Greenstretch

Consultants (Z) Limited

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

FOR

THE PROPOSED ESTABLISHMENT AND OPERATION OF AN ELECTRONIC WASTE COLLECTION, TRANSPORTATION, DISMANTLING, STORAGE AND PROCESSING FACILITY IN LIVINGSTONE DISTRICT OF SOUTHERN PROVINCE ZAMBIA BY GREENSTRETCH CONSULTANTS LIMITED

OCTOBER 2025

(Revision No. 1)

EXECUTIVE SUMMARY

Background

Zambia is experiencing an increase in the volume of waste electrical and electronic equipment (WEEE). This is referred to as e-waste, the term that is used to cover all types of WEEE. E - waste, exacerbated by the high-level demand for electronic gadgets and subsequent influx of second-hand equipment from developed countries, many of which are old, near or at end of life.

With the lack of the needed investment, recycling technologies and facilities to adequately handle e-waste in an environmentally sound manner, e-waste is currently either landfilled, dumped illegally or burnt in Zambia. E-waste contains large amounts of heavy metals and other toxic chemicals such as lead, mercury, cadmium and brominated flame retardants, which when released into the environment due to inappropriate disposal, pose significant adverse environmental health risks to the local communities.

To address the continued e-waste challenges, the "Africa Environmental Health and Pollution Management Program" (EHPMP) in Zambia seeks to finance cleaner technologies and processes in e-waste management. The main objective of the project is to reduce Unintentional Persistent Organic Pollutants (uPOPs) release in pilot sites and strengthen the institutional capacity to manage and regulate solid waste and e-waste. The project is being financed by a grant provided by the Global Environment Facility (GEF) through the World Bank as an executing Agency. The Zambia Environmental Management Agency (ZEMA) is the implementing Agency of the Zambian Component on behalf of the Government of the Republic of Zambia.

Greenstretch Consultants Limited (GCL) intends to establish and operate an electronic and electrical waste (e-waste) recovery, collection, transportation, storage, dismantling and processing facility under the auspices of the World Bank through the EHPMP. This project will not include any kind of infrastructure construction. However, installation, operation and maintenance of e-waste Collection Centers will be part and parcel of this project. Additionally, this project seeks to introduce an e-waste collection, storage and transportation system for Livingstone and surrounding Districts across the entire Southern Province covering areas like; Sesheke, Kazungula, Zimba, Kalomo, Monze, Pemba, Choma, and Mazabuka.

The preparation of this Environmental and Social Management Plan (ESMP) is in line with the World Bank's Environmental and Social Framework. This ESMP has been prepared to address environmental and social issues that may emanate from the establishment and operation of an e- waste recovery facility during the lifecycle of the project.

Project Implementation Unit

The Project Implementation Unit (PIU) is one of the bodies that shall carry out governance and management of the EHPMP grant scheme. The PIU will act as the Grants secretariat headed by the project coordinator and relevant ZEMA Senior Management staff. The PIU will provide technical/administrative oversight and guidance on routine operational issues and ensure compliance with EHPMP reporting requirements. Additionally, it will be responsible for carrying out day-to-day duties of the Grant and generally for executing the instructions and recommendations of the National Steering Committee (NSC), the World Bank and Grants Technical Committee (GTC) so that the Fund's objectives are realized.

Further, the PIU shall provide GCL with guidance on general rules for procurement of goods, works and services. It will also be responsible for disbursement of the grant for the implementation of the proposed project and ensure project implementation is monitored. The PIU shall conduct field monitoring of the proposed project by GCL, and these shall include semi-annual site sites to assess and verify implementation progress and compliance with National Environmental Laws and World Bank Environmental and Social Standards.

Project Objectives

The main objective of the project is to establish and operate an e-waste recovery facility and set up a system to recover, collect, transport, store, dismantle and process electronic waste materials in an environmentally sound manner. Specifically, the project seeks the following:

- To set up e-waste collection centers at strategic locations away from critical habitats, flood prone areas or areas considered to be elephant corridors.
- To introduce an e-waste collection, storage and transportation system for Livingstone District including surrounding Districts within the entire Southern Province.
- To ensure that project activities adhere to the applicable World Bank Environmental and Social Standards (WB – ESSs), Environmental Health and Safety Guidelines (EHSG) as well as Good International Industry Practices (GIIPs)
- To contribute to the reduction in the generation and subsequent release of Unintentional Persistent Organic Pollutants (uPOPs) into the environment in Livingstone and surrounding Districts
- To sort, segregate, dismantle and store electronic scrap
- To ensure e-waste is collected not only in Livingstone but also in the entire Southern Province, targeting districts like: Sesheke, Kazungula, Zimba, Kalomo, Pemba, Mazabuka, Monze and Choma.
- To buy e-waste from the public and the community and deliver to the centralized e-waste recovery facility to be set up in Livingstone
- To transport and sell extracted Printed Circuit Boards (PC-Boards) to advanced e-waste facilities for further processing
- To form mutual partnerships/collaborations to ensure adherence to international best practices
- To ensure adherence to the Basel convention guidelines as well as local environmental regulations in case of any trans-boundary movement of e-waste
- To raise awareness about the importance of recycling e-waste as well as the environmental and social risks and impacts associated with improper handling and disposal of e-waste.

Project Rationale

Negative impacts of poor waste management on Zambia's environment and human health have steadily increased in recent years due to numerous factors, including relatively high rates of economic growth, population growth and urbanization. A large volume of both solid and e-waste generated in most cities in Zambia is inappropriately disposed resulting in uncontrolled environmental pollution. Electronic waste (E-waste) is a term used to cover items of all types of electrical and electronic equipment (EEE) and its parts that have been discarded, irreparable or at the end of life. Although e-waste is a general term, it is considered to cover laptops, desktops, tablets, TV's, mobile phones, and household appliances. E-waste contains materials that, if mishandled, can be hazardous to human health and the environment, but, most importantly, also contains materials that are valuable and scarce. Electrical and electronic equipment contain different hazardous materials, which are harmful to human health and the environment if not disposed of carefully. While some naturally occurring substances are

harmless in nature, their use in the manufacture of electronic equipment often results in compounds, which are hazardous (e.g. chromium becomes chromium VI). Lead, mercury, cadmium, and poly-brominated flame retardants are found in electronic equipment and are all persistent, bio-accumulative toxins (PBTs). The effects are felt across the country and endanger human well-being and Zambia's environmental and natural assets. The status of e-waste management in the targeted nine districts is currently unknown, (Civil Society for Poverty Reduction (CSPR) 2022).

According to an Information and Communication Technology (ICT) survey that was conducted by the Zambia Information and Communications Technology Authority (ZICTA) in 2018, the country disposes 90% of its e-waste in dumpsites and only 10% of the population using electronic devices are even aware of the risk associated with careless disposal of such materials.

In consideration of the foregoing, Greenstretch Consultants Limited (GCL) seeks to establish and operate an e-waste recovery facility and set up a system to receive, collect, store, safely dismantle and transport e-waste scrap and extracted e-waste components, to reduce uPOPs releases. The extracted useful and valuable e-waste fractions (particularly PC-Boards) shall be shipped to Namibia or South Africa for further processing with strict adherence to the Basel convention guidelines.

In the absence of an e-waste collection service, e-waste is either landfilled or dumped illegally or burnt. Setting up an e-waste collection, storage and dismantling facility is a solution to the e-waste challenges Zambia is facing. Additionally, the implementation of this project will directly and indirectly benefit the local community in terms of job creation and knowledge transfer. This will equally benefit the Government of the Republic of Zambia to manage e-waste in an environmentally sound manner.

Project Location

The proposed project site is located in Livingstone District of Southern Province, on plot number 1411, along Sambono Road, in Cold Storage Area in the Industrial Area. Geographically, the site lies between latitude 17º52'08.64"S and longitude 25º50'53.10"E and can be accessed through the Belewa road and Sambono road. The site is located off the Mosi-Oa-Tunya Road, and lies approximately 3km from the Livingstone Central Business District (CBD), 0.22km from the Food Reserve Agency (FRA) Deport on the western side, 0.85km from Protea Hotel Livingstone on the eastern side, and about 0.77Km from Oriental Swan Hotel on the southeast direction.

The proposed project site is a warehouse which is currently unoccupied and located within an industrial area. The site is being used for commercial purpose with no illegal or informal activities being carried out in the immediate area. The project site is situated in an area which is generally flat with no critical habitats, flood prone areas or areas considered elephant corridors in close proximity.

The site is approximately 1.37Km away from the Mosi-O-Tunya National Park. It is worth noting that the project area is frequented by migratory elephants, especially after or before the rainy season.

As already alluded to, this project will establish and operate Collection Centers which will consist of closed containers. However, it is anticipated that these Collection Centers to be set up shall not pose any potential risks to key species in the project area as they will be installed

and operated far away from critical habitats. Critical habitats are defined as areas of high biodiversity importance or value according to the World Bank ESS 6.

Additionally, the centralized e-waste facility location is not prone to flooding and not near any critical habitats or areas considered elephant corridor. Hence this facility will not pose any serious threats to species of concern in project area where water bodies are not in close proximity. The only nearby water body is the Zambezi River on the South located about 3.6km from the proposed project site.

Project Description

The proposed project will involve the establishment and operation of an e-waste recovery, collection, transportation, storage, and dismantling facility in the city of Livingstone, Southern Province. The project shall be operated in a leased warehouse which measures approximately 15 x 18 meters in size. No infrastructure construction will be undertaken as the project will utilize an already built warehouse. However, the project will involve the installation, operation and maintenance of Collection Centers.

Further, it is planned that the e-waste facility warehouse shall consist of different segments namely; the receiving, loading, storage, dismantling, and weighing areas. Other sections shall include shredding, sorting and baling. This facility will be a strategic location for the reception, storage and dismantling of e-waste materials generated in Livingstone and the surrounding districts.

Collection of e-waste

One of the key elements of the proposed project is the collection of e-waste from the waste streams. GCL shall employ various methods to collect and transport e-waste in order to keep it out of landfills. One of the ways e-waste will be collect is through partnerships with both the bulk consumers of e-waste such as Government departments, local private businesses and banks among others, as well as repair shops, informal collectors and the general community that may require safe disposal of their e-waste items. The collection of e-waste shall be done directly from the respective organization, household or location on an agreed date, and a provision for businesses or corporate clients to book a collection shall be put in place. The following options shall be utilized;

Take-back program: Under this program, consumers will be able to drop off their old electronics directly at GCL e-waste facility. Alternatively, arrangements shall be made for the e-waste to be collected directly from the repair shops, informal collectors or consumer's location on an agreed date.

On-demand collection: Consumers of e-waste will request a collection for electronic items and the materials will be collected as agreed. To enhance accessibility, GCL shall provide transport for those who may face challenges in reaching the facility.

Recycling bins: GCL shall encourage the use of appropriate e-waste recycling bins to ensure e-waste items are separated from other type of waste to avoid cross-contamination. Where possible, GCL shall provide such bins to designated organizations or businesses and regular collection done to prevent over flowing.

E-waste collection events: GCL shall from time to time arrange e-waste collection events, at which members of the local community will be invited to bring their electronic waste on the

day of the collection event. All received e-waste on that particular day shall then be loaded on pallets and trucks, and safely transported to the e-waste recovery facility for recycling. An incentive shall be paid in exchange for e-waste delivered directly to the facility or during such arranged collection events. Donations of e-waste items as a way of safely disposing them of shall be accepted and encouraged.

E-waste Collection Centers

In addition to the above, e-waste shall be collected through the established and operated e-waste collection centers. Five (5) centers shall be set up and each center or site shall consist of one closed 20ft shipping container. The containers will act as collection sites or drop-off locations where e-waste shall be received, weighed, bought and recorded. These centers shall be installed and operated at designated locations around the City of Livingstone strictly away from critical habitats or flood prone areas.

Once sufficient volumes of e-waste accumulates at the five Collection Centers, they will be loaded on pallets into a truck and transported to the central location i.e., the centralized E-waste recovery facility for further processing. The following gives an elaborative view of the Collection Centers.

a) Location of the Collection Sites

To ensure that a suitable location is determined for the collection sites, GCL shall use the following criteria;

- The site must be not be located close to residential houses
- The site must not be located within or close to a protected area or an area prone to flooding or a wetland
- The site must not be located in areas considered elephant corridors
- The site must not be located within or close to critical habitats which are defined as areas of high biodiversity or importance according to the World Bank (WB) ESS6
- Consultation with the local authority and the regulatory agency (ZEMA) must be done prior to the installation and operation of the Collection Centers

b) Installation of Containers at Collection Sites

Key activities during the installation stage shall include the placement of a 20ft shipping containers at each collection center on four raised square concrete slabs. Prior to installation of the containers, the site will be prepared by clearing the area of any grasses and shrubs present. Thereafter, the site will be fenced and provided with security. Added to that site branding and installation of visible signage will be done.

c) Equipment at the Collection Centers

Each collection site shall be equipped with a weighing scale and separate waste containers including a table and chair. The centers will be managed by trained personnel.

d) Management of e-waste at Collection Sites

GCL will ensure that proper storage of received materials. Incompatible e-waste materials shall be separated and stored in separate containers. The collection site area shall be separate from other types of waste to avoid cross-contamination. GCL will ensure that each collection site is well fenced, secured, maintained, properly marked, consist of a closed container and is well equipped with waste separation based on the nature, components and hazard level of the materials received. To avoid incompatible materials mixing, e-waste shall be separated and stored in separate containers. GCL shall also ensure that each site receives only e-waste

materials, other solid waste materials like plastics and food waste will not be accepted.

The centers shall be managed by a trained personnel who will be responsible for attending to the local community delivering e-waste materials, weighing and buying the materials as well as maintaining, and cleaning the site. As part of the operation activities, transportation of e-waste from the collection centers to the e-waste facility shall be regularly done to avoid e-waste piling up.

e) Accessibility of the Collection Sites

Access to the centers shall be restricted to authorized personnel only. Appropriate signage shall be installed to restrict entry. Security shall be put in place to secure the sites 24/7. Children will not be allowed to the sites, GCL shall apply a no child labour policy and further guide all employees accordingly.

f) Operation of the Collection Centers

Each center shall be operated and managed by a trained personnel, who will be maintaining and ensuring cleanliness at the center to avoid attracting rodents and snakes. The employed personnel shall attend to the local community selling e-waste materials. The duty holder shall ensure that e-waste materials are weighed, paid for and recorded in a book. The selected personnel shall also be responsible for educating the community on proper e-waste handling and disposal.

Concisely, Greenstretch Consultants Limited (GCL) shall ensure that the proposed Collection Centers;

- Are well secured and fenced, restricting entry to authorized personnel only
- Have designated access points
- Have adequate appropriate signage and visible markings with proper instructions for disposal of e-waste
- Have separate waste containers to keep incompatible e-waste materials separately
- Are separate from other types of waste to avoid cross contamination
- Are well maintained and kept clean at all times to avoid attracting rodents and snakes
- Are NOT Installed and operated within or close to critical habitats as defined by the WB ESS6
- Are NOT installed and operated near (1) areas that are prone to floods, (2) near residential houses, and/or (3) near areas considered elephant corridors
- Are provided with adequate waste receptacles and equipped for waste separation and storage based on the nature, components and hazard level of the e-waste.
- Each consist of one closed 20ft container and equipped with a fire extinguisher
- Have all necessary permits and approvals from the local authority

An incentive shall be paid in exchange for e-waste delivered to the facility or any of the collection centers or during an arranged collection event. Donations of e-waste items as a way of safely disposing them of shall be accepted and encouraged.

This project will mainly collect e-waste for the purpose of recovering reusable, useful, and valuable e-waste components for resell to potential buyers, simultaneously contributing to the reduction of e-waste volumes to landfills and release of uPOPs. It is planned that recovered e-waste components (e.g., Printed Circuit Boards – (PC – Boards)) that cannot be processed locally shall be shipped abroad to advanced e-waste material recovery facilities e.g., to NamiGreen of Namibia, alternatively to AST Recycling Company of South Africa for further

processing to recover precious metals.

At full operating capacity, GCL anticipates collecting approximately 40 to 50 tons of e-waste per month from Livingstone and the surrounding districts viz. Sesheke, Kazungula, Zimba, Kalomo, Monze, Choma and Mazabuka. Based on expert judgment, project budget and to some extent on the number of collection vehicles, machinery and equipment to be procured for the project, and also considering e-waste collection events to be arranged as well as the number of project workers to be employed, GCL expects that the facility will have the following estimated capacities:

Capacity	Tons per day
E-waste collection capacity	2 - 3
E-waste dismantling capacity	1 - 2
Sorting / processing capacity	2 - 3
Baling capacity	1 - 2

ESMP Objectives

The main objective of ESMP is to identify and evaluate risks and impacts associated with the proposed establishment and operation of an electronic and electrical waste (e-waste) recovery, collection, transportation, storage, dismantling and processing project on the physical, biological, and socio- economic environment and develop mitigation measures. The other key objective of this ESMP is to identify and evaluate all potential risks and impacts associated with the installation, operation, maintenance and decommissioning of the e-waste Collection Centers and propose mitigation measures.

The national environmental legislation, the World Bank Environmental and Social Standards (ESSs) and the technical Environmental and Health and Safety Guidelines (EHSGs) were applied in the preparation of the ESMP. This ESMP specifically seeks:

- To assess applicable legal instruments, World Bank Environmental and Social Standards, WB EHSGs and Good International Industry Practice (GIIP)
- To determine the project location Environmental and Social (E&S) baseline
- To assess the impacts and risks of the project activities on the baseline condition
- To provide E&S mitigation measures to manage the project impacts and risks.
- To address mechanisms for public consultation and disclosure of project documents as well as redress of possible grievances
- To establish the budget requirements for implementation of the ESMP
- To assess capacity gaps and training which will be carried out to fill those gaps (Annex 3)
- To specify appropriate roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring E & S issues related to the project activities
- To identify the staffing requirements, as well as the training and capacity building needed to successfully implement the provisions of the ESMP.
- To establish procedures for the environmental and social screening, review, approval, and implementation of activities.

ESMP Methodology and Approach

The methodology and approach applied included review of literature, field assessments to collect environmental and social (ES) baseline data and conduct stakeholder consultations. The ES baseline data was collected by GCL field team at the project site and its immediate surrounding area, specifically, in the industrial area in Cold Storage area of Livingstone

District, adjacent to the old Livingstone Motor Assembly Plant. The field assessments involved;

- Collection of water samples for laboratory analysis to measure key parameters therein and determine the water quality,
- Sampling and measurement of the levels of pollutants in the air to assess the Ambient Air Quality (AAQ), and
- Noise level measurements.

The water and air quality as well as noise levels were assessed in the project area as stipulated in the Zambian EIA regulations and considering the nature of the project whose operational activities (particularly e-waste sorting and dismantling) would mainly be dry processes. The stakeholders' consultations were based on field visits, consultations with selected nearby communities and interviews with relevant government institutions including project interested and affected persons (IAPs).

Legal, Institutional and Policy Framework

Relevant policies, regulations and institutions relating to the proposed establishment and operation of an e-waste recovery project, including international agreements and conventions to which Zambia is a signatory were reviewed. The key regulations, policies and institutions to which compliance is required among others were:

Legal Framework

- The Environmental Management Act No. 12 of 2011
- The Environmental Management (Licensing) Regulations, SI No. 112, 2013
- The Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, Statutory Instrument No. 28 of 1997
- Environmental Management (Extended Producer Responsibility) Regulations, No.65 2018
- The Environmental Management (E-Waste Management) Regulations – 2024 (draft copy)
- The Solid Waste Regulation and Management Act No. 20 of 2018
- The Gender Equity and Equality Act No. 22 of 2015
- Persons with Disabilities Act No.6 of 2017
- The Occupational Health and Safety Act No. 36 of 2010
- The Human Rights Commission Act No. 4 of 2024
- The Ant-Gender-Based Violence Act, 2011

Institutional Framework

- Ministry of Green Economy and Environment
- Zambia Environmental Management Agency
- Ministry of Local Government
- Ministry of Labour and Social Security
- Livingstone City Council

Policy Framework

- The National Policy on Environment 2007
- The National Environmental Action Plan
- The National Gender Policy 2023
- The Eighth National Development Plan 2022 – 2026
- The National Health Policy 2012

- The National Employment and Labour Market Policy 2018
- The National Youth Policy 2015

International Agreements and Conventions
- The Basel Convention
- The Bamako Convention
- The Stockholm Convention on Persistent Organic Pollutants (POP)
- The United Nations Sustainable Development Goals

The World Bank Environmental and Social Framework
In addition to national legislation, the proposed project will also conform to the World Bank Environmental and Social Standards (ESS) as contained in the World Bank Environmental and Social Framework (ESF). Key standards relevant to the project and to which the project will comply with include:

- ESS 1: Assessment and Management of Environmental and Social Risks and Impacts
- ESS 2: Labor and Working Conditions
- ESS 3: Resource Efficiency and Pollution Prevention
- ESS 4: Community Health and Safety and
- ESS 10: Stakeholders Engagement and Information Disclosure

The World Bank Environmental Health and Safety Guidelines and Good Industry Practices
The proposed project to establish and operate an e-waste recovery facility by Greenstretch Consultants Limited (GCL) shall endeavor to comply with all relevant EHS Guidelines as contained in the World Bank Group EHS Guidelines.

Project Alternatives
Various alternatives for implementing this project were looked at considering the environment, and the socio-economic impacts of each alternative including the zero alternative of doing nothing. The purpose of considering various alternatives was to ensure that the best among all possible options is selected. The analysis of alternative for the proposed project considered the following:

- No project or Zero alternative (“Do nothing” alternative)
- Project Location Alternative
- Alternative Technologies for processing e-waste
- Waste Management Alternatives
- Power Supply Alternatives
- Raw Material Alternatives
- Water Sources Alternatives

Environmental and Social (E&S) Impacts and Risks and Mitigation Measures
The impacts in the various phases of the project to set up and operate the e-waste facility have been summarized and tabulated below. The project will not involve any infrastructure construction as it will utilize an already built warehouse. However, installation operation and maintenance of the Collection Centers will be part and parcel of this project. The detailed information on the impacts and risks and proposed mitigation measures have been incorporated in this report under the Environmental and Social Management Plan.

Summary of E&S Impacts/Risks and Mitigation Measures

IMPACT	MITIGATION MEASURE
PRE-CONSTRUCTION PHASE	
Regulatory compliance and permitting issues and delays	Develop a comprehensive permitting strategy early Identify all required permits, timelines and approvals early Engage permitting institutions like ZEMA and local authority Maintain all documentation related to permits and approvals
Inadequate project planning	Develop a comprehensive plan covering all processes Use proper project planning using project charter, governance, and clear roles & responsibilities
Inadequate stakeholder engagement	Develop and implement comprehensive stakeholder engagement plan which will analyze stakeholders' interests for inclusive engagement, particularly vulnerable groups. It will outline how feedback will be collected, addressed, and integrated into sub-project design and implementation Ensure clear and document process Establish an accessible and transparent grievance management system to assess concerns/issues and resolve them
Disruption in procurement	Establish relationships with multiple suppliers Use readily available substitute materials that meet specification
Unforeseen challenges like labour shortages, bad weather or permitting delays	Conduct thorough risk assessment Develop proactive plans to mitigate identified risks Create contingency plans to address unexpected situations
CONSTRUCTION PHASE	
Reduced Road Safety	Use road signs and follow set speed limits Train drivers on safe road practices Sensitize community on road safety Develop an organizational transport road safety policy
Groundand Surface Water Contamination	Store hazardous materials on impervious floors with bunding Regularly inspect storage conditions Prevent oil and fuel spills by regular maintenance of vehicles and machines Monitor water quality
Reduced Ambient Air Quality	Suppress dust emissions by sprinkling water Limit vehicle speed to 20 km/h. Provide appropriate dust masks to workers Regular maintenance of vehicles Use low Sulphur fuels Monitor air quality Construction trucks transporting raw materials will be covered. Prohibit open burning of waste on site
Noise and Vibration	Provide PPE like earmuffs/plugs Monitor noise levels Limit operation hours to daytime Regular maintenance of machinery
Soil Erosion	Preserve and reinstate topsoil Limit site clearance to construction footprint Install drainages to manage runoff water Conduct earthworks during dry season
Soil Contamination	Conduct maintenance of vehicles and equipment offsite Use non-leaking containers for hazardous chemicals Train personnel in safe handling of chemicals
Visual Intrusion	Avoid parking heavy machinery on site when not in use
Reduced Worker Safety	Provide Personal Protective Equipment (PPE) like dust masks, gloves, ear plugs, safety shoe wear Erect warning signs and barricades Conduct safety inductions and regular toolbox talks on proper e-waste

	handling, proper management of hazardous materials, usage of PPE, efficient use of firefighting equipment, how to efficiently respond to an emergency and on adhering to the Standard Operating Procedure (SOP) to be in place, among others. Monitor and report safety incidents Ensure provision of worker welfare facilities including appropriate tools and equipment
Site security risks	Implement robust security protocols and measures which may include physical barriers, access control systems, surveillance systems, and the employment of trained security personnel. Additionally, establish good relations with local law enforcement agencies and involving the community in security efforts can help deter criminal activities and foster a sense of shared responsibility.
Land Degradation from Waste Generation	Implement waste management protocols Use licensed waste collectors Maintain good housekeeping practices
Strain on social facilities	Hire local community members
Risk of Disease exposure and Transmission	Sensitize workers and community on health impacts
GBV / SEA /SH	Establish and implement accessible and transparent Grievance Redress Mechanisms (GRM) for workers and community. Periodically sensitize workers and community member on GRM, emphasize confidentiality. Sensitize workers and community on GBV/SEA/SH issues Introduce code of conduct for workers and signed by all project workers.
Unfair employment	Implement the Labour Management Procedures (LMP) to ensure all workers have signed contract with clear working conditions. Implement non-discriminatory labour practices and processes (recruitment, promotion and dismissal). Prevent Child labour, ensure that management of the site will strictly adhere to national and international labour laws prohibiting child labour. Ensure to verify documentation of all workers as guided on the minimum age for employment. Awareness will be undertaken to emphasize importance of preventing child labour. Prevent forced labour by management attested voluntary and fair engagement of all workers, free from coercion or exploitation. Establish and implement an accessible and transparent worker GRM. Periodically sensitize workers of mechanism.
Inadequate stakeholder engagement	Establish open and transparent communication channels with all stakeholders. Ensure GRM should address any concerns or complaints that may arise during operation. Raise awareness of both positive and negative impacts among the local community. Encourage individuals to adopt responsible e-waste management practices, ultimately contributing to the maintenance of a clean and healthy environment.
Influx of workers	Hire local labour
OPERATIONAL PHASE	
Reduced Road Safety and Traffic Congestion	Develop an organization transport and road safety policy Ensure the use of road signs, compliance to traffic rules set speed limits. Train drivers on safe and defensive driving safe practices Schedule transportation of e-waste material during off-peak hours. Employment of the Logistics and Transport Manager to monitor the implementation of the transport and road safety policy
Possible heavy metal contamination	Ensure sorting and dismantling processes are dry processes Conduct dismantling operations strictly within the warehouse in an enclosure with proper ventilation systems.

	Conduct dismantling operations on impervious surface or floor Immobilize heavy metals via bioremediation or encapsulation Provide appropriate PPE to project workers e.g., nose respirators, safety googles, gloves, safety boots and work suits.
Soil and Ground/Surface Water Contamination	Prevent oil and fuel spills by regular maintenance of vehicles and machines Ensure the dismantling processes are dry processes Store chemicals in labelled, non-leaking containers. Train personnel in handling hazardous materials. Install secondary containment systems. Use impermeable surfaces for areas where e-waste is stored or processed to prevent leachate from seeping into the ground. Install secondary containment systems, such as bunds or dikes, around storage areas to capture any accidental spills or leaks. Implement a leachate collection system to capture any liquids that may percolate through e-waste materials. Treat collected leachate using appropriate treatment technologies before discharge to ensure contaminants are removed. Construct an effective drainage system to manage surface runoff and prevent contamination of nearby water bodies. Build retention or detention ponds to capture and treat runoff before it is released into the environment. Install groundwater monitoring wells around the facility to regularly test for contamination and take corrective actions if needed. Use geomembrane liners and barriers beneath storage and processing areas to prevent contaminants from reaching the groundwater. Train employees on proper handling and processing techniques to minimize the risk of spills and leaks. Conduct regular inspections and maintenance of equipment and containment systems to ensure they are functioning correctly. Separate hazardous and non-hazardous e-waste to reduce the risk of hazardous substances contaminating water sources. Maximize recycling and reuse of materials to minimize the amount of waste that needs to be stored or processed Develop and implement a spill response plan that includes procedures for containing and cleaning up spills quickly and effectively. Equip the facility with necessary spill response equipment, such as absorbents, booms, and neutralizing agents. Stakeholder Engagement: Engage with local communities and stakeholders to inform them about the measures in place and address any concerns. Ensure compliance with all relevant environmental regulations and standards to prevent legal and environmental issues. Raise awareness among the local community about the importance of proper e-waste disposal and its impact on water quality and sanitation: Educational campaigns and outreach programmes can empower individuals to adopt responsible e-waste management practices, ultimately contributing to the preservation of water resources and the maintenance of a clean and healthy environment.
Power outages and instability	Procure energy efficient equipment Consider solar as an alternative source of energy to ensure reduced downtime
Elevated Noise Levels	Monitor and limit noise levels Regular maintenance and proper lubrication of equipment to reduce noise Install soundproof barriers or enclosures around noisy equipment Apply acoustic insulation materials to facility's walls, ceilings, and floors Schedule noisy operations during daytime hours to minimize community impact Invest in machinery designed to operate with lower noise levels Establish buffer zones or green belts around the facility Maintain open communication with nearby communities to address noise concerns

	Implement a noise monitoring program to identify and mitigate noise hotspots Provide appropriate PPE such as earmuffs/plugs
Emission of uPOPs	Ensure optimal processing conditions to reduce heat generation, and Installation of air filtration system Regular monitoring Ensure that the sources of emissions like waste incineration and open burning of e-waste are avoided throughout the project lifecycle Where appropriate use substitute or modified materials, products and processes to prevent the generation of Unintentional Persistent Organic Pollutants (UPOPs) Use the Stockholm Convention's guidelines on Best Available Techniques (BAT) and apply the Best Environmental Practices (BEP) regarding (UPOPs) Identify strategies to address unintentional releases of POPs, including promoting awareness, education and training around those strategies Use BAT/BEP for uPOPs sources Reduce human exposure to uPOPs through appropriate training on health and safety and use of appropriate PPE
Reduced Ambient Air Quality	Use air pollution abatement equipment like scrubbers and filters to remove pollutants before release. Conduct e-waste operations in enclosed areas and implement dust suppression techniques. Prohibit open burning of e-waste and ensure proper storage to prevent pollutant release. Provide safe dismantling methods and PPE for workers, with health and safety training. Ensure compliance with air quality regulations and conduct regular monitoring and training.
Poor solid waste management	Implement waste management plan Use designated bins. Engage licensed waste collectors Promote recycling
Failure to comply with labour and occupational health and safety laws and regulations	Ensure compliance with labour practices and working conditions through periodic checks by the Project Implementation Unit (PIU) Implement labour management procedures to guarantee signed contracts with clear working conditions for all workers. Adopt non-discriminatory labour practices including recruitment, promotion, and dismissal processes. Prevent child and forced labour by adhering to national and international laws, verifying worker documentation, and ensuring voluntary and fair engagement of workers. Establish and maintain a transparent grievance redress mechanism for workers and nearby communities, with periodic sensitization. Ensure workers have a dedicated GRM Ensure safety and health standards are met by identifying hazards, providing corrective measures, training workers, documenting incidents, and maintaining emergency response arrangements
Unfair employment	Implement the Labor Management Procedures (LMP) to provide fair employment opportunity, Establish accessible worker GRM and, Periodically sensitize workers and ensure minimum age for employment in preventing forced labour and child labour
GBV / SEA / SH	Establish and implement an accessible and transparent worker GRM and periodically sensitize workers Sensitize workers and community on GBV/SEA/SH issues Introduce code of conduct for workers and signed by all workers.
Risk of Disease exposure and transmission	Sensitize workers and community on health impacts of exposure to e-waste including the route of exposure and how they can protect themselves
Inadequate stakeholder engagement	Establish open and transparent communication channels with all stakeholders.

	Ensure GRM should address any concerns or complaints that may arise during operation. Raise awareness of both positive and negative impacts among the local community. Encourage individuals to adopt responsible e-waste management practices, ultimately contributing to the maintenance of a clean and healthy environment.
Equipment-Related Injuries	Install safety guards and emergency stop buttons Conduct regular maintenance and inspections Train workers on safe operation Ensure presence and displayed operational equipment instructions and manual Supervise and monitor the implementation of equipment instructions,
Fire Hazards	Develop and display fire emergency response procedures Install fire detection and suppression systems and ensure they are functional Store flammable materials safely, away from ignition sources Conduct comprehensive fire drills and training for staff Ensure the use of fire-resistant materials and obtain necessary fire certifications Implement measures to control combustible dust and conduct regular inspections Promote a health and safety culture, encouraging vigilance and adherence to protocols
Ergonomic Hazards	Use mechanical aids and rotate tasks Provide training on lifting techniques Design ergonomic workstations Ensure short-term resting breaks are implemented
Occupation health and safety risks including worker injuries poor working conditions	Provide PPE like gloves, safety shoes, helmets Conduct health and safety training Develop and implement a Hazardous Materials Management Plan: Identify and assess the hazardous materials present in the e-waste streams. Implement proper handling, storage, and disposal procedures for hazardous materials. Provide specialized training and PPE for workers handling hazardous materials. Establish emergency response plans and procedures for spills or accidents involving hazardous materials. Implement Occupational Health and Safety Management System: Establish an OHS management system aligned with international standards (e.g., ISO 45001) ESS2 including EHS guidelines and national regulations on labour an OHS. Conduct regular workplace inspections, risk assessments, and hazard identification activities and develop safe systems of work Provide appropriate PPE, safety equipment, and training to workers based on their job roles and exposure risks. Implement a medical surveillance program for workers exposed to hazardous materials or conditions. Install emergency facilities and proper safety signage
Delays in collection of PC-Boards and other extracted e-waste parts	Secure legally binding Memorandum of Understanding (MoU) with advanced e-waste facilities Sign mutual contracts to ensure timely pick-up and delivery Adhere to the Basel convention guidelines Have valid permits and ensure timely renewal including the hazardous license for transportation, storage, handling and pre-treatment of e-waste.
DECOMMISSIONING / DEMOBILIZATION PHASE	
Reduced Road Safety	Use road signs Set speed limits Train drivers on safe practices
Unfair employment	Implement Labour Management Procedures (LMP) to provide fair employment opportunities Establish accessible worker GRM, and

	Periodically sensitize workers and ensure minimum age for employment in preventing forced labour and child labour
Risk of Disease Transmission	Sensitize workers and community on health impacts
Reduced Ambient Air Quality	Provide appropriate PPE Suppress dust emissions with water Air monitoring
Elevated Nosie Levels	Provide suitable PPE like earmuffs/plugs Monitor and limit noise levels Limit operation hours to daytime Short duration of activities
Soil, Ground and Water Contamination	Use non-leaking containers for hazardous chemicals Store and handle oil and hazardous substances properly Train personnel in handling chemicals Soil and water monitoring

CONCLUSION

GCL management shall ensure that the proposed mitigation measures in the ESMP are implemented and monitored throughout the project lifecycle. The implementation of the ESMP will ensure avoidance or minimization of negative impacts and enhancement of positive impacts. Adequate stakeholder engagement will also be conducted throughout the project lifecycle.

GCL shall promote compliance to national E&S legislation and adhere to relevant WB environmental and social standards and applicable EHSGs and GIIPs. The project will include several mechanisms to address concerns and grievances arising in connection to the proposed project. Project-affected parties will have access to project grievance mechanisms. Through application of the ESS, GCL will ensure to do the following:

- Achieve good international practice relating to Environmental & Social Sustainability.
- Fulfil both national and international Environmental & Social obligations.
- Enhance non-discrimination, participation, accountability, transparency etc.
- Enhance Sustainable Development outcomes of project through stakeholder engagement.

ABBREVIATION AND ACRONYM

Abbreviation / Acronym	Definition
APs	Aggrieved Parties
BAT	Best Available Techniques
BMPs	Best Management Practices
CBD	Central Business District
EEE	Electrical and Electronic Equipment
EHPMP	Environmental Health and Pollution Management Program
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EPB	Environmental Project Brief
ESHG	Environmental Safety and Health Guidelines
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standard
E-WASTE	Electronic and Electrical Waste
EWMP	E-Waste Management Plan
GBV	Gender Based Violence
GCL	Greenstretch Consultants Limited
GIIP	Good International Industry Practice
GRM	Grievance Redress Mechanism
GRZ	Government of the Republic of Zambia
IAPs	Interested and Affected Parties
LCC	Livingstone City Council
LMP	Labour Management Procedures
NGO	Non-Governmental Organization
OHS	Occupational Health and Safety
PBTs	Persistent bio-accumulative toxins (PBTs)
PC-Boards	Printed Circuit Boards
PCBs	Polychlorinated biphenyls
PIU	Project Implementation Unit
PM	Particulate Matter
PPE	Personal Protective Equipment
PPP	Public Participation Process
SEA/SH	Sexual Exploitation Abuse / Sexual Harassment
SI	Statutory Instrument
SOP	Standard Operating Procedure
SWASCO	Southern Water and Sanitation Company
uPOPs	Unintentionally Persistent Organic Pollutants
USD	United States Dollar
ZEMA	Zambia Environmental Management Agency
ZICTA	Zambia Information and Communication Technology Authority

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1.0 INTRODUCTION

E-waste contains toxic substances like mercury, lead, cadmium, and flame retardants, posing risks to health and the environment. Valuable raw materials in e-waste are often lost due to poor recycling practices. E-waste volumes increase due to products designed for a linear lifecycle, leading to obsolescence and lack of reparability. Improper disposal can lead to soil and water contamination, affecting biodiversity and human health with issues like neurological disorders and respiratory impacts.

Effective e-waste management can prevent these harms and recover valuable metals. The recycling process involves three main steps: collection, sorting/dismantling and pre-processing, and end processing. These steps must work together holistically. Key objectives include treating hazardous materials safely, maximizing material recovery, creating sustainable business, and considering social impacts.

Greenstretch Consultants Limited (GCL) is a duly registered entity in the Republic of Zambia specialized in the provision of environmental consulting and waste management services. GCL was incorporated in May 2018 under the Companies Act No. 10 of 2017 of the laws of Zambia with the Patents and Companies Registration Agency (PACRA) as a private company limited by shares, Registration No. 120180003782. The company is headquartered in Livingstone District of Southern Province. It is located on Plot No. 231, Nkumbi Road, 217Area, off Nakatindi Road.

GCL intends to establish and operate an electronic and electrical waste (e-waste) recovery, collection, transportation, storage, dismantling and processing facility under the auspices of the World Bank through the Environmental Health and Pollution Management Program (EHPMP) being implemented by the Zambia Environmental Management Agency (ZEMA). The project will introduce an e-waste collection, storage and transportation system for Livingstone District including surrounding Districts within Southern Province. The districts to be targeted shall include namely, Sesheke, Kazungula, Zimba, Kalomo, Monze, Pemba, Choma, and Mazabuka District.

The preparation of this Environmental and Social Management Plan (ESMP) is in line with the World Bank's Environmental and Social Framework. This ESMP has been prepared to address environmental and social issues that may emanate from the establishment and operation of an e- waste recovery facility during the lifecycle of the project.

1.1 Project Objectives

The main objective of the project is to establish and operate an electronic and electrical waste (e- waste) recovery facility and set up a system to recover, collect, store, dismantle and transport e- waste materials in an environmentally sound manner. Specifically, the project seeks the following:

- To set up e-waste collection centers at strategic locations away from critical habitats, flood prone areas and areas considered elephant corridors.
- To introduce an e-waste collection, storage and transportation system for Livingstone District including surrounding Districts within Southern Province
- To sort, segregate, dismantle and store electronic scrap
- To ensure e-waste is collected not only in Livingstone but also in the entire Southern Province, targeting districts such as: Sesheke, Kazungula, Zimba, Kalomo, Pemba, Mazabuka, and others

- To buy e-waste from the general public and the community and deliver to the centralized e- waste recovery facility to be set up in Livingstone
- To transport and sell extracted Printed Circuit Boards (PC-Boards) to advanced e-waste facilities for further processing
- To form mutual partnerships/collaborations to ensure adherence to international best practices
- To ensure adherence to the Basel convention guidelines as well as local environmental regulations in case of any trans-boundary movement of e-waste
- To raise awareness about the importance of recycling e-waste as well as the environmental and social risks associated with improper handling and disposal of e-waste.

1.2 Project Description

Greenstretch Consultants Limited intends to establish and operate an e-waste recovery, collection, storage, and dismantling facility in the city of Livingstone, Southern Province. The proposed facility shall be operated in a leased warehouse which measures approximately 15 x 18 meters in size. The warehouse shall consist of different segments namely, the receiving, loading, storage, dismantling, and weighing areas. Other sections shall include shredding, sorting and baling. The facility will be a strategic location for the reception, storage and dismantling of e-waste materials generated in Livingstone and the surrounding districts.

1.3 Collection of e-waste

One of the key elements of the proposed project is the collection of e-waste from the waste streams. GCL shall employ various methods to collect and transport e-waste in order to keep it out of landfills. One of the ways e-waste will be collect is through partnerships with both the bulk consumers of e-waste such as Government departments, local private businesses and banks among others, as well as repair shops, informal collectors and the general community that may require safe disposal of their e-waste items. The collection of e-waste shall be done directly from the respective organization, household or location on an agreed date, and a provision for businesses or corporate clients to book a collection shall be put in place. The following options shall be utilized;

Take-back program: Under this program, consumers will be able to drop off their old electronics directly at GCL e-waste facility. Alternatively, arrangements shall be made for the e-waste to be collected directly from the repair shops, informal collectors or consumer's location on an agreed date.

On-demand collection: Consumers of e-waste will request a collection for electronic items and the materials will be collected as agreed. To enhance accessibility, GCL shall provide transport for those who may face challenges in reaching the facility.

Recycling bins: GCL shall encourage the use of appropriate e-waste recycling bins to ensure e-waste items are separated from other type of waste to avoid cross-contamination. Where possible, GCL shall provide such bins to designated organizations or businesses and regular collection done to prevent over flowing.

E-waste collection events: GCL shall from time to time arrange e-waste collection events, at which members of the local community will be invited to bring their electronic waste on the day of the collection event. All received e-waste on that particular day shall then be loaded on pallets and trucks, and safely transported to the e-waste recovery facility for recycling. An

incentive shall be paid in exchange for e-waste delivered directly to the facility or during such arranged collection events. Donations of e-waste items as a way of safely disposing them of shall be accepted and encouraged.

1.4 E-waste Collection Centers

In addition to the above, e-waste shall be collected through the established and operated e-waste collection centers. Five (5) centers shall be set up and each center or site shall consist of one closed 20ft shipping container. The containers will act as collection sites or drop-off locations where e-waste shall be received, weighed, bought and recorded. These centers shall be installed and operated at designated locations around the City of Livingstone strictly away from critical habitats or flood prone areas.

Once sufficient volumes of e-waste accumulates at the five Collection Centers, they will be loaded on pallets into a truck and transported to the central location i.e., the centralized E-waste recovery facility for further processing. The following gives an elaborative view of the Collection Centers.

a) Location of the Collection Sites

To ensure that a suitable location is determined for the collection sites, GCL shall use the following criteria;

- The site must be not be located close to residential houses
- The site must not be located within or close to a protected area or an area prone to flooding or wetland
- The site must not be located in areas considered elephant corridors
- The site must not be located within or close to critical habitats which are defined as areas of high biodiversity or importance according to the World Bank (WB) ESS6
- Consultation with the local authority and the regulatory agency (ZEMA) must be done prior to the installation and operation of the Collection Centers

b) Installation of Containers at Collection Sites

Key activities during the installation stage shall include the placement of a 20ft shipping containers at each collection center on four raised square concrete slabs. Prior to installation of the containers, the site will be prepared by clearing the area of any grasses and shrubs present. Thereafter, the site will be fenced and provided with security. Added to that site branding and installation of visible signage will be done.

c) Equipment at the Collection Centers

Each collection site shall be equipped with a weighing scale and separate waste containers including a table and chair. The centers will be managed by trained personnel.

d) Management of e-waste at Collection Sites

GCL will ensure that proper storage of received materials. Incompatible e-waste materials shall be separated and stored in separate containers. The collection site area shall be separate from other types of waste to avoid cross-contamination. GCL will ensure that each collection site is well fenced, secured, maintained, properly marked, consist of a closed container and is well equipped with waste separation based on the nature, components and hazard level of the materials received. To avoid incompatible materials mixing, e-waste shall be separated and stored in separate containers. GCL shall also ensure that each site receives only e-waste materials, other solid waste materials like plastics and food waste will not be accepted.

The centers shall be managed by a trained personnel who will be responsible for attending to the local community delivering e-waste materials, weighing and buying the materials as well as maintaining, and cleaning the site. As part of the operation activities, transportation of e-waste from the collection centers to the e-waste facility shall be regularly done to avoid e-waste piling up.

e) Accessibility of the Collection Sites

Access to the centers shall be restricted to authorized personnel only. Appropriate signage shall be installed to restrict entry. Security shall be put in place to secure the sites 24/7. Children will not be allowed to the sites, GCL shall apply a no child labour policy and further guide all employees accordingly.

f) Operation of the Collection Centers

Each center shall be operated and managed by a trained personnel, who will be maintaining and ensuring cleanliness at the center to avoid attracting rodents and snakes. The employed personnel shall attend to the local community selling e-waste materials. The duty holder shall ensure that e-waste materials are weighed, paid for and recorded in a book. The selected personnel shall also be responsible for educating the community on proper e-waste handling and disposal.

Concisely, Greenstretch Consultants Limited (GCL) shall ensure that the proposed Collection Centers;

- Are well secured and fenced, restricting entry to authorized personnel only
- Have designated access points
- Have appropriate signage and visible markings with proper instructions for disposal of e-waste
- Have separate waste containers to keep incompatible e-waste materials separately
- Are separate from other types of waste to avoid cross contamination
- Are well maintained and kept clean at all times to avoid attracting rodents and snakes
- Are NOT Installed and operated within or close to critical habitats as defined by the WB ESS6
- Are NOT installed and operated near (1) areas that are prone to floods, (2) near residential houses, and/or (3) near areas considered elephant corridors
- Are provided with adequate waste receptacles and equipped for waste separation and storage based on the nature, components and hazard level of the e-waste.
- Each consist of one closed 20ft container and equipped with a fire extinguisher
- Have all necessary permits and approvals from the local authority

The proposed project will mainly collect e-waste for the purpose of recovering reusable, useful, and valuable e-waste components for resell to potential buyers. It is planned that recovered e-waste components (e.g., Printed Circuit Boards) that cannot be processed locally shall be shipped abroad to advanced e-waste material recovery facilities e.g., to NamiGreen of Namibia, alternatively to AST Recycling Company of South Africa for further processing to recover precious metals.

At full operating capacity, GCL anticipates collecting approximately 40 to 50 tons of e-waste per month from Livingstone and the surrounding districts viz. Sesheke, Kazungula, Zimba, Kalomo, Monze, Choma and Mazabuka. Based on expert judgment, project budget and to some extent on the number of collection vehicles, machinery and equipment to be procured for the project, and also considering e-waste collection events to be arranged as well as the number

of project workers to be employed, GCL expects that the facility will have the following estimated capacities:

Capacity	Tons per day
E-waste collection capacity	2 - 3
E-waste dismantling capacity	1 - 2
Sorting / processing capacity	2 - 3
Baling capacity	1 – 2

GCL will ensure that the facility area has adequate working space during operational phase and that received e-waste is separated, sorted and dismantled accordingly to recover various useful components (i.e., metals, PC-Boards, aluminum, copper and others), which will then be transported and dispatched out of the facility to certified organizations for further processing. GCL will ensure there is constant receipt of materials and continuous dispatch or removal of processed materials to ensure sufficient working space at all times.

In terms of water availability and accessibility, the project site is connected to the water utility company i.e., the Southern Water and Sanitation Company (SWASCO). In case of unavailability of water from SWASCO, the site has a borehole water storage tank with a ccess to groundwater which will be used at different stages of the project, mainly at operational stage. Considering that the project operational processes shall be dry processes, the water requirements will be minimal and this will have insignificant impact on the local water availability. Water will only be used by project workers during day to day operations mainly for drinking, bathing, hand washing, cleaning of vehicles and flushing of toilets.

1.5 Project Rationale

Negative impacts of poor waste management on Zambia's environment and human health have steadily increased in recent years due to numerous factors, including relatively high rates of economic growth, population growth and urbanization. A large volume of both solid and e-waste generated in most cities in Zambia is inappropriately disposed resulting in uncontrolled environmental pollution. Electronic waste (E-waste) is a term used to cover items of all types of electrical and electronic equipment (EEE) and its parts that have been discarded, irreparable or at the end of life. Although e-waste is a general term, it is considered to cover laptops, desktops, tablets, TV's, mobile phones, and household appliances. E-waste contains materials that, if mishandled, can be hazardous to human health and the environment, but, most importantly, also contains materials that are valuable and scarce. Electrical and electronic equipment contain different hazardous materials, which are harmful to human health and the environment if not disposed of carefully. While some naturally occurring substances are harmless in nature, their use in the manufacture of electronic equipment often results in compounds, which are hazardous (e.g. chromium becomes chromium VI). Lead, mercury, cadmium, and poly-brominated flame retardants are found in electronic equipment and are all persistent, bio-accumulative toxins (PBTs). The effects are felt across the country and endanger human well-being and Zambia's environmental and natural assets. The status of e-waste management in the targeted nine districts is currently unknown, (Civil Society for Poverty Reduction - CSPR 2022).

According to an Information and Technology Authority (ICT) survey that was conducted by the Zambia Information and Communications Technology Authority (ZICTA) in 2018, the country disposes 90% of its e-waste in dumpsites and only 10% of the population using electronic devices are even aware of the risk associated with careless disposal of such materials.

Considering the foregoing, the proposed project by Greenstretch seeks to establish and operate an e- waste recovery facility and set up a system to receive, collect, store, safely dismantle and transport e-waste scrap and extracted e-waste components. The extracted useful and valuable e-waste fractions (particularly PCBs) shall be shipped to Namibia or South Africa for further processing with strict adherence to the Basel convention guidelines.

In the absence of an e-waste collection service, e-waste is either landfilled or dumped illegally or burnt. Setting up an e-waste collection, storage and dismantling facility is a solution to the e-waste challenges Zambia is facing. Additionally, the implementation of this project will directly and indirectly benefit the local community in terms of job creation and knowledge transfer. This will equally benefit the Government of the Republic of Zambia to manage e-waste in an environmentally sound manner.

1.6 The Developer's Physical Address and Contact Person

Details Physical Address & Contact Details
Greenstretch Consultants Limited
Plot 231 Nkumbi Road, 217Area,
Livingstone, Zambia
Tel: +260 979 618 731, +260 965 618 731
E-mail: greenstretchc@gmail.com
Website: https://greenstretch.mybusiness.site

Contact Person
Name: Mr. Bernard Musukuma
Designation: Director and Lead Consultant
Company: Greenstretch Consultants Limited
Mobile No: +260 979 618 731, +260 965 618 731
Email: musukumabernard@gmail.com

1.7 Particulars of GCL Shareholders, Directors and Shareholding Percentage

Table 1: Particulars of Shareholders, Directors and Shareholding Percentage

Shareholder / Directors	Shareholding	Nationality	National ID	Contact No.
Bernard Musukuma	50%	Zambian	140752/10/1	+260 979 618 731
Gravy Sinkamba	50%	Zambian	976116/11/1	+260 978 308 683
Total Percentage	100%			

Greenstretch Consultants Limited is the project proponent.

1.8 Track record

Greenstretch Consultants Limited (GCL) is a duly registered entity in the Republic of Zambia specialized in the provision of environmental consulting and waste management services. GCL was incorporated in May 2018 under the Companies Act No. 10 of 2017 of the laws of Zambia with the Patents and Companies Registration Agency (PACRA) as a private company limited by shares, Registration No. 120180003782. The company is headquartered in Livingstone District of Southern Province, located on Plot No. 231, Nkumbi Road, 217Area, off Nakatindi Road.

GCL has been involved in waste recovery, collection, baling and transportation in the City of Livingstone from 2022 to date. The company has established essential working relationship with the local authority (Livingstone City Council), ZEMA, including the local community and private businesses, particularly the waste collectors and other waste management service providers. Greenstretch has grown to become a trusted name in the environmental sector, providing a broad- spectrum of services to all clients required to comply with environmental health and safety regulations and standards. The services and solutions provided promotes sustainability, circular economy practices and regulatory compliance.

To provide comprehensive waste management solutions, GCL intends to diversify and go into e- waste management, and it is for this reason that the company seeks to establish and operate an e- waste recovery, collection and dismantling facility through the support of the World Bank, to help address the environmental health risks associated with e-waste management. Setting up an e-waste facility is a solution to the e-waste challenges that Zambia is facing today due to increased human population, urbanization and economic activities.

GCL currently has a valid hazardous waste management licence from ZEMA. This licence particularly covers waste oil, used oil, pharmaceutical waste and medical waste. GCL will in due course apply for amendment of the conditions to this licence for inclusion of other waste types like e-waste.

1.9 Project Location

The proposed project site is located in Livingstone District of Southern Province, on Plot number 1411, along Sambono Road, in Cold Storage Area in the Industrial Area. Geographically, the site lies at latitude 17º52’08.64”S and longitude 25º50’53.10”E, accessible through Belewa road and Sambono road. The site is located off the Mosi-Oa-Tunya Road, and lies approximately 3km from the Livingstone CBD, 0.22km from FRA Deport on the western side, 0.85km from Protea Hotel Livingstone on the eastern side, and 0.77Km from Oriental Swan Hotel on the southeast direction.

The proposed project site is a warehouse which is currently unoccupied and located in an industrial area. The site is being used for commercial purpose with no illegal or informal activities being carried out in the immediate area. The project site is located far from the Central Business District and is in an area which is generally flat with no critical habitats, flood prone areas or areas considered elephant corridors in close proximity.

The site is approximately 1.37Km away from the Mosi-O-Tunya National Park. One of the key aspect to note is that the project area is frequented by migratory elephants, especially after the rainy season.

The project will establish and operate Collection Centers which will consist of closed

containers. These Collection Centers to be set up shall not pose any potential risks to key species as they will be installed and operated far away from critical habitats. Critical habitats are defined as areas of high biodiversity importance or value according to the World Bank ESS 6.

Additionally, the centralized e-waste facility location is not prone to flooding and not near any critical habitats or an area considered elephant corridor, and hence will equally not pose any serious threats to species of concern.

There are no water bodies in the project area. The only nearby water body is the Zambezi River on the South located about 3.6km from the proposed project site.

1.10 Total Project Cost

The proposed project will cost approximately USD 533, 778.00.

1.11 Project Implementation Date and Lifespan

The proposed project will be implemented as soon as the Environmental Impact Assessment is approved by ZEMA and soon after approval of the Environmental and Social Management Plan by the World Bank. Greenstretch will ensure that prior to project implementation, all other required approvals, permits and licenses are secured through the various relevant regulatory bodies and institutions.

2 THE POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

This section discusses the policy, legal and institutional framework relating to the proposed project.

2.1 The Policy Framework

The following are some of the national environmental protections polices and strategies relevant to the proposed establishment and operation of an e-waste recovery facility.

2.1.1 National Policy on Environment, 2007

The National Policy on Environment (NPE) is the principal policy that coordinates environmental management in Zambia. The NPE is designed to create a comprehensive framework for effective natural resource utilization and environmental conservation which will be sensitive to the demands of sustainable development. The NPE is premised on a number of objectives. These include: Promoting the sound protection and management of Zambia's environment and natural resources in their entirety, balancing the needs for social and economic development and environmental integrity to the maximum extent possible, while keeping adverse activities to the minimum; Managing the environment by linking together the activities, interests and perspectives of all groups, including the people, non-governmental organizations (NGOs) and government at both the central and decentralized local levels; Accelerating environmentally and economically sustainable growth in order to improve the health, sustainable livelihoods, income and living conditions of the poor majority with greater equity and self-reliance; Ensuring broadly-based environmental awareness and commitment to enforce environmental laws and to the promotion of environmental accountability; Building individual and institutional capacity to sustain the environment; and Regulating and enforcing environmental laws; and promote the development of sustainable industrial and commercial processes having full regard for environmental integrity.

Relevance to the proposed project: The aim of this Policy is to ensure sound environmental management within a framework of sustainable development in Zambia. Once operational, an e- waste recovery facility will assist in terms of reducing the volume of e-waste materials to landfill, reducing indiscriminate disposal of e-waste and thus reducing open burning of e-waste materials at landfill sites.

Compliance thereof: The developer will ensure the project adheres to all relevant environmental regulations for sound environmental management.

2.1.2 National Environmental Action Plan

The National Environmental Action Plan (NEAP) of 1994 identifies environmental problems and issues, analyses their causes, and recommend necessary interventions. The NEAP was prepared as a comprehensive plan to contain the ever-increasing environmental degradation in Zambia. The NEAP is founded on three fundamental principles which includes: The right of citizens to a clean and healthy environment; Local community and private sector participation in natural resources management; and Obligatory EIA of major development projects in all sectors. The overall objective of the NEAP is to integrate environmental concerns into Zambia’s social and economic development planning process.

Relevance to the proposed project: The plan advocates for environmental impact assessment (EIA) for major development projects in all sectors. The proposed project is one such project that must be subjected to the EIA process. The developer shall conduct an EIA, thereafter, prepare and submit an Environmental Project Brief (EPB) report to ZEMA for consideration prior to implementation of the project.

Compliance thereof: An EIA report will be prepared in line with the provisions of the ZEMA EIA regulations. The project will be implemented once approval of the EIA is granted by ZEMA and also after approval of the ESMP by the World Bank.

2.1.3 The National Gender Policy 2023

Zambia's 2023 National Gender Policy is a comprehensive framework designed to address the gender inequalities that persist in the country. This policy aims to create a just and equitable society where women and girls have equal opportunities to participate fully in all aspects of national life. Recognizing the critical role of gender equality in achieving sustainable development, this policy outlines a set of strategic objectives and actions to promote gender equality and women's empowerment. It addresses key areas such as education, health, economic participation, political representation, and social protection.

Relevance to the proposed project: Gender equality plays a critical role in achieving sustainable development.

Compliance thereof: Greenstretch will ensure to adhere to the policy by giving equal opportunities to women in the recruitment of workers for the project.

2.1.4 The Eighth National Development Plan 2022 - 2026

The Eighth National Development Plan is a nationally owned and comprehensive document that was formulated through a highly consultative and participatory process, involving stakeholders across all sectors. In pursuit of the economic transformation agenda, the plan states that “it is imperative that development pathways are sustainable. This entails the sustainable utilization of natural resources which are the basis for wealth creation, as well as building resilience to the adverse effects of climate change. Thus, measures aimed at promoting green growth, safeguarding the environment and natural resources, enhancing climate change mitigation and adaptation, as well as strengthening disaster risk reduction, have been prioritized”.

Relevance to the proposed project: The plan aims at safeguarding the environment and ensuring that development is sustainable.

Compliance thereof: The proposed project will be undertaken in an environmentally sound manner in line with all applicable local and international environmental regulations and standards.

2.1.5 The National Health Policy 2012

Zambia National Health Policy 2012 is a cross-sectoral strategic plan designed to improve the health status of the people of Zambia by providing equitable access to cost effective and quality health services as close to the family as possible. The policy recognizes that food safety and environmental health are among the national health priorities and addresses these issues by seeking

to promote hygiene, universal access to safe water, acceptable sanitation and food safety in order to reduce the incidence of environmentally related diseases.
Further, the policy recognizes that occupational mortality, morbidity and disability are a major problem in Zambia. The objective of the policy is to achieve increased coverage of occupational health and safety services in all sectors in order to contribute to the reduction of occupational health and safety hazards at places of work.

Relevance to the proposed project: This policy is key as there will be need to observe occupational health and safety during construction and operational stages of the project

Compliance thereof: The developer will ensure to adhere to all occupational health and safety issues by providing appropriate PPE and training, and by installing fire extinguishers in the facility as well as promoting hygiene and hand washing before eating.

2.1.6 The National Policy on Climate Change

The National Climate Change Policy is an important policy development that introduces a well-structured and coordinated national strategy to effectively tackle the adverse effects of climate change. The Policy provides the country with home grown initiatives targeted at minimizing the impact of climate change on national development. The Ministry of Lands and Natural Resources will spear head the implementation of climate change programmes. The policy will support and facilitate a coordinated response to climate change by re-aligning its climate sensitive sectors of the economy and society. The policy provides stakeholders with a clearer framework on how to tackle climate change in Zambia. With a policy in place, duplication of sectors and time wasting would not arise because of the integrated efforts.

Relevance to the proposed project: This policy provides stakeholders with a clear framework on how to tackle the adverse effects of climate change in Zambia

Compliance thereof: The developer shall ensure that proposed project activities are conducted in an environmentally friendly manner and in manner that will contribute to minimizing the impact of climate change on national development.

2.1.7 The Vision 2030

The Vision 2030 is a government policy document that reflects the country's collective understanding, aspirations, and determination of the Zambian people to be a prosperous middle- income nation by 2030. The Vision provides that Zambia will aspire to achieve "universal access to clean, reliable and affordable energy at the lowest total economic, financial, social and environmental cost consistent with national developmental goals by 2030". The Vision is founded on seven key basic principles which include sustainable development. Sustainable Development requires that the exploitation of natural resources by the present generation is done in a manner that does not compromise the ability of the future generation to meet its own needs.

In order to ensure that the Vision is achieved, the GRZ developed the National Performance Framework (NPF). To attain the Vision 2030, one of the NPF strategic objectives is to enforce environmentally and socially sustainable development principles. Vision 2030 is operationalized in sequential 5-year National Development Plans. Currently, the Eighth National Development Plan (8NDP) is in force.

Relevance to the proposed project: This policy document provides for opportunities for improving the well-being of all, embodying values of socio-economic justice, underpinned by the principles such as gender responsive sustainable development and respective for human rights among others.

Compliance thereof: The proposed project will be implemented in line with the principles of sustainable development. The developer will shall that non-discrimination of persons and that human rights are respected at all stages of the project.

2.1.8 The National Employment and Labour Market Policy, 2018

The Government of Zambia identified the need to formulate the 2018 National Employment and Labour Market Policy by building upon the successes and challenges identified in the implementation of the 2005 National Employment and Labour Market Policy. The Policy provides an appropriate and evidence-based response measures to the challenge of unemployment facing the Zambian economy. It also provides measures to progressively formalize the informal sector and employment, enhance national productivity, promote respect for fundamental principles and rights at work, and strengthen the labour administration and labour market information systems. Upon their achievement, all these objectives will contribute to inclusive growth and poverty reduction in Zambia.

Further, the policy provides a platform for an inclusive labour market through integration of the youth, women, rural communities and persons with disabilities into productive job opportunities in Zambia. Furthermore, the Policy will guide the nation towards the attainment of employment and labour objectives at sub-regional, regional and international levels as outlined in the National Development Plan.

Relevance to the proposed project: The proposed project will create job opportunities for all, integrating the youth, women and persons with disabilities.

Compliance thereof: The proposed project will contribute to poverty reduction through the creation of job opportunities at project operation phase. The developer shall ensure to promote respect for fundamental principles and rights at workplace.

2.1.9 The National Youth Policy, 2015

The National Youth Policy was adopted in 2015 with the aim of providing an enabling environment that promotes the rights and obligations of the Youth and foster their participation in national development. The policy defines a “youth” as a person aged between 15 and 35 years old. The policy also embraces provisions stipulated in various pieces of legislation and policies that regulate labour laws as a means of creating youth opportunities to legitimate work 18 and self- employment opportunities.

Relevance to the proposed project: The proposed project will create job opportunities for all, including the youth.

Compliance thereof: The proposed project will integrate and empower the youth through the creation of jobs. All forms of discrimination against the youth will be prohibited.

2.2 The Legal Framework

This section discuses national environmental laws and regulations of relevance to the proposed project. A number of Acts of parliament related to Environmental Protection relevant to the implementation of the project were reviewed and summarized in the subsequent sections.

2.2.1 Environmental Management Act No. 12 of 2011

The Environmental Management Act (EMA) No. 12 of 2011 is the principal Act of Zambia. Section 29 (1) of the Act states that "A person shall not undertake any project that may have an effect on the environment without the written approval of the Agency, and except in accordance with any conditions imposed in that approval". The Act was immediately preceded by the Environmental Protection and Pollution Control Act No. 12 of 1990. Provisions of the Environmental Management Act require that all new projects begin with an Environmental Impact Assessment (EIA) and thereafter, licensing, auditing and compliance inspections follow.

Relevance to the proposed project: The establishment of ZEMA is provided for under the EMA No. 12 of 2011, and section 29 of the Act compels the developer of a new project with such a scale as the proposed project to carry out Environmental Impact Assessment studies and submit the findings to the Agency for approval.

Compliance thereof: The EPB report for the proposed project has been prepared in compliance with the requirements of section 29 of the EMA No. 12 of 2011.

Applicable regulations to the proposed project under Environmental Management Act No. 12 of 2011 are described below:

2.2.1.1 Environmental Protection and Pollution Control (Environmental Impact assessment) Regulations, SI No. 28 of 1997.

This regulation provides the main framework under which EIAs are conducted, submitted to ZEMA and considered for either approval or rejection.

The Environmental Project Brief for the proposed project by Greenstretch Consultants Limited was prepared in accordance with the legal framework on environmental management enshrined in the Environmental Protection and Pollution Control Act, Cap 204 of the Laws of Zambia and its subsidiary legislation, the Environmental Impact Assessment Regulations S.I. No. 28 of 1997.

Section 3 (1) of the EIA Regulations states that, *"a developer shall not implement a project for which a project brief or environmental impact statement is required under these Regulations, unless the project brief or the environmental impact statement has been concluded in accordance with these regulations and the Environmental Council of Zambia (Now ZEMA) has issued a decision letter."*

Relevance to the proposed project: The various activities to be undertaken during project operational stage may trigger environmental and social impacts. This will require that site specific environmental assessments be undertaken to eliminate or minimize possible impact. The EIA regulation gives guidance, schedules and categories the various project types and relevant EIA studies to be undertaken.
The proposed project is outlined in the Environmental Impact Assessment Regulations S.I. No. 28 of 1997, First Schedule. The guidelines from these regulations shall assist the developer to

maintain environmental protection and pollution control.

Compliance thereof: This Project Brief was being prepared in compliance with the above legal provisions. This project shall comply with all the laws and regulations to mitigate the social and environmental damage. The developer will ensure that project approval from ZEMA is secured before implementing the project.

2.2.1.2 Environmental Management (Licensing) Regulations of SI No. 112 of 2013 part III

This regulation provides for the licensing of non-hazardous solid waste transportation and operating/owning of non-hazardous disposal sites.

Relevance to the proposed project: The proposed project will somehow generate solid waste during implementation, operation and decommissioning stages. The transportation and disposal of these waste shall require constant monitoring and appropriate handling and disposal in line with the regulations.

Compliance thereof: The solid wastes generated during operation and decommissioning stages of the proposed project will be governed and handled in accordance with the provisions of this regulation. A licensed waste management service provider shall be engaged to manage the solid wastes.

2.2.1.3 Environmental Management (Licensing) Regulations, Statutory Instrument No. 112 of 2013 Part II – Air Emission Pollution Control

The regulation provides for the licensing of gaseous waste to the environment and also provides for the statutory discharge limits for respective parameters.

Relevance to proposed project: The proposed project may cause emissions of dust. The regulation is relevant to project in the sense that the project construction, operational or decommissioning activities may emit dust and cause aim pollution.

Compliance thereof: The developer shall comply by installing dust collectors to collect dust particles from the shredding or crushing operations. Regular air quality monitoring shall be undertaken and appropriate corrective measures implemented accordingly.

2.2.1.4 Environmental Management (Licensing) Regulations, Statutory Instrument No.112 of 2013 Part IV – Hazardous Waste Management

The regulation provides for licensing of solid/liquid hazardous waste management from generation through to disposal and owning of hazardous waste disposal sites.

Relevance to the proposed project: The proposed project will generate hazardous waste whose transportation and disposal shall require constant monitoring and obtaining of a licence from ZEMA. The project will collect electronic and electrical waste (e-waste) which contain hazardous and harmful components such as lead and mercury. Improper handling and dismantling of e-waste may result in spillage and seepage of these hazardous materials into the environment contaminating ground/surface water resources. GCL shall secure licence to manage hazmats.

Compliance thereof: The project will conduct dismantling activities on impervious and paved surfaces in a dry, controlled and closed environment. The dismantling and sorting activities will be a dry process. Onsite fuel oil and waste oil shall be contained in leak-free containers and

stored on paved surfaces in secure location.

2.2.1.5 Environmental Management (Extended Producer Responsibility) Regulations, Statutory Instrument No. 65 of 2018

The Extended Producer Responsibility (EPR) Regulations is one of the tools that the Government will rely on to manage, in an environmentally sound manner, packaging materials such as plastics and their resultant waste. The EPR Regulations will also regulate non-returnable glass and plastic bottles, cartons, beverage cans, waste oils, pesticides or chemical containers, used tyres, electrical and electronic equipment and their resultant waste. The Regulations require a person or persons whose activities generate waste with potential to pollute the environment to employ measures essential to minimize waste through treatment, reclamation, re-use, recovery or recycling.

Relevance to the proposed project: The EPR will also regulate electrical and electronic (e-waste) equipment and their resultant waste. The proposed project activities have the potential to pollute the environment

Compliance thereof: Greenstretch shall employ all necessary measures essential to minimize the impact of e-waste on the environment at project operation stage.

2.2.2 Information and Communication Technologies Act No. 15 of 2009

An Act to continue the existence of the Communications Authority and re-name it as the Zambia Information and Communication Technology Authority; provide for the regulation of information and communication technology; facilitate access to information and communication technologies; protect the rights and interests of service providers and consumers; repeal the Telecommunications Act, 1994, and the Radio-communications Act, 1994; and provide for matters connected with or incidental to the foregoing.

The authority (ZICTA) is responsible for the regulation of the electronic communication services and products, ICT and monitoring of the performance of the sector, including the levels of investment and the availability, quality, cost and standards of the electronic communication services in Zambia.

ZICTA a lead authority responsible for regulating information and communication technology in the country and provides compliance oversight over the Electrical and Electronic Waste. It also serves as a key data provider on the inflows of related equipment and technologies.

Relevance to the proposed project: The proposed project will involve the collection of electronic waste including electronic communication products which may require protection of personal data, and the confidentiality of information contained in the equipment.

Compliance thereof: The developer shall comply with the Act and also ensure that ZICTA is engaged and consulted before implementation. The developer will further ensure that e-waste (e.g., hard drives) containing confidential information is completely destroyed by shredding or the information contained shall be fully deleted or erased to protect personal and corporate data and information

2.2.3 Solid Waste Regulation and Management Act No 20 of 2018

An Act to provide for the sustainable regulation and management of solid waste; general and self- service solid waste services; the incorporation of solid waste management companies and

define their statutory functions; the licensing and functions of solid waste service providers, operators and self-service solid waste providers and provide for their functions; the regulation, operation, maintenance and construction of landfills and other disposal facilities; the setting and approval of tariffs for management of solid waste and provision of solid waste services; and matters connected with, or incidental to, the foregoing.

Relevance to the proposed project: The proposed project to establish, operate and maintain an e-waste plant has the potential to generate solid waste by project employees at both operation as well as decommissioning phases.

Compliance thereof: The developer will ensure to act in accordance with the Act. Therefore, a licensed solid waste company shall be engaged to manage waste generated onsite. Further, the developer shall ensure appropriate disposal guidelines are followed, appropriate waste receptacles shall be provided.

Other Acts Relevant to the Proposed Project

2.2.4 Persons with Disabilities Act No. 6 of 2012

The Act provides for the protection of the interests of persons with disabilities in various spheres of life, including the workplace. Section 2 of the Act defines a disability as "a permanent physical, mental, intellectual or sensory impairment that alone, or in a combination with social or environmental barriers, hinders the ability of a person to fully or effectively participate in society on equal basis with others".

Relevance to the proposed project: Livingstone district has persons with disabilities who may need equal employment opportunities and working conditions.

Compliance thereof: The developer will ensure measures are put in place to avoid hindering persons with disabilities from accessing the facility. The project facility shall be made accessible to persons with disabilities, and fair treatment and working conditions shall be put in place.

2.2.5 National Heritage Conservation Act No. 19 of 2021

The National Heritage Conservation Commission Act CAP 173 stipulates preservation and protection of ancient cultural and natural heritage resources and objects of aesthetic, historical and archaeological value. In this Act, "Ancient Heritage is defined as being among other things, any structure, settlement previously inhabited, landmark, burial place or any other item designated by the commission which is known or believed to have been erected, constructed or used before 1st January 1924. The Act also provides for the formation of National Heritage and Conservation Commission which is the responsible institution.

The Act, under Part V protects any area which have unique or rare natural or cultural values of national and cultural significance including flora and fauna.

Relevance to the proposed project: This Act is relevant in that during operation and decommissioning stages, resources of national heritage importance may be discovered. The knowledge of their protection if found is important and workers shall report any unique feature for examination by archaeological and cultural heritage experts.

Compliance thereof: The developer shall comply with this Act by documenting and reporting any such archeological and cultural artifacts should there be found at the project site or within project area.

2.2.6 The Forests Act No. 4 of 2015

An Act to provide for the establishment and declaration of National Forests, Local Forests, joint forest management areas, botanical reserves, private forests and community forests; provide for the participation of local communities, local authorities, traditional institutions, non- governmental organizations and other stakeholders in sustainable forest management; provide for the conservation and use of forests and trees for the sustainable management of forests ecosystems and biological diversity; establish the Forest Development Fund.

Relevance to the proposed project: Although the project area is not a protected forest, this Act is relevant in that it promotes the conservation of tree species and other species that are of high concern in the project area. Therefore, all the guidelines shall be strictly followed to conserve the environment.

Compliance thereof: The developer shall comply with this Act by safeguarding the tree species in the project area by avoiding any unnecessary cutting down of trees to promote conservation of tree species.

2.2.7 The Zambia Wildlife Act No. 14 of 2015

The Zambia Wildlife Act No. 14 of 2015 establishes the Department of National Parks and Wildlife and provides for the management and conservation of wildlife ecosystems, including National Parks and Game Management Areas. It also involves local communities in wildlife management, regulates game ranching and hunting, and implements international wildlife conservation agreements. The Act is relevant to the project as it guides the preservation of wildlife in the area. Compliance requires reporting endangered species and prohibiting hunting or poaching **Relevance to the proposed project:** This Act provides guidelines on how the developer shall preserve the wild animals present in the project area and ensure maximum protection.

Compliance thereof: The developer shall comply with the Act by reporting any endangered animal species in the project area should need arise and shall prohibit any hunting or poaching of wild animals in the project area.

2.2.8 The Gender Equity and Equality Act No. 22 of 2015

An Act to establish the Gender Equity and Equality Commission and provide for its functions and powers; provide for the taking of measures and making of strategic decisions in all spheres of life in order to ensure gender equity, equality and integration of both sexes in society. The aim of the Act is to promote gender equality in all spheres of life. The Act seeks to achieve its aim through the establishment of the Gender Equity and Equality Commission as well as the promotion of the implementation of measures strategies that ensure gender equity, equality and integration of both sexes in society. The Act, under Part IV further provides for the elimination of all forms of discrimination against women and achieve gender equity and equality by giving effect to the Convention on the Elimination of all Forms of Discrimination against Women, the Protocol to the African Charter on Human and People's Rights on the Rights of Women in Africa and the SADC Protocol on Gender and Development.

Relevance to the proposed project: The aim of the Act is to promote gender equality in all spheres of life. The establishment and operation of an e-waste facility will require inclusion of both sexes – men and women working together for a common goal.

Compliance thereof: Greenstretch will put in place measures to promote and ensure gender equity, equality and integration of both men and women throughout the project life cycle. The

developer will ensure there will be NO any form of discrimination against women at all stages of the project.

2.2.9 Local Government Act No. 2 of 2019

An Act to provide for an integrated local government system; give effect to the decentralization of functions, responsibilities and services at all levels of local government; ensure democratic participation in, and control of, decision making by the people at the local level; revise the functions of local authorities; provide for the review of tariffs, charges and fees within the area of a local authority; provide for the proceedings of the council and committees; provide for the role of traditional leadership in democratic governance; repeal and replace the Local Government Act, 1991.

Relevance to the proposed project: The proposed project lies within Livingstone district which is under the Livingstone City Council.

Compliance thereof: The developer shall comply with this Act by engaging the Local Government and the traditional leadership as it is a requirement in the EPB process. Therefore, the Livingstone City Council (LCC) together with the local leadership shall be engaged at an early stage of the project.

2.2.10 Public Health Act No. 22 of 1995

This Act provides for the prevention and suppression of public health hazards. It regulates all matters and activities that are connected to outbreak of diseases. Local Authorities, in this case the Livingstone City Council is the custodian of the Public Health Act. Provisions of the Act are implemented by Councils through licensing and inspections. Section 67 prohibits the cause of various type of public nuisances which includes any noxious matter or wastewater flowing or discharged from any premises into any public street, water course, irrigation channel or bed not approved for the reception of such discharge. Under Section 71, the Act provides for prevention of pollution of water sources and places an obligation on local authorities to ensure that measures are put in place to prevent pollution.

Relevance to the proposed project: The process of operating an e-waste facility shall undergo different phases, and workers are likely to encounter environmental and health hazards. Therefore, the guidelines from the Act are of relevance to the project.

Compliance thereof: The developer shall comply with all applicable environmental health guidelines under the Ministry of Health and the local authority.

2.2.11 The Occupational Health and Safety Act No.36 of 2010

Provides for the prevention of work-related injuries, illnesses, and death by issuing and enforcing workplace health and safety standards. Hundreds of OHSA safety standards, covering everything from first aid to fire protection, apply to most federal and private workplaces. OHSA allows employees to question unsafe conditions, request inspections, and file lawsuits to correct unsafe conditions without retaliation.

The Act provides for the protection of persons, other than persons at work, against risks to health or safety arising from, or in connection with the activities of persons at work. Part IV, Section 16 (1 and 2) provides for duties of the employers which generally include: providing a safe working environment; making sure that the employees are healthy and fit to work in the provided work environment; provide protective clothing or equipment; making sure there are health, safety, emergency and first aid measures; providing information on safety and health and so on. On the other hand, the employees have a responsibility for their personal health and

safety (Part IV, Section 17). The act also requires workplaces to establish and maintain a health and safety committee; identify health and safety representatives from among the workforce; providing duties of an employer and duties of the employees in the workplace; duties of persons in control of workplace; compliance with the standards; conduct suitable and sufficient assessment of risks; eliminate hazards or reduce risks, provide plant and safe system of work, provide information, instruction and training, measures to deal with emergencies, accidents and ensure sufficient first aid arrangements are in place, ensure PPE is provided free of charge etc.
Relevance to the proposed project: Undertaking e-waste operational activities has potential to expose workers to health hazards and unsafe conditions. The proposed project will involve dismantling of e-waste materials, e-waste items are hazardous in nature as result of the hazardous and harmful components they contain. Dismantling activities may be the source of occupational health and safety risks for facility workers. Workers may also be exposed to heavy metals found in e-waste during sorting and dismantling operations.

Compliance thereof: The developer shall comply with the occupational health and safety Act, by conducting health and safety trainings to all workers, and all guidelines from the Act shall be strictly followed, full personal protective equipment shall be considered a priority. Further, the developer shall adhere to all safety guidelines from the responsible ministry.

2.2.12 Employment Code Act No. 3 of 2019

This Act provides conditions under which employees should work in Zambia. The Act covers both temporary and permanent employees. Generally, this Act talks about employee protection and social security requirements. Major provisions include:

- Minimum contractual age.
- Establishment of employment contracts.
- Settlement of disputes arising from such contracts of employment.
- The appointment of Labor Officers and other staff for the administration of the Act; and certain conditions of employment such as ordinary leave, sick leave, maternity, redundancy and welfare of employees

Relevance to the proposed project: The Act is relevant considering that the developer shall employ workers during the project implementation stage. The relevance of this Act to the project shall serve as guide to equal and formidable employment conditions.

Compliance thereof: the developer shall comply with this Act by employing the required age, establishing contracts, conditions of service and settling disputes in accordance with this Act.

2.2.13 The Water Supply and Sanitation Act No. 20 of 1997

The Water Supply and Sanitation Act provides for the regulation and standards applied in the provision of public water and sanitation services. It also provides for permitting of water supply and sanitation service provision.
Relevance to the proposed project: Good quality domestic water and sanitation facilities shall be required for workers and provision of this water shall require maximum adherence to the Act. The Southern Water Supply and Sanitation Company (SWASCO) is responsible for supply of water and sanitation services in Livingstone and Southern Province. This utility company shall supply water to the proposed facility.
Compliance thereof: The developer shall comply with the Act by abiding with the regulations and standards applied in this Act. The project site already has an ablution block with flushable toilets, the developer shall ensure the said facilities are well maintained.

2.2.14 Water Resources Management Act of 2011

An Act to establish the Water Resources Management Authority and define its functions and powers; provide for the management, development, conservation, protection and preservation of the water resource and its ecosystems; provide for the equitable, reasonable and sustainable utilization of the water resource; ensure the right to draw or take water for domestic and non-commercial purposes, and that the poor and vulnerable members of the society have an adequate and sustainable source of water free from any charges; create an enabling environment for adaptation to climate change; provide for the constitution, functions and composition of catchment councils, sub-catchment councils and water users associations; provide for international and regional cooperation in, and equitable and sustainable utilization of, shared water resources; provide for the domestication and implementation of the basic principles and rules of international law relating to the environment and shared water resources as specified in the treaties, conventions and agreements to which Zambia is a State Party; repeal and replace the Water Act, 1949; and provide for matters connected with, or incidental to, the foregoing.

The water Act provides the control process for the abstraction of water from surface sources and also addresses issues of the protection of groundwater resources. The Act is currently being revised as an Integrated Water Resources Management Act that will widen its influence to include groundwater. The Act further provides for the right to access public water and restricts public access prohibiting activities around public water sources such as rivers.

Relevance to the proposed project: In terms of water availability and accessibility, the project site is connected to the water utility company i.e., the Southern Water and Sanitation Compnay (SWASCO), and in case of unavailability of water from SWASCO, the site has a borehole water storage tank with access to groundwater. The fact that a borehole was drilled to access groundwater guidelines from this Act shall be relevant. The project water requirements will be minimal, as the project activities expected will mainly be dry processes.

Compliance thereof: The developer shall comply with this Act by obtaining all the required permits during all phases of project, and also ensure all renewals for the borehole onsite with the relevant authority are done in a timely manner. It should however be noted that the proposed project site does not have surface water, no local streams or rivers in close proximity to the site. Therefore, there are very low chances of ground and surface water contamination for the project as machinery to be utilized will be efficient and works shall be conducted in a controlled manner, on impervious surfaces.

2.2.15 Workers Compensation Act No.10 of 1999

This is a social security Act which has provisions for employee compensation in case of injury or death of an employee whilst at work. It is a requirement under this Act that all employers register their employees with the workers Compensation Fund and make periodic subscriptions for compensation of their employees.

Relevance to the proposed project: It is a right of every employee to be compensated for the work done therefore workers shall be registered and all guidelines in this Act are relevant.

Compliance thereof: The developer shall comply with this Act by registering all employees with Worker's Compensation Authority.

2.2.16 The National HIV/AIDS/STI/TB Council Act of 2002

The Act provides for the establishment of the HIV/AIDS/STI/TB Council, whose main function is to coordinate and provide support to the development, monitoring and evaluation of the multi- sectorial response for the prevention and combating of the spread of HIV, AIDS, STI and TB in order to reduce the personal, social and economic impact of HIV, AIDS, STI and TB.

Relevance to the proposed project: An influx of people seeking employment will increase throughout the project's lifespan, as such human interaction; including illicit/unprotected sex might rise posing a health hazard to workers and the surrounding communities.

Compliance thereof: The developer shall comply with Act's guidelines by raising awareness among workers and the local communities.

2.2.17 Land and Land Acquisition Act No. 20 of 2015

The Department of Lands administers the Lands Act for alienation of land under statutory leaseholds. Under the Land Act of 1995, land has been divided into the following categories: State, Local Authority and Traditional land. The proposed development falls under the land of the local authority.

Relevance to the proposed project: It is relevant because the project site allocated is under state land tenure system in Zambia.

Compliance thereof: Compliance with the provisions of the Act with regards to operating and acquisition of land in accordance with the requirements of State Land. The land for the proposed project is already on title and was legally acquired. The proposed development shall be implemented on leased land and the lease agreement is attached hereto.

2.2.18 Urban and Regional Planning Act No. 3 of 2015

An Act to provide for development, planning and administration principles, standards and requirements for urban and regional planning processes and systems; ensure sustainable urban and rural development by promoting environmental, social and economic sustainability in development initiatives and controls at all levels of urban and regional planning.

Relevance to the proposed project: The development cannot proceed without the City Council planning approval from the local authority.

Compliance thereof: Where applicable all necessary documentation will be submitted to Livingstone City Council and approvals obtained for project implementation in accordance with the terms of the Act. The Livingstone City Council as one of the key stakeholders shall be consulted and engaged at an early stage in the EIA process.

2.2.19 Investment Act No. 18 of 2022

This Act provides a legal framework for investment in Zambia. The Act relates to the environment indirectly by providing incentives for tree planting, soil and water conservation activities. The Act further recognizes the role of other agencies including those responsible for environmental protection in authorities' specific projects.

Relevance to the proposed project: The implementation of the project will require an investment of capital starting from procurement of equipment and machinery to project

operational activities.

Compliance thereof: The proponent shall abide by the laws and framework by following the laid down investment procedure relating to this Act during the stages of project implementation.

2.2.20 Factories Act, Cap 441

The Factories Act provides inter alia for the safety, examination and inspection of certain plant and machinery. Section 2 of the Act defines a factory as any premises in which, or within the close or cartilage or precincts of which, persons are employed in manual labour for various purposes.

Section 33 of the Factories Act provides that a factory or premises that has in place machinery or equipment that contains dangerous substances should be secured and warning signs, warning of the hazard must be put in place. As a minimum, the Act provides for:

Maintenance of workplaces in a clean state. Prohibition of overcrowding of workplaces, while work is carried on, to avoid risk of injury to employed persons. Effective and suitable ventilation of workplaces by natural or artificial means. Effective and suitable lighting of every workplace by natural or artificial means. Provision of sufficient and suitable sanitary conveniences for persons employed in a workplace. Secure fencing of moving parts and dangerous parts of machinery including flywheels, head and tail race of every water wheel and water turbine, every part of any electric generator, motor or rotary converter, parts of transmission machinery etc. Secure covering or fencing of vessels, structures, sumps or pits containing any scalding, corrosive or poisonous liquid, or any molten metal into which a person might fall. Training and supervision of inexperienced workers. Sound construction and maintenance of floors, steps, stairs, passages and gangways. Safe means of access to and egress from every place at which any person has at any time to work. Precautions in places (including confined spaces) where dangerous fumes are liable to be present. Precautions with respect to works likely to generate explosive or inflammable dust, gas, vapour or substance. Prevention and fighting of fire. Means of escape and warning in case of fire. Testing and examination of means for giving fire warning. Carrying out of fire drills. The construction specifications, use, maintenance, safety, examination and inspection of lifting machinery. Register of lifting machinery. The construction specifications, use, maintenance, safety, examination and inspection of pressure vessels including steam boilers, steam receivers and containers and air receivers. The welfare of employed persons including provision of: Adequate supply of wholesome drinking water. Washing facilities, supply of soap and suitable means of cleaning or drying. Accommodation for clothing and change rooms. Facilities for sitting when taking breaks. First-aid. Removal of and prevention of inhalation of dust or fumes. Provision, use and maintenance of suitable PPE. Limits on lifting excessive weights likely to cause injury. Requirement of certificates of fitness in respect of young persons in order to protect them from work that may be prejudicial to their health. Notification of accidents, dangerous occurrences and occupational diseases. Posting of abstract of the Act, regulations and notices in prominent positions in the workplace. Keeping a register in which should be entered or attached: Certificates issued under the Act. Prescribed particulars as to the washing, whitewashing, colour washing, painting or vanishing of the workplace. Prescribed particulars as to every accident, case of industrial disease or dangerous occurrence happening in a workplace of which notice is required to be sent to an inspector.

Relevance to the proposed project: The proposed project will involve the installation of

machinery and equipment, there will be need to adhere to the safety requirements of the Act.

Compliance thereof: GCL shall adhere to the provisions of the Act as well as the safety requirements during the use of machinery at all project cycles. GCL shall provide project workers with appropriate training and PPE, install fire extinguishers and secure all required permits and approvals to ensure safety and health of persons at workplace.

Below are subsidiary regulations under the Factories Act, Cap 441 of the Laws of Zambia

2.2.20.1 The Construction (Safety and Health) Regulations

As a minimum, the Regulations provide for:

- Sending notice of commencement of work to the Labour Commissioner in respect of construction works that will not be completed within a period of less than six weeks.
- Provision of scaffolds and safe means of access at construction sites.
- Construction, safe erection, support, use, maintenance, inspection and dismantling of scaffolds.
- Accountabilities in cases where scaffolds are used by workmen belonging to different employers.
- Construction specifications, erection, use and maintenance of working platforms.
- Construction, use and maintenance of gangways and runs.
- Construction, use and maintenance of ladders and stepladders.
- Communication ladders.
- Lighting of workplaces.
- Construction, erection, support, anchoring and stability, use, maintenance and dismantling of lifting machinery at construction sites.
- Drums, pulleys and brakes and controls of lifting machinery.
- Marking of safe working load on lifting machinery.
- Precautions when using lifting machinery.
- Testing, examination and inspection of lifting machinery.
- Training and competence of lifting machinery operators.
- Reports and records of tests, examinations and inspections of lifting machinery.
- Inspection, fencing and safeguarding of excavations.
- Means of entry into and exit from excavations, shafts and tunnels.
- Safe handling and use of explosives.
- Provision of safety measures and competent supervision before and during demolition works.
- Use, maintenance and loading of vehicular transport at construction sites.
- First-aid provisions.
- Wholesome drinking water.
- Convenient and suitable shelters for taking refuge during interruptions owing to bad weather.
- Convenient and suitable accommodation for changing clothes.
- Convenient and suitable accommodation for taking meals.
- Sufficient and suitable sanitary conveniences.
- Provision of suitable PPE including hard hats.
- Securing and maintaining the adequate ventilation of every working place in any excavation, pit, hole, tunnel, shaft, caisson, or other enclosed space.
- Prevention of drowning.
- Provision of safety nets, sheets and belts.

- Secure fencing and guarding of parts of machinery that may pause danger to any person at a construction site.
- Duty of contractors and employers of workers undertaking any construction work to comply with the regulations.
- Duty of employed persons undertaking construction work to cooperate in implementing these regulations.
- Notification of accidents, dangerous occurrences and occupational diseases.
- The regulations set minimum OHS requirements to be met by the GCL with respect to:

- Submission of notices of commencement of construction works.
- Construction, use, maintenance and inspection of scaffolds.
- Safety of working platforms and gangways.
- Construction, use, maintenance, inspection and testing of lifting machinery.
- Safety of excavations, shafts and tunnels.
- Safety of demolition works.
- Safety of on-site transportation systems and vehicles.
- Health and welfare facilities.
- Personal protective equipment.
- Duties of contractors and employers of workers.
- Duties of employed persons.
- Recording, notification, reporting and investigation of occupational accidents and dangerous occurrences on construction sites.

2.2.20.2 The Factories (Electricity) Regulations

This is another regulation under the Factories Act, Cap 441. As s a minimum, the Regulations provide for:

- Safety of electrical installations in respect of their size and power for the work they are required to do.
- Insulation of electrical conductors.
- Placement, protection and arrangement of electrical control gear (e.g. switches, switch fuses, circuit-breakers) in a safe manner.
- Construction specifications for electrical joints.
- Earthing of bare neutral conductors.
- Arrangement, enclosure and placing of switchboards.
- Protection of high and extra high-pressure apparatus.
- Precautions against accidental charging of metal other than conductors.
- Provision of insulating stands or screens.
- Provision and use of portable insulating devices.
- Protection of conductors and apparatus against exposure to the elements.
- Adequate lighting of all parts of undertaking where apparatus is placed.
- Restricting operation of apparatus to authorized personnel with relevant technical knowledge and experience.
- Construction, control, maintenance, safety and security of substations.
- Safe means of access to substations.
- Display of printed instructions as to treatment of persons suffering from electric shock.

Relevance and compliance thereof: Project activities will involve electrical installations. The regulations set minimum OHS requirements to be met by the GCL with respect to:

- Safety of electrical installations.

- Placement, arrangement and maintenance of switchboards.
- Control of substations.
- All electrical installation activities will be done in compliance with this regulation.

2.2.21 Public Health (Notifiable) (Coronavirus disease 2019) Regulations, SI 22 of 2020
The statutory Instrument outlines preventative measures aimed at containing the spread of COVID-19.

Relevance to the proposed project: Activities at all phases of project implementation will involve employees and the public coming contact with one another.

Compliance thereof: The developer will put in place measures as prescribed by the Ministry of Health through the public health to ensure that the spread of the pandemic is controlled.

2.2.22 The Human Rights Commission Act, No. 4 of 2024 (Cap. 48)
An Act to provide for the membership, functions, operations and financial management of the Human Rights Commission; repeal and replace the Human Rights Commission Act, 1996; and provide for matters connected with, or incidental to, the foregoing. This Act seeks to promote the human rights of individuals, and it establishes the Human Rights Commission as the body responsible for eradication of human rights abuse. Section 9 of the Act provides for the function of the Human Rights Commission to investigate human rights violations; investigate any maladministration of justice; and propose effective measures to prevent human rights abuse.

Relevance to the proposed project: The establishment and operation of an e-waste facility may result in human rights violations. The project will bring together people from different background and regions. Issues of human rights violations and complaints of discriminations may arise during operation stage of the project.

Compliance thereof: Deliberate measures will be put in place by the developer to ensure no person be it people of different genders, ethnic groupings, religious or political groupings, are not discriminated against, but everyone including facility workers will be fairly and equally treated without favoritism.

2.2.23 The Ionizing Radiation Protection (Amendment) Act No. 19 of 2011
This Act provides for the protection of the public workers and the environment from hazards arising from the use of devices or materials capable of producing ionizing radiation. Part IV requires a person who intends to import, process, mine, export, possess, transport, use, dispose of, or undertake any other activity relating to radioactive material or any other source of harmful ionising radiation to apply to the Radiation Protection Authority Board for an ionising radiation licence. It also requires a licensee to appoint a competent person as a radiation protection officer and provides that an owner or a user of radioactive material or source of harmful ionising radiation for which the person does not hold a valid licence shall be answerable for any harmful effects arising from the possession, storage, transport, use or disposal of such radioactive material or source of harmful ionising radiation.

Relevance to the proposed project: The proposed project will be dealing in E-waste which may contain radioactive elements or materials such as Lead, Mercury, Cadmium, Nickel, Barium, Beryllium etc. Exposure to these radioactive materials can damage kidneys, liver,

brain and bone structure of the body and can cause allergic reactions to skin causing asthma, (Impact-of-E-waste- on-life-Treasure-or-Threat)

Compliance thereof: Greenstretch shall comply with the Act by engaging the Radiation Protection Authority early enough, ensuring that appropriate PPE is provided to all project workers and by ensuring that all safety measures are put in place for the protection of all personnel.

2.2.24 The Anti-Gender-Based Violence Act, 2011

An Act to provide for the protection of victims of gender-based violence; constitute the Anti-Gender-Based Violence Committee; establish the Anti-Gender-Based Violence Fund; and provide for matters connected with, or incidental to, the foregoing.

Relevance to the proposed project: The project will integrate both male and female workers and there is a possibility that gender-based violence may arise during the operation stage of the project.

Compliance thereof: Greenstretch shall ensure that all project workers are made aware about issues pertaining gender-based violence at workplace. All cases of gender-based violence that may occur shall be recorded and reported accordingly to relevant authorities, further the developer shall ensure strict adherence to the Act.

2.2.25 The Employment Young Persons and Children (Amendment) Act, 2004

An Act to regulate the employment of young persons, and children; and to provide for matters incidental thereto. The Act prohibits the employment of child in any public or private industrial undertaking or in any branch thereof.

Relevance to the proposed project: This Act was revised and incorporated in the Employment Code Act of 2019.

Compliance thereof: GCL will adhere to this Act as well as the Employment Code Act of 2019 by ensuring that children and young persons under the age of 18 are not employed. Further, GCL shall promote the rights, safety, and well-being of children and young persons, while also contributing to their education, development, and future opportunities.

2.3 International Agreements and Conventions

Zambia is a signatory to a number of international environmental conventions which are applicable to this project. When countries become signatory to conventions, protocols, treaties and agreements; they accede to incorporate the conventions principles and standards into their legislation. Either new laws are developed or as in most cases regulations are drawn up or amended. This is done to ensure compliance by the country's citizens and to provide measures to be able to enforce and thus ensure compliance to Zambian legislations and the conventions. Some of the most important conventions relevant to the project are discussed below.

2.3.1 Basel Convention and Bamako Convention

The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal was adopted in 1989 and it came into force in 1992. It is the most comprehensive global environmental agreement on hazardous wastes and other wastes. The Convention aims to protect human health and the environment against the adverse effects resulting from the

generation, trans-boundary movements and management of hazardous wastes and other wastes. The Basel Convention regulates the trans-boundary movements of hazardous wastes and other wastes and obliges its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner.

The Basel Convention on trans-boundary movement of hazardous wastes requires that prior notice of any proposed export of certain hazardous items should be given to the government of an importing country and approved by it. Although the Basel Convention does not regulate second- hand items and some e-waste scrap (including printed-circuit boards). E-waste is classified as hazardous.

On the other hand, the Bamako Convention on the Ban of the Import into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes within Africa. Most of the electrical and electronic products contain hazardous substances such as lead, cadmium and mercury.

The objective of the Bamako Convention is to protect human health and the environment from dangers posed by hazardous wastes by reducing their generation to a minimum in terms of quantity and/or hazard potential.

Relevance to the proposed project: Zambia is a signatory to the Basel convention. E-waste is classified as hazardous waste, and any export or trans-boundary movement of e-waste materials require adherence to the Basel convention guidelines.

Compliance thereof: The developer will comply with all international conventions relevant to the proposed project and to which Zambia is signatory. The developer shall ensure that the any trans- boundary movement or transportation of e-waste materials meets the requirement of the Basel Convention.

2.3.2 Kyoto Protocol by the United Nations Framework Convention on Climate Change

It was signed by the Zambian Government in 1992. The main objective is to achieve stabilization of greenhouse gas concentration in the atmosphere. Zambia recognizes that the largest source of greenhouse gases is carbon dioxide from burning wood fuel and the use of coal and oil. The aim is to further reduce greenhouse gases by enhancing the national programs of developed countries aimed at this goal and by establishing percentage reduction targets for the developed countries.

Relevance to the proposed project: Climate change is a global challenge; therefore, companies/organizations are obliged to reduce their carbon footprint by adhering to necessary regulations and this project is no exception as proposed project activities could contribute to climate change at different project phases. Knowledge of the convention is relevant to ensure carbon emissions are minimized.

Compliance thereof: The project activities will not result in emissions of greenhouse gases. However, the developer shall ensure to protect the environmental by not cutting down of tree species in the area.

2.3.3 Convention on Biological Diversity (CBD)

The major aim of the CBD is to effect international co-operation in the conversation of biological diversity and to promote sustainable use of living natural resources worldwide. It also aims at bringing about sharing of the benefits arising from utilization of natural resources.

A number of plans in this convention fall under the department of Agriculture, Forestry, Fisheries and ZAWA.

Relevance to the proposed project: The project falls in a district which has miombo vegetation type with a diverse vegetation and animal species.

Compliance thereof: The developer shall endeavour to protect animal and biological resources found in the project area through compliance with the Zambia Wildlife Act and applicable local regulations. Compliance shall include avoiding disturbance to bird nests, and habitants of other animal species.

2.3.4 Convention Concerning the Protection of Workers against Occupational Hazards in Working Environment Due to Air Pollution, Noise and Vibration - Ratified in 1977

This convention was ratified in 1977, and it applies to all branches of economic activity.

Relevance to the proposed project: Zambia is a signatory to this convention, and moreover the proposed project will generate noise and air pollution may occur.

Compliance thereof: The developer will ensure compliance with this convention by adhering to applicable local regulations on air quality and noise. The company will ensure all onsite workers are provided with appropriate PPE at construction and operation stages.

2.3.5 Convention on Migratory Species and African – Eurasian Water Bird Agreement

Like other migratory species, water birds cross several international borders during their migration, facing a wide range of threats. Without international co-operation, conservation efforts of one country can be meaningless if these birds are not protected in another country.

Relevance to the proposed project: There are chances that migratory species especially birds may migrate to or be found near the project site. These species require protection in accordance with this convention.

Compliance thereof: The developer shall comply with this convention and shall follow all the necessary guidelines to protect the migratory species locally. Various means such as educating the site workers on the preservation of bird species shall be used.

2.3.6 The Stockholm Convention on Persistent Organic Pollutants

The Stockholm Convention is a global treaty that aims to protect human health and the environment from the effects of persistent organic pollutants (POPs). The Convention entered into force on May 17, 2004. POPs have been shown to adversely affect human health and the environment. They have been linked to cancer, damage to the nervous system, reproductive disorders, and weakening of the immune system. For unintentionally produced POPs, the Stockholm Convention requires countries to develop national action plans to address releases and to apply “Best Available Techniques” to control them. The Stockholm Convention also aims to ensure the sound management of stockpiles and wastes that contain POPs.

Relevance to the proposed project: The main objective of the EHPMP project is to reduce uPOPs release in pilot sites.

Compliance thereof: GCL shall employ best Available Techniques and Best Environmental

Practices (BAT/BEP) to ensure that uPOPs are reduced through the implementation of the proposed project.

2.3.7 The United Nations Sustainable Development Goals

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. There are 17 SDGs that are all integrated, ensuring that development must balance social, economic and environmental sustainability.

Zambia has domesticated the SDGs and one of the key goals is SDG No. 12 on Responsible Consumption and Production. This goal encourages industries, businesses and consumers to recycle and reduce waste.

Relevance to the proposed project: The UN SDGs promote development that balances the social, economic and environmental matters. Hence, most of the SDGs are relevant to the proposed project.

Compliance thereof: The developer will comply with all local regulations relating to the management of e-waste in Zambia. The developer will further promote the recycling of e-waste by encouraging corporations and consumers to donate or sell their e-waste to Greenstretch as a way of safely disposing them off in line with the principles of SDG 12 which emphasizes sustainable waste management, recycling and efficient utilization of resources.

2.4 The Institutional Framework

A number of institutions will have a regulatory and monitoring role directly or indirectly under their respective pieces of legislation. However, the following will be the key institutions whose requirements the developer needs to be complied with.

- Ministry of Green Economy and Environment
- Zambia Environmental Management Agency
- Zambia Information and Communication Technology Authority
- Ministry of Local Government
- The Radiation Protection Authority
- The Zambia Bureau of standards
- Ministry of Labour and Social Security
- National Heritage and Conservation Commission
- Livingstone City Council
- The Zambia Statistics Agency
- The Zambia Revenue Authority

2.5 The World Bank Environmental and Social Framework (ESF)

The ESF aims at protecting people and the environment from potential adverse impacts that could arise from the World Bank funded projects and promotes sustainable development. This new framework provides broad coverage, including important advances on transparency, non-discrimination, social inclusion, public participation and accountability. It promotes enhanced transparency and stakeholder engagement through timely information disclosure, meaningful and ongoing consultations throughout the project life cycle, and responsive grievance mechanisms to facilitate resolution of concerns and grievances of project-affected parties.

The ESF consist of ten (10) Environmental and Social Standards (ESSs), however, five (5) of

the ESSs are relevant to the proposed establishment and operation of an e-waste recovery facility in Livingstone district.

The ESSs relevant to the proposed E-waste recovery project are:

- ESS 1: Assessment and Management of Environmental and Social Risks and Impacts
- ESS 2: Labor and Working Conditions.
- ESS 3: Resource Efficiency and Pollution Prevention.
- ESS 4: Community Health and Safety.
- ESS 10: Stakeholders Engagement and Information Disclosure.

2.5.1 ESS 1: Assessment and Management of Environmental and Social Risks and Impacts

ESS1 sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing (IPF), to achieve environmental and social outcomes consistent with the Environmental and Social Standards (ESSs). The ESS1 applies to all projects supported by the Bank through IPF. The objectives of the ESS1 are indicated below.

- To identify, evaluate and manage the environment and social risks and impacts of the project in a manner consistent with the ESSs
- To adopt a mitigation hierarchy approach to: (a) Anticipate and avoid risks and impacts; (b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels;
- (c) Once risks and impacts have been minimized or reduced, mitigate; and (d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible
- To adopt differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable, and they are not disadvantaged in sharing development benefits and opportunities resulting from the project
- To utilize national environmental and social institutions, systems, laws, regulations and procedures in the assessment, development and implementation of projects, whenever appropriate
- To promote improved environmental and social performance, in ways which recognize and enhance Borrower capacity

ESS require that borrowers (project developers) to manage environmental and social risks and impacts of the project throughout the project life cycle in a systematic manner, proportionate to the nature and scale of the project and the potential risks and impacts.
Further ESS1 require that the developer of a project financed by the World Bank to conduct an environmental assessment and prepare appropriate instruments including the Environmental and Social Impact Assessment and the Environmental and Social Management Plans.

Relevance of the ESS1 to the proposed project: The proposed project to establish and operate an e-waste facility will involve collection, storage and dismantling of e-waste materials. These activities have the potential risks and impacts as e-waste is considered hazardous waste due to some harmful /hazardous components such as lead and mercury they contain. Hence the relevance.

ESS1 applies to all projects financed by the World Bank through IPF. The proposed project by Greenstretch seeks financial support from the Bank. The project shall be implemented once grant is approved by the World Bank.

ESS1 applies to all projects supported by the Bank through Investment Project Financing (IPF), and this standard sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project.

Compliance thereof: GCL will undertake an Environmental Impact Assessment (EIA) as required by the Zambia Environmental Management Agency (ZEMA) in line with the provisions of the Environmental Management Act No. 12 of 2011, in order to address all issues pertaining to assessment, management and monitoring of environmental and social risks and impacts associated with each stage of the project and ensure that all negative impacts are well mitigated and managed, all positive impacts are enhanced accordingly to benefit the local community of Livingstone. Additionally, this ESMP was prepared based on the requirements of the Environmental and Social Standard Number 1 (ESS1) for this project and the World Bank (WB) Environmental, Social, Health and Safety (ESHS) Guidelines. GCL will thus comply with ESS1 and the WB ESHS Guidelines.

2.5.2 ESS 2: Labor and Working Conditions

ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions.

ESS2 Objectives include;

- To promote safety and health at work
- To promote the fair treatment, nondiscrimination and equal opportunity of project workers
- To protect project workers, including vulnerable workers such as women, persons with disabilities, children (of working age, in accordance with this ESS) and migrant workers, contracted workers, community workers and primary supply workers, as appropriate
- To prevent the use of all forms of forced labor and child labor
- To support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law
- To provide project workers with accessible means to raise workplace concerns

ESS2 applies to project workers including full-time, part-time, temporary, seasonal and migrant workers.

Relevance of ESS2 to the proposed project: This standard is relevant because the proposed project will create employment for the locals on full-time, part-time and temporary basis. The developer needs to put in place measures to promote sound worker-employer relationship, deliberately ensure that all workers are treated fairly and provided with safe and healthy working conditions as the proposed project will result in occupational health hazards and risks.

Compliance thereof: GCL will comply with the World Bank standard ESS2 including local national law and labour regulations, by providing a safe and healthy working environment for project workers by ensuring potential hazards are identified, process modifications or substitutions are done, appropriate training for workers are conducted, emergency response plans are prepared and appropriate PPE provided to all workers. Deliberate measures will be put in place to create

sound worker – management relationship. The WB ESH are detailed in sub-heading 2.8 and guidelines for hazardous waste management are elaborated in table 2 below.

Further to the above, GCL will develop and implement written labour management procedures (LMP) applicable to the proposed project in accordance with ESS2. These procedures will set out the way in which project workers will be managed, in accordance with the requirements of national law and ESS2. The procedures will address the way in which ESS2 will apply to different categories of project workers including direct workers, and the way in which GCL will require third parties to manage their workers in accordance with this ESS. In line with ESS2, GCL will;

a) Make reasonable efforts to ascertain that third parties who engage contracted workers are legitimate and reliable entities and have in place labor management procedures (LMP) applicable to the project that will allow them to operate in accordance with the requirements of the ESS2, except for paragraphs 34–42.
b) Establish procedures for managing and monitoring the performance of such third parties in relation to the requirements of ESS2. In addition, GCL will incorporate the requirements of this ESS into contractual agreements with such third parties, together with appropriate noncompliance remedies. In the case of subcontracting, GCL will require such third parties to include equivalent requirements and noncompliance remedies in their contractual agreements with subcontractors

c) Ensure contracted workers will have access to a grievance mechanism. In cases where the third party employing or engaging the workers is not able to provide a grievance mechanism to such workers, GCL will make the grievance mechanism provided under Section C of ESS2 available to the contracted workers.

Further to the above, GCL will require any contractors engaged to prepare contractor Environmental and Social Management Plan (CESMP) which must include all relevant labor related clauses, Codes of Conduct as well as specific language referencing the prioritization of the hiring of unskilled local labor.

In terms of training of contractor workers, GCL will ensure that the contractors to be engaged provide specific training for Project workers on the code of conduct, E&S provisions to be followed as per this ESMP and Contractor ESMP including gender-based violence, occupational health and safety, emergency prevention and preparedness and response arrangements to emergency situations.

2.5.3 ESS 3: Resource Efficiency and Pollution Prevention

ESS3 recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. The current and projected atmospheric concentration of greenhouse gases (GHG) threatens the welfare of current and future generations. At the same time, more efficient and effective resource use, pollution prevention and GHG emission avoidance, and mitigation technologies and practices have become more accessible and achievable.

ESS3 Objectives

- To promote the sustainable use of resources, including energy, water and raw materials
- To avoid or minimize adverse impacts on human health and the environment by avoiding

or minimizing pollution from project activities
- To avoid or minimize project-related emissions of short and long-lived climate pollutants
- To avoid or minimize generation of hazardous and non-hazardous waste
- To minimize and manage the risks and impacts associated with pesticide use.

Relevance of ESS3 to the proposed project: ESS3 recognizes that economic activity and urbanization often generate pollution to air, water, and land. The proposed project activities may result in air, water and land pollution if not well managed.

Compliance thereof: Greenstretch will avoid the release of pollutants, where avoidance is not feasible, Greenstretch will minimize and control the concentration and mass flow of their release using the performance levels and measures specified in the Zambian environmental regulations and law. Additionally, GCL will implement technically and financially feasible measures for improving efficient consumption of energy, water and raw materials as well as other resources. This Environmental and Social Management Plan (EMSP) has been prepared to address and mitigate all potential risks / impacts associated with the proposed project.

In terms of management of hazardous waste (e-waste) and non-hazardous waste, Greenstretch shall by all means avoid the generation of waste both hazardous and non-hazardous, where waste cannot be avoided, Greenstretch will minimize and put in place measures to reuse, recycle and recover waste in a manner that is safe for human health and the environment. The e-waste and other general waste materials not reused, recycled or recovered will be treated and disposed of in an environmentally sound and safe manner that includes the appropriate control of emissions and residues resulting from the handling, dismantling and processing of e-waste material, in line with ZEMA regulations and standards.

2.5.4 ESS 4: Community Health and Safety

ESS4 recognizes that project activities equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration or intensification of impacts due to project activities.

ESS4 addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable.

ESS4 Objectives
- To anticipate and avoid adverse impacts on the health and safety of project-affected communities during the project life cycle from both routine and non-routine circumstances
- To promote quality and safety, and considerations relating to climate change, in the design and construction of infrastructure, including dams
- To avoid or minimize community exposure to project-related traffic and road safety risks, diseases and hazardous materials
- To have in place effective measures to address emergency events
- To ensure that the safeguarding of personnel and property is carried out in a manner that avoids or minimizes risks to the project-affected communities.

Relevance of ESS4 to the proposed project: The proposed project activities i.e., collection, storage and dismantling of e-waste may expose the local community to risks and impacts from

e- waste materials. ESS4 is also relevant because e-waste has the possibility of causing heavy metal contamination which may compromise the health and safety of the local community.

Compliance thereof: Greenstretch will evaluate the risks and impacts of the project on the health and safety of the affected communities. GCL will operate the facility in accordance with this ESS and local safety regulations, and quality management system put in place. Further, Greenstretch will put in place appropriate safety signage, raise awareness about the dangers of e-waste and its improper disposal.
In addition, GCL will comply with ESS4 requirements on security personnel. GCL will ensure that the project will assess site specific security risks and as part of the ESMP develop and implement a security personnel management plan should need arises.

2.5.5 ESS 10: Stakeholders Engagement and Information Disclosure

This ESS recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation
Stakeholder engagement is an inclusive process conducted throughout the project life cycle. Where properly designed and implemented, it supports the development of strong, constructive and responsive relationships that are important for successful management of a project's environmental and social risks. Stakeholder engagement is most effective when initiated at an early stage of the project development process and is an integral part of early project decisions and the assessment, management and monitoring of the project's environmental and social risks and impacts.

ESS10 Objectives

- To establish a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders and build and maintain a constructive relationship with them, in particular project-affected parties
- To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be taken into account in project design and environmental and social performance
- To promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them
- To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format.

Relevance of ESS10 to the proposed project: This standard is relevant because stakeholder engagement and consultation is part of the EIA process in Zambia and is required by law for projects of this magnitude.

Compliance thereof: As part of the Environmental Impact Assessment (EIA) process, key stakeholders including all interested and affected parties (IAPs) were consulted, engaged and made aware about the proposed project and all realistic alternatives, to enable them to participate in the decision-making process.

GCL managed to interview and consult the local residents residing near the proposed project site, the local authority i.e., the Livingstone City Council including other interested parties were

consulted and interviewed during the stakeholder engagement / consultation stage. Their comments were noted and responses to their concerns and issues raised were provided accordingly. An attendance registers of people consulted and interviewed was incorporated in the EIA report submitted to ZEMA. Greenstretch shall ensure to comply with ESS10 as a best practice in addition to national regulations and requirements.

2.6 Environmental and Social Risk Classification

The Bank will classify all projects (including projects involving Financial Intermediaries (FIs)) into one of four classifications: High Risk, Substantial Risk, Moderate Risk or Low Risk. In determining the appropriate risk classification, the Bank will take into account relevant issues, such as the type, location, sensitivity, and scale of the project; the nature and magnitude of the potential environmental and social risks and impacts; and the capacity and commitment of the Borrower (including any other entity responsible for the implementation of the project) to manage the environmental and social risks and impacts in a manner consistent with the ESSs. This project is classified as substantial as its activities may irreversible environmental risks and impacts due to the toxic nature of the e-waste that will be handled.

2.7 World Bank Environmental Health and Safety Guidelines and Good Industry Practices

The World Bank Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice.

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project based on the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account.

The applicability of specific technical recommendations should be based on the professional opinion of qualified and experienced persons. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures than those provided in these EHS Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

The EHS Guidelines aims to prevent waste generation, and to promote reuse and recycling, good housekeeping, inventory control, avoidance of damage and instituting procurement measures that allow the return of reusable material. Section 1.6 of the EHS guideline on Waste Management requires the segregation of hazardous wastes from other wastes, its appropriate storage (labelled containers) and record keeping. In addition, collection, transport, and disposal should be in accordance with the guidelines and local regulations. The EHS guidelines also requires monitoring records for hazardous waste collected, stored, or shipped using the recommended procedures.

The EHS Guidelines aim to prevent waste generation by promoting reuse and recycling, good

housekeeping practices, inventory control, damage avoidance, and procurement measures that allow the return of reusable materials. Section 1.6 of the EHS guideline on Waste Management requires the segregation of hazardous wastes from other types of waste, ensuring safe storage in clearly labelled containers, and maintaining thorough record-keeping practices.

Additionally, the collection, transportation, and disposal of hazardous waste must comply with both the EHS guidelines and local regulations. These guidelines recommend monitoring records for hazardous waste collected, stored, or shipped, ensuring that all procedures follow the recommended safety and environmental protocols. Moreover, the guidelines stipulate that facilities should implement training programs for personnel handling hazardous waste, ensuring they are knowledgeable about safety procedures and emergency response protocols. Regular audits and inspections are also advised to maintain compliance and to identify areas for improvement. Furthermore, the guidelines emphasize the importance of community engagement and education about hazardous waste, promoting awareness and collaboration to enhance overall waste management efforts for the safe and efficient management of electronic waste, protecting both human health and the environment.

The proposed project to establish and operate an e-waste recovery facility by Greenstretch Consultants Limited (GCL) shall endeavor to comply with all relevant EHS Guidelines.

2.8 EHS Guidelines

Table 2*: List of EHS Guidelines Applicable to the proposed E-waste recovery project*

EHS Guideline	Relevance to the project	Compliance thereof
Air Emissions and Ambient Air Quality	This guideline applies to facilities or projects that generate emissions into the air at any stage of the project life cycle.	GCL will ensure emissions of gases such as SO_2, NO_2 and Particulate Matter (dust) are below the WHO Ambient Air Quality Guidelines by conducting regular air quality assessment.
Hazardous Materials Management	These guidelines apply to projects that use, store, or handle any quantity of hazardous materials (Hazmats), defined as materials that represent a risk to human health, property, or the environment due to their physical or chemical characteristics. Hazmats can be classified according to the hazard as explosives; compressed gases, including toxic or flammable gases; flammable liquids; flammable solids; oxidizing substances; toxic materials; radioactive material; and corrosive substances. This guideline specifically highlights Polychlorinated biphenyls (PCBs) in electrical equipment and ozone depleting substances in refrigeration as hazardous materials. Further, improper handling of batteries may result in fire outbreaks	GCL shall ensure protection of workforce by providing appropriate PPE GCL shall ensure protection of the environment by preventing and controlling releases of hazmats and accidents during handling, storage and use. Further, GCL will provide appropriate training to project workers in emergency preparedness response. Generally, GCL will ensure protection of human life and the environment in line with this guideline.
Waste Management	These guidelines apply to projects that generate, store, or handle any quantity of waste across a range of industry sectors. It is not intended to apply to projects or facilities where the primary business is the collection, transportation, treatment, or disposal of wastes. Specific guidance for these types of facilities is presented in the Environmental Health and Safety (EHS) Guidelines for Waste Management Facilities. A waste is any solid, liquid, or contained gaseous material that is being discarded by disposal, recycling, burning or incineration. It can be byproduct of a manufacturing process or an obsolete commercial product that can no longer be used for intended purpose and requires disposal.	GCL shall establish a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes. NB: GCL recognizes that disposal of wastes is the last resort. Therefore, general solid waste generated will be proper separated at source, to recover recyclables and thus reduce waste to landfill. All recyclables recovered will be taken to the nearest recycling facility. Only residue wastes or non-recyclables shall be disposed of at the local authority approved site.

Waste Management Facilities	Management of electronic waste is under the Environmental Management Regulations SI 112 of 2013 Part IV on Hazardous Waste. Hence, for management (including storage, transportation, and disposal) of hazardous waste, this will be complemented by the World Bank Group's Environmental, Health, and Safety Guidelines for Waste Management Facilities that provide guidance on best practice in terms of waste collection, storage, treatment and transfer.	Waste management will be guided by these EHS guideline
Noise and vibrations	This guideline addresses the impacts of noise beyond the property boundary of the facilities Noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at point of reception. The preferred method for controlling noise from stationery sources are to implement noise control at source	GCL will ensure the noise levels do not exceed the Noise Level Guideline of 70dBA. This will be done by conducting noise monitoring and applying corrective measures where noise levels exceed the limit.
Contaminated Land	This section provides a summary of management approaches for land contamination due to anthropogenic releases of hazardous materials, wastes, or oil, including naturally occurring substances. Releases of these materials may be the result of historic or current site activities, including, but not limited to, accidents during their handling and storage, or due to their poor management or disposal.	In case of accidental spillage or release of hazmats in the environment causing land pollution, appropriate bio- remediation works should be undertaken in line with the guidelines Contamination of land should be avoided by preventing or controlling the release of hazardous materials, hazardous wastes, or oil to the environment. When contamination of land is suspected or confirmed during any project phase, the cause of the uncontrolled release should be identified and corrected to avoid further releases and associated adverse impacts.
Occupational Health and Safety	This guideline state that employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers. This guideline covers the general facility design and operation, communication and training including physical, chemical,	GCL shall ensure that preventive and protective measures are introduced in the following order ▪ Elimination of the hazard ▪ Controlling the hazard ▪ Minimizing hazards ▪ GCL shall conduct occupational risk assessments and apply corrective measures where necessary

	biological and radiological hazards as well as Personal Protective Equipment (PPE)	▪ GCL will provide appropriate PPE in conjunction with training use, and maintenance of the PPE
Community Health and Safety	Community Health and Safety issues may arise at any stage of the project life cycle and can have an impact beyond the life of the project. This guideline addresses the following issues such as disease prevention, transportation of hazmats, life and fire safety, water quality and availability, emergency preparedness and response, including traffic safety and structural safety of the project infrastructure	GCL shall adhere to the guidelines in this guideline
Construction and decommissioning	This section provides additional, specific guidance on prevention and control of community health and safety impacts that may occur during new project development, at the end of the project life cycle, or due to expansion or modification of existing project facilities.	Where applicable GCL shall adhere to this guideline

3 DESCRIPTION OF THE PROJECT

3.1 The Project Location

The proposed project site is located in Livingstone District of Southern Province, on plot number 1411, along Sambono Road, in Cold Storage Area in the Industrial Area. Geographically, the site lies between latitude 17º52'08.64"S and longitude 25º50'53.10"E and can be accessed through Belewa road and Sambono road. The site is located off the Mosi-Oa-Tunya Road, and lies approximately 3km from the Livingstone CBD, 0.22km from FRA Deport on the western side, 0.85km from Protea Hotel on the eastern side, and 0.77Km from Oriental Swan Hotel on the southeast direction.

The proposed project site is a warehouse which is currently unoccupied and located within an industrial area. The site is being used for commercial purpose with no illegal or informal activities being carried out in the immediate area. The project site is situated in an area which is generally flat with no critical habitats, flood prone areas or areas considered elephant corridors in close proximity.

The site is approximately 1.37Km away from the Mosi-O-Tunya National Park. It is worth noting that the project area is frequented by migratory elephants, especially after or before the rainy season.

As already alluded to, this project will establish and operate Collection Centers which will consist of closed containers. However, it is anticipated that these Collection Centers to be set up shall not pose any potential risks to key species in the project area as they will be installed and operated far away from critical habitats. Critical habitats are defined as areas of high biodiversity importance or value according to the World Bank ESS 6.

Additionally, the centralized e-waste facility location is not prone to flooding and not near any critical habitats or areas considered elephant corridor. Hence this facility will not pose any serious threats to species of concern in project area where water bodies are not in close proximity. The only nearby water body is the Zambezi River on the South located about 3.6km from the proposed project site.
The project area is a built-up environment located in the industrial area. The project site is generally flat with an elevation ranging between 906m and 907m. The site is a warehouse measuring approximately 15m by 18m in size.

3.2 Project Site GPS Coordinates

Table 3: Proposed Project Area GPS Coordinates and Physical Landmarks

CO-ORDINATES SYSTEM: Geographical Coordinates Systems		
Point	Location Coordinates	
	Latitude	Longitude
A	17º52'06.91" S	25º50'51.65" E
B	17º52'07.24" S	25º50'54.89" E
C	17º52'10.45" S	25º50'54.43" E
D	17º52'09.88" S	25º50'51.31" E

LANDMARKS			
Physical Landmark	Distance from Project Site	Latitude	Longitude
FRA Depot	0.22km	17°52'08.43" S	25°50'46.64" E
Salem Executive Lodge	0.41km	17°51'59.82" S	25°50'42.46" E
James Hitchins Truckyard	0.17km	17°52'12.02" S	25°50'56.89" E
Nearest house / family	0.10km	17°52'06.05" S	25°50'53.83" E
Protea Hotel Livingstone	0.85km	17°52'05.99" S	25°51'21.45" E
Falls Park Shopping Centre	0.87km	17°52'14.81" S	25°51'23.10" E
Oriental Swan Hotel	0.77km	17°52'19.58" S	25°51'15.60" E

Figure 1: Project site for e-waste project facility in Livingstone (Outside view)

Figure 2: Interior view of the e-waste project facility

Landmarks & their distances from site

FRA Depot – 0.22Km Protea Hotel - 0.85Km
Nearest house /family – 0.10km Salem
Executive Lodge – 0.41km Oriental Swan Hotel – 0.77km

Figure 3: Google Map of the project site in relation to landmarks

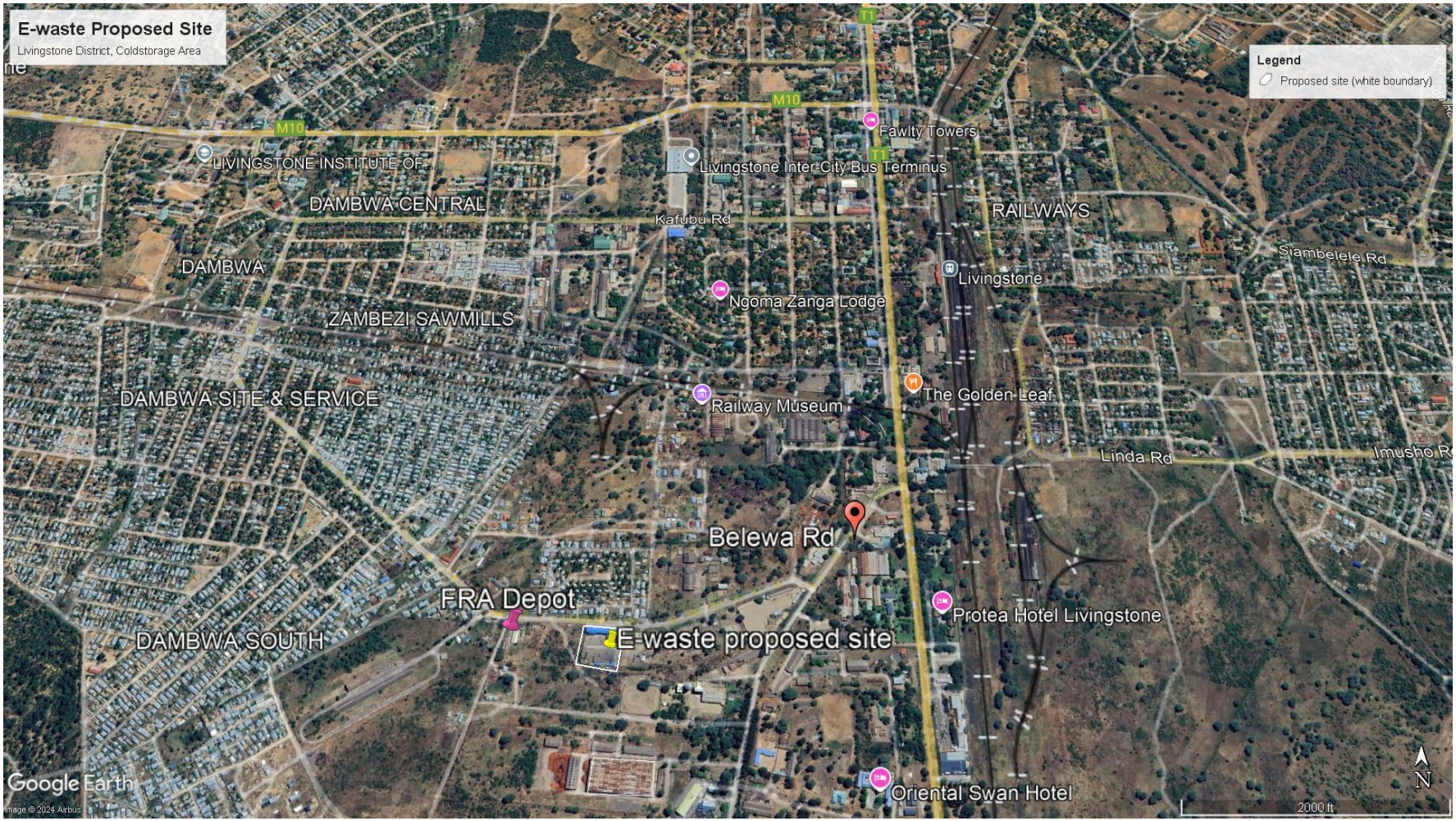


Figure 4: Aerial Extent of the project area

3.3 Nature of the project

The project will involve the establishment and operation of an electrical and electronic waste (e- waste) recovery facility to be based in Livingstone District. This project will consist of the collection, storage and transportation of waste electronic equipment for the purpose of:

- Preprocessing and safe dismantling
- Transportation of recovered valuable and useful e-waste components (i.e., PC-Boards) to advanced e-waste material recovery facilities for further processing
- Reusing of parts by refurbishment
- Safe and environmentally sound disposal of unrecovered e-waste materials

E-waste is one of the fastest growing solid waste streams in the world. Below are items considered “Consumer Electronic waste";

- Audio/Stereo Equipment
- Cellular and Smart phones
- Computer Peripherals -printers, scanners, network equipment modems etc.
- Computers (PCs, servers, laptops etc.)
- DVD Players
- Fax and Copying Machines
- Telephones
- Televisions and Monitors
- Videocassette Recorders (VCRs)
- Video Cameras
- Video Game Consoles
- Wireless Devices

This definition includes used office electronics which are destined for reuse, resale, salvage, recycling, or disposal. The following list consist of the type of e-waste that the project will collect and process at the facility;

- Computers: i.e., Laptops, Desktops, Servers, personal computers (PCs) etc.
- Computer peripherals: i.e., network equipment, modems, keyboards, mice, printers, scanners, webcams, etc.)
- Mobile devices: i.e., cell phones, smartphones, tablets, smart watches etc.
- Audio / Video equipment: i.e., Televisions, DVD players, Videocassette Recorders (VCRs), stereos and boom boxes etc.
- Tablets and gaming system: PlayStation etc.
- Printed Circuit Boards (PC – Boards)
- RAMs, CPU and Hard Disk Drives (HDD)
- Household Appliances: Microwaves, toasters, coffee makers, hairdryers, electric shavers, fans etc.
- Power tools: Electric drills, saws, sanders
- Batteries: Lead-acid batteries, lithium-ion batteries (from electronics)
- Cables and wires: Power cords, data cables, speaker wires
- Office electronics: Copiers, fax machines, calculators, answering machines
- Personal electronics: Digital cameras, e-readers, portable media players

On the other hand, the facility will not accept, collect or process the following type of e-waste. These shall include;

- Solar panels
- Fluorescent tubes and bulbs
- Medical devices with specialized components and potential biohazard risks including those containing radioactive materials
- Transformers
- Capacitors
- Electrical equipment containing radioactive materials
- Industrial e-waste equipment

GCL shall implement an e-waste take-back system and introduce e-waste collection, storage and transportation system in Livingstone and surrounding districts in Southern Province in order to reduce pollution and its resulting environmental and health impacts.

The following are toxic substances found in e-waste

Table 4: Toxic substances found in e-waste

Toxic substance	**Occurrence in e-waste**
Halogenated Compounds	
PCB (polychlorinated biphenyls)	Condensers, Transformers
TBBA (tetrabromo-bisphenol-A) PBB (polybrominated biphenyls) PBDE (polybrominated diphenyl ethers)	Fire retardants for plastics (thermoplastic components, cable insulation) TBBA is presently the most widely used flame retardant in printed wiring boards and casings
Chlorofluorocarbon (CFC)	Cooling unit, Insulation foam
PVC (polyvinyl chloride)	Cable insulation
Heavy Metals and other metals	
Arsenic	Small quantities in the form of gallium arsenide within light emitting diodes
Barium	Getters in CRT
Cadmium	Rechargeable NiCd-batteries, fluorescent layer (CRT screens), printer inks and toners, photocopying-machines (printer drums)
Chromium VI	Data tapes, floppy-disks
Lead	CRT screens, batteries, printed wiring boards
Lithium	Li-batteries
Mercury	Fluorescent lamps that provide backlighting in LCDs, in some alkaline batteries and mercury wetted switches
Nickel	Rechargeable NiCd-batteries or NiMH-batteries, electron gun in CRT
Rare Earth elements (Yttrium, Europium)	Fluorescent layer (CRT-screen)
Selenium	Older photocopying-machines (photo drums)
Zinc sulphide	Interior of CRT screens, mixed with rare earth metals

3.4 Collection of e-waste

One of the key elements of the proposed project is the collection of e-waste from the waste streams. GCL shall employ various methods to collect and transport e-waste in order to keep it out of landfills. One of the ways e-waste will be collect is through partnerships with both the bulk consumers of e-waste such as Government departments, local private businesses and banks among others, as well as repair shops, informal collectors and the general community that may require safe disposal of their e-waste items. The collection of e-waste shall be done directly from the respective organization, household or location on an agreed date, and a provision for businesses or corporate clients to book a collection shall be put in place. The following options shall be utilized;

Take-back program: Under this program, consumers will be able to drop off their old electronics directly at GCL e-waste facility. Alternatively, arrangements shall be made for the e-waste to be collected directly from the repair shops, informal collectors or consumer's location on an agreed date.

On-demand collection: Consumers of e-waste will request a collection for electronic items and the materials will be collected as agreed. To enhance accessibility, GCL shall provide transport for those who may face challenges in reaching the facility.

Recycling bins: GCL shall encourage the use of appropriate e-waste recycling bins to ensure e-waste items are separated from other type of waste to avoid cross-contamination. Where possible, GCL shall provide such bins to designated organizations or businesses and regular collection done to prevent over flowing.

E-waste collection events: GCL shall from time to time arrange e-waste collection events, at which members of the local community will be invited to bring their electronic waste on the day of the collection event. All received e-waste on that particular day shall then be loaded on pallets and trucks, and safely transported to the e-waste recovery facility for recycling. An incentive shall be paid in exchange for e-waste delivered directly to the facility or during such arranged collection events. Donations of e-waste items as a way of safely disposing them of shall be accepted and encouraged.

3.5 E-waste Collection Centers

In addition to the above, e-waste shall be collected through the established and operated e-waste collection centers. Five (5) centers shall be set up and each center or site shall consist of one closed 20ft shipping container. The containers will act as collection sites or drop-off locations where e-waste shall be received, weighed, bought and recorded. These centers shall be installed and operated at designated locations around the City of Livingstone strictly away from critical habitats or flood prone areas.

Once sufficient volumes of e-waste accumulates at the five Collection Centers, they will be loaded on pallets into a truck and transported to the central location i.e., the centralized E-waste recovery facility for further processing. The following gives an elaborative view of the Collection Centers.

a) Location of the Collection Sites

To ensure that a suitable location is determined for the collection sites, GCL shall use the following criteria;

- The site must be not be located close to residential houses

- The site must not be located within or close to a protected area or an area prone to flooding or wetland
- The site must not be located in areas considered elephant corridors
- The site must not be located within or close to critical habitats which are defined as areas of high biodiversity or importance according to the World Bank (WB) ESS6
- Consultation with the local authority and the regulatory agency (ZEMA) must be done prior to the installation and operation of the Collection Centers

b) Installation of Containers at Collection Sites

Key activities during the installation stage shall include the placement of a 20ft shipping containers at each collection center on four raised square concrete slabs. Prior to installation of the containers, the site will be prepared by clearing the area of any grasses and shrubs present. Thereafter, the site will be fenced and provided with security. Added to that site branding and installation of visible signage will be done.

c) Equipment at the Collection Centers

Each collection site shall be equipped with a weighing scale and separate waste containers including a table and chair. The centers will be managed by trained personnel.

d) Management of e-waste at Collection Sites

GCL will ensure that proper storage of received materials. Incompatible e-waste materials shall be separated and stored in separate containers. The collection site area shall be separate from other types of waste to avoid cross-contamination. GCL will ensure that each collection site is well fenced, secured, maintained, properly marked, consist of a closed container and is well equipped with waste separation based on the nature, components and hazard level of the materials received. To avoid incompatible materials mixing, e-waste shall be separated and stored in separate containers. GCL shall also ensure that each site receives only e-waste materials, other solid waste materials like plastics and food waste will not be accepted.

The centers shall be managed by a trained personnel who will be responsible for attending to the local community delivering e-waste materials, weighing and buying the materials as well as maintaining, and cleaning the site. As part of the operation activities, transportation of e-waste from the collection centers to the e-waste facility shall be regularly done to avoid e-waste piling up.

e) Accessibility of the Collection Sites

Access to the centers shall be restricted to authorized personnel only. Appropriate signage shall be installed to restrict entry. Security shall be put in place to secure the sites 24/7. Children will not be allowed to the sites, GCL shall apply a no child labour policy and further guide all employees accordingly.

f) Operation of the Collection Centers

Each center shall be operated and managed by a trained personnel, who will be maintaining and ensuring cleanliness at the center to avoid attracting rodents and snakes. The employed personnel shall attend to the local community selling e-waste materials. The duty holder shall ensure that e-waste materials are weighed, paid for and recorded in a book. The selected personnel shall also be responsible for educating the community on proper e-waste handling and disposal.

Concisely, Greenstretch Consultants Limited (GCL) shall ensure that the proposed Collection Centers;

- Are well secured and fenced, restricting entry to authorized personnel only
- Have designated access points
- Have appropriate signage and visible markings with proper instructions for disposal of e-waste
- Have separate waste containers to keep incompatible e-waste materials separately
- Are separate from other types of waste to avoid cross contamination
- Are well maintained and kept clean at all times to avoid attracting rodents and snakes
- Are NOT Installed and operated within or close to critical habitats as defined by the WB ESS6
- Are NOT installed and operated near (1) areas that are prone to floods, (2) near residential houses, and/or (3) near areas considered elephant corridors
- Are provided with adequate waste receptacles and equipped for waste separation and storage based on the nature, components and hazard level of the e-waste.
- Each consist of one closed 20ft container and equipped with a fire extinguisher
- Have all necessary permits and approvals from the local authority

The project shall encourage the separation of e-waste at the point of generation so that the general public and other e-waste consumers could sell or donate pre-sorted e-waste materials to the facility as a way of safely disposing them of. Examples of e-waste scrap that the facility shall accept include laptops, desktops, tablets, TV's, mobile phones, and household appliances among others. The complete list of accepted e-waste is included in the preceding paragraphs.

It is hoped that by setting up the e-waste facility, pollution and release of uPOPs shall be minimized with Livingstone and its surrounding districts positively benefiting from the project.

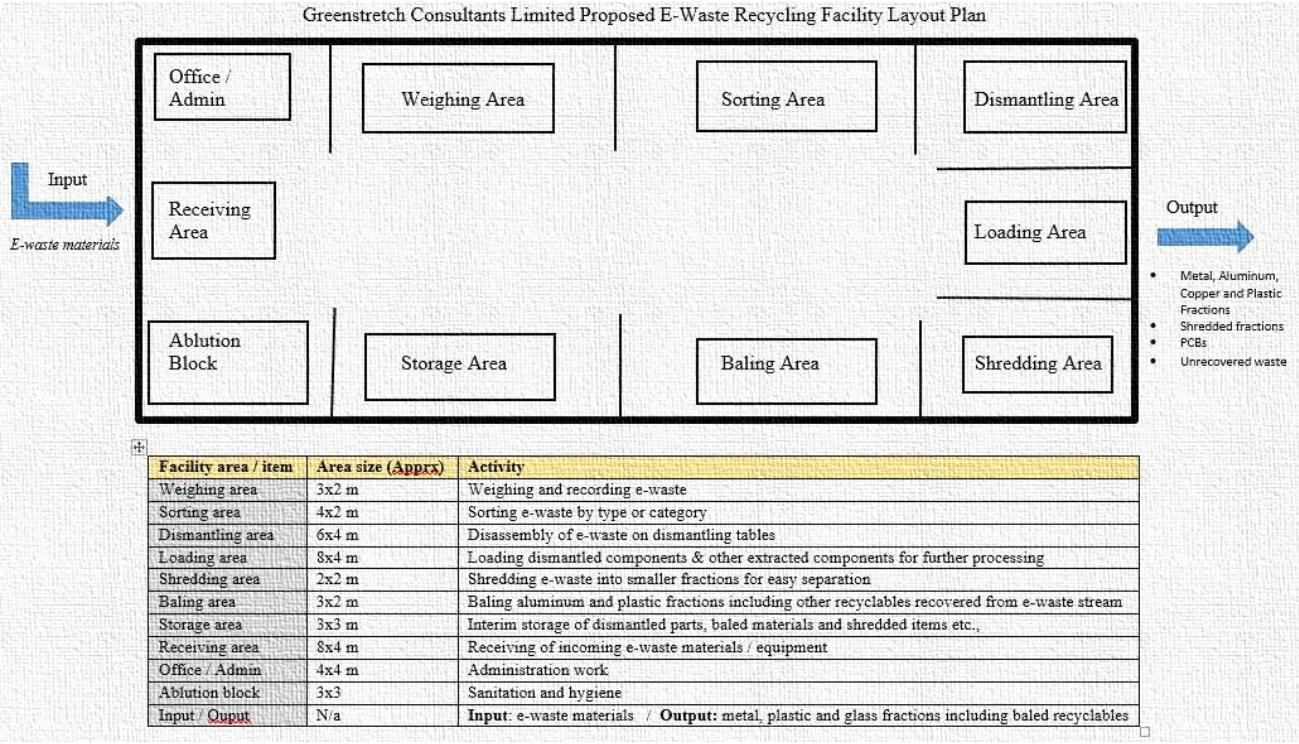
Figure 5: Collection, safe dismantling, export and recycling of end-of-life electronics (e-waste)

Table 5: Proposed rates for buying e-waste scrap

Materials	Rate	Examples of e-waste
Un-dismantled e-waste materials	TBA	Printers, Computers, laptops, TVs, phones etc.
Dismantled e-waste items like PCBs	Varies depending on grade of boards	PCBs, etc.
Donated e-waste materials	N/a	Assorted

3.5 Segments of the Facility

The warehouse shall consist of different segments namely, the receiving, loading, storage, dismantling, and weighing areas. Other sections shall include shredding, sorting and baling. The figure below provides detailed warehouse facility sections.



Facility area / item	Area size (Apprx)	Activity
Weighing area	3x2 m	Weighing and recording e-waste
Sorting area	4x2 m	Sorting e-waste by type or category
Dismantling area	6x4 m	Disassembly of e-waste on dismantling tables
Loading area	8x4 m	Loading dismantled components & other extracted components for further processing
Shredding area	2x2 m	Shredding e-waste into smaller fractions for easy separation
Baling area	3x2 m	Baling aluminum and plastic fractions including other recyclables recovered from e-waste stream
Storage area	3x3 m	Interim storage of dismantled parts, baled materials and shredded items etc.,
Receiving area	8x4 m	Receiving of incoming e-waste materials / equipment
Office / Admin	4x4 m	Administration work
Ablution block	3x3	Sanitation and hygiene
Input / Ouput	N/a	**Input**: e-waste materials / **Output:** metal, plastic and glass fractions including baled recyclables

Figure 6: Segments of the e-waste facility

The following highlight the processing sections that will constitute the warehouse.

Table 6: E-waste Facility Sections

Section	Sub-section
Collection Area	Drop-off Stations: Individuals and businesses shall dispose e-waste at five strategic designated drop-off points or collection sites. 20ft containers shall be used as drop-off sites or e-waste buy-back centers. Each station shall be provided with visible signage and instructions for proper disposal. Weighing Scales: Industrial grade weighing scales will be used to determine the quantity of e-waste received, ensuring precise recordkeeping and proper processing, allowing the facility to maintain accurate data on the volume of e-waste handled.
Sorting and Segregation Area	Conveyor Systems: Automated conveyor belts make it easier to sort e- waste into several categories, such as plastics, metals, glass, and hazardous items. Manual Sorting Stations: To ensure proper segregation of complex e- waste items, sections will be designated for hand sorting by skilled staff. These stations allow for the meticulous separation of components that require special attention and expertise.

Dismantling area	Workstations: Workstations shall be ergonomically constructed and equipped with the instruments such as screwdrivers, pliers, and specialized e-waste tools needed to dismantle various types of electronic devices, enabling workers to safely and efficiently disassemble items. Safety Equipment: Personal protective equipment (PPE) such as gloves, safety glasses, and anti-static wristbands shall be used to keep workers safe. This equipment is essential for protecting staff from potential hazards and possible heavy metals contamination associated with e-waste dismantling. Dust Extraction Systems: High-efficiency dust extractor devices (dust collectors) shall be used to minimize airborne particles and maintain a clean working environment. These systems are crucial for ensuring the health and safety of workers by reducing exposure to harmful dust and debris.
Storage Facilities	Hazardous Material Storage: Hazardous materials such as batteries, CRTs, and other harmful components should be stored in secure and segregated environments. Recyclable Material Bins: Clearly labelled bins for sorted recyclable items allow for convenient transportation to recycling partners. Warehouse: A large, well-ventilated warehouse for dismantled components and unsorted e-waste, equipped with shelving units and pallets for efficient storage shall be used.
Processing Equipment	Shredders: Industrial shredders are used to reduce massive amounts of e- waste into smaller, more manageable pieces for further processing. Crushers: Crushing and compacting equipment reduces waste volume while also making handling and transportation easier. Magnetic Separators: Devices to separate ferrous metals from other materials, enhancing the efficiency of the recycling process. Baling machines: Balers shall be used to compact all recyclable solid wastes (plastics, carton boxes, cardboards, and Aluminium cans) that will be recovered from the various operational activities.
Environmental Control Systems	Ventilation Systems: Advanced ventilation ensures the elimination of dangerous pollutants and the preservation of air quality. Spill Containment: Measures in place to contain and manage accidental spills of hazardous substances, preventing environmental contamination. Dust collectors: These shall be used to collect dust particles to protect workers. Particulate matter (dust) generated during shredding and dismantling operations shall be managed using dust collectors

3.6 Cradle to grave approach

Greenstretch shall employ a cradle to grave approach consisting of the management of e-waste from collection point to the final disposal site with key stakeholders such as the Zambia Environmental Management Agency (ZEMA), the local authority (Livingstone City Council), waste management service providers, waste pickers and collectors as well as the general e-waste consumers involved in the process.

The five specific stages in this approach include (1) the generation of e-waste by consumers, or corporations, (2) transportation of the e-waste, (3) the treatment of e-waste which basically include dismantling of the materials to extract components for recycling, reuse, (4) interim storage and lastly (5) safe disposal of unrecovered e-waste materials.

3.7 Technology

The developer will utilize various equipment and machinery to achieve the objective of the project. The project seeks to recover, collect, store and dismantle e-waste materials. Examples of equipment to be utilized shall include:

- Forklift
- Electronic scrap shredder and crushers
- Electronic waste magnate separators
- Collection vehicles – 15ton trucks
- Electrical screwdrivers and grinders
- Floor platform scales
- 20ft shipping containers

The project will collect, sort, segregate and dismantle e-waste to extract valuable components such as metals, aluminum and copper which will be processed locally. Other extracted fractions of e- waste such as Printed Circuit Boards (PC-Boards) will be shipped to advanced material recovery facilities for further processing. The PC-Boards contain precious metals, copper, gold and other non- ferrous metals which require advanced facilities to process. Greenstretch has identified two advanced e-waste material recovery facilities namely, AST Recycling of South Africa and Namigreen of Namibia, one of Zambia's neighboring countries.

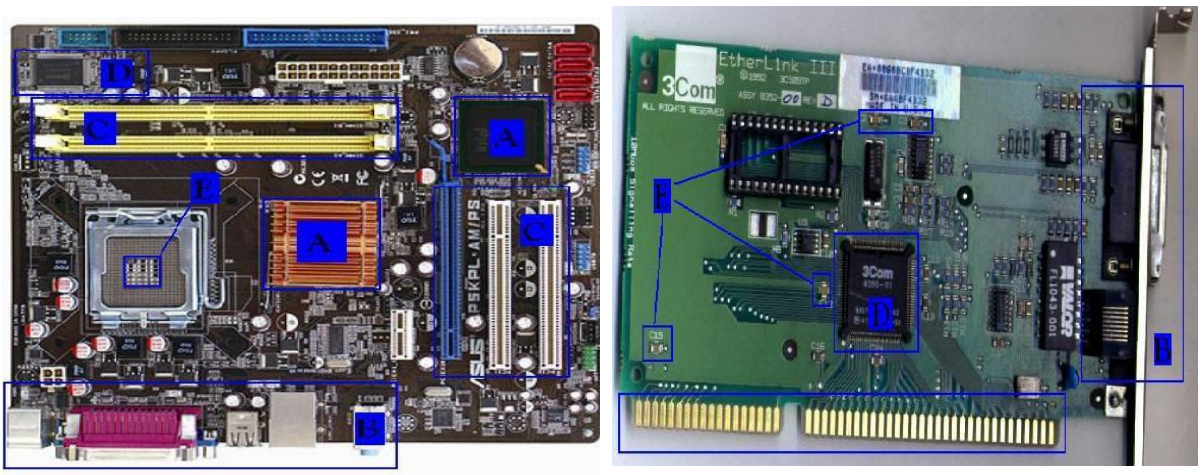


Figure 7: Printed Circuit Board (PC-Board)showing different components that will be extracted

Table 7: E-waste components with their explanation

Component	Explanation
A	North and south bridge, also known as "Flat Packs", contains microscale gold wires inside and gold-plated traces between the epoxy packages to the fibre.
B	Female connector pins, plated with gold.
C	PCI and Memory slots, gold plated pins inside.
D	Integrated circuit, also known as quad IC, contains micro scale gold wires inside.
E	Monolithic ceramic capacitor, this SMD (Surface mount device) contains Palladium, and some types contain Silver/Palladium.
	Visible gold-plated pins and edges do not need mentioning. CPU

NB: Visible gold-plated pins and edges do not need mentioning. CPU

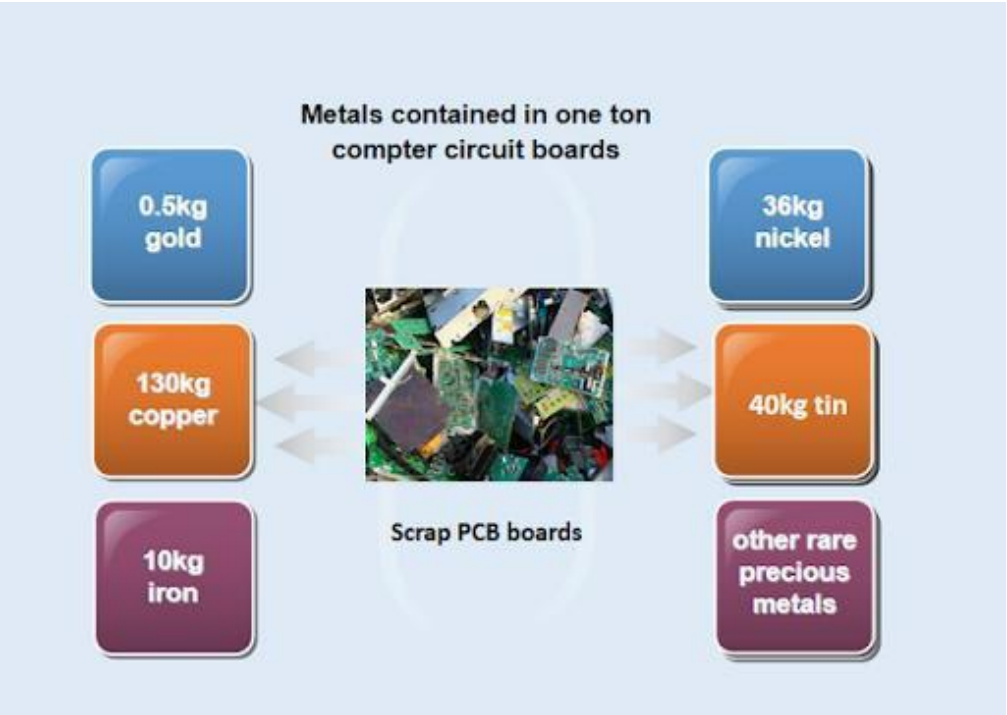


Figure 8: Most valuable recyclable components of PCBs

Flow Chart of the e-waste recovery process flow

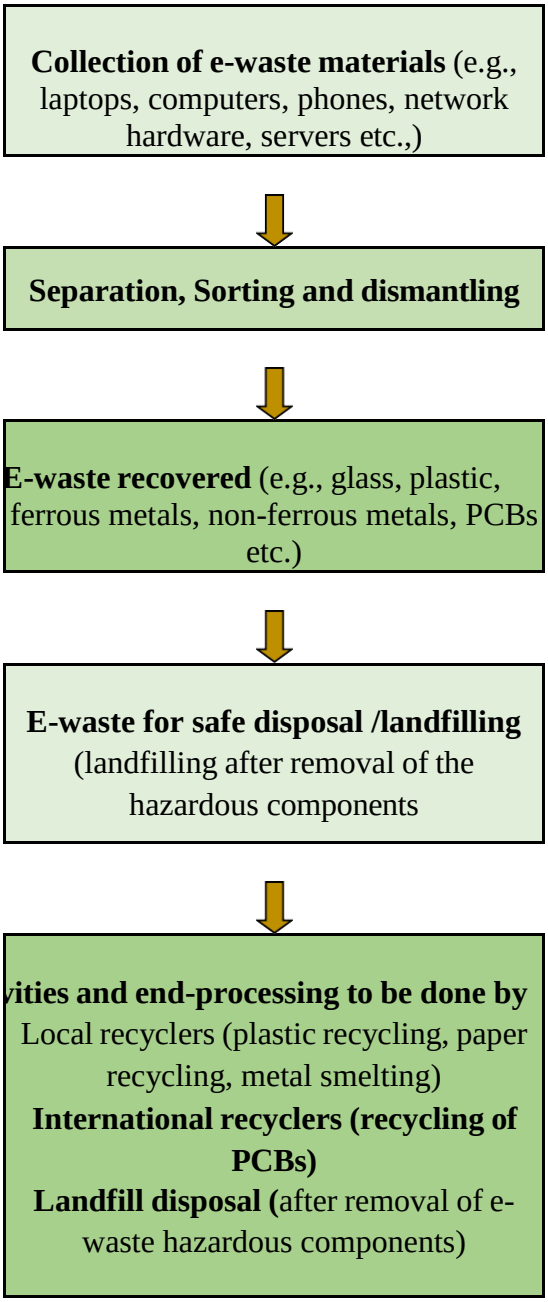


Figure 9: Process Flow Chart for summarized recovery process

3.8 Raw materials

The anticipated raw materials will include e-waste materials, as well as lubricants for the machines and site vehicles.

3.9 Products and by-Products

The major product will be the sorted and dismantled e-waste components such as copper, gold, aluminum and other precious metals extracted from electronic waste. The by-products anticipated will include residual waste from the sorting and dismantling process, waste oil spillages, lubricants and general waste materials.

3.10 Hazardous Materials and Their Storage

The major likely hazardous materials to be generated from the sorting and dismantling process will be the residual waste contaminated with e-waste and waste oils. Other materials to be generated shall include waste oils and fluids, lubricants and diesel. Diesel, lubricants, fluids and other waste oils shall be stored in 210L drums and placed on a concrete base within the warehouse.

3.11 Main Activities

The project will comprise of the planning/preparation, construction, operation & decommissioning phases.

Table 8: Project Main Activities

Stage	Main Activities
Planning/Preparatory Phase	Obtaining relevant approvals from regulatory authorities and other stakeholders. Mobilizing all equipment and machinery to site Recruitment of local labour (skilled, semi-skilled and unskilled) for operational and construction works Preliminary investigations and consultations with authorities on legal and institutional aspects regarding the proposed project. Identification of sources of equipment and materials to be used at project implementation and identification of suppliers
Construction Phase	Site preparation and construction activities shall include the following: Construction of simple e-waste sorting and dismantling tables Installation of an electronic scrap machine and other equipment Demarcation of the warehouse into sections like receiving, weighing, storage, sorting, and dismantling areas Installation of 20ft shipping containers at strategic locations Welding and fabrication work Site branding and installation of fire extinguishers
Operation phase	Buying and collection of e-waste across the entire Livingstone and other surrounding districts of Southern province Buying and collection of e-waste from the collection or buying points and transportation of collected materials to the central location Receiving, sorting and dismantling of e-waste materials Shredding of plastic fractions of e-waste for further processing Handling and storage of dismantled e-waste components Servicing machines and site generators Marketing and raising awareness about the importance of e-waste recycling Conducting the actual operational works
Decommissioning and Closure Phase	Notifying the local authority of the closure of the project Uninstallation of e-waste shredding machine Removal of sorting and dismantling tables Removal of all the reusable items such as the generator, tables, chairs etc. Dismantling of all mounted equipment for relocation to next project or alternative use. Removal of 20ft containers at designated locations

3.12 Expected activities in respect to the proposed E-Waste Collection Sites

Activities involved at installation, operation and decommissioning of collection sites shall include the following.

3.12.1 Planning / Preparatory Stage

- Identification of suitable locations for setting up collection sites in consultation with the local authority and the ZEMA, the regulatory agency
- Undertaking adequate consultations and careful consideration to ensure that the identified locations are not near residential houses, areas prone to flooding or critical habitats as defined by the World Bank ESS6

3.12.2 Installation and Construction Stage

- Construction of four raised one meter square concrete slabs at each collection center or site
- Placement of 20ft shipping containers on four concrete slabs – one meter square ($1m^2$)
- Clearing of the area to allow installation/placement of containers
- Fencing of the center with a wire
- Installation of visible signage and instructions for proper disposal
- Equipping the centers with a weighing scale and adequate separate containers for e-waste
- Securing the centers with adequate security
- Branding of each of site
- Equipping the center with separate waste containers for storage of e-waste according its nature, components and hazard level

3.12.3 Operation Stage

- Reception of e-waste from the local community
- Weighing and paying for received e-waste materials
- Collection and transportation of e-waste to the centralized facility
- Education of the local community on e-waste handling, proper separation and storage
- Ensuring the center is separated from

3.12.4 Decommissioning Stage

- Notifying the local authority and ZEMA about the closure of the centers
- Removal of containers
- Restoration of the area to its original state
- Conducting remedial works where necessary

3.13 Other activities anticipated at Operation phase

The following are some of the anticipated activities to be carried out during operation phase;

3.13.1 E-waste recovery and collection

E-waste shall be recovered and collected through various options such as organized collection events, on-demand collection, recycling bins and take back programs as well as through partnerships with bulk consumers of e-waste and the local community members. Scheduled regular collection events and provision of recycling bins for various types of e-waste, will ensure residents have multiple options for responsible disposal. Providing transport options for those who may face challenges in reaching these sites, will help GCL collect more quantities of e-waste.

3.13.2 Community Awareness and Sensitization

This objective focuses on educating community members about the dangers associated with improper e-waste disposal, such as environmental contamination and health risks, as well as the numerous benefits of recycling electronic devices. To achieve this, Greenstretch will develop a comprehensive awareness campaign that includes workshops, informational sessions, and interactive activities to engage community members. These workshops will cover topics such as the lifecycle of electronics, the impact of e-waste on the environment, and practical tips for responsible disposal. Additionally, GCL will utilize social media platforms and local media outlets to disseminate information, share success stories, and provide ongoing updates about the program in appropriate language. Informational materials, including brochures and flyers, will be distributed at community events and collection sites to ensure that residents have access to essential information about e-waste recycling and its benefits.

Further, GCL will engage environmental organizations, the local authority public services (such as schools, health centers and facilities), private sector entities like hotels, businesses, banks among others, and relevant Non-Governmental Organization (NGO) concerned with environmental matters.

3.13.3 Storage

E-waste shall be stored temporarily before being processed or dismantled to extract useful items. One – ton bulk bags shall be used for storage of e-waste after thorough sorting of the materials into different categories.

3.13.4 Dismantling & Disassembling

GCL shall utilize a combination of manual and mechanized dismantling methods.

- **Manual Method**

This section will involve sorting, dismantling and pre-processing of the e-waste materials to recover useful components. This will take place in the e-waste recovery facility in Livingstone. Dismantling is the systematic removal of components, parts, a group of parts or a sub-assembly from waste electronic equipment. The dismantling process shall be performed with simple tools such as screwdrivers, air drivers, hammers, tongs, and conveyors to separate the materials and components into different categories (i.e., plastics, iron, steel, copper, printed circuit boards, etc.). Disassembling of waste computers makes the recycling process easy and efficient. Disassembling process breakdowns the computers into small components and materials, which makes the packing, shipping, pre-processing and refining process easy and efficient.

The dismantling shall be done manually, although this option is time consuming and requires extensively skilled human capital to handle the e-waste manually; removing all the various materials, it does not use a lot of equipment or machinery and is pollution free as human has an incredible accuracy.

- **Mechanized Method**

In addition to the manual dismantling method elaborated above, Greenstretch shall also utilize mechanized method by using an electronic scrap shredder to shred e-waste materials to produce granules. The preferred shredder will be such that the granulate size is able to be adjusted so that metals and non-metals can be separated and recycled as efficiently as possible.

Figure 10: Electronic scrap shredder (Shredding Technology)

The shredders are specifically designed to protect data, facilitate recycling and handle large volumes of e-waste. Shredders will also be used to shred the plastic fractions of e-waste to make it easy to transport for safe disposal at an approved site. Disposal shall be done after removal of the hazardous components such as mercury and lead.

Once the electronic scrap is shredded to the desired size, magnetic separators which incorporate magnets shall be used to separate ferrous metals (like iron) from non-ferrous metals and plastics.

- **Dismantling Equipment & Tools**

GCL shall ensure that the workers involved in the dismantling operations have the proper e-waste dismantling equipment such as screwdrivers, wire cutters, pincers, power screwdrivers, hammers, angle grinder, scraper, flat nose plier, socket wrench sets with bits, cotton pin drive, and bit set among others. The dismantling exercise will also utilize some electrical and pneumatic tools like screwdrivers and grinders. GCL will further ensure that workers have the proper training and skills to use the aforesaid tools and equipment.

- **Safety Equipment**

In terms of safety during the dismantling process, Greenstretch will provide site workers with appropriate safety equipment such as safety shoes, safety gloves, shin guards, leather sleeve, face masks and respirators and protective overall, including fire extinguishers in case of fire outbreak.

- **Unloading and Offloading Equipment**

Greenstretch shall ensure that a number of equipment for unloading and offloading of e-waste materials are in place, these shall include forklift, pallet jack, pallet boxes, all for easy movement of the e-waste.

- **Dismantling Tables**

Dismantling tables shall be constructed to make manual dismantling easy. Adequate collection bins shall be placed near the tables to keep the dismantled components.

3.13.5 Components recovered through Manual Dismantling

A number of components such as cables, power plugs, glass panels, glass funnel, copper wires, printed circuit boards, TV casing, etc., shall be recovered from TV sets. Motherboards, graphic cards, network cables, microprocessors, RAM, Aluminium heat-sinks, hard drives, cables, connectors, power units, steel, copper and Aluminium scraps, PC casing, etc., shall be recovered from PC components. All reusable and valuable materials shall be assessed and extracted from other e-waste materials secured from various points. This exercise shall be done by trained and skilled workforce who will ensure dismantling of devices is done without damaging valuable components.

3.13.6 Identification of Scrap Metals

Different types of scrap metal shall be extracted from waste computers, such as copper, aluminium, magnesium, zinc, etc. Since the market value of these scrap metals is different, they shall be separated at the time of the dismantling process. The scrap metals mined from waste computers will be separated into two categories by magnet test: ferrous and non-ferrous metals. Non-ferrous metals are typically more valuable than ferrous metals. Once the magnet test is finished, additional scratch tests shall be executed to distinguish the non-ferrous metal (i.e., aluminium, copper, stainless steel, etc.).

3.13.7 Recovery Activities and End Processing

The recovery and refinery process of disassembled scraps is a big task in the recycling business. Each type of scrap should be sent to a specialized recovery facility to yield maximum recovery efficiency. Greenstretch has identified Namibia (Namigreen) and AST Recycling (South Africa) as the final destination (recovery facility).

Once the e-waste components are separated, sorted and dismantled they will be packaged in bulk bags and plastic wrapping, then loaded and taken for end processing, so as to recover valuable components (i.e. precious metals) and remove impurities. The ferrous and aluminum fractions will be locally processed to recover iron and aluminum respectively. Whereas the copper alloys from printed circuit boards (PC-Boards) will be sent to an integrated facility in either South Africa or Namibia to recover precious metals, copper, gold and other non-ferrous metals.

GCL will ensure that sampling and assaying is undertaken to determine the composition and content of precious metals in the e-waste stream, and to ensure that the optimum process is used to recover precious metals.

Table 9: *End of processing after e-waste separation, sorting, and dismantling*

No.	Fraction of e-waste items	Final Destination
1	PCBs	AST Recycling (South Africa) Namigreen (Namibia)
2	Plastic fraction	Shred /crush and recycle Repurpose
3	Metal fraction	Local scrap metal dealers
4	Aluminum, copper, & other useful components	Local scrap metal dealers
5	Residual waste / non-recyclables	ZEMA authorized landfill site
6	Unrecovered e-waste materials	ZEMA authorized landfill site

7	Glass	Encapsulate in appropriate drums Repurpose the glass Blend the glass with other materials and use it to make blocks, where possible

3.13.8 Transportation

Appropriate collection vehicles shall be used to transport e-waste around and outside the city. Recovered useful e-waste items (i.e. PC-Boards only) shall be transported to advanced e-waste recovery facilities for further processing. All appropriate procedures and regulations shall be adhered to during trans-boundary movement of the consignment, particularly, adherence to the Basel Convention on the trans-boundary movement of hazardous waste shall be complied with. Any spillage in transit shall be avoided during the transportation of e-waste.

Further, GCL shall ensure that the transportation of e-waste comply with all applicable national laws and World Bank Environmental, Health and Safety (WB – EHS) Guidelines and procedures for transportation of hazardous materials (hazmats). GCL shall ensure the following procedures are adhered to during the transportation of e-waste;

- Proper labeling of containers, including the identity and quantity of the contents, hazards, and shipper contact information
- Providing a shipping document (e.g. shipping manifest) that describes the contents of the load and its associated hazards in addition to the labeling of the containers. The shipping document should establish a chain-of-custody using multiple signed copies to show that the waste was properly shipped, transported and received by the recycling or treatment/disposal facility
- Ensuring that the volume, nature, integrity and protection of packaging and containers used for transport are appropriate for the type and quantity of hazardous material and modes of transport involved
- Ensuring adequate transport vehicle specifications
- Training employees involved in the transportation of hazardous materials regarding proper shipping procedures and emergency procedures
- Using labeling and placarding (external signs on transport vehicles), as required
- Providing the necessary means for emergency response on call 24 hours/day

In a nutshell, GCL shall ensure transportation of e-waste is undertaken in compliance with all applicable local regulations and international requirements including the WB EHS guidelines.

3.14 Waste generation on occupancy

The operation of the project in general will result in the production of solid waste such as food waste. The proponent will provide appropriate facilities for handling the waste generated within the areas of operation. These will include

- Providing waste receptacles for temporarily storage of the solid waste and for easy collection and transportation to sanitary disposal sites.
- Providing leak proof storage containers (steel drums) for storage of any waste oil waste and used oil and grease which will require special disposal to avoid land contamination. Any liquid waste generated which are hazardous in nature shall be stored on impervious surface in appropriate containers.
- Unrecovered e-waste shall be managed in line with the E-waste Management Plan incorporated in the appendices and in accordance with ZEMA regulations.

3.15 Wastewater management

The proposed project site already has an ablution block or toilets for workers to be used during operation phase of the project to manage sewage. The ablution blocks have flushable toilets and are connected a septic tank.

3.16 GCL Organizational Structure

To ensure successful operation of the project and implementation of this ESMP, GCL will put up an effective organization structure to assist employees to fully understand their roles and the hierarchy of authority. This structure will also assist GCL in terms of decision-making, resource management and workforce planning.

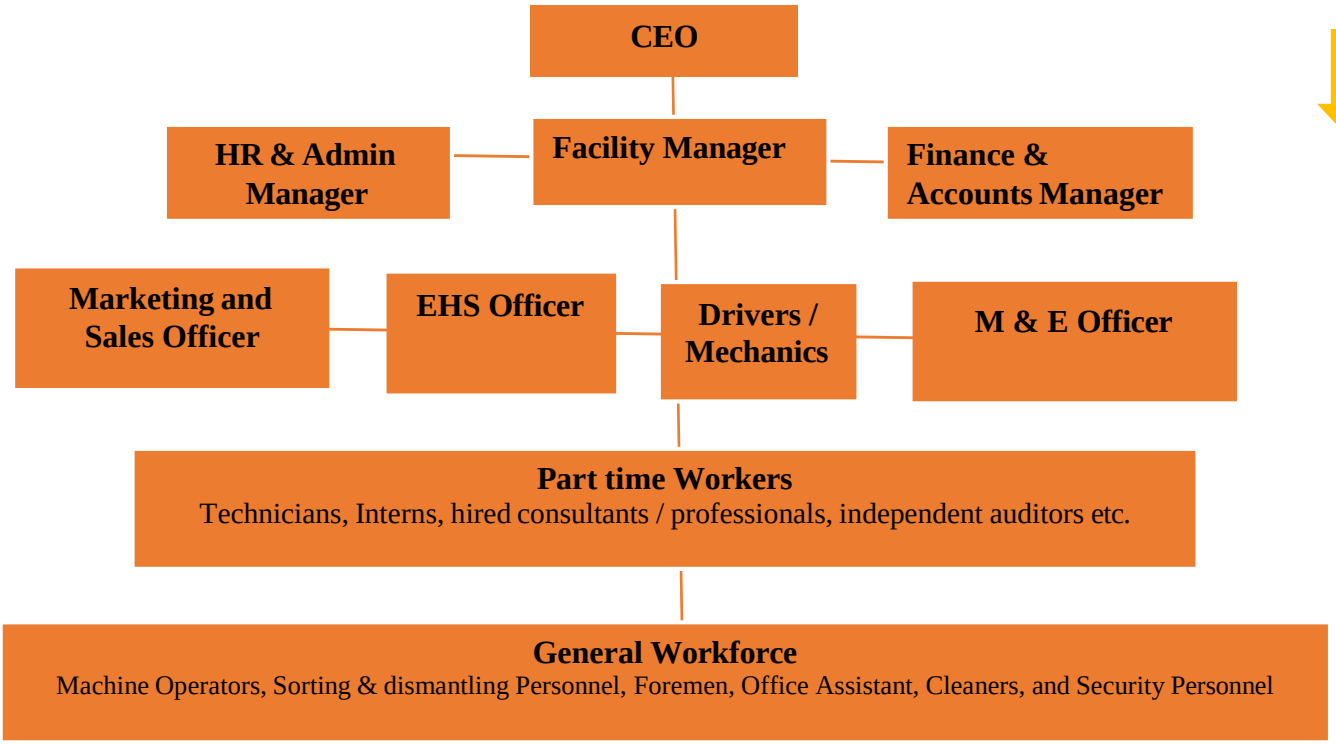


Figure 11: GCL Organizational Structure

3.17 Project staff and their Responsibilities

Table 10: Project staff and their responsibilities

Staff	Responsibility
Chief Executive Officer	Company's overall operations and performance
HR & Admin Manager	Management of employee records and contracts Payroll management and implementation Coordinating and Supporting HR related duties

Facility / Operations Manager	Overseeing the collection, transportation and safe disposal of unrecovered electronic waste Planning and organizing dismantling operations Ensuring compliance with environmental regulations Ensuring processes are efficient & environmentally friendly
Finance & Accounts Manager	Overseeing financial activities, preparing budgets, and ensuring compliance with financial regulations Preparing financial reports and statements
Marketing & Sales Officer	Developing sales and marketing strategies Analyzing market trends, managing campaigns and nurturing client relationships to drive revenue growth
EHS Officer	Ensuring compliance with EHS regulations and standards Ensuring employees are following safety protocols and procedures Ensuring employees use appropriate PPE for their tasks Verifying that employees are trained and skilled in using tools and equipment Providing training on implementing the project's environmental and social management plan
Drivers / Mechanics	Having all necessary documentation and licensing/permits for transporting e-waste Driving, maintaining vehicles and performing repairs Checking the condition of vehicles before transporting e-wastes
M & E Officer	Conducting risk assessments, safety audits, incident / accident investigation and emergency response & developing safety policies Collecting, analyzing and reporting data to help assess the effectiveness of the project Design, coordination and implementation of M & E activities
Technicians	Inspecting and troubleshooting machines Repairing faulty machines or equipment Installation of equipment and testing connections Performing routine maintenance tasks to keep equipment in good condition Replacing damaged or obsolete components in machines Carrying out machinery service
Interns	Providing additional assistance & support to the project
Hired consultants /Professionals	Providing technical support to the proposed project Providing contracted services when need arise Providing independent audit services etc.
Machine Operators	Operating shredders and balers
Sorting & dismantling personnel	Sorting, segregating and dismantling e-waste equipment Weighing incoming e-waste materials
Foremen	Making schedules for workers Assigning tasks to crew members Supervising workers and resolving disputes
Office Assistant / Secretary	Managing and organizing files Office maintenance Performing routine clerical and operational duties including typing Performing secretarial and clerical duties Taking messages and handling correspondence
Security personnel	Providing security at the facility
Cleaners	Cleaning the facility and the outside surrounding

3.17 Fire Management

There is risk of fire arising from improper electrical connections, arson and vandalism at project operational phase. Fire outbreaks can arise from internal sources such as open flames, improper storage of batteries, cigarette lighters and cigarettes at the facility. Fire has the potential to cause serious property damage, endanger human life and adversely affect neighboring properties. Below are the proposed mitigation measures:

- Only competent, and certified Electricians will be allowed to carry out electrical wiring.
- Adhere to electrical safety requirements, as stipulated in ZS 418 – 2, ZS 402 and SABS 0142
- Carry out regular inspections of electrical connections

To mitigate the fire risk internally, GCL will ensure the following:

- Designate a fire assembly point within the premises and carry out regular fire drills.
- Install fire/smoke detection systems within the premises of the processing plant.
- Ensure that Dry Chemical Powder (DCP) trolley units, foam and Carbon Dioxide fire extinguishers, absorbents, sand buckets, fire hydrants and horse reels are provided in the processing area.
- Service fire-fighting equipment regularly, and such records properly kept.
- Train key operators in firefighting and keep such records.
- Always keep all escape/emergency exit points clear and carry out regular checks to ensure that they always remain clear.
- Ensure that all spillage within the processing plant is quickly cleaned up and that used absorbent materials and other flammable wastes are disposed of quickly, in accordance with hazardous waste management regulations.
- Ensure that no sources of ignition (phones, fire fighters and cigarette smoking) are allowed in processing areas. Further, necessary signage prohibiting the above will be displayed and this will be strictly enforced; and
- Identify hazardous areas and control all sources of ignition through appropriate warning and hazard signs.

The positions of fire-fighting equipment will be clearly marked on the plant's site layout plan. A list of key emergency contacts will also be displayed with names and phone numbers. These will include Fire Brigade, Police, Hospital, ZEMA, and the Emergency Response Coordinator. All personnel will be trained in what action to take in the event of a fire. The person who has discovered the firewall take the following steps:

- Sound the alarm.
- Make sure no one is trapped in the immediate area of the fire; and
- If it is safe to do so, tackle the fire with the fire-fighting equipment available on site while waiting for specialized response from the Fire Brigade.
- The person in-charge will conduct a quick investigation as to the type and size of the fire then:
- Make sure the Fire Brigade has been informed as soon as possible
- Instruct the trained fire team from the employees to tackle the fire

4.0 ANALYSIS OF PROJECT ALTERNATIVES

4.1 Introduction

The analysis of alternatives is part of the EIA process, its purpose is to ensure that the best among all possible options is selected. Various alternatives for implementing this project have been looked at considering the environment, and the socio-economic impacts of each alternative including the zero alternative of doing nothing.

The analysis of alternative for the proposed project activities considered the following:

- No project or Zero alternative ("Do nothing" alternative)
- Project Location Alternatives
- Alternative Technologies for processing e-waste
- Waste Management Alternatives
- Power Supply Alternatives
- Raw material Alternatives
- Water Sources Alternatives

4.2 'No Project' Alternative

This option meant no investment taking place. This entails that the proposed development would NOT be undertaken, and the following benefits shall not be realized.

- Employment creation
- Contribution to improved local economy
- Competition in the e-waste industry
- Improved socio-economic wellbeing of Livingstone district and surrounding districts

The "No Project Option" would negatively affect the district and hence deprive the country of the much-needed income that the project would contribute through taxes. This option also meant that there will be no solution to the current challenges of e-waste in the country. E-waste materials will continue to be dumped, buried or built at landfill sites, causing release of pollutants into the environment and atmosphere.

Justification for the selected option: The No project' alternative was rejected because it meant foregoing all the above benefits. Further, the option was not in line with the Directors' vision of expanding their business opportunities in the waste management industry.

4.3 Project Location Alternatives

Option 1: Preferred Project Site

This site is a warehouse located in an industrial area and very easy to access by road for easy delivery of e-waste materials from various designated points at provincial level. The warehouse is newly built, spacious and the lease agreement has already been secured from the property owner. The said site is already on title and suitable for the nature of the project being proposed. The proposed project activities will involve recovery, collection, storage and dismantling. Dismantling activities will mainly be carried out manually strictly in a controlled setup within the warehouse which has impervious surface.

Justification for the selected option: This site is ideal for the proposed project based on the reasons highlighted above.

Option 2: Alternative Project Site
The alternative site is also located in the industrial area, not far from the preferred site. This site is also located along Belewa road and is also suitable for the proposed project. However, it was not considered because the lease agreement was not secured. This might lead to delay in implementing the project once grant for the project gets approved.

4.4 Alternative Technologies for processing e-waste

Under this category, the focus was on the mechanical and manual dismantling methods.

Option 1: The Mechanical Method – shredding and crushing
This method involves the use of various machines, such as shredders, granulators, and magnetic separators, to break down and sort electronic components. Mechanical separation accelerates the dismantling process, ensuring maximum resource recovery and waste reduction. Under this method, removal of copper and other precious materials shall be done mechanically using magnetic separation. To avoid exposure of workers to toxic gases, all hazardous components from e-waste materials shall be removed before shredding and crushing.
This option is recommended for adoption.

Option 2: Manual Method – Use of a conventional assorted tools
In this process, dismantling is achieved manually by using assorted tools. Despite this option being time consuming, trained personnel will be used to enhance efficiency and effectiveness, and to avoid damage to the valuable components.
Justification for the selected option: Both mechanical and manual methods of dismantling are recommended in order to realize best results.

Option 3: Thermal processing method
This option involves applying heat to e-waste to recover valuable materials such as precious metals. Thermal processing typically involves smelting e-waste in furnaces or utilizing pyrolysis techniques to break down components into their constituent materials.
This option is NOT recommended and will not be adopted.

Option 4: Chemical method
This technique uses specific chemical processes, such as leaching and precipitation, to recover valuable materials from e-waste. While efficient, chemical extraction must be performed with caution due to the potentially hazardous nature of the substances involved.
This option is NOT recommended and shall not be used at the facility

4.5 Waste Management Alternatives

Option 1: Management of human waste
Under this category, various options for sewer waste management were consider as the (1) use of toilets connected to a SWASCO sewer line, (2) use of portable toilets or (3) use of pit latrines

Justification for the selected option: The project site already has a borehole and an ablution block with flushable toilets already connected to SWASCO Sewer line. GCL will use the flushable toilets onsite. Therefore, GCL shall NOT use pit latrines nor portable toilets for sewerage management.

Option 2: Management of general and hazardous waste generated onsite:
There were two options considered; (1) the use of portable bins (Preferred option), (2)

engagement of a licensed waste management service provider to manage general solid waste (Recommended option), (3) engagement of a licensed hazardous waste management service provider (recommended option), use of rubbish pits (Not recommended option), and lastly (4) waste separation and recycling (Recommended option).

Justification for the selected option: GCL preferred and selected the following options; (1) the engagement of a waste management service provider to ensure environmentally friendly disposal of both general and hazardous waste materials, (2) the use of appropriate waste receptacles and transporting of all the non-recyclable waste to a licensed dumpsite, (3) separating the waste at source to recover recyclable waste materials for recycling as best practice, (4) installing appropriate waste receptacles for waste storage at construction and operation phases to separate recyclables from non-recyclables, (5) management of the hazardous waste materials such as waste oil, chemicals and e-waste residual waste generated onsite through a licensed hazardous waste service provider was another preferred option and best practice. The only options not recommended, and which will not be adopted are (1) digging of rubbish pits, and (2) burying or open burning of waste

4.6 Power Supply Alternatives

Option 1: ZESCO Power Supply
Use of electricity provided by national power utility company, ZESCO

Option 2: Generator sets and Solar Energy
Use of generators or solar energy for lighting and to power machinery.

Justification for the selected option: The ZESCO power supply option proved ideal as the proposed project site is already connected to the national grid. Hydropower is clean energy and has no pollution. Using alternatives like diesel powered generators as well as use of solar energy were also preferred options but only to be used as alternatives in the absence of ZESCO supply.

4.7 Raw Materials Alternatives

Option 1: The first choice was to source raw materials such as lubricants, machine spare parts and fuel oil locally. Option 2: The second choice was to source the raw materials outside the Republic of Zambia.

Justification for the selected option: Raw materials that can be sourced locally shall be procured within Zambia, however, those that cannot be purchased locally will be sourced abroad, depending on availability and cost of the said raw materials at a given period.

On the other hand, raw materials in terms of e-waste materials shall be sourced within and outside Livingstone district. The said raw materials (e-waste) shall not be sourced outside of the Republic of Zambia.

4.8 Water Sources Alternatives

Under this category, three options were considered and these included (1) use of borehole water on site, (2) connecting to the Southern Water Supply and Sanitation Company (SWASCO) line, and lastly (3) use of a water bowser and storage of water in mini-portable tanks

Justification for the selected option: The project site is already connected to the water utility

company namely; the Southern Water and Sanitation Company (SWASCO) line and also has a borehole water storage tank with access to groundwater. GCL shall use water from SWASCO and in case water from SWASCO is unavailable, the borehole water shall be used, this will ensure constant supply.

5. DESCRIPTION OF BASELINE ENVIROMENT

A detailed description of the existing environment around the proposed project area was undertaken. The environmental components that were considered are physical, biological and socio-economic environment.

5.1 Physical Environment

5.1.1 Climate

The proposed project is located in Southern Province which generally has a typical Zambian climate that is described as sub-tropical. The project area falls in the Semi-arid Agro-Ecological Region I which also includes areas of eastern and western Zambia besides Southern Province: Zambia's valleys at 300-800 m altitude mostly lie in region 1. Livingstone district receives annual rainfall of less than 800mm and constitutes 12% of Zambia's total land area. The winter months of May to July are generally cool and dry, with maximum daily temperatures of 18-26°C. The months of August to October are warm and dry with average daily temperatures of 30-36oC and maxima of around 37°C in October.

5.1.2 Air Quality and Noise Levels

According to the field assessments and observations undertaken in December of 2024, the air quality at the project site was generally good as the area had no industries operating at the time of the survey. The field observations indicated that the air was generally lightly polluted by fumes from vehicles and minimal dust emanating due to vehicular movements. It was discovered that visibility was generally good and there was no foul smell in the area.

On the other hand, the noise levels at the project area were low due to low levels of traffic and absence of industrial activities. Noise levels at the site were primarily influenced by moving vehicles and there were no major sources of noise or vibrations that could cause nuisance to the residents.

The air quality analysis and noise level measurements were conducted at selected points around the project site. The field surveys and observation revealed that some parts of the project area are still in their natural form regarding air and noise pollution. The tables below give a baseline situation regarding site air quality and noise levels.

Table 11: Dust measurement results at the proposed project area

Dust Measurements at the Project Site					
Sampling location	Dust Level Results (mg/Nm^3)			ZEMA limit	Comments
	1st Results	2nd Results	Average		
17º52'06.91" S, 25º50'51.65" E	15.5	16.5	16.00	50 mg/Nm^3	Below Limit
17º52'07.24" S, 25º50'54.89" E	14.00	15.5	14.75	50 mg/Nm^3	Below Limit
17º52'10.45" S, 25º50'54.43" E	17.5	14.50	16.00	50 mg/Nm^3	Below Limit
17º52'09.88" S, 25º50'51.31" E	13.00	15.00	14.00	50 mg/Nm^3	Below Limit

Source: GCL Field Survey Team

Generally, the levels of respirable dust pollution did not exceed the ZEMA limits.

Table 12: Noise Measurements at Project Site

Sampling Location	Noise level dB(A) Duration: 15min			Duration (min)	IFC Standard (Industrial)	Remark s	Noise Source & Receptor
	Min	Max	Average				Source
17°52'06.91" S, 25°50'51.65" E	27.50	66.00	46.75	10	85dB	Normal	People, Birds
17°52'07.24" S, 25°50'54.89" E	30.00	61.50	45.75	10	85dB	Normal	People, Birds
17°52'10.45" S, 25°50'54.43" E	33.50	59.50	46.50	10	85dB	Normal	People, Birds
17°52'09.88" S, 25°50'51.31" E	38.00	60.50	49.25	10	85dB	Normal	People, Birds

Source: GCL Field Survey Team

The noise is disruptive when people and vehicle are moving along the road near the project site. The noise level ranged from 45.75 dB to 49.25 dB on average. As it can be seen from the results the noise level is within and below ZEMA and International standards.

Table 13: Concentration of gases at Project Site

S/N	Parameter	1st Results (µg/m³)	2nd Results (µg/m³)	Average Results (µg/m³)	Limit / Day
01	SO2	Not detected	Not detected	Not detected	500 µg/m³
02	NOx	Not detected	Not detected	Not detected	400 µg/m³
03	CO	Not detected	Not detected	Not detected	100 µg/m³

Source: GCL Field Survey Team

Very minimal amounts of Carbon dioxide (CO2) were detected in the air at the project site and the presence of this gas was attributed mainly to emission from combustion engines. The other gases: SO_2, CO and NOx were not present (Not detectable) in the air at sampling time

5.1.3 Land use and Soil Resources

The proposed project site lies in the industrial area of the city. Tourism is the major activity in the city which is often referred to as "tourist capital of Zambia". The land-uses within the project area are classified commercial with some residential houses developed in close proximity. The district has a good range of soil variations from sandy to clays loams. However, the most common soils found in the districts are the sandy soils patches of red clays and red-brown loams. The soil pH ranges from 3.8 to 7. The soils of the site are characterized by greyish sandy soil.

The project area belongs to Region I of the Agro-ecological zone which contains a variety of soil types, ranging from slightly acidic loamy and clayey soils with loam topsoil, to acidic sandy soils. Characteristics of these soils which have significant constraints for crop production, include erosion, limited soil depth in hilly and escarpment areas, poor physical properties that make it difficult to till especially on cracking clay soils, crusting, and low water holding capacities in sandy soils.

5.1.4 Hydrology and Topography

The Zambezi River is the main hydrological feature in the project area with the SWASCO sewer ponds located in close proximity. The area is comprised mainly of basalt which forms the main groundwater system. Generally, the people in the district are dependent on water from the Southern Water and Sewerage System for their drinking water.

The area does not have nearby local streams or river over a radius of about 3km, this meant that surface water was not analyzed. However, borehole water sample in the project area were collected for laboratory analysis at SWASCO laboratory department, to determine the baseline status of the groundwater currently obtaining in the area. The borehole water sample results obtained revealed that groundwater was suitable for drinking and that most of the parameters tested were below the limits. The tests were carried out in conformity with the standards methods for the examination of water and wastewater, National Water Supply and Sanitation Council (NWASCO) and the Zambia Bureau of Standards (ZABS).

5.1.5 Geology

The proposed project site is located in an area that is underlain by Palaeozoic – Mesozoic sedimentary rocks called the Karroo Complex (karroo basalts) which is a geosyncline deposit including a glacial deposit at the initial stage and basaltic lava at the last stage. The basaltic lava is widely distributed along the middle section of the Zambezi River, forming many waterfalls and cataracts with faults such as Victoria Falls. The basaltic lava of the Karroo complex is covered with Tertiary-Pleistocene sedimentary rocks called the Kalahari Group. The Kalahari Group consists of calcretes, silcretes and ferricretes (laterites) which are members of the duricrusts group of secondary surface deposits formed by the near-surface cementation of pre-existing soils. Biological Environment.

5.1.6 Flora

The proposed site is a built environment with the flora species or vegetation greatly disturbed by human settlement or activities. However, the vegetation at district and surrounding the project site was studied, revealing that the area vegetation was basically that of miombo woodlands, characterized by young trees and shrubs. The height of the vegetation indicated that it was a secondary type and re-emerging (regenerating) probably due to human disturbance mostly likely for wood fuel. The proposed area is generally composed of the secondary vegetation communities of mainly mopane, mixed with munga species. Though the area has mostly secondary vegetation, it was observed that the common tree species included the following:

Scientific Name	**English / Common Name**
Colophospermum mopane,	Balsam or butterfly tree
Acacia tortilis,	Umbrella thorn
Acacia erioloba,	Camel thorn or Giraffe thorn
Combretum apiculatum,	Red bushwillow
Combretum zeyheri,	Large-fruited bushwillow
Acacia nigrescens,	Knob – Thorn Tree
Terminalia spp	Black afara
Rhigozum zambesiacum	Mopane rhigozum
Balanites aegyptiaca	Simple-thorned torchwood

The dominant tree species in the area include Colophospermum mopane and other species that are found in the munga vegetation, which include Commiphora schimperi.

Figure 12: Type of biodiversity found in the project area

Rare and endangered flora species: There was **no** known endangered, vulnerable or rare flora species spotted in the project area.

5.1.6.1 Aquatic Flora

There were no aquatic resources in the project area, as there were no water bodies or local streams or river within and/or in close proximity to the project area.

5.1.7 Fauna

The data on fauna was collected mostly by way of observations during field visits to the project site. There were no wild animals spotted on site during the survey. Nearby places or the surrounding areas have been hugely disturbed by human activities such a settlement. However, small species such as grasscutter, reptiles, lizards, mice, grasshoppers and dragonflies were spotted onsite. The project area was devoid of large mammals at the time of site visit. The project site is located approximately 1.37Km from the Mosi-O-Tunya National Park, and the site is often frequented by migratory elephants. The collection centers to be set up shall not pose any potential risk to key species as they will be installed and operated far away from critical habitats. Critical habitats are defined as areas of high biodiversity importance or value by the World Bank ESS 6. The centralized e-waste facility location is not prone to flooding and is not near critical habitats and hence will equally not pose any serious threats to species of concern.

There are no water bodies in the project area. The only water body is the Zambezi River on the South about 3.6km from the proposed project site. The following are some of the species (with their scientific names) found around the project area.

Scientific Name	English or Common Name
Ceragrion banditum	Dragonfly
Tipulidae – daddy longlegs crane flies	Fly
Myrmeleon inconspicuous	Antlion
Loxodonta Africana	African bush elephant
Mus minutoides	African pygmy mouse
Stomoxyini	Housefly

Thryonomys swinderianus	Grasscutter
Eciton Burchelli	Army ants
Hippopotamus amphibious	Hippo
Chlorocebus pygerythrus	Vervet Monkey
Papio Kindae	Kinda baboon

Livingstone district hosts the Mosi – Oa – Tunya National Park which is a unique park in Zambia with white rhinos (*Ceratotherium simum*) which are closely protected from poachers by the scouts from the Department of National Parks and Wildlife.

Other species found in the park and the project area include migratory elephants (*Loxodonta Africana)*, giraffe (*Giraffa camelopardalis thornicroft*), buffalo (*Syncerus caffer*), waterbuck (Kobus ellipsiprymnus), impala (*Aepyceros melampus*), zebra (*Equus quagga*), bushbuck (*Tragelaphus sylvaticus*), warthog (*Phacochoerus africanus*), monkeys, baboon, hippo and crocodiles (*Crocodylus niloticus*) are residents in the park year-round. They inhabit a mix of riverine forest and mopane woodland as well as grassland, which also provides a variety of habitats for numerous bird species.

It is worth noting that the African bush elephant (Loxodonta Africana) – though NOT spotted at the time of the site survey, is well known to frequent the project area especially during evening time off the rainy season.

Figure 13: *Migratory elephants common in the project area*

Rare or endangered fauna spotted: None

5.1.7.1 Terrestrial Fauna

No presence of large animals was spotted in the project area during the field survey. The ever-increasing population at district level, necessitates demand for more land to pave way for agriculture and settlement, this resulted in most animals fleeing the area. However, the migratory African bush elephants though not spotted at survey time, are known to frequent the

area during evening time.

5.1.7.2 Aquatic Animals

There were no aquatic resources in the project area, as there were no water bodies or local streams or river within and/or near the project area. However, at provincial level some common aquatic species are listed below:

English name	Scientific name
African Banded Barb	*Barbus Fasciolatus*
Blackspotted squeaker	*Synodontis nigromaculatus*
Flog	*Ptychadena oxyrhynchus (common in rain season)*
African sharptooth catfish	*Clarias gariepinus*
blackspot climbing perch	*Ctenopoma / Microctenopoma intermedium*
Giraffe catfish	*Anchenoglanis Occidentalis*
Crocodiles	*Crocodylus niloticus*

5.1.7.3 Avi-Fauna

The project area hosts common bird families, however the species found in the project area during field visits included blue waxbill (Uraeginthus angolensis), and Caprimulgus pectoralis. Other species (with their scientific names) spotted at the Livingstone sewer ponds located near the proposed project site included the following:

English Name	Scientific Name
African Purple Swamphen	*Porphyrio madagascariensis*
Lesser Jacana	*Microparra capensis*
Greater Jacana	*Linnaeus*
Egrets	*Ardea alba*
Herons	*Ardea cinerea*
Lapwings	*Vanellinae*

It is worth noting that the sewer ponds located between Dambwa Site and Service and the Mosi-O-Tunya National Park in Livingstone are within project area. The sewer ponds are part of the Mosi-O- Tunya National Park and Batoka Gorge, and are an important Birding Area (ZM013) covering 8600ha in total. The ponds were partly overgrown with water hyacinth, making a perfect habitat for species. This is an important feature /area for the proposed project. Therefore, the project proponent shall abide by laws protecting species of regional and global conservation concern. Special bird species if found at any phase of the project which is a species of concern classified as endangered under the IUCN Red list because of their population is decreasing shall be protected.

5.1.7.4 Insects

During the field investigations, a few insects were observed in the project area and at the project site. These included:

Common name	Scientific name
Mosquito	*Anopheles spp.*
Red ants	*Solenopsis spp.*
Giant cricket	*Brachytrypas membraneus*

Honeybee	*Apis mellifera*
Wasp	*Belonogastar junceus*
Termite	*Microtermes goliath*

Other organisms of insects included butterflies and moths (*Papilionacea), beetles (Coleoptera),* Stink bugs (*Hemiptera),* Grasshoppers (*Orthoptera),* Dragonfly and Damselflies (*Odonata).* There were **no** rare and endangered species spotted in the area during the study area

5.2 Socio-Economic Environment

5.2.1 Demography

In 2010, Livingstone City had a total population of approximately 139,509 of which 68,763 were males (49.3%) while 70,746 were females (50.7%) according to the 2010 census of population and housing. On the other hand, the 2022 census of population and housing census revealed that Livingstone's total population had increased to 177,393 out of which 84,384 (47.6%) were males while 93,009 were females (52.4%). The average annual population growth rate stands at 2%, with a population density of 257.3, total land area size of 689.5km^2.

Table 14: Population of Livingstone District

Constituency	2010 Population			2022 Population		
	Male	Female	Total	Male	Female	Total
Livingstone	68,763 (49.3%)	70,746 (50.7%)	139,509	84,384 (47.6%)	93,009 (52.4%)	177,393

Source: Zambia Statistics Agency: 2022 Census of Population and Housing.

5.2.2 Health

Healthcare services in Livingstone District include 12 health centres and 2 hospitals, with Livingstone Central Hospital being notable. Services are not evenly distributed, and there are issues with insufficient beds, inadequate trained personnel, poor maintenance due to lack of funds, and inadequate transport systems for referrals.

5.2.3 Prevalence of HIV/AIDS

Livingstone being the Tourist Capital of Zambia and a border town, has a prevalence of HIV, standing at 25.3% (National HIV/AIDS/STI/TB Council NAC, 2010). Like in most towns in Zambia, poverty at the household level has led to increased practice of unprotected sex work, which in turn has increased HIV/AIDS infections, especially among women of the productive age group of 15–45 years. The mode of transmission is to a larger extent heterosexual and mother-to-child. The statistics shared during the 2021 World AIDS Day commemoration revealed that Livingstone has continued recording one of the districts with highest HIV/AIDS prevalence rates in the country, alarmingly high at 25.3%, (Joseph Lungu – Acting Livingstone District Health Director, 2021).

5.2.4 Education

The Zambian education system was restructured to a 3-6-6-3 tier system, with early childhood education lasting three years, primary education six years, secondary education six years, and tertiary and vocational education three years. Despite improvements in access to primary education, quality has declined due to a lack of teachers, facilities, and learning materials. The

pupil-teacher ratio in Livingstone is 26:1, but there is a significant need for more classrooms to achieve a better pupil-classroom ratio.

Basic primary and secondary education are affected by the economic crisis in the district, which is threatening to undermine both the quality of and access to education. Public expenditure for education has declined dramatically. Enrolment is increasing in the city and in peri-urban areas and this has meant lower expenditure per student. Construction of new classrooms has not matched the rise in enrolment and the teachers required. Notable among the higher order educational institutions in Livingstone is the teacher's training college, (UN-HABITAT, 2009).

5.2.5 Economy activity

Tourism is the major activity in Livingstone, the hospitality industry creates employment for the locals through hotels, lodges and other facilities. On the other hand, Livingstone is a border town, this means that there is a fairly high cross-border trading, creating opportunities for locals and the government to generate revenues through trading, taxation and levies. However, the Tourism economy has been severely hit by the corona virus (COVID 19) pandemic, resulting in reduced number of tourists visiting Livingstone. Zambia's tourism sector has been thrown into a crisis too due to the pandemic, putting thousands of businesses and jobs at risk.

5.2.6 Built Environment

The project area lies in the commercial zone where most of the plots are developed. Among the prominent features within the project area is the SWASCO Sewer treatment ponds and the Mosi- O-Tunya National Park. The proposed project site already has the ZESCO transmission lines in proximity. The Old Livingstone Motor Vehicle Assembly plant is another feature located near the project site. Livingstone city is the tourist capital of Zambia, housing one of the Seven Wonders of the World, the mighty Victoria Falls. Tourism is the major activity in Livingstone and the hospitality industry creates employment for the locals through hotels, lodges and other facilities.

5.3 Stakeholder Consultation and Engagement

The objectives of the Public Participation Process (PPP) are to identify and inform potential Interested and/or Affected Parties (IAPs) and stakeholders of the proposed project. It provides IAPs with the opportunity to register any issues or concerns regarding the development proposal and identify mitigatory and management options to address issues and concerns that have been raised. The following are the objectives of the public participation process in summary (PPP):

- To identify and inform potential IAPs of the proposed development
- To provide IAPs with the opportunity to register any issues or concerns regarding the proposed development; and
- To identify mitigatory and management options to address issues and concerns raised, where appropriate.

In accordance with the ZEMA EIA Regulations, The PPP should include the date, physical meetings, interviews, virtual discussions/consultations and consultation with organs of state, stakeholders, local communities, neighbors, vulnerable groups, the youth and women including minority groups and other registered IAPs. The PPP is an ongoing and inclusive process, and the developer shall ensure to adhere it if applicable.

The developer considered the PPP, IAPs residing near the proposed project were consulted or interviewed, and their details and comments or concerns raised were recorded and a list of

people consulted is contained herein. Below are the comments and concerns raised by the local residents near project site, the local authority at Livingstone City Council and other IAPs.

- Most of the people consulted or interviewed welcomed the project
- The local authority advised that due process must be followed
- There was an expression of happiness about jobs the project would create
- There was an enquiry about when the project would commence

NB: Responses to the comments/concerns raised were given during meetings and visits with IAPS and other stakeholders. The developer responded that the proposed project to establish and operate an e-waste recycling facility in Livingstone would follow the due process, all regulations relevant to the proposed project would be adhered to, the many benefits that would come as a result of the project would be enhanced by prioritizing the locals, adverse impacts of the proposed would be mitigated accordingly, the project would commence once all legal permits were secured and once the World Bank approved the project grant. It was further added that should any conflicts, concerns and comments rose up because of the implementation of the project, the developer would utilize a Grievance Redress Mechanism (GRM) to address all issues raised in a mutual, fair and timely manner.

5.4 Authority Consultation

The following are the competent authorities relevant to the proposed establishment and operation of an e-waste recycling facility by Greenstretch Consultants Limited. The said authorities will be consulted or engaged in the EIA process.

- Ministry of Green Economy and Environment
- Zambia Environmental Management Agency
- The Radiation Protection Authority
- Ministry of Water Development, Sanitation and Environmental Protection
- Ministry of Labour and Social Security
- Livingstone City Council

Authority consultation included the following activities:

- Pre-meeting with ZEMA to determine whether the proposed project required an EPB or EIS
- Consultation and engagement with traditional leadership and the local authority
- Securing of lease agreement for the proposed e-waste recycling site
- Approval from interested and affected parties (local communities) for the project to go ahead

5.5 Consultation with Other Relevant Stakeholders

As required by the EIA regulations, all interested public, interested and affected parties (IAPs), local residents, vulnerable groups and others have to be provided with information about the proposed project. Their comments, concerns, fears, suggestions and views have to be noted and taken into account.

Conducting public scoping allows full environmental disclosure, ensures that public views are taken into account and allows for active participation in the decision-making process. Therefore, key stakeholders, agencies, NGOs, local authorities including interested and affected parties (IAPs) like rural communities, local residents that are near proposed project

site, need to be informed about the proposed project and all realistic alternatives, (where applicable) in line with the Environmental Impact Assessment (EIA) Regulations SI No. 28 of 1997.

The six hardcopies of the final EPB report shall be submitted to ZEMA for distribution to relevant authorities such as the Ministry of Green Economy and Environment, the Livingstone City Council, and other IAPs that ZEMA shall deem relevant to the proposed development. The comments or concerns raised by stakeholders and IAPs shall be noted and a list of people consulted/interviewed attached herein.

5.6 Key stakeholders that must be consulted and engaged

5.6.1 The Zambia Environmental Management Agency (ZEMA)

ZEMA is a very crucial Agency for the proposed development, as it is responsible for all matters pertaining to environmental management throughout the Republic of Zambia in line with the provisions of the Environmental Management Act No. 12 of 2011. Electric and Electronic Waste (E-waste) is a component of hazardous waste. Hazardous waste is regulated by ZEMA through the Environmental Management Act No.12 of 2011 and its regulations such as the Environmental Impact Assessment (EIA), the Licensing Regulations and the Extended Producer Responsibility.

5.6.2 The Ministry of Local Government (MLG):

The MLG is responsible for regulating solid waste management at sub-national level, through the City Council (Municipality). Under the City Council, planning for and provision of SWM services is mandated to the Department of Public Health and planning. Services are administered by the local Waste Management Unit, which falls under the local Department of Public Health. The developer consulted the Livingstone City Council (LCC) at pre-construction stage of the project

5.6.3 The Zambia Information & Communications Technology Authority (ZICTA)

ZICTA a lead authority responsible for regulating information and communication technology in the country and provides compliance oversight over the Electrical and Electronic Waste. It also serves as a key data provider on the inflows of related equipment and technologies.

5.6.4 Zambia Revenue Authority (ZRA)

In E-Waste management, ZRA is the first contact point in all electrical and electronic products that are entering the country. Therefore, they provide statistics of how much electric and electronic products, and their value are entering into the country.

5.6.5 Zambia Statistics Agency (ZSA)

It provides key data and statistics for use in the E-Waste management in the country.

5.6.6 The Zambia Bureau of Standards (ZABS):

As regards, management of E-Waste, it plays a central role in the development of respective electrical and electronic waste management standards and guidelines.

5.7 Grievance Redress Mechanism (GRM)

To ensure successful implementation of the proposed project to establish and operate an e-waste recovery facility in Livingstone, Greenstretch shall has prepared an GRM to ensure that

community members, stakeholders or any person affected by the proposed project are able to raise their concerns, complaints or grievances regarding the proposed project environmental and social impacts and risks.

Objectives of the GRM

- To help identify problems before they become more serious or widespread, thereby preserving the project's funds and its reputation
- To provide affected parties and stakeholders with a formal avenue to raise their concerns, complaints or grievances regarding the project's environmental and social impacts and risks
- To provide for a transparent and credible process to all parties, resulting in outcomes that are fair, effective, and lasting.
- To give the Aggrieved Parties (APs) within the project scope access to seek redress to their perceived or actual grievance or any feedback that needs clarity, and to ensure there is speedy resolution of the project specific grievances

Scope of the GRM

- To address and manage all grievances or complaints from all stakeholders or aggrieved parties (APs) relating to environmental and social impacts arising from the implementation of the proposed project to establish and operate an e-waste facility by Greenstretch Consultants Limited

Principles of the GRM

GCL shall adhere to the following guiding principles for the GRM:

- Fairness
- Accessibility
- Transparency
- Accountability
- Equity
- Confidentiality
- Speedy response

Examples of Grievances or Complaints

Grievances shall result from project implementation activities and may come as formal or informal complaints, minor concerns, or serious concerns.

Table 15: Examples of grievances or complaints

Grievance / Complaints	Example
Disturbance of elephant movement in the area	Complaints by the local community and key stakeholders (NGOs) relating to disturbance of the movement of migratory elephants that frequent the project area due to increased traffic congestion by vehicles delivering or transporting e-waste materials in the project area
Harassment	Grievances related to unwanted conduct which violates an individual's dignity, grievances relating to offensive or inappropriate comments, jokes or language form colleagues or supervisors.
Noise pollution	Grievances related to noise generated by machines, project workers, vehicles and e-waste dismantling activities

Environmental pollution	Grievances due to pollution as a result of the implementation of the project
Traffic congestion	Grievances related to increased traffic congestion due to delivery of e-waste to the project facility
Discrimination	Grievances arising from discrimination against women or persons with disability or persons of different groupings at workplace. Also, grievances relating to employees feeling targeted due to their race, gender, age, or disability
Occupational health risks	Grievances relating to unsafe and unhealthy working conditions
Odour and nuisance	Grievances relating to unpleasant odours, dust, or other nuisances emanating from the facility, impacting the quality of life and well-being of nearby residents.
Lack of stakeholder engagement or consultation	Grievances relating to perceived lack of consultation, participation, or engagement with affected stakeholders in the decision-making process regarding the project.
Workload	Grievances related to the feeling by employees of being overwhelmed by excessive workloads
Compensation and benefits complaints	Grievances relating to the adequacy or fairness of employee's benefits package including health insurance, retirement plans, and other issues.

Grievance Administration

Greenstretch will be responsible for coordinating the GRM. Greenstretch will assign a Grievance Officer to evaluate the nature of the grievance and take appropriate action in a timely manner.

Table 16: Procedures and timelines for GRM

Step	Actions	Time frame
1. Registration of complaints by GCL will	Grievance or complaint is received and registered in registry book Receipt of complaint is acknowledged	24 hours
2. Initial assessment by GCL	An initial assessment is conducted to establish validity, eligibility or relevance of the grievance received	24 hours
3. Evaluation and Investigation of grievance by GCL	Once grievance or complaint is deemed valid or relevant, an investigation is initiated promptly, to gather relevant information, assess the impacts, and identify potential resolutions.	3 – 5 days
4. Engagement and consultation GCL	During the investigation, aggrieved parties (APs) may be consulted or engaged to provide additional information, clarify concerns, and explore potential solutions.	4 days
5. Recommendation GCL (in collaboration with APs)	Based on the findings of the investigation and consultation, recommendations or resolutions are developed, outlining specific actions or measures to address the grievance.	4 days

6. Review and approval of resolutions by GCL	The recommendations or proposed resolutions are reviewed and discussed internally and then approved by relevant decision-makers within the company management team. Once the recommendations are approved, the Grievance Officer communicates the proposed resolutions to the complainant(s) in writing or through a designated communication channel.	8 days
7. Implementation of remedies by GCL	Upon acceptance of the proposed resolution or recommendation by the complainant(s), implementation of the agreed-upon actions or measures commence.	6 days
8. Follow up and monitoring by GCL	A monitoring and follow-up mechanism is established to track the progress of implementation, assess the effectiveness of the resolution, and address any outstanding issues. Regular monitoring reports are provided to the complainant(s) and relevant stakeholders, with updates provided every [2] months until resolution completion.	Every 2 months
9. Closure and feedback GCL	Once the grievance is satisfactorily resolved and all agreed-upon actions are completed, the Grievance Officer formally closes the complaint. Feedback is sought from the complainant(s) to evaluate their satisfaction with the resolution process and identify areas for improvement in the GRM	2 days

Greenstretch Consultants Limited (GCL) shall ensure to comply with the Grievance Mechanism as described in the Stakeholder Engagement Plan in ESS10 which covers stakeholder engagement and information disclosure.

In line with the grievance mechanism in ESS10, GCL will respond to concerns and grievances of project-affected parties related to the environmental and social performance of the project in a timely manner by proposing and implementing a grievance mechanism to receive and facilitate resolution of such concerns and grievances. GCL will ensure that the grievance mechanism;

- Is proportionate to the potential risks and impacts of the proposed project to establish and operate an e-waste recovery facility.
- Is accessible and inclusive.
- Where feasible and suitable for the project, utilizes existing formal or informal grievance mechanisms, supplemented as needed with project-specific arrangements.
- Addresses concerns promptly and effectively, in a transparent manner that is culturally appropriate
- Is readily accessible to all project-affected parties, at no cost and without retribution.

GCL will further ensure that the mechanism, process or procedure will not prevent access to judicial or administrative remedies. All project-affected parties will be informed about the

grievance process in the course of the community engagement activities, and will make publicly available a record documenting the responses to all grievances received;

Additionally, GCL will ensure that handling of grievances will be done in a culturally appropriate manner and be discreet, objective, sensitive and responsive to the needs and concerns of the project-affected parties. The mechanism will also allow for anonymous complaints to be raised and addressed.

Other key points to note include the following;

- GCL will ensure that Project affected parties or party can submit their grievances in person, by phone, text message, mail, e-mail or via a web site
- A log where grievances are registered in writing and maintained as a database will be used
- GCL will publicly advertised procedures, set out the length of time users can expect to wait for acknowledgement, response and resolution of their grievances;
- GCL will ensure there is transparency about the grievance procedure, governing structure and decision makers; and
- GCL will further ensure that the GRM has an appeals process (including the national judiciary) to which unsatisfied grievances may be referred when resolution of grievance has not been achieved. This will give complainants have the right to use the juridical system of the country in case resolution is not satisfactory, and GCL may provide mediation as an option where users are not satisfied with the proposed resolution.
- GCL will ensure the GRM has a mechanism in place to ensure anonymity of complainants for cases of gender based violence /SEA/SH.

5.8 Grievance Redress Service (GRS)

If project-affected party believe that the proposed project to establish and operate an e-waste recovery facility in Livingstone has or is likely to have adverse effects on them, their community, or their environment, GCL will encourage them to use the World Bank GRS which is an avenue for such individuals and communities to submit complaints directly to the World Bank.

The GRS enhances the World Bank's responsiveness and accountability to project-affected communities by ensuring that grievances are promptly reviewed and addressed. Any individual or community who believes that this project (a World Bank-financed project) has or is likely to, adversely affect them shall be able to submit a complaint. It should be noted that complaints must be in written and addressed to the WB GRS and can be sent by the following methods;

- Online by accessing the online form
- By email to grievances@worldbank.org
- By letter or by hand delivery to the World Bank Headquarters in Washington D.C., United States or any World Bank Country Office by printing and using a form provided this form.

The GRS considers a complaint admissible when:

- The complaint relates to a World Bank-supported project that is under preparation, active, or has been closed for less than 15 months

- The complaint is submitted by individuals or communities affected by a World Bank-supported project, or by their authorized representative; and
- The complainant(s) allege that they have been or will be affected by the World Bank-supported project

Information to include in a complaint

Complaints must:

- Identify the project subject of the complaint
- Clearly state the project's adverse impact(s)
- Identify the individual(s) submitting the complaint
- Specify if the complaint is submitted by a representative of the person(s) or community affected by the project
- If the complaint is submitted by a representative, include the name, signature, contact details, and written proof of authority of the representative.

Supporting evidence is not necessary but may be helpful in reviewing and resolving the complaint. The complaint may also include suggestions on how the individuals believe the complaint could be resolved. All complaints will be treated as confidential. The GRS will not disclose any personal data that may reveal the identity of complainants without their consent.

5.9 World Bank Inspection Panel

The Inspection Panel is the World Bank's independent complaints mechanism whose mandate is to ensure that the voices of people who may be adversely affected by Bank-financed projects are heard, and to promote accountability at the Bank.

The Inspection Panel is a non-judicial body that acts independently, impartially and objectively in evaluating the process followed by the Bank. The Panel does not investigate unless it receives a formal, written Request for Inspection.

The Panel has the power to review Bank-funded projects, and determine whether Bank Management is following the World Bank' s operational policies and procedures including Bank's environmental and social policies (Environmental and Social Safeguard Policies and the Environmental and Social Framework), and all other policies and procedures applicable to the design, appraisal and implementation of a Bank-financed project, which were put in place in order to provide social and economic benefits, and avoid harm to people or to the environment.

In terms of the proposed project by GCL to set up and operate an e-waste recovery facility, the inspection panel will review complainants from;

- Any group of two or more people in the country where the project is located and who believe that, as a result of the Bank's violation of its policies and procedures, their rights or interests have been, or are likely to be, adversely affected in a direct and material way. They may be an organization, association, society or other group of individuals.
- A duly appointed local representative acting on explicit instructions as the agent of adversely affected peoples.
- In exceptional cases, a foreign representative acting as the agent of adversely affected peoples.

- A World Bank Executive Director in special cases of serious, alleged violations of the Bank's policies and procedures.

Requirements for requesting inspection
The Requesters need to show in writing that:

- They live in the project area (or represent people who do), and have been or are likely to be adversely affected by project activities.
- They believe that they may suffer actual or future harm resulting from a failure by the Bank to comply with its policies and procedures.
- Their concerns have been brought to the attention of Bank Management, and they are not satisfied with the outcome.

Format
Requests should be submitted in writing in any language, and no specific form or format is required. The Request should be dated and signed by the Requesters or their representative, and may be submitted via mail or electronically, with any supporting documentation. Requesters may ask for confidentiality in the handling of the Request. The Inspection Panel is not authorized to proceed with requests under certain conditions.

5.10 Baseline Survey on Heavy Metals

The implementation of an electronic and electrical waste (e-waste) management project in Livingstone District by GCL involves the recovery, collection, transportation, storage, dismantling and processing of e-waste that contains both valuable components and toxic substances including heavy metals (mercury, lead, cadmium, and flame retardants) which may pose risks to health and the environment if improperly handled. GCL is committed to ensuring that all project operations are conducted in a safe and environmentally friendly manner, in compliance with all applicable regulations. In this regard, the baseline survey on heavy metals was conducted prior to full project operation. The main purpose of this baseline survey was to assess the existing environmental conditions in terms of heavy metal concentration levels in soil and water in order to keep track and formulate corrective measures where applicable. The assessment of the soil and water samples which were collected at the project site followed by laboratory analysis at the University of Zambia (UNZA), was to determine and analyze the current pollution levels of heavy metals. For the more details about the baseline survey report including the laboratory results, kindly refer to **ANNEX 5** herein.

6.0 ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS AND MITIGATION MEASURES

To manage and effectively mitigate the environmental and social (ES) risks and impacts associated with the proposed establishment and operation of an e-waste facility, Greenstretch Consultants Limited (GCL) shall ensure that the World Bank (WB) Environmental, Health and Safety General Guidelines (WB EHSG) including international Best Available Techniques (BAT) and Best Environmental Practices (BEP) are adhered to and applied duration the project's life cycle. GCL shall ensure that relevant World Bank (WB) Environmental and Social Standards (ESSs), particularly, GCL will ensure strict adherence to ESS1 which covers assessment and management of Environmental and Social risks and impacts, and which sets out the responsibility for GCL for assessing, managing and monitoring environmental and social (ES) risks and impacts associated with each stage of the proposed project to set up and operate an e-waste facility in Livingstone.

GCL will further ensure to promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions as stipulated by ESS2 which addresses issues pertaining to labour and working conditions. Other relevant Environmental and Social Standards (ESSs) that GCL will meet include;

- Environmental and Social Standard 3 (ESS3): Resource Efficiency and Pollution Prevention and Management
- Environmental and Social Standard 4 (ESS4): Community Health and Safety;
- Environmental and Social Standard 10 (ESS10): Stakeholder Engagement and Information Disclosure.

These relevant standards will assist GCL to avoid, minimize, reduce or mitigate the adverse environmental and social risks and impacts of the proposed project.

The environmental and social risks and impacts associated with the establishment and operation of an electronic and electrical waste (e-waste) recovery facility are listed below.

Table 17: Environmental and Social Risks and Impacts

PROJECT PHASE	POSITIVE IMPACT
Planning / Preparatory stage	Involvement of the local authority and other regulatory agencies like ZEMA
Construction phase	Creation of employment opportunities Increased income generation for the local community
Operation phase	Increased income generation for the local community Contribution to the e-waste management sector Creation of employment opportunities Increased awareness programs and activities with stakeholders and the local community on e-waste management issues Contribution to Government through taxes Contribution to Economic Growth Capacity Building and Awareness Campaigns Benefits Creation of awareness benefits regarding e-waste Increased e-waste collection activities at district level Reduced waste management costs for the Local Authorities Improved value of the land on and around the project area

	Improved infrastructure due to improved household income levels Improved public aesthetics Provision of alternative livelihood by creating jobs for most of the local people that depend on charcoal production as a source of income; thereby helping protect the trees of the district and enhancing biodiversity conservation. Reduction in greenhouse gas emissions Reduction in carbon footprint of electrical equipment Contribution to sustainable waste management in the country
Decommissioning phase	Creation of job opportunities for specialists engaged to decommission the facility
PROJECT PHASE	**NEGATIVE IMPACTS AND RISKS**
Planning / preparatory phase	Delays in securing permits and approvals Inadequate planning
Construction phase	Gender Based Violence Occupational accidents, hazards and safety risks Child labour and forced labour Impacts on archaeological and other cultural properties Increased noise generation Reduced Road Safety due to increased traffic
Operation phase	Gender Based Violence Occupational accidents, hazards and safety risks Increased noise generation Child labour and forced labour Spread of communicable diseases and other infections due to influx of workers Increased risks of injuries due to use of project machinery and equipment Increased HIV/AIDS prevalence and other STIs Increased cultural impacts due to cultural differences Reduced Road Safety due to increased traffic Impacts due to waste generation Possible heavy metal contamination Impacts on water quality Impacts due to accidental fire outbreaks Noise generation Impacts on air quality due to dust emissions Impacts due to generation of hazardous materials and wastes Impacts on the environment due to accidental spillage and leakage Soil and groundwater contamination Impacts on flora and fauna / Biodiversity Breeding area for vectors and foul odor due to solid waste generation Accidental spillage of hydrocarbons
Decommissioning Phase	Loss of employment Reduced Road Safety due to increased traffic

Table 18: Environmental and Social Management Plan

CONSTRUCTION PHASE – Environmental and Social Plan

ACTIVITY	ASPECT	ENVIRONMENTAL / SOCIAL IMPACT	MITIGATION MEASURES	RESPONSIBLE PERSONNEL	MONITORING / PERFORMANCE INDICATORS	FREQUENCY OF MONITORING	COST OF MONITORING AND MITIGATION
NEGATIVE ENVIRONMENTAL & SOCIAL IMPACTS							
CONSTRUCTION PHASE							
Installation of 20ft shipping containers at Collection Centers Site branding at the e-waste facility and designated collection sites	Occupational health and safety risks	Noise pollution and Vibration	GCL will ensure contractor provide proper training to the workers GCL will ensure work area is well ventilated Conduct hazard risk assessment and develop safe systems of work Provision of PPE to workers	Contractor	Noise levels within the statutory limit. Records indicating vehicle maintenance Absence of complaints Records of PPE issued to workers	Weekly	USD 200
Installation of 20ft shipping containers at Collection Centers Movement and operation of heavy equipment and trucks Installation of 20ft shipping containers at Collection Centers Installation of machinery & equipment at the facility Site branding at the e-waste facility and designated collection sites	Increased noise levels and vibration from site activities	Noise pollution and Vibration Reduced / Loss of hearing and sleep disturbance	GCL will ensure contractor provide workers with appropriate PPE and make usage of PPE mandatory where workers are exposed to elevated sound levels GCL will regularly monitor noise levels and ensure it does not exceed the maximum allowable limit stipulated by the WB EHS Guidelines Regularly maintain vehicles and equipment to ensure they are working as per manufacturer's specifications Monitor noise levels and ensure they do not exceed the maximum allowable 55 dB during daytime hours and not more than 45 dB in the night in compliance with the WB EHS Guidelines on Noise level guidelines	Contractor	Noise levels within the statutory limit. Records indicating vehicle maintenance Absence of complaints Records of PPE issued to workers	Daily	USD 450
Site preparation and clearing prior to installation of containers at Collection Centers	Stripping of topsoil and removal vegetation	Soil erosion & land disturbance	Limit site clearance to only the area for the placement of shipping containers Minimize soil compaction by avoiding the	Contractor	Presence of covered stripped topsoil Percentage of site cleared	Weekly	USD 150

			movement of heavy vehicles and machinery on wet soils and using wider tires where possible. Preserve topsoil by stockpiling and covering it. Reinstate topsoil after completion of construction works, where possible for landscaping.		vs. site restored.		
Transportation and offloading of materials to site	Reduced ambient air quality due to dust emissions	Air pollution	Provide dust masks to the workforce at points of high dust generation Regularly monitor air quality on the project site through the use of portable monitoring equipment Open burning of waste material at work sites will be prohibited Use low sulfur fuels in construction vehicles and equipment Sprinkle affected or worked areas with water to suppress fugitive dust Ensure construction materials are well covered to prevent littering and cause air pollution	Contractor / Operations Manager	Absence of dust Absence of complaints	Daily	USD 550
Installation of 20ft shipping containers at Collection Centers Installation of machinery & equipment at the facility Site branding at the e-waste facility and designated collection sites Construction / Fabrication of sorting and dismantling tables	Unfair employment	Strain on social facilities due to increased migrant workers Child labour and forced labour Omission of vulnerable groups or persons	Implementation of Labor Management Procedures (LMP) to ensure fair employment opportunities. Establish accessible worker GRM and periodically sensitize workers Prioritize hiring local community members to reduce, where possible, the number of migrant workers towards the project area of influence. Adhere to minimum age when hiring, to avoid forced labour and child labour according to Employment Code Act	Facility / Operations Manager Contractor	Presence of trained first aiders Presence of a first aid kit Records showing local people employed	Weekly	USD 650
	Public health and safety	Psychological and physical harm GBV/SEA/SH	Periodically sensitize workers and community member. Establish accessible project GRM and periodically sensitize workers and community	Facility / Operations Manager Contractor	Records of sensitization initiatives Adherence to the GBV/SEA/SH policy	Quarterly	USD 1000

			Sensitize workers and community on GBV/SEA/SH issues. Establish accessible worker GRM and periodically sensitize workers Introduce code of conduct for workers and signed by project workers.				
Movement of delivery vehicles	Increased traffic	Reduced road safety	Road signs will be used to guide community members and construction workers on proper road use to reduce the risk of accidents A speed limit of 20 Km/hour will be set for vehicles moving within the project area. Ensure drivers are well trained on safe road practices Sensitize community member, especially children, on safe road practices during road use	Facility / Operations Manager Contractor	Records of accidents Presence of safety signage Records of community sensitization conducted Number of trainings conducted with drives of construction vehicles	Daily	USD 450
Movement of delivery vehicles Site preparation and clearing prior to installation of containers at Collection Centers	Oil leaks from delivery vehicles and hazardous chemicals	Surface and groundwater contamination	Except for minor or emergency cases, carry out all repair and maintenance work offsite. Store and handle oil, lubricants, and other hazardous substances in accordance with the Environmental Management (licensing) regulations SI No, 112 of 2013 and the EHSG of the World Bank. Use of non-leaking containers for storage of hazardous chemicals at the construction site The storage area for the hazardous materials will have an impervious floor with bunding.	Facility / Operations Manager Contractor	Absence of material spills on the road Logbook of vehicles accessing the site Absence of oils on the ground	Daily	USD 1200
Movement of delivery vehicles Site preparation and clearing prior to installation of containers at Collection	Oil leaks from vehicles and activities	Soil contamination	Train personnel dealing with oil products (e.g., mechanics, maintenance personnel) in handling and storage oil and hazardous chemicals. All vehicles will refuel at existing fuel stations in Livingstone.	Facility / Operations Manager Contractor	Absence of oils on the ground Presence of dedicated hazardous materials and chemical storage area	Daily	

Centers			Store and handle oil, lubricants, and other hazardous substances in accordance with the Environmental Management (licensing) regulations SI No, 112 of 2013 and the EHSG of the World Bank.				
Installation of 20ft shipping containers at Collection Centers Installation of machinery & equipment at the facility Site branding at the e-waste facility and designated collection sites	OHS risks and poor waste management	Injuries & Accidents Exposure of workers to harmful metal fumes, ultraviolet radiation from the welding arc, burns from hot metal, electrical shock, eye injuries, and potential injuries from flying sparks, resulting in eye, nose and throat irritation, dizziness and nausea Inhalation of paint pigments by workers Soil and water contamination	Ensure to substitute hazardous paint with less hazardous Avoid using dishes, containers or utensils from the kitchen to mix and store paints and pigments. Read the material safety data sheet and label on the application and disposal of empty containers. Training workers in safe painting techniques Provide appropriate PPE for workers including gloves, safety goggles and respiratory equipment. Isolate welding activities using shields	Contractor / Safety Officer	Records of training conducted Established systems of work Risk assessment Form Records of PPE provided Records of less hazardous material used Presence of material safety data sheet labels, and safe application procedures Records of training conducted, and PPE provided. Records of waste disposal	Daily	USD 600
Construction related works including the following Installation of 20ft shipping containers at Collection Centers Installation of machinery & equipment at the facility Site branding at the e-waste facility and designated collection sites	Occupation health and safety	Injuries due to working in confined spaces, falls and trips in open and excavations	Conduct and implement a risk assessment using the risk assessment form in Table 20 Prepare safe working methods Ensure all works are inducted in health and safety including safe excavations including not working close to each other to avoid being hit by a pick Ensure are trained in working in confined spaces and with well outlined procedures Ensure all workers are supplied with appropriate and functional PPE (e.g., safety boots, safety glasses, hardhat, gloves, high visibility vest or work suit)	Facility / Operation Manager / EHS officer / Contractor	Site and task specific risk assessment forms Number of incidents on site Records of safe systems of work Training records including register of participants Records of PPE provided	Daily	USD 1500

			before commencing any task as follows. Hard Hats: Protects the head from impacts and flying debris. Safety Glasses: Shields the eyes from dust, dirt, and small particles. Work Gloves: Provides a better grip on tools and protects hands from blisters and cuts. Steel-Toed Boots: Protects feet from heavy objects and sharp tools. High-Visibility Clothing: Ensures that workers are easily seen by others on the site. Implementing safe work practices to significantly reduce the risk of being hit by a pick during excavation Pre-Task Planning: Before beginning any excavation work, assess the site and identify potential hazards. Develop a plan that outlines safe work methods and assigns specific tasks to each worker. Establishing Safe Zones: Designate areas where tasks, such as digging or tool storage, should be carried out. Ensure that these zones are clearly marked and communicated to all workers. Maintaining a Safe Distance: Workers should maintain a safe distance from each other when using picks. A minimum distance of two meters is recommended to avoid accidental contact. Proper Handling and Storage: When not in use, picks should be stored securely in designated areas. Avoid leaving picks lying on the ground or in walkways where they can cause tripping hazards. Regular Equipment Inspections: Inspect picks and other tools regularly for signs of wear or damage.		Good housekeeping on site		

			Replace any tools that are no longer safe to use. Communication Skills: Encouraging clear and concise communication among workers can prevent misunderstandings and ensure everyone is aware of ongoing activities.				
Construction related works	Community health and safety	Trips and falls in excavation trenches, exposure	Barricade work areas and excavation trenches Install appropriate signage to warn the public about the excavations Ensure to bury excavations within the shortest period of time.	Facility / Operation Manager / EHS officer / Contractor	Number of construction sites barricaded Number of sites with signage Absence of open excavations Presence of spill kits on site Records of refueling at existing service stations Number of trainings held Training attendance registers	Daily	USD 1000

OPERATIONAL PHASE - Environmental and Social Plan

ACTIVITY	ASPECT	ENVIRONMENTAL /SOCIAL IMPACT	MITIGATION MEASURES	RESPONSIBLE PERSONNEL	MONITORING / PERFORMANCE INDICATORS	FREQUENCY OF MONITORING	COST OF MONITORING AND MITIGATION
OPERATIONAL PHASE							
NEGATIVE ENVIRONMENTAL & SOCIAL IMPACTS							
Sorting, dismantling and processing of e-waste equipment	Solid waste generation Generation of unrecovered e-waste	Contamination of groundwater and surface water	GCL will conduct sorting and dismantling operations strictly within the warehouse facility on impermeable surfaces GCL will provide appropriate PPE to project workers Ensure dismantling and sorting processes are dry processes Implement a comprehensive E-Waste Management Plan. (See annex 4) Use designated bins for different waste types. Engage licensed waste collectors Promote recycling and reuse waste materials where possible Containment and Storage: Impermeable Flooring: Use impermeable surfaces for areas where e-waste is stored or processed to prevent leachate from seeping into the ground. Secondary Containment: Install secondary containment systems, such as bunds or dikes, around storage areas to capture any accidental spills or leaks. Ensure that sorting and dismantling operations are pure dry operations to prevent or avoidthe possibility of any liquid percolating through e-waste materials. Surface Water Management; Conduct all activities away from surface water, ensure e-waste handling. Sorting or dismantling operations are dry processes to	Facility / Operations Manager EHS Officer	Quantity of waste segregated Number of training records on e-waste management procedures Impermeable floors in storage and dismantling areas Presence of monitoring wells and results. Soil monitoring results to assess heavy metal contamination of the vicinity	Weekly	USD 2500

			prevent contamination of nearby water bodies. Groundwater Protection: Conduct regular water sample collection and tests to check for contamination and take corrective actions if needed. Liners and Barriers: Where necessary use geomembrane liners and barriers beneath storage and processing areas to prevent contaminants from reaching the groundwater. Operational Controls: Proper Handling Procedures: Train employees on proper handling and processing techniques to minimize the risk of spills and leaks. Regular Inspections and Maintenance: Conduct regular inspections and maintenance of equipment and containment systems to ensure they are functioning correctly. Pollution Prevention: Waste Segregation: Separate hazardous and non-hazardous e-waste to reduce the risk of hazardous substances contaminating water sources. Recycling and Reuse: Maximize recycling and reuse of materials to minimize the amount of waste that needs to be stored or processed Emergency Response Planning Spill Response Plan: Develop and implement a spill response plan that includes procedures for containing and cleaning up spills quickly and effectively Emergency Equipment: Equip the facility with necessary spill response equipment, such as absorbents, booms, and neutralizing agents. Community Engagement and Compliance: Stakeholder Engagement: Engage with local communities and stakeholders to inform them about the measures in place and address any concerns.				

			Regulatory Compliance: Ensure compliance with all relevant environmental regulations and standards to prevent legal and environmental issues. Raise awareness among the local community about the importance of proper e-waste disposal and its impact on water quality and sanitation Educational campaigns and outreach programs can empower individuals to adopt responsible e-waste management practices, ultimately contributing to the preservation of water resources and the maintenance of a clean and healthy environment				
Sorting, dismantling and processing of e-waste equipment	Labour and OHS risks	Injuries associated with work activities	GCL will develops and implements a Labour Management Plan (LMP) in accordance with national laws and the World Bank ESS2 GCL will regularly review and update the LMP to align with changes in labour regulations, industry best practices, or operational requirements. Ensure the LMP remains relevant and effective in managing labour-related risks during the operational phase. Implement OHS monitoring and improvements: Maintain ongoing OHS monitoring and risk assessments to identify and address emerging hazards or issues related to working conditions. Additionally, implement corrective and preventive measures to enhance OHS performance and maintain a safe working environment, in accordance with ZEMA regulations and the World Bank EHS General guidelines on section 2.0 – Occupational Health and Safety Promote worker engagement and feedback: Encourage worker participation and feedback in decision-making processes related to labour practices and working conditions. Foster open and transparent dialogue between management and workers to address concerns and	Facility / Operations Manager EHS Officer	Number of training records on e-waste management procedures Number of complaints recorded Number of injuries recorded	Weekly	USD 2000

			continually improve workplace conditions. Maintain a grievance redress mechanism (GRM): Continue to operate and promote accessible grievance redress mechanisms for workers to report any concerns or violations during the operation phase. Promptly investigate and resolve grievances and implement corrective actions as necessary. Conduct periodic audits and assessments: Engage independent third-party auditors or the occupational health and safety department under the Ministry of Labour and Social Services to conduct periodic assessments of labour practices and working conditions during the operational phase. Use findings from these assessments to identify areas for improvement and implement corrective actions.				
E-waste sorting and dismantling operations	Possible heavy metal contamination	Land contamination	GCL will ensure dismantling processes are dry processes and are done on impermeable surfaces Provide suitable PPE to workers Restrict entry to the warehouse Only trained personnel to handle sorting and dismantling operations Manage and store hazardous substances in accordance with the Environmental Management (licensing) regulations SI No. 112 of 2013 and the EHSG of the World Bank.	Facility / Operations Manager EHS Officer	Training records on proper e-waste management No. of contaminated site clean-up works done Records on bioremediation	Weekly	USD 3500
E-waste dismantling, shredding and handling operations	Reduced ambient air quality due to dismantling operations	Air pollution	GCL will regularly monitor air quality on the project site through the use of portable monitoring equipment like dust collectors GCL will use dust collectors to collect dust particles GCL will provide workers with suitable PPE Proper ventilation and air filtration systems: Effective ventilation systems equipped with high-efficiency particulate air (HEPA) filters should be installed at holding facilities to capture and remove airborne	Facility / Operations Manager EHS Officer	Absence of sick notes Dust levels within the statutory limits No. of complaints	Daily	USD 1500

			particulates, heavy metals, and other pollutants generated during e-waste handling and dismantling processes. Emission control equipment: The use of emission control equipment, such as scrubbers, cyclones, or baghouse filters, is essential to remove pollutants from exhaust streams before their release into the atmosphere. Enclosed processing areas: Conducting e-waste dismantling and shredding operations within enclosed areas or structures is advisable to contain and control the release of dust, particulates, and other airborne contaminants. Dust suppression techniques: Implementing dust suppression measures, including water spraying or misting systems, can effectively minimize the generation and dispersion of dust during the handling and processing of e-waste. Proper waste storage: E-waste materials should be stored in covered containers or designated areas to prevent the release of pollutants into the air due to external disturbances such as wind. Restriction on open burning: The open burning of e-waste materials, which can release toxic fumes and persistent organic pollutants into the air, must be strictly prohibited. GCL will comply with regulations by adhering to relevant air quality regulations, emission standards, and permitting requirements established by local, national, WB EHSG or international authorities is critical.				
Operation of machines and equipment	Worker injuries and health risks	Occupational health and safety	Provide facility workers with appropriate PPE GCL will conduct and implement a risk assessment using the risk assessment form in Table 20 Conduct regular safety training and drills	EHS Officer	Machine maintenance and safety checks Number or records of PPE issued Training and certification	Quarterly	USD 800

			Install emergency showers and eye wash stations Install proper signage and barricade hazardous areas Ensure machinery is fixed with emergency stop buttons All rotating parts to have safeguards Machine operating instructions to be visibly displayed		of staff		
Use of electronic scrap shredder and baling machine	Risks of equipment related injuries Noise and vibrations	Mechanical hazards	Install safety guards and emergency stop buttons on machines. Conduct regular maintenance and inspections. Train workers on safe operation procedures. Provide first aid facilities and trained personnel Noise barriers and enclosures: Installing soundproof barriers or enclosures around noisy equipment, such as shredders, granulators, or compactors, can help contain and reduce the propagation of noise. Acoustic insulation: Applying acoustic insulation materials to walls, ceilings, and floors of the facility can help absorb and dampen noise levels within the premises. Strategic equipment placement: Strategically placing noisy equipment away from sensitive areas, such as offices or residential areas, and positioning them in dedicated noise-controlled zones can minimize the impact of noise on workers and nearby communities. For example, the centre is in a light industrial area, where citizens are used to light noises. Noise-reducing equipment: Investing in equipment and machinery that are designed to operate with lower noise levels or incorporating noise-reducing technologies, such as sound-dampening enclosures or vibration isolators.	Facility / Operations Manager EHS Officer Facility / Operations Manager EHS Officer	Presence of a first aid kit Presence of a trained first aider Presence of safety signage Number of decibels recorded Presence of acoustic insulation on equipment Facility location in light industry area Procured lower noise level equipment Maintenance and lubricating schedule and records Noise monitoring plan Records of PPE provided	Weekly	USD 150

			Maintenance and lubrication: Regular maintenance and proper lubrication of machinery and equipment can help reduce excessive noise levels caused by friction, wear, and tear. Scheduling of noisy activities: Scheduling noisy operations, such as shredding or compacting, during times when the impact on nearby communities is minimized, such as during daytime hours or avoiding weekends and holidays. Personal protective equipment (PPE): Providing workers with appropriate PPE, such as earplugs or mufflers, to protect them from excessive noise exposure within the facility. Noise monitoring: Implementing a noise monitoring program to regularly measure noise levels within the facility and at the facility boundaries, allowing for the identification of noise hotspots and the implementation of targeted mitigation measures. Buffer zones: Establishing buffer zones or green belts around the facility by planting trees or constructing earth berms, which can help absorb and attenuate noise propagation to nearby areas. Community engagement: Maintaining open communication with nearby communities,				
Storage of e-waste materials like batteries	Increased risk of fire	Fire hazard	GCL will handle & store wastes in accordance with e-waste management plan (EWMP) in place GCL will train workers in SOP in place GCL will install fire detection and suppression systems (fire extinguishers) Store flammable materials away from ignition sources. Conduct regular fire drills and training Maintain clear and accessible emergency exits.	Facility / Operations Manager EHS Officer	Segregation of e-waste Presence of fire safety signage Records of fire drills & training conducted	Weekly	USD 650

Delivery of e-waste to site	Increased traffic	Reduced road safety	GCL will use road signs to guide community members and project workers on proper road use to reduce the risk of accidents. A speed limit of 20 Km/hour will be set for vehicles moving within the project area. Ensure drivers are well trained on safe road practices Sensitize community member, especially children, on safe road practices during road use	Facility / Operations Manager EHS Officer	Records of accidents Presence of safety signage Records of community sensitization conducted Number of trainings conducted with drives of construction vehicles	Weekly	USD 800
Truck loading activities	Soil degradation	Compacted soil, soil erosion and sedimentation	Truck Unloading Area Design: GCL will designate specific areas for truck unloading. These areas should be designed with impermeable surfaces, drainage systems, and sediment control measures to prevent soil compaction and erosion in surrounding areas. Vehicle Movement Restrictions: Implement traffic management plans to restrict vehicle movement to designated paved or compacted areas, thereby minimizing soil compaction in sensitive regions. Vegetative Cover: Maintain a vegetative cover, such as grasses or ground covers, on exposed soil areas within the facility's premises to stabilise the soil and prevent erosion caused by wind or water runoff. Mulching: Apply a layer of mulch (e.g., wood chips, straw, or gravel) to exposed soil surfaces to protect the soil from erosion caused by wind and water. Stabilized Construction Entrances: Construct stabilized entrances and exits at the facility using materials like gravel or stone to prevent soil from being tracked onto adjacent roads by vehicles, thereby reducing the potential for erosion and sediment transport. Stormwater Management: Implement a stormwater management plan that includes measures to control the volume and velocity of runoff, such as retention				

			basins, infiltration trenches, or permeable paving. Routine Inspections and Maintenance: Conduct regular inspections and maintenance of erosion control measures to ensure they function properly, making necessary repairs or replacements as needed. Regularly monitor soil conditions and implement maintenance activities such as tilling or aeration to prevent excessive soil compaction and promote soil health.				
Recruitment of project workers	Unfair employment	Influx of workers exploiting vulnerable persons	GCL will Implement the Labor Management Procedures (LMP) to ensure fair employment opportunity in accordance with WB ESS2 and Zambian labour laws establish accessible worker GRM and periodically sensitize workers and ensure minimum age for employment in preventing forced labour and child labour	Facility / Operations Manager HR Manager	Number of complaints	Weekly	USD 550
Recruitment of project workers	Public health and safety	Psychological and physical harm GBV/SEA/SH	GCL will periodically sensitize members of staff and community member. GCL establish accessible and dedicated GRM and periodically sensitize community Sensitize workers and community on GBV/SEA/SH issues. Establish accessible worker GRM and periodically sensitize workers Introduce code of conduct for workers and signed by project workers.	Facility / operations Manager EHS Officer HR Manager	Records of sensitization initiatives Adherence to the GBV/SEA/SH policy	Quarterly	USD 550
Collection and transportation of e-waste	Risks of spillage in transit	Waste littering Reduced road safety	GCL will use trained and licensed truck drivers GCL will use appropriate collection vehicles e.g., container trucks or vehicles with canopy Secure the consignment with appropriate packaging to avoid spillage in transit	EHS Officer	Absence of complaints Presence of spillage	Daily	USD 400

DECOMMISSIONING AND DEMOBILIZATION PHASE - Environmental and Social Plan

ACTIVITY	ASPECT	ENVIRONMENTAL /SOCIAL IMPACT	MITIGATION MEