD.

6.9.8 OPERATION STAGE

During the operational stage of the project, role of CC and SC will gradually decrease. During this phase of the project, implementation of recommendations of EMP and its supervision will be the responsibility of monitoring team coordinating with top management.

6.9.9 SUMMARY OF IMPACT AND THEIR MITIGATION MEASURES

Sr. No.	Anticipated Impacts	Mitigation Measure
Construction phase		
Physical Environment		
1.	- Dust may take place in the project areas as a result of excavation, transportation of machinery to site and assimilation of machinery. - Soil contamination may take place due to the generated solid waste at site.	- Good engineering practices should be adopted by Contractors, which will help to control dust emission at the construction sites. - Soil contamination can be curtailed by monitoring and maintaining the generator and proper solid waste management.
2.	A Number of machinery and equipment is in operation for the construction of this project, dumping trucks, other vehicles and elevators generating noise, particulate matter (PM₁₀), smoke, dust, CO, and NO_x in the ambient air which may deteriorate the air quality and cause impacts on human health, fauna and flora.	- Tuning of vehicles should be made mandatory to reduce the emissions of NO_x, CO, Hydrocarbons (HC) and PM. - Equipment and vehicles powered with diesel should be well maintained to minimize particulate emissions. - Containers and truck containing construction material and

Sr. No.	Anticipated Impacts	Mitigation Measure
	Due to movement of trucks and other vehicles noise and vibration may increases and residents of the nearby settlements may get affected.	machinery will come in the night time and to control the noise of the machinery the boundary wall of the construction site will play a vital role as noise barrier.
Ecological Environment		
1.	Dust on trees and other plants during construction	The sprinkling of water on tress as well as on ground will be done.
Social Environment		
1.	The project construction will not harm any private structures.	No mitigation required
2.	- Construction activities, particularly excavation, foundation and movement of haul trucks and machinery may prove dangerous for safety of the workers as well as for the residents. - Contractor's staff while working on the high-rise columns, transoms, etc. may slip and get injured.	- Contractor will ensure the provision of medicines, first aid kits, emergency vehicles, etc. at the work place. - Training of workers in the construction safety procedures, environmental awareness, equipping all construction workers with safety boots, helmets, gloves, ear plugs, and protective masks, and monitoring their proper and sustained usage.

Sr. No.	Anticipated Impacts	Mitigation Measure
Operational Phase		
Physical Environment		
1.	Daily municipal solidwaste and sludge during operational phase will be produced.	▪ The municipal solidwaste and sludge will be disposed off through contractor.
2.	Emissions from the generators will be produced if not managed properly will affect the air quality.	▪ Proper tuning of generators ▪ Fuel to air ratio will be maintained to control air pollution.
Ecology		
1.	Native plants will be planted. The Use of native trees will welcome the local and migratory birds for nesting and shelter.	▪ Environmental Enhancement Measures ▪ Increase overall environmental features of the area.

6.9.10 EQUIPMENT MAINTENANCE DETAIL

Maintenance and washing of all heavy mobile machinery & vehicles should be carried out at adequate service stations. Regular maintenance of all vehicles and machines to be used on site will be mandatory. It should be noted that the project foot print is small and therefore the number of vehicles to visit the project site will also be very less in number as compared to the large scale project. Maintenance and re-fueling (if necessary) of any construction equipment shall be done at a decent distance from the excavation area and only be undertaken on sealed area. Any re-fuelling must be handled carefully taking particular attention to avoid any spilling of any fuel.

6.9.11 ENVIRONMENTAL BUDGET

Environmental monitoring cost related to the mitigation measures of environmental parameters related to the location of construction site and activities, borrow materials,

etc. will be the sole responsibility of the Contractor and he will take care of cost implications. Tentative annual monitoring cost as per environmental monitoring plan is given in Table 6.4.

Table 6-7: Annual Monitoring Cost

Sr. #	Phase	Item	Cost per Year (Rs.)
1.	Construction	Monitoring and Laboratory Testing	600,000
		Salary and Direct Cost	800,000
2.	Operation	Monitoring and Laboratory Testing	10,00,000
		Salary and Direct Cost	10,00,000

Training Cost

The Project training will be imparted at different stages of the Project at different staff levels. CC will be mainly responsible for the arrangement of these trainings. During the operational phase the trainings will be conducted by monitoring team like fire drills etc.

A training log will be maintained by the SC. The training log will include;

- Topic
- Date, time and location
- Trainer
- Participants

6.9.12 SITE SELECTION

The site is selected on the basis of prohibition area, environmental sensitivity, competent to the surrounding and suitability. The site is not present in the prohibited area. The area is as well not situated in the environmental sensitive area as this area does not fall in the high seismic zone, not near the river as there are very low chances of flood and not extremely polluted area. The site is competent and suitable for this type of project.

6.9.13 IMPACT SIGNIFICANCE

Impacts significance is defined on the basis of its acceptance ecologically, socially as well as on the basis of environmental standards that either it is according to the environmental standards or not.

6.9.14 ECOLOGICAL IMPORTANCE

The impact of this project has least ecological risk. However during the operational phase native plants will be planted in abundance which will enhance the environmental feature of the project. Moreover use of native trees will welcome the local and migratory birds for nesting and shelter.

6.9.15 SOCIAL IMPORTANCE

Development projects bring social change in their wake. Much of this is beneficial, particularly that which promotes economic and social development. Another side to development as it provides the opportunities for wage earners and skill groups of local community as well as for the outsiders. It seems clear that this plant has positive impacts on the social life of the area.

During the construction stage in case of any complaint, it can be noted down by the site representative. The site representative will maintain a register of complaints received from the local communities and measures will be taken to mitigate these concerns. They will report the status of complaints in his monthly report to top management, for information and further action.

6.9.16 ENVIRONMENTAL STANDARDS

Drinking water standards

Table 6-8: Drinking water standards

Properties /parameters	Standard values for Punjab	WHO Guidelines	Remarks
Bacterial			
All water intended for drinking (E.coli or Thermotolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water entering the distribution system (E.Coli or Thermotolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water in the distribution system (E.coli or Thermotolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12- month period.	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12- month period.	Most Asian countries also follow WHO standards
Physical			
Colour	≤15 TCU	≤15 TCU	
Taste	Non objectionable/Acceptable	Non objectionable/Acceptable	

Table 6-9: Drinking water standards

Properties /parameters	Standard values for Punjab	WHO Guidelines	Remarks
Odour	Non objectionable/Acceptable	Non objectionable/Acceptable	
Turbidity	< 5 NTU	< 5 NTU	
Total hardness as CaCO ₃	< 500 mg/l	---	
TDS	< 1000	< 1000	
pH	6.5 – 8.5	6.5 – 8.5	
Chemical			
Essential Inorganic	mg/Litre	mg/Litre	
Aluminium (Al) mg/l	≤0.2	0.2	
Antimony (Sb)	≤0.005 (P)	0.02	
Arsenic (As)	≤ 0.05 (P)	0.01	Standard for Pakistan similar to most Asian developing countries
Barium(Ba)	0.7	0.7	
Boron (B)	0.3	0.3	
Cadmium(Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing countries
Chloride(Cl)	<250	250	
Chromium(Cr)	≤0.05	0.05	
Copper (Cu)	2	2	
Toxic Inorganic	mg/Litre	mg/Litre	
Cyanide (CN)	≤0.05	0.07	Standard for Pakistan similar to Asian developing countries

National environmental quality standard and Punjab Environmental Quality Standards for Ambient Air

Table 6-10: Ambient air quality standards

Pollutants	Time-weighted average	Concentration in Ambient air		Method of measurement
		PEQS	NEQS	
Sulphur Dioxide (SO ₂)	Annual Average*	80µg/m ³	80µg/m ³	Ultraviolet fluorescent method
	24 Hours**	120µg/m ³	120µg/m ³	
Oxides of Nitrogen	Annual Average*	40µg/m ³	40µg/m ³	Gas phase chemiluminescence
	24 Hours**	80µg/m ³	80µg/m ³	
O ₃	1 Hour	130µg/m ³	130µg/m ³	Non dispersive UV absorption method
Suspended Particulate matter (SPM)	Annual Average*	360 µg/m ³	360µg/m ³	High volume Sampling, (Average flow rate not less than 11 m3/minute)
	24 Hours**	500 µg/m ³	500µg/m ³	
Respirable Particulate Matter (PM ₁₀)	Annual Average*	120 µg/m ³	120µg/m ³	β Rays absorption method
	24 Hours**	150 µg/m ³	150µg/m ³	
Respirable Particulate Matter (PM _{2.5})	Annual Average*	15 µg/m ³	15µg/m ³	β Rays absorption method
	24 Hours**	35 µg/m ³	35µg/m ³	
	1 Hour	15 µg/m ³	15µg/m ³	
Lead (pb)	Annual Average*	1µg/m ³	1µg/m ³	ASS method after sampling 2000or equaling filter paper
	24 Hours**	1.5 µg/m ³	1.5µg/m ³	
Carbon Monoxide (CO)	8 Hours**	5mg/m ³	5mg/m ³	Non dispersion Infrared Method
	1 Hour	10mg/m ³	10mg/m ³	
*Annual arithmetic mean of minimum 104 measurement in a year taken twice a week 24 hourly at uniform interval				
**24 hourly/8 hourly values should be meet 98% of the in a year. 2% of the time, it may exceed about but not on two consecutive days				

6.10 MITIGATION AND IMPACT ASSESSMENT

6.10.1 IMPACT AND THEIR MITIGATIONS DURING CONSTRUCTION PHASE

The most likely environmental problems to occur during construction phase could due to:

- Construction machinery,
- Compaction of soil activity,
- Leveling of land,
- Moving vehicles,
- Installation of machinery
- Associated civil work.

The problems which are associated with these activities are:

- Gaseous emission of SO₂, NO_x and CO, hydrocarbons etc.
- Particulate Matter (PM)
- Noise
- Effluent

The mitigations use to avoid these impacts are:

- Vehicles transporting lose construction material (clay, sand etc.) to be covered with tarpaulins.
- Routine service and maintenance of vehicles and machines to reduce engine emissions.
- During periods with abnormal wind speeds, in particular during dry weather conditions, workers on the construction site should be provided with adequate inhalation and eyes protection gears. In case particulates in air hamper a clear view over the site completely, so that safety is impaired, the construction should be interrupted until weather conditions improve.
- Spraying exposed soil with water to reduce PM₁₀ emissions and particulate matter deposition. Water to be applied at a rate to maintain a moist surface, but not create surface water runoff or erosion conditions.

- During construction, water would be supplied from the water storage facility already provided at the work site which is very closely present to the project site.
- Potable drinking water for construction workers would be provided.
- Solid wastes resulting from the construction activity will be sale out and disposed of properly to avoid any threat to environment.
- Power mechanical equipment like bulldozers, air compressors, concrete pumps, concrete mixers, and heavy cairns etc. shall only be used with low sound power, whenever possible.
- The building machinery equipment shall be well maintained and serviced regularly during construction phase.
- Silencers or mufflers on construction equipment shall be used.

6.10.2 IMPACT AND THEIR MITIGATIONS DURING OPERATIONAL PHASE

The major impacts of operational phase are:

- Solid Waste/Sludge
- Air emissions
- Noise
- Waste water

The mitigation will be used to avoid the impacts are:

- The solid waste and sludge will be disposed off through contractor.
- Ear muff / ear plugs, silencers will be applied to the machinery to reduce the noise pollution.
- Waste water will be treated through septic tank and after that this wastewater will be discharged in Hadiara drain.

What are the hazards?	When will the risk occur?	Who might be harmed and how?	What will the actions do take?	Responsible Person
Ground contamination	During construction & operational phase	Worker working there during construction and operational phase	Provision of good site welfare facilities, Septic tank to prevent ground contamination	Supervising consultants
Inhalation of gases	During construction & operational phase	Workers, nearby community	Provision of PPE & use of new technology generators, installation of wet scrubber	Supervising consultants and top management
Water contamination	During construction & operation phase	Worker, nearby community	Proper drainage of wastewater, after passage from Septic tank	Supervising consultants and Building's management team
Noise	During construction & operation phase	Worker, nearby community	Generator will put in the close canopy, silencers will be applied to the machinery new technology will be used	Supervising consultants and Building's management team

6.10.3 OBJECTIVE OF MITIGATORY MEASURES

Mitigation is the stage of the EIA process when measures are identified to avoid, minimize or remedy impacts. These measures are implemented as part of the process of impact management, together with any necessary adjustments to respond to unforeseen impacts. Both elements are integral to ensuring that the EIA process leads to practical action to offset the adverse environmental impacts of proposed developments. The migratory measures are designed to minimize the environmental impacts of the project.

7 ENVIRONMENTAL MANAGEMENT PLAN

7.1 ENVIRONMENT MANAGEMENT PLAN

This Chapter provides an overall approach for managing and monitoring the environmental issues and describes the institutional framework and reporting mechanism to implement the Environmental Management Plan (EMP) for the construction of E-waste recycling unit at Chakwal. The EMP has been prepared with the following objectives:

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

7.2 STRUCTURE OF EMP

The EMP has been divided into the following sections:

- Review of regulatory requirements and applicable standards
- Mitigation Management Matrix (MMM)
- Institutional Arrangements for Implementing the EMP
- Roles and Responsibilities of the different agencies.
- Environmental Monitoring Plan
- Traffic Management Plan (TMP)
- Training program

7.3 REGULATORY REQUIREMENTS AND APPLICABLE STANDARDS

The main law and legislation concerned with the environment is Punjab Environmental Protection Act (PEPA) 1997 (Amended 2012). This Act is a fairly comprehensive legislation and provides for protection, conservation, rehabilitation and improvement of the environment.

The salient features of the law are:

- No proponent of a project shall commence construction or operation unless he has filed with the Government Agency designated by Federal EPA or Provincial EPAs an IEE/EIA, and has obtained NOC.
- Establishment and Formation of the Pakistan Environmental Protection Council (PEPC).
- Powers and Functions of the Federal and Provincial Environmental Protection Agencies.
- Prohibition of certain discharges or emissions.
- PEQS for wastewater, air emissions and noise.
- Empowers Government to issue notices and to enforce them for the protection of the environment.

The proposed project related environmental laws/guidelines are as follows:

- Punjab Environmental Protection Agency Regulations, 2022 for Review of IEE and EIA
- Pakistan Environmental Impact Assessment Procedures
- Guidelines for Public Consultation
- PEQS
- Sectoral Guidelines for Environmental Reports, Major Roads, October 1997

7.4 MITIGATION MANAGEMENT MATRIX (MMM)

This matrix identifies the environmental impacts of multipurpose project during the construction and operation stages and establishes the linkages between the environmental and social impacts, mitigation strategy and the agencies responsible for execution. The MMM presented in Table 7.1 identifies the following:

- The mitigation measures recommended in EIA.
- The person/organization directly responsible for adhering to or executing the required mitigation measures.
- The person/organization responsible for ensuring and monitoring adherence to the mitigation measures.
- The parameters which will be monitored to ensure compliance with the mitigation measures.
- The timing at which the mitigation or monitoring has to be carried out.

Table 7-1: Mitigation management matrix

Sr. no.	Anticipated impacts	Mitigation measures	Responsibility		Actions/Monitoring parameters/Monitoring methods
			Execution	Monitoring	
Construction phase					
Physical Environment					
1	• Soil erosion may take place in the project as a result of excavation. • Soil contamination may take place due to the generated solid waste at project site.	• Good engineering practices should be adopted by Contractors, which will help to control soil erosion at the construction sites. • Soil contamination can be curtailed by reducing the oil spill from generator and other machinery at project construction areas, proper solid waste management. • The Contractor is required to impart proper	CC	SC and HSE E-Waste Management	• Equipment maintenance. • Placement of solid waste storage containers at project site. • Collection and disposal by contractor

Sr. no.	Anticipated impacts	Mitigation measures	Responsibility		Actions/Monitoring parameters/Monitoring methods
			Execution	Monitoring	
		training to his workforce in the storage and handling of obnoxious materials, like oil, diesel and petrol that can potentially cause soil contamination.			
2	Generation of noise and exhaust emission due to construction activities like transportation of machinery excavation, foundation, clearing, leveling, assimilation of plant	• Tuning of vehicles should be made mandatory to reduce the emissions of NO_x, SO_x, CO and PM₁₀. • Water Sprinkling on roads • Equipment and vehicles should be well maintained to minimize particulate emissions. • Haul-trucks carrying, earth, sand, aggregate and other materials should be kept covered during transportation of materials and during	CC	SC and HSE E-Waste Management	• Maintenance of Vehicles • Water Sprinkling • Filled Vehicles covered with tarpaulin

Sr. no.	Anticipated impacts	Mitigation measures	Responsibility		Actions/Monitoring parameters/Monitoring methods
			Execution	Monitoring	
		storage at site, with tarpaulin.			
Ecological Environment					
1	None of trees will be affected with the implementation of the project.	In order to enhance the environmental measures of the site the significant amount of indigenous trees will be planted.	CC	SC and HSE E-Waste Management	Plantation of trees,
Social Environment					
1	People will face the noise and dust problems during the construction phase.	- Effective construction controls may be made by the Contractor to avoid inconvenience to the population due to noise, smoke and fugitive dust. - Temporarily, the Contractor should select specific timings for heavy machinery operation so as to cause least	CC	SC and HSE E-Waste Management	- Sprinkling of water in dust affected areas as per schedule - Timing of vehicle movement to be noted.

Sr. no.	Anticipated impacts	Mitigation measures	Responsibility		Actions/Monitoring parameters/Monitoring methods
			Execution	Monitoring	
		disturbance to the population considering their peak movement hours.			
2	Construction activities, particularly transportation of machinery, excavation and movement of haul trucks and machinery may prove dangerous for safety of the workers as well as for the locals.	- Contractor will ensure the provision of medicines, first aid kits, emergency vehicles, etc. at the work place. - Training of workers in the construction safety procedures, environmental awareness, equipping all construction workers with safety boots, helmets, gloves, ear plugs, and protective masks, and monitoring their proper and sustained usage.	CC	SC and HSE E-Waste Management	Instruct Staff of the Contractor to strictly follow the HSE policies of the company

Sr. no.	Anticipated impacts	Mitigation measures	Responsibility		Actions/Monitoring parameters/Monitoring methods
			Execution	Monitoring	
Operational phase					
Physical Environment					
1	Daily municipal solid waste generation during operational phase will be of Office waste, kitchen waste etc. If not managed properly then it will create Soil and water pollution.	Solid waste will be collected in separate bins and disposed off through a contractor	E-Waste Management	EPA	Regular monitoring of solid waste
2	Stack emission. If not managed properly then it will create the air pollution	Proper tuning and maintenance of generators and adjusting Air to fuel ratio to control pollution.	E-Waste Management	EPA	Monthly monitoring of air emissions
3	Daily sewage wastewater generated during the operational	Wastewater is treated through the settling and	E-Waste Management	EPA	Monthly analysis of wastewater after passing through Septic tank

Sr. no.	Anticipated impacts	Mitigation measures	Responsibility		Actions/Monitoring parameters/Monitoring methods
			Execution	Monitoring	
	stage is 2 m ³ /day. If not managed properly then it will create the land and water pollution.	septic tank. After that, this water will be discharged in to drain.			
4	There will a Daily sludge generation during operational phase if not managed properly then it will create soil and water pollution.	The sludge will be collected in septic tank and will be disposed off by contractor	E-Waste Management	EPA	Regular Monitoring of Sludge
5	Workers working on plant may face HSE hazards like noise, vibration and generation of dust and particulate matter due to shredding and	• Use local exhaust ventilation systems • Provide workers with appropriate personal protective equipment (PPE), such as dust	E-Waste Management	E-Waste Management	Regular Monitoring/Audits/inspections

Sr. no.	Anticipated impacts	Mitigation measures	Responsibility		Actions/Monitoring parameters/Monitoring methods
			Execution	Monitoring	
	crushing and other operations of plant.	masks, respirators, earing protection (e.g., earplugs or earmuffs) and anti-vibration gloves and tools. • Conduct regular air quality, noise and vibration related monitoring to ensure compliance with occupational exposure limits • Train workers on safe operating practices			

7.5 INSTITUTIONAL ARRANGEMENTS FOR IMPLEMENTATION OF EMP

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

- HSE E-Waste Management company
- Supervisory Consultants (SC)
- Construction Contractor (CC)
- Punjab Environmental Protection Agency (Punjab-EPA)

7.6 ROLES AND RESPONSIBILITIES

The key organizations will have the following roles and responsibility during the construction and operation stages:

7.6.1 CONSTRUCTION STAGE

During the construction stage, Construction Contractor (CC) will be mainly responsible for the execution of the mitigation measures. Supervisory Consultants (SC) will be responsible for the monitoring of the compliance with top management as defined in mitigation management matrix.

7.6.2 OPERATION STAGE

During the operational stage of the project, role of CC and SC will gradually decrease. During this phase of the project, implementation of recommendations of EMP and its supervision will be the responsibility of E-Waste Management company Chakwal and Punjab-EPA as defined in mitigation management matrix.

7.7 ENVIRONMENTAL MONITORING PLAN

7.7.1 OBJECTIVES

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

- To check compliance with the requirements of the EMP by monitoring activities of the project contractors. This will be called Activity Monitoring.

- To monitor actual impacts of the project activities on physical, ecological and socioeconomic receptors of the Project Area so that any impacts not anticipated in the EMP or impacts which exceed the levels anticipated in the EMP can be identified and appropriate mitigation measures can be adopted in time. This objective will be achieved through effects monitoring.

To achieve these objectives, the following monitoring program will be implemented.

7.7.2 MONITORING STRATEGY

Activity Monitoring

Activity monitoring will be carried out to ensure compliance with the requirements of the EMP. The mitigation management matrix will be used as a management and monitoring tool. Activity monitoring will be the responsibility of all organizations involved in the operation, i.e. top management of multi-purpose building, Project Consultants and the Contractors and hence it will be done at three levels:

- Activity Monitoring by E-Waste Management company Chakwal
- Activity Monitoring by Consultant's field monitors
- Activity Monitoring by the Contractor's officers

The Contractors will report compliance with the MMM to SC and E-Waste Management company Chakwal for verification.

Effects Monitoring

Effects monitoring will be the responsibility of Environmental Protection Department. Monitoring requirements have been outline in the EMP. However, a detailed monitoring program is attached as Table 6.1. The monitoring program describes in detail the resources and methodology that will be adopted for the purpose of Effects Monitoring.

Physical Environment will target at identifying project impacts on:

- Water
- Air

A monitoring protocol is provided in the matrix given in Table 7.2.

Ecological Environment

Floral surveys will be conducted to determine the effects of different project activities on Flora. The recommended effects monitoring protocol for Flora is provided in Table 7.3.

Socio-economic Environment

Effects on the socio-economic environment will be monitored by the consultants who will conduct survey both during construction and operation stage. The surveys will be structured to ascertain the level of impacts during the course of the project and the implementation of mitigation measures prescribed in the EMP such as health and safety of communities.

Table 7-2: Recommended Activity Monitoring Protocol for Physical, Ecological and Social Environment

Parameter/Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
Water Quality	- Near the project area - Concrete preparation plants - Fuel (Petrol. Oil and Grease) products storages	Discrete grab sampling and laboratory testing of water samples.	Sampling and laboratory testing should be done on Monthly basis during the construction and Quarterly during the operational stage.
Dust Emissions	Construction site	Visual checks	Daily visual monitoring during routine monitoring by activity monitors and reported on a monthly basis during the construction period.
Noise Levels	- Construction site - Nearby area due to track movement	Noise meter	- On monthly basis during the construction stage of the project. - Quarterly during the operational stage.
Stack emissions and Ambient Air	Silencers of heavy machinery, trucks and other vehicles.	Monitoring of ambient air quality in ppb.	Monthly monitoring of air pollution parameters including PM, NO_x, SO_x, CO, Hydrocarbons during the

Parameter/Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
	Stack monitoring of generator. Construction site Ambient Air		construction period, and quarterly monitoring of the air emissions during the operation stage.
Ecological Environment			
Plants and agriculture disruption	It will be monitored in Project Area during the construction phase	Plants and agriculture	Weekly during routine monitoring and reported on monthly basis during the construction period, and once in a year monitoring and reporting during the operation period.
Socio-cultural Environment			
Inconvenience to community	All around the Project Area	Consultations with community to get feedback about inconvenience due to the construction activities to perform their daily routine chores.	Monthly monitoring and reporting during the construction period.

Table 7-3: Recommended Effects Monitoring Protocol

Parameter/Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
Water Quality	Sampling from the points located at a greater distance from the construction sites to ensure that they show the influence on a wider range of receiving body.	Sampling and laboratory testing of wastewater from disposal Nallah	Sampling and laboratory testing should be done on monthly basis during the construction stage and quarterly during the operation stage.
Air Quality	Existing residential near the project site.	Ambient air quality monitoring in ppb.	Monthly air quality monitoring for NO_x, SO_x, CO, PM₁₀ during the construction stage. Once a year during the operation stage.
Noise	Existing residential near the project site	Noise monitoring in dB	Monthly during the construction phase and quarterly during the operational phase of the project.

7.8 TRAFFIC MANAGEMENT PLAN

No traffic diversion plan needed during the construction stage of the project because the project will not disturb the road side traffic.

7.9 MATERIAL TRANSPORTATION PLAN (MTP)

Material Transportation Plan will be prepared which specifies the routes for material and machinery transportation for construction of this project of E-Waste Management company Chakwal. These routes have been established in such a way that there is minimum hindrance or disturbance to the local communities and flow of traffic. HSE arrangements and proper documentation have been planned in order to achieve the above objectives as follows:

- Material Transportation HSE Arrangements
- Transportation timings should preferably be at night time to minimize the traffic conflicts.
- Filled trucks should be covered with tarpaulin to avoid fugitive dust and should be visually inspected for proper loading, sealing and decontamination.
- Vehicles should have passed an annual inspection and carry the fitness certificate.
- The truck drivers will be strictly instructed not to play music and do not use horns at night time to minimize disturbances.
- Material Transportation Documentation

A field logbook will be maintained for the documentation. This logbook will additionally serve to document observations, personnel onsite, equipment arrival, and departure times, a truck exit inspection checklist and other project information.

Field logbooks will document where, when, how, and from whom any vital project information is obtained. Logbook entries will be completed and accurate enough to permit reconstruction of field activities. Logbooks will be bound with consecutively numbered pages. Each page will be dated and the time of entry notice. All entries will be legible, written in black ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions or inappropriate

terminology. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Correction will be dated and initialed. No entries will be obliterated or otherwise rendered unreadable.

Entries in the field logbook will include at a minimum the following for each field work date:

- Site name and address
- Recorder's name
- Time of site arrival/entry on site and time of site departure
- A summary of any onsite meetings
- Description of transport vehicle(s)
- Names of waste transporters and proposed disposal facilities
- Quantity of import fill material in truckloads
- Levels of safety protection

The HSE officer of the Contractor will communicate HSE requirements and tailgate safety meetings to all drivers and on-site workers. He will provide information related to contaminant descriptions, and requirements for the containment and cleanup of an accidental release along with basic safety requirements, name of personnel in-charge, contact information and a map and directions to the nearest hospital.

7.10 EQUIPMENT MAINTENANCE DETAILS

All Construction vehicles, Earth moving equipment, Construction equipment and Material handling equipment will be maintained in accordance with the Maintenance Scheduling for Mechanical Equipment (Facilities Instructions, Standards, and Techniques Volume 4-1A – Revised 2009), U.S. Department of the Interior Bureau of Reclamation.

The contractor will make the detail plan for maintenance schedule of their machinery before the construction to be started and will be submitted to the consultant. The contractor will do the continuous follow-up and regular checks will ensure on all the construction machinery equipment's.

7.11 TRAINING PROGRAMS

Environmental training for construction period will form part of the environmental management system. The training will be directed towards all personnel for general environmental awareness.

7.11.1 OBJECTIVES

The key objective of the training program is to ensure that the requirements of the EMP are clearly understood and followed throughout the Project.

7.11.2 ROLES AND RESPONSIBILITIES

SC will be responsible for conducting environmental training to all the Project personnel on potential environmental issues of the Project through Contractor, who will be responsible to arrange training and ensure the presence of targeted staff. SC will prepare a Project specific training manual for this purpose. Contractors on their part will be required to provide induction training/briefing to all their staff at the time of their recruitment and before the start of any activity in the Project Area. This will be followed by training arranged by the SC to all the targeted staff.

7.11.3 TRAINING LOG

A training log will be maintained by the SC. The training log will include;

- Topic
- Date, time and location
- Trainer
- Participants

8. STAKEHOLDER CONSULTATION

8.1 GENERAL

Any person, group or organization with an interest in the project or who can be affected directly or indirectly, negatively or positively by the project activities is a project stakeholder.

There are two types of stakeholders - primary and secondary stakeholders. Primary stakeholders are those which are directly affected by the project activities and secondary stakeholders are those which are affected indirectly. Stakeholder consultation is a mean of involving the primary and secondary stakeholders in the project decision making process by getting feedback from the community and addressing their concerns.

Stakeholder consultation was therefore conducted in the project area, not only to comply Punjab EPA regulations for conducting EIA Study but also to improve and enhance the social and environmental design of the project and achieve the goal of sustainable development.

Public consultation sessions in detail are discussed in this section, which was held with the stakeholders/ groups likely to be affected by the project. This process has been proceeded to involve the stakeholders from the initial stages of the project. All applicable concerns and suggestions of the stakeholders have been included during the planning and design phases of this project. Much of the PC process to date has revolved around concerns for the mitigation of construction impacts and the possible side effects.

The process of consultation is expected to continue through all stages of the project to accommodate stakeholders' desires and to orient the stakeholders positively towards the project implementation and where possible to harness cooperation over access issues to facilitate timely completion. This process has been initiated during the feasibility stage to disclose the project information to the stakeholders and record feedback regarding the proposed project and preferences.

Role of the public participation is very important in the design making process to achieve the goal of sustainable development. The major objectives of public consultation are as follows:

- Promote better understanding of the project, its objectives and its likely impacts and their management.
- Identify and address the concerns of all interested and affected parties of the project.
- Provide a mean to Identify and resolve issues before plans are finalized and development commences, thus avoiding public anger, resentment and potentially costly delays.
- Encourage transparency and inculcate trust among various stakeholders to promote cooperation and partnership with the communities and local leadership.

Stakeholders that were consulted include general public, local residents, shop keepers, businessmen of the adjacent areas and pedestrians. All those stakeholders have different concerns depending on their involvements in various aspects of the project. The experts from Academia, private organizations and government agencies were also consulted.

Stakeholders were consulted during informal and formal meetings held in the project area. The consultation process was carried out in Urdu and native language. During these meetings, a simple, non-technical, description of the project was presented, with the overview of the project's likely human and environmental impacts. This was followed by an open discussion allowing participants to voice their concerns and opinion. Their feedback along with their major concerns and suggestions were documented for analysis and mitigation. Focus group discussions and in-depth interviews were also conducted. The issues recorded in the consultation were examined, validated, and addressed in the EIA report.

The consultation process will continue even after the EIA report submission, particularly in the Public Hearing and afterwards to create consensus among the

stakeholders on specific environmental and social issues in context of the project in order to incorporate sustainability in the on-going project.

8.2 MAIN VIEWS AND CONCERNS OF THE STAKEHOLDERS

During consultations, the following people of the Study Area expressed their views and concerns about the Project.

Table 8.1: Details of Public Consultation

Sr. No.	Name	S/O	Occupation	Concerns	CNIC No.
1.	Mr. Syed Ibrar Hussain	--	Agriculturist	Cost Effective	37201-1720083-3
2.	Mr. Mu. Saleem	--	Agriculturist	Employment Opportunities	37201-7119707-7
3.	Mr. Syed Ahmad Hassan Shah	--	Agriculturist	Employment Opportunities	37201-1720083-3
4.	Mr. Malik Hasrat Nawaz	--	Business	Recycling of e-waste	37201-1788895-1
5.	Mr. Abdul Hameed	Ali Muhammad	Agriculturist	Recycling of e-waste	37201-9857360-1
6.	Mr. Mu. Mushtaq	Samundur Khan	Retired from Army	No concern	37201-6249432-1
7.	Mr. Shahid Mhemood	Muhammad Akram	Business	No concern	37201-7118840-1
8.	Mr. Mu. Awais	Muhammad	Business	Benefit for the country	37201-4203809-1
9.	Mr. Mu. Adnan	Muhammad Gulstan	Business	Benefit for the country	37201-6941867-9
10.	Mr. Ahmad Shehraz	Fateh Khan	Business	No concern	37201-4105151-5
11.	Mr. Ali Raza	Iftikhar Ahmad	Agriculturist	Employment Opportunities	37201-7585963-9
12.	Mr. Mu. Azeem	Ghukam Shabir	Employee	Employment Opportunities	37201-8632613-1
13.	Mr. Mu. Mubashir Razaq	--	Shopkeeper	Employment Opportunities	37201-697447-3
14.	Mr. Shahid Iqbal	Mu. Zaman	Shopkeeper	No concern	42401-475438-1

15.	Mr. Mu. Saeed	--	Shopkeeper	Employment Opportunities	37201-2573343-5
16.	Mr. Mu. Zaheer	Mu. Mubashir	Agriculturist	Employment Opportunities	37201-1609822-1
17.	Mr. Mu. Nawaz	Mu. Ashraf	Business	No concern	37201-6324340-7
18.	Mr. Mu. Nadeem	Taj Muhammad	Business	Employment Opportunities	37201-1439742-5

Concerns of public and stakeholders—According to the public and stakeholders, operations of this project will pose positive impact on local community as it will provide new employment opportunities to residents of the area and will prove to reduce the growing rate of unemployment in Chakwal district. It will increase their revenue of our country.

Residents did not raise any issues. The main concerns of the residents are as follows

i. Company workers should take care of our culture during the installation of the E-waste recycling plant.

ii. Employment should be given to local men,

This project does not seem to pose any adverse impact on community and environment because ground water, land, ambient air of area was not polluting due to operations of this industry.

Pictures of stakeholders consultations and public are given in **Annex-VII**.

9. CONCLUSION

The project aims in the Construction of a Electronic Waste Management & Recycling Unit at Dullah – Thanil Kamal Road, District Chakwal. According to the “Punjab Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2022” the project falls in schedule II. Accordingly, this EIA has been prepared for issuance of NOC/EA by the EPA, Government of the Punjab, Lahore before initiation of the project on ground.

9.1 CONSTRUCTION PHASE

The potential impacts during construction stage are summarized below. Majority of these impacts are of temporary nature and can be mitigated as described below:

1. Construction site will generate about 0.5 kg/person/day solid wastes from site camps and construction debris from construction activities. Although quantity of waste is much less, inappropriate disposal methods will have a negative impact on the physical environment of the project area. Proper solid waste management plan should be developed by the Contractor and implemented to avoid the littering and any other waste problems. Adequate number of solid waste containers should be placed at various locations for ease in storage and collection/disposal of solid waste.
2. Construction activities such as excavation, foundation, transportation, assembling and installation may affect the existing soil conditions in the Project Area. In addition, such work is likely to lead to changes in the existing drainage pattern and may have a significant adverse impact on the environment that can be mitigated by good engineering practices.
3. Soil contamination may take place due to the generated solid waste at project site in addition to oil spillage at site which can be curtailed by reducing the oil spill at project construction areas, proper solid waste management.
4. During construction stage, dust problem can affect the health of the community belonging to nearby residential areas. However, proper mitigation measures will remedy the impacts and in order to avoid dust problems during the

construction stage, contractor should sprinkle water at least twice a day during the construction activities.

5. Construction machinery using diesel engines will generate noise and exhaust emissions. Generally, the above machinery will generate particulate matter (PM10), smoke, dust, CO and NOx in the ambient air, which can deteriorate the air quality and result in impacts on human health and nearby fauna and flora. The movement of heavy machinery and vehicles on the dirt tracks can also cause fugitive dust emissions. Periodic tuning of vehicles should be made mandatory to reduce the emissions of NOx, CO, Hydrocarbons (HC) and PM10.
6. None of the trees at site will be effected due to the implementation of the project. The indigenous trees will be planted as per landscaping plan at the site.

9.2 OPERATION STAGE

The potential impacts during operational phase and its mitigations are summarized below-:

- Air Emissions are possible from the operation of generators. Air to fuel ratio of generators and proper maintenance will be maintained to control air emissions.
- Daily Municipal solidwaste during operational phase will be generated consisting of office waste, kitchen waste etc. which will be disposed off through TMA/contractor. Sludge septic tank will also be collected by the contractors.
- 2 meter cube/day of the wastewater will be produced during the operational phase. Wastewater will be treated through septic tank and after that it will be discharged in to drain.
- Workers working on plant may face HSE hazards like noise, vibration and generation of dust and particulate matter due to shredding and crushing and other operations of plant. Which will be tackled down by the use local exhaust ventilation systems, Providing workers with appropriate personal protective equipment (PPE), such as dust masks, respirators, earing protection (e.g., earplugs or earmuffs) and anti-vibration gloves and tools,

Conducting regular air quality, noise and vibration related monitoring to ensure compliance with occupational exposure limits and Training workers on safe operating practices

- There is need for vigilant security presence in and around the industry round the clock on a permanent basis to guard against theft and terrorist activities. The security concerns will have to be addressed adequately. Any threat to the security should be dealt with as a major challenge.

Based on the EIA report, it can be concluded that the implementation of the environmental mitigation measures, proper monitoring and compliance of the environmental standards/legislations will make the Project environmentally more sustainable.

9.3 RECOMMENDATION

On the basis of the facts summarized as above, the project merits for issuing Environmental Approval by the Environmental Protection Agency, Government of Punjab.

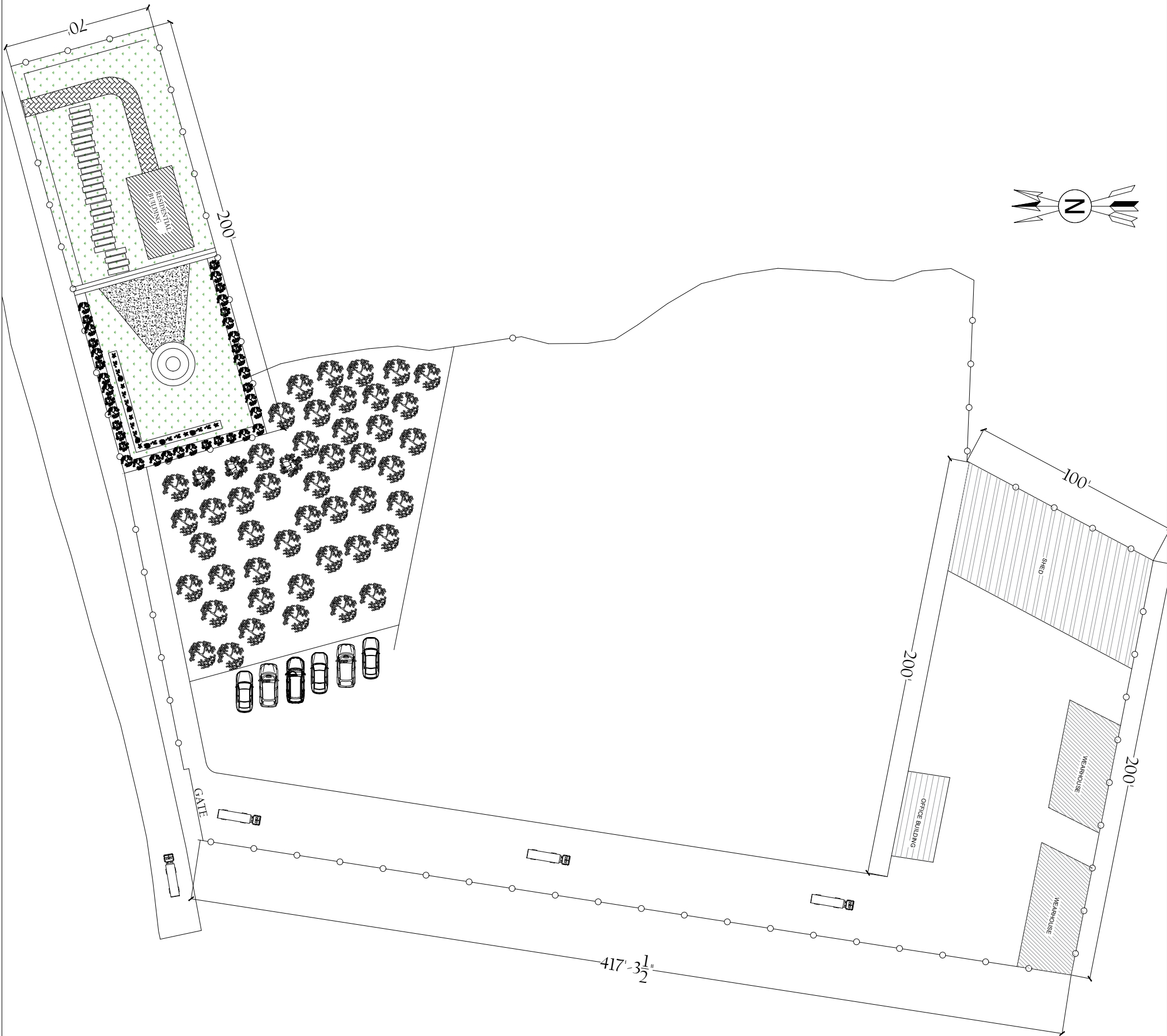
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ANNEXURE – I

MASTER PLAN OF THE PROJECT



DRAWINGS PROVIDED BY:
IAC ARCHITECTS & CONSULTANTS
ENGINEERING SOLUTIONS
ARCHITECTURE/MEPP/CONSULTANT/QUANTITY SURVEYOR
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ALTHOUGH GREAT EFFORT AND CARE HAVE GONE INTO THE PREPARATION OF THIS HOME PLAN, IT IS IMPOSSIBLE TO AFFECT ANY CONTROL OVER THE ACTUAL CONSTRUCTION. FOR THAT REASON AND DUE TO THE MANY JURISDICTIONAL DIFFERENCES IN LOCAL BUILDING CODE REQUIREMENTS AND OTHER LOCAL SEISMIC AND WEATHER CONDITIONS, "IAC" ASSUMES NO RESPONSIBILITY FOR ANY DAMAGES, MONETARY OR OTHERWISE, INCLUDING STRUCTURAL FAILURES DUE TO ANY DEFICIENCIES, OMISSIONS, OR ERRORS IN THE DESIGN. HOME PLANS ARE GENERAL IN NATURE. IT IS THE RESPONSIBILITY OF THE OWNER AND BUILDER TO CONSULT A LOCAL ARCHITECT OR ENGINEER AND TO CHECK WITH LOCAL BUILDING OFFICIALS BEFORE THE START OF CONSTRUCTION. ADDITIONAL ENGINEERING AND DESIGN MAY BE REQUIRED TO COMPLY WITH LOCAL BUILDING CODES.

DRAWING TITLE:
SITE PLAN

CLIENT NAME:
PROJECT ADDRESS:

SCALE:
AS-SHOWN
DATE:
DATE

DWG NO.:
DWGNO-1
REVISION:
0

SHEET NO.
A-1

ANNEXURE – II

SOCIO-ECONOMIC PERFORMA

Serial No. _____

COMMERCIAL ACTIVITIES

(SHOPS)

Interviewer's Name _____

Date _____

Q.1 Name of the Respondent _____

Q.2 Father's Name _____

Q.3 Age (years) _____

Q.4 Education _____

Q.5 Income _____

Q.6 Marital Status _____

Q.7 No. of family member _____

Q. 8 How many shop(s) do you have to run your business?

(a) Self Owned _____ (b) Rented _____

Q. 9 what is the nature of your business in your shops.

(a) Grocery Shop	☐	(b) Medical Store	☐	(c) Medical Clinic	☐
(d) Driver Hotel	☐	(e) Cloth/Garments	☐	(f) Shoes Store	☐
(g) Fertilizers/Pesticides	☐	(h) Grains/Flour Shop	☐	(i) Fruit/Vegetables	☐
(j) P.C.O.	☐	(k) Gold Smith	☐	(l) Black Smith	☐
(m) Driver Hotel	☐	(n) Auto Workshop	☐	(o) Dry Fruits Store	☐
(p) Precious Stones	☐	(q) General Store	☐	(r) Other_____.	

Q. 10 What is the approximate distance of your shop from Base Station/Landing Station?
_____ feet.

Q. 11 What is the size of plot, nature of construction and the estimated cost of your shop(s)?
_____ feet.

Shop No.	Size of Plot (sq. ft)	Nature of Construction 1. Pucca	Estimated Cost (Rs)
----------	-----------------------	------------------------------------	---------------------

		2. Semi-Pucca 3. Kachha 4. Wooden Cabins	
1			
2			
3			

Q. 12 For how many years are you running your business here? _____ years.

Q. 13 What is the estimated value of your present stock of goods in your shop? Rs. _____

Q. 14 How many persons are working in your shops? No. _____

Q. 15 What is the dominant mode of payment of your goods & services?

(a) Cash Payment ☐ (b) Deferred / Credit Payments ☐
(c) Kind ☐ (d) All ☐

Q. 16 How much is your estimated daily sale of goods / services on an average? Rs. _____

Q. 17 How much do you earn profit on an average in a month? Rs. _____

--- END ---

BASELINES CONDITIONS AND IMPACTS

1. TYPE OF AREA

- Arid
- Semi-arid
- Populated
- Densely populated
- Any other _____specify)

2. PHYSICAL ENVIRONMENT

a. geological conditions

- Is the origin of rocks a) Sedimentary b) Igneous c) Metamorphic
- Any other _____ (specify)

b. seismology

- Is there any record of earthquakes in the past 50 years
- Presence of faults/fractures
- Any other details _____ (specify)

c. topography & soils

- Are the soils mixtures of sand /silt/clay/gravel/clayey silt_____
- Any other _____ (specify)

d. Climate

Temperature (°C) (Min - Max)		Winds	Relative humidity	Precipitation	Wind speed
Summer	Winter				

Does the project area has any previous records of flooding?

e. Surface and Ground water

- Is groundwater potable
- If surface water available, what is its quality? _____

f .Air Quality

- Is the area visually pollution free

Yes

No

- Is the source of pollution traffic (cars, trucks, etc.) Or any other _____ (specify)
- Is the project area is highly; a) populated b) commercial

g .Liquid effluents

- Are there any liquid effluents due to industries/household

Yes

No

- If any other reason _____(specify)
- Is there exists proper drainage system?

Yes

No

- Is there any effluent treatment system exists?

Yes

No

- How much quantity of wastewater generated per day

h. Solid Waste

- Is solid waste management of the area poor/nominal/good _____
- Is poor management due to lack of awareness among people/authority is not responsible enough _____
- What type of solid waste management system exists? _____
- What is approximate quantity of solid waste generated from the project area/study area per day?
- What type of solid waste generated from the project area?

-
- Is there any hospital waste generated in the project/study area

Yes

No

- If yes, what are the management/disposal system
-

i. Noise

- Any sources of noise like traffic/industry/commercial activities or other _____(specify)
- Was any instrumental monitoring carried out to observe the noise levels?
- If yes, provide details

j. Buffer Zone

- Are there any protected areas/park in close vicinity of the project area/study area _____

i). ECOLOGICAL ENVIRONMENT

a. Flora & Fauna

- Aquatic ecosystems (if exists)_____
- Prevailing non fruit trees_____
- Prevailing fruit trees_____
- Is there presence of any endangered or rare species of plants

- Is there presence of any endangered or rare species of animals

- Is there any removal of trees involved
- Is the project area falls under route of migratory birds?
- Common wild animals in study/project area

Yes

No

- Is there any threaten national park, reserved forest or wildlife sanctuary in close vicinity of the project route.

☐ Yes☐ No

- Common birds species in study/project area

-
- Anything special

SOCIO-ECONOMIC ENVIRONMENT

i). Human & Economic Development

a. Industries

- Does the project area has any industries big / small _____
- Are there some home industries in the area _____

b. Infrastructure facilities

Infrastructure facilities available to the people:

Facility	Yes	No
Roads		
Sanitation		
Water Supply		
Heath facilities		
Educational facilities		
If any other (Specify)		

c. Mode of Transportation

- Do the people of the area use conservative/modern modes of transportation:

_____ (Specify)

- Is there any special trade of transportation in project area, etc.

Yes

No

e. Power Sources & Transmission

- Is there any grid station/ sub-station present in the project area?

- Is electric supply available to every commercial/

Yes

No

Yes

No

- Do people use other sources of power like generators?

Yes

No

ii). Quality of Life Values/Socioeconomic Values

a. Income

- Are most of people living below/above poverty line? _____
- Does the population comprises of Katcha Abadi/Pucca Abadi? _____
- Do people have basic needs of life in their houses? _____
- Do people are well off _____

b. Employment and Occupation

- What are major sources of employment

c. Education

- Is literacy level of the area low/medium/high _____

d. Religion

- Is the religion of majority population Islam _____
- Any other _____ (Specify)

e. Gender Ratio

- Is population of women more than men _____
- Is population of men more than women _____
- Ratio of population of men to population of women in the area (%)
1. Men _____ 2. Women _____
- Population density of the area is low/medium/high _____

f. Role of Women

- Either women of the area involve in

Activity	Yes	No
Household activities		
Business Activities		
Private/Government service		

Electoral activities		
Any other (specify)		

g. Public Health

- Are sanitation, water supply facilities available _____
- Any hospitals, dispensaries available in the area _____
- Any social health workers available _____
- Any particular diseases reported in the area _____

h. Recreational Resources & Development

- Parks/Swings get together areas / festivals arrangements _____
- If any other _____ (Specify)

i. Aesthetic Values

- Any sources of visual pollution _____
- Sources which add to the visual beauty _____
- If any other _____ (Specify)

i. Archeological or Historical Treasures

- Does the area any archeological or historical monuments

Yes

No

- If yes, _____ (Specify)

j. Cultural Values

- Is the culture of area modernized/conservative or a blend of both _____
- Is the community agree to absorb outsider visitors

Yes

No

k. Indigenous People

- Is there any group of indigenous people in project area?

Yes

No

- Is there relocation of such a group is involved.

Yes

No

- Anything special

4. STATUS OF LAND

- Does the area fall under government proprietorship

Yes

No

- Is it a private land

Yes

No

- The extent of land which is to be acquired (if any)

5. EXISTING STRUCTURES

Sr.No	Category	Nos.
1	Residences	
2	Commercial	
3	Communal property	
4	Religious building	
5	Any other	

6. Respondent's Views about Project

- 6.1** In your opinion, how will you be affected by construction/operation of this project?

- 6.2** Is this project beneficial for the community?

Yes

No

- 6.3** Will you feel any disturbance from noise generated by the operation of ropeway system?

Yes

No

6.4 Do you think it will disturb your privacy?

Yes

No

6.5 Would you like to be associated with the project as a worker?

Yes

No

8. General Observations of Interviewer

Name & Signature of Interviewer: _____

Date: _____

ANNEXURE – III

BASELINE ENVIRONMENTAL LAB MONITORING REPORTS



ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF THE PUNJAB
National Hockey Stadium, Gate No. 08
Gaddafi Stadium Complex, Lahore



Validation for Stack & Ambient Monitoring / Sampling

Emission Monitoring under CTM-34 or OTM-39			
Facility Name & Address	Construction of E-Waste Recycling Unit by E-Waste Management Pvt. Ltd		
Phone	Neela Dullah, Dist. Chakwal		
Industry Category	09/DD (Lab)/EPA/RWP (Validation)/2023 06-09-2023		
Analyzer Model & Make			
Average stack emission Values of CO, NOx (In mg/nm3)			
Excess Air / Excess Oxygen (%age):-			
Analyzer exposed for Ramp-Up phase to the sample gas for 5 minutes	Yes	NO	NA
Analyzer flow rate and EC temperature monitored during calibration and testing	Yes	No	NA
Test Data Phase of sample gas recorded with 15 second interval	Yes	No	NA
All key requirements to ensure QA/QC complied for said EPA approved Method	Yes	No	NA
Particulate Matter (PM) Monitoring / Sampling under USEPA Method 5 / 17			
Model & Make of Iso-kinetic PM Assembly			
The PM sampling train is complete as per Method 5 & 17	Yes	No	NA
Leak Test performed prior to sampling	Yes	No	NA
Field data Sheet for PM Sampling filled during PM sampling	Yes	No	NA
Data for determining of "K" factor & DGM "Y" Factor filled during sampling	Yes	No	NA
All method key requirements during sampling were complied to ensure QA/QC	Yes	No	NA
Filter of Particulate matter is suitable for metal Testing	Yes	No	NA
SOx sampling as per Method 8 (Thorin Indicator Method)			
The right absorbent solution are available for SOx Sampling	Yes	No	NA
The equipment is capable to maintain flow rate @ 2.0LPM or as per method 8 requirement	Yes	No	NA
Sampling for SOx is performed as per method	Yes	No	NA
Ambient Air Quality Monitoring by Automatic Monitors for CO, O3, SO2, NOx, PM2.5 & PM10			
In case of continuous monitoring at a site, One Point QC Check Single analyzer & Zero/span check is performed every 14 days.	Yes	No	NA
The CE of NOx analyzer is ensured to be maintained within 96% - 104.1%	Yes	No	NA
Zero/span check is performed prior to starting ambient monitoring	Yes	No	NA
All key requirements for Critical & Operational Criteria for ambient air monitoring by automatic monitors were complied during monitoring	Yes	No	NA
The measuring techniques of monitors comply PEQS	Yes	No	NA
Ambient Air Sampling of SPM, PM10, Pb by High Volume Sampler			
In case of Sampling for SPM through samplers, the flow rate of sampler comply PEQS (1.1m3/min).	Yes	No	NA
Calibration of Sampler performed prior to sampling	Yes	No	NA
Vehicular Emissions & Noise Measurement			
Sampling of Vehicle emissions and noise measurement have been performed as per method and SOPs	Yes	No	NA

Remarks (If Any):-

Signature

Name of EPA Officer / Office Address

Munir Ahmad Afreen Baig
Research Officer
Environmental Protection Agency
Govt. of the Punjab, Rawalpindi

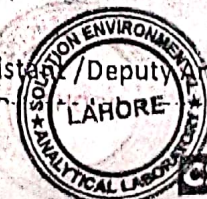
Dated

05-08-2023

Nasir Ali

Signature

Name of Assistant / Deputy Analyst, Analyst



CamScanner



ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF THE PUNJAB
National Hockey Stadium, Gate No. 08
Gaddafi Stadium Complex, Lahore



Validation for Wastewater & Drinking Water

Facility /Project Name & Address Phone	Construction of E-Waste Recycling Unit by E-Waste Management Pvt. Ltd				Sampling Point			
	Neela Dullah District Chakwal				Tap water			
	Waste Water (WW) Treatment facility				Drinking Water (W) Treatment Facility			
	Primary Secondary Tertiary NA							
Total WW collected Sample				Total Collected Drinking water samples.....				
Sample Tag for testing parameter is assigned on sample container				Yes ✓	NO	NA		
Sample is preserved properly for each testing parameter				Yes ✓	NO	NA		
Sample size is adequate for testing the target parameters				Yes ✓	NO	NA		
Wastewater Flow Measurement performed to ensure sample representativeness				Yes	NO	NA ✓		
No. of Waste Water outlets	Waste Water Flow m ³ /hr from each outlet (Optional)	Water Intake m ³ /hr (Optional)	Water Mass balance complied during sampling (Optional)	Sample Type				
				Ground water				
Parameter	Matrix		Container	Sample Size	Preservation	Grab Composite		
	W	WW				Yes	NO	NA
Coliform, Total or Fecal	✓		Sterile Container	100 mL	Refrigerate 6 C	✓		
Coliform, Total or Fecal, Chlorinated Water	✓		Sterile Container	100 mL	0.008% Thiosulphate & cooled 6 C			
Color, Turbidity	✓		P,G	500 mL	Cool 6 C			
Hardness, Total	✓		P,G	500ml	HNO ₃ to pH <2			
Nitrogen, Nitrate + Nitrite, Phenolic Compounds, Oil & Grease, COD, NH ₃	✓		P,G	2000 mL	H ₂ SO ₄ to pH <2, Cool 6C			
Metals, General	✓		P,G Rinsed I.I HNO ₃	500 mL	HNO ₃ to pH <2			
Cyanide, Total	✓		P,G	500 mL	NaOH to pH > 12, Cool 6C			
Pesticides, General			Glass	1 Liter	Cool 6 C	✓		
Field Parameters*								
Field parameter	pH meter, Model Make		Measurement Method	Calibrated In Field	Measured value			
pH			APHA	Yes ✓ NO	7.16			
Temp			APHA		26°C			
Cl			APHA		0.39			

* Field testing parameters only be validated by RAs, ROs, DD (Labs)

Remarks for Sample Quality (If Any):-

Signature

Name of EPA Officer with office Address

Inspectors / RAs / ROs / DDs

Research Officer
Environmental Protection Agency
Govt. of the Punjab, Rawalpindi

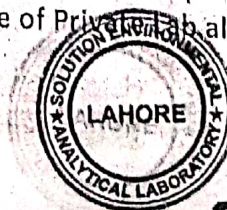
Dated

05-08-2023

Nasir Ali

Signature

Name of Assistant / Deputy Analyst, Analy:
with Name of Private Lab along with Address:





SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY



GROUND WATER ANALYSIS REPORT

Client Name: Construction Of E-Waste Recycling Unit By E-Waste Management Pvt.Ltd
Site Location: Neela Dullah District Chakwal
Sampling Point: Tap Water
Sampling Date: 05-08-2023
Nature of Sample: Ground Water
Date of Completion: 15-08-2023
Temp. & Humidity: 23-27 C° & 50-70 %
Reference No.: SEAL/LAB/2023/GW/191
Sampling By: Solution Environmental & Analytical Laboratory

Results: -

Sr. No.	Parameter	Method	Unit	Result	PEQS
1	pH	APHA 4500-H ⁺ B	--	7.16	6.5-8.5
2	Total Dissolved Solids (TDS)	APHA 2540 C	mg/l	1870	1000
3	Chloride	4500- APHA Cl ⁻ B	mg/l	227.33	250
4	Fluoride	APHA 4500-F ⁻ D	mg/l	0.14	1.5
5	Taste	APHA 2120 B	Object. /unobj.	Non-object.	Unobject.
6	Odour	APHA 2120 B	Object. /unobj.	Non-object.	Unobject.
7	Colour	APHA 2120 B	TCU	0.9	15
8	Nitrate (as NO ₃ ⁻)	APHA 4500-NO ₃ ⁻ E	mg/l	4.76	50
9	Nitrite (as NO ₂ ⁻)	APHA 4500-NO ₂ ⁻ B	mg/l	1.12	3
10	Lead	APHA-Pb B	mg/l	0.01	0.05
11	Total Hardness as CaCO ₃	APHA 2340 C	mg/l	337.12	500
12	Turbidity	APHA 2130 B	NTU	0.1	5
13	Zinc	APHA 3500-Zn B	mg/l	0.45	5
14	Aluminum	APHA 3111 D	mg/l	0.12	0.2
15	Chromium	APHA 3500-Cr B	mg/l	BDL	0.050
16	Cadmium	APHA 3500-Cd D	mg/l	BDL	0.01
17	Copper	APHA 3500-Cu C	mg/l	BDL	2
18	Boron	APHA 4500-B C	mg/l	0.014	0.300
19	Barium	APHA 3111 B	mg/l	0.020	0.700



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KARACHI OFFICE :

Office No. M-06-07 in Fort Sultan opp. Air Port Telephone Exchange, Shahrah-e-Faisal, Karachi, Pakistan. Phone : 92-300-9768799
Email : karachi@seal.com.pk

Client Name: Construction Of E-Waste Recycling Unit By E-Waste Management Pvt.Ltd
Site Location: Neela Dullah District Chakwal

Sampling Point: Tap Water
Sampling Date: 05-08-2023
Nature of Sample: Ground Water
Date of Completion: 15-08-2023
Temp. & Humidity: 23-27 C⁰ & 50-70 %
Sampling By: Solution Environmental & Analytical Laboratory
Reference No.: SEAL/LAB/2023/GW/191

Results:

Sr. No.	Parameter	Method	Unit	Result	PEQS
20	Antimony	APHA 3114 C	mg/l	BDL	0.020
21	Arsenic	APHA 3114 C	mg/l	0.014	0.050
22	Cyanide	APHA 4500-CN ⁻ D	mg/l	0.016	0.05
23	Mercury	APHA 3112	mg/l	BDL	0.001
24	Nickel	APHA 3111 B	mg/l	0.005	0.020
25	Residual Chlorine	APHA 4500-Cl ₂	mg/l	0.39	0.2 – 0.5
26	Total Thermo Coliform	APHA 9222 B	Number/100ml	0	0/100 ml
27	Total Coliform	APHA 9222 B	Number/100ml	0	0/100 ml
28	E. coli	APHA 9222 C	Number/100ml	0	0/100 ml

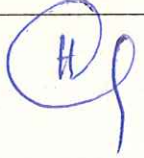
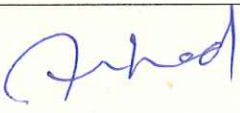
PEQS = Punjab Environmental Quality Standards

BDL (Below Detection Limit)

APHA = American Public Health Association

Note:

- Standard Method for the Examination of Water & Wastewater, 23rd Edition, 2017
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over samples (if so available) shall be retained for 15 days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiation.

ANALYZED BY	REVIEWED BY	APPROVED BY
		
Lab Analyst	Assistant Lab Manager	Lab Manager





SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY



AMBIENT AIR MONITORING REPORT

Client Name: Construction Of E-Waste Recycling Unit By E-Waste Management Pvt.Ltd
Site Location: Neela Dullah District Chakwal
Monitoring Point: Mid of Project
Monitoring Time: 24 Hour
Starting Date: 05-08-2023
Reporting Date: 15-08-2023
Monitoring By: SEAL
Reference No.: SEAL/Lab/2023/AA/001
Results: -

Sr. No.	Parameter	Method	Unit	Results	PEQS
1	Particulate Matter (PM ₁₀)	40 CFR Part 50, App J (US-EPA)	µg/m ³	121.52	150
2	Carbon monoxide (CO)	40 CFR Part 50, App. C (US-EPA)	mg/m ³	3.12	5
3	Oxides of Nitrogen NO _x (NO & NO ₂)	40 CFR Part 50, App F (US-EPA)	µg/m ³	37.25	120
4	Sulphur dioxide SO _x (SO ₂)	EQSA-0197-114 (US-EPA)	µg/m ³	45.14	120
5	Particulate Matter (PM _{2.5})	40 CFR Part 50, App J (US-EPA)	µg/m ³	17.54	35

PEQS: Punjab Environmental Quality Standards

Note:

- Quality was assured through self-calibration of the instrument.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.

ANALYZED BY	REVIEWED BY	APPROVED BY
Lab Analyst	Assistant Lab Manager	Lab Manager



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Email : karachi@seal.com.pk



SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY



NOISE LEVEL MONITORING REPORT

Client Name: Construction Of E-Waste Recycling Unit By E-Waste Management Pvt.Ltd
Site Location: Neela Dullah District Chakwal
Monitoring Point: Mid of Project
Monitoring Date: 05-08-2023
Instrument Used: Digital Sound Level Meter BSWA-308
Reporting Date: 15-08-2023
Time of Monitoring: 24 Hours
Monitoring By: Solution Environmental & Analytical Laboratory
Reference No.: SEAL/LAB/2023/NM/001

Results: -

Sr. No.	Time	Noise dB(A)		PEQS
1	02:00 PM	58.4	Day Time	75
2	03:00 PM	54.2		
3	04:00 PM	56.6		
4	05:00 PM	60.4		
5	06:00 PM	62.8		
6	07:00 PM	57.7		
7	08:00 PM	55.2		
8	09:00 PM	52.4		
9	10:00 PM	50.2		
10	11:00 PM	48.5	Night Time	65
11	12:00 AM	51.1		
12	01:00 AM	46.2		
13	02:00 AM	44.8		



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Email : karachi@seal.com.pk

14	03:00 AM	47.5	Night Time	65
15	04:00 AM	44.2		
16	05:00 AM	46.4		
17	06:00 AM	48.5		
18	07:00 AM	50.7	Day Time	75
19	08:00 AM	48.3		
20	09:00 AM	52.7		
21	10:00 AM	54.5		
22	11:00 AM	58.8		
23	12:00 PM	56.6		
24	01:00 PM	60.5		
Average Noise Level		52.8 dB(A)		

PEQS: Punjab Environmental Quality Standards

Note:

- The average noise levels describe the overall ambient noise levels of the points.
- Selected measurement units were dB (A) otherwise stated.
- Quality was assured through self calibration of the instrument.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report is not valid for any negotiation.

ANALYZED BY	REVIEWED BY	APPROVED BY
		
Lab Analyst	Assistant Lab Manager	Lab Manager



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Email : karachi@seal.com.pk



SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY



SOIL ANALYSIS REPORT

Client Name: Construction Of E-Waste Recycling Unit By E-Waste Management Pvt.Ltd
Site Location: Neela Dullah District Chakwal
Nature of Sample: Soil
Sampling Date: 05-08-2023
Date of Completion: 15-08-2023
Temp. & Humidity: 23-27 C° & 50-70 %
Sampling By: Solution Environmental & Analytical Laboratory
Reference No.: SEAL/2023/SA/001

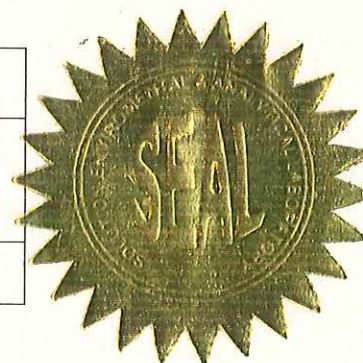
Results:-

Sr No.	Parameters	Units	Results
1	pH	---	7.60
2	Phosphorous	mg.kg ⁻¹	6.1
3	Sulphur	mg.kg ⁻¹	101.4
4	Chloride	mg.kg ⁻¹	223
5	Sodium	mg.kg ⁻¹	41.1
6	Potassium	mg.kg ⁻¹	34.4
7	Calcium	mg.kg ⁻¹	37.8
8	Magnesium	mg.kg ⁻¹	1.21
9	Nickel	mg.kg ⁻¹	0.02
10	Copper	mg.kg ⁻¹	0.24
11	Zinc	mg.kg ⁻¹	BDL

Note:

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ANALYZED BY	REVIEWED BY	APPROVED BY
Lab Analyst	Assistant Lab Manager	Lab Manager

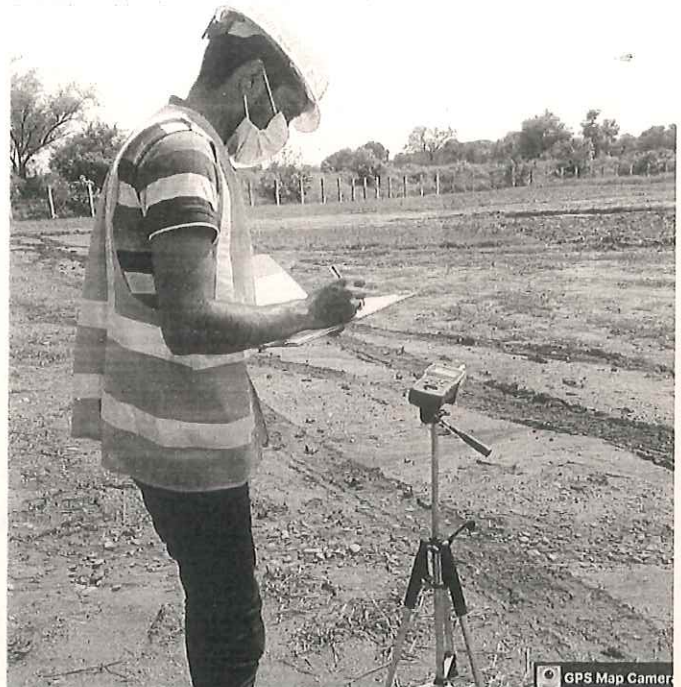




GPS Map Camera



Chakwal, Punjab, Pakistan
Dullah-Thanil Kamal Rd, Chakwal, Punjab, Pakistan
Lat 33.149668°
Long 72.700902°
05/08/23 03:29 PM GMT +05:00



GPS Map Camera



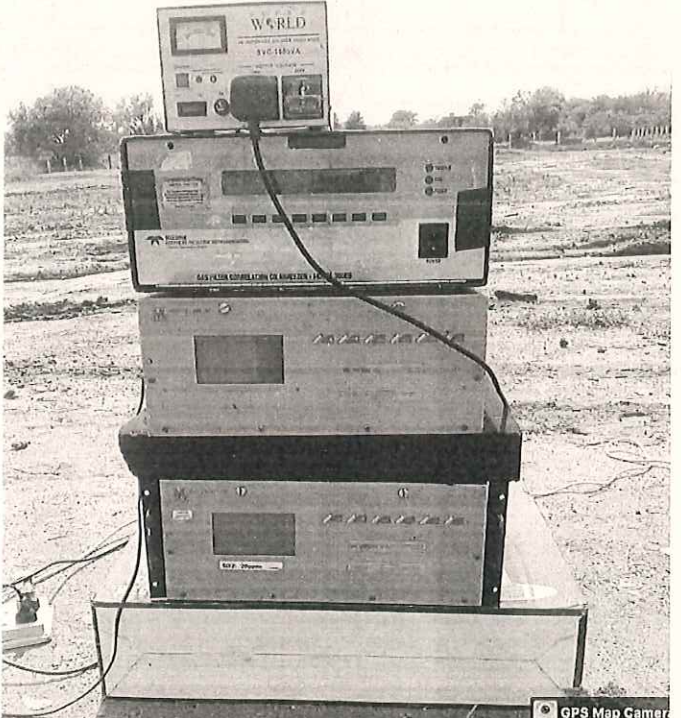
Chakwal, Punjab, Pakistan
Dullah-Thanil Kamal Rd, Chakwal, Punjab, Pakistan
Lat 33.15022°
Long 72.700343°
05/08/23 02:54 PM GMT +05:00



GPS Map Camera



Chakwal, Punjab, Pakistan
Dullah-Thanil Kamal Rd, Chakwal, Punjab, Pakistan
Lat 33.150213°
Long 72.700341°
05/08/23 02:53 PM GMT +05:00



GPS Map Camera



Chakwal, Punjab, Pakistan
Dullah-Thanil Kamal Rd, Chakwal, Punjab, Pakistan
Lat 33.150204°
Long 72.700324°
05/08/23 02:45 PM GMT +05:00

ANNEXURE – IV
PROJECT IMPACT MATRIX

Project Impact Matrix With Mitigation for E-Waste Management & Recycling Plant Chakwal

ENVIRONMENTAL COMPONENTS	PHYSICAL								ECOLOGICAL			SOCIAL						
PROJECT ACTIVITIES/COMPONENTS	Acquisition of Temp. Land	Solid waste generration and disposal	Flood	Soils (Erosion/Stability/Contamination)	Surface Water (quantity/quality)	Groundwater (quantity/quality)	Air Quality	Noise and Vibration	Crops/Vegetation/Trees	Terrestrial Fauna	Bird Species	Public Health	Public/Private Utilities	Employment/Income	Worker Safety	Public Safety	Living Standards of Surrounding Community	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
	Planing Stage	0	0	0	0	0	0	0	0	0	0	0	0	0	HB	0	0	0
	Construction Phase																	
	1. Excavation	HA	LA	0	LA	0	LA	HA	LA	0	0	0	LA	LA	MB	LA	LA	LA
	2. Traffic on Main Roads	0	0	0	0	0	0	LA	LA	0	0	0	LA	0	0	0	0	0
	3. Clearing and Cutting	LA	0	0	LA	0	0	LA	LA	HA	0	0	LA	0	HB	0	0	0
	4. Construction Camp	LA	LA	0	LA	0	0	0	LA	0	0	0	0	0	HB	0	0	0
5. Storage of Excavated Material	LA	LA	0	LA	0	0	0	0	0	0	0	0	0	LB	LA	LA	LA	
6. Compaction	LA	0	0	0	0	LA	LA	0	0	0	0	0	0	LB	LA	0	0	
7. Laying of Infrastructure Facilities	LA	LA	0	LA	0	LA	LA	0	0	0	0	LA	LA	HB	LA	LA	LA	
8. Use of Chemicals	LA	LA	0	0	0	LA	0	0	0	0	0	0	0	0	LA	0	0	
9. Batching Plant	LA	LA	0	LA	0	0	LA	0	0	0	0	LA	0	LB	LA	LA	0	
10. Use of Heavy Machinery	LA	LA	0	0	0	0	LA	LA	0	0	0	LA	LA	MB	LA	0	0	
11. Vehicle/Equipment Maintenance	0	0	0	0	0	0	LA	0	0	0	0	0	0	LB	0	0	0	
12. Demolition	LA	LA	0	0	0	0	LA	LA	0	0	0	LA	0	LB	LA	LA	LA	
13. Sewage Waste Generation	LA	LA	0	LA	0	LA	0	0	0	0	0	LA	0	0	0	LA	0	
Wiegthed Overall	HA	LA	0	LA	0	LA	HA	LA	HA	0	0	LA	LA	HB	LA	LA	LA	
Operation Phase	0	LA	0	0	LA	LA	LA	LA	0	0	0	LA	LA	HB	HB	0	LA	

High Adverse:
Medium Adverse:
Low Adverse:
None/Insignificance:

HA
MA
LA
0

High Beneficial:
Medium Beneficial:
Low Beneficial:

HB
MB
LB

ANNEXURE – V
PROJECT CHECKLIST

SCREENING CHECKLIST

Adverse Impact - , Significant Adverse --, Beneficial Impact +, Highly Beneficial ++, No Impact 0

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Project			
			During Construction without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
1	Atmosphere					
a	Ambient Air	0	--	--	-	-
b	Primary Pollutants	0	--	--	-	-
c	Secondary Pollutants	0	-	--	0	-
d	Noise	0	--	--	-	-
e	Vibration	0	-	0	-	0
2	Climate					
a	Temperature	0	0	-	0	-
b	Precipitation	0	0	0	0	0
c	Relative Humidity	0	0	0	0	0
e	Evaporation	0	0	0	0	0
3	Water Resources					
a	Surface Water	0	-	--	0	-
	Rivers	0	-	--	0	-
	Streams	0	-	--	0	-
	Springs	0	0	0	0	0
	Wetland	0	0	0	0	0
	Flow	0	-	-	-	-

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Project			
			During Construction Without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
	Quality	0	--	-	0	0
	Usage	0	-	-	0	0
	Sediments	0	0	0	0	0
	Chemicals	0	-	0	0	0
	Pollution	0	-	0	0	0
	Erosion	0	-	0	0	0
b	Ground Water					
	Sources	0	-	-	0	-
	Depth	0	-	-	-	-
	Quantity	0	-	-	-	-
	Potential Extraction	0	-	-	-	-
	Usage	0	-	-	-	-
	Domestic Supply	0	0	0	0	0
	Industrial Supply Water	0	0	0	0	0
	Irrigation	0	0	0	0	0
	Hydropower Generation	0	0	0	0	0
	Quality	0	-	-	0	-
4	Land Resources					
a	Topography	0	-	0	0	0
b	Soil	0	-	0	0	0

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Project			
			During Construction Without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
c	Major Land use	0	0	0	0	0
5	Ecological Environment					
a	Terrestrial Ecology					
	Flora	0	--	0	-	++
	Fauna	0	--	0	-	++
b	Aquatic Ecology					
	Aquatic Flora	0	--	0	-	0
	Aquatic Fauna	0	--	0	-	0
	Fisheries	0	-	0	0	0
c	Wildlife	0	-	0	0	++
d	Forestry	0	0	0	0	0
e	Beneficial Plants and Animals	0	0	0	0	+
f	Endangered Species	0	0	0	0	0
6	Socio-economic Environment					
a	Institutional and Administrative Setup	0	0	0	0	0
b	Demography	0	0	0	0	0
c	Gender issues	0	-	-	0	0
d	Social Equity	0	0	0	0	0
e	Settlement Patterns	0	-	0	0	0

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Project			
			During Construction without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
f	Land Holdings & Titling	0	-	0	0	++
g	Common Resource Rights	0	0	0	0	0
h	Fish	0	0	0	0	0
i	Wood	0	0	0	0	0
j	Grazing	0	0	0	0	0
k	Fodder	0	-	0	-	0
l	Domestic Energy and Fuel	0	0	0	0	0
m	Domestic Water Supply	0	0	0	0	0
n	Sanitation	0	-	0	0	0
o	Health	0	-	--	0	-
p	Waterborne Disease	0	-	-	0	+
q	Common Diseases	0	0	0	0	0
r	Mental Health	0	0	0	0	++
s	Human Nutrition	0	0	0	0	0
t	Education & Literacy	0	0	0	0	+
u	Cultural & Historical Sites	0	0	0	0	0
v	Religious Sites	0	0	0	0	0
w	Aesthetics	0	-	-	0	++

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Project			
			During Construction Without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
x	Landscape	0	-	-	0	++
y	Livelihood	0	--	0	0	++
z	Agriculture	0	-	0	-	0
	Livestock	0	0	0	0	0
	Forestry	0	0	0	0	0
	Fisheries	0	0	0	0	0
	Industry	0	0	0	0	0
	Other Cash Income	0	+	+	+	+
7	Transport, Infrastructure & Communication					
a	Roads	0	-	+	0	++
b	Tracks	0	-	+	0	++
c	Bridges	0	0	0	0	+
d	Pedestrian Tracks	0	-	+	0	++
e	Navigation	0	0	0	0	0
f	Energy and Power	0	-	0	0	+
g	Telecommunication	0	0	0	0	+
8	Natural Risks and Hazards					
a	Earthquake	0	0	0	0	0
b	Landslides	0	0	0	0	0

Sr. No.	Main Environmental Parameters	Baseline Conditions	With Project			
			During Construction Without Mitigation	During Operation without Mitigation	During Construction with Mitigation	During Operation with Mitigation
c	Storms	0	0	0	0	0
d	Floods	0	0	0	0	0
e	Erosion	0	0	0	0	0
f	Drought	0	0	0	0	0
g	Human Disease	0	0	0	0	0
h	Pollution	0	--	0	-	0
i	Social Instability	0	0	0	0	+
j	Economic Instability	0	+	+	0	++
k	Political Instability	0	0	0	0	0
9	External Constraints					
a	Upstream Constraints	0	0	0	0	0
b	Upstream Impacts	0	0	0	0	0
c	Downstream Constraints	0	0	0	0	0
d	Downstream Impacts	0	0	0	0	0

ANNEXURE – VI
OWNERSHIP DOCUMENTS

ANNEXURE – VII
SITE PHOTOGRAPHS



Ambient Air and Noise Monitoring at Project site



Water and Soil sampling at Project site



Public Consultation at Project site



Consultation with Academia and Government Officials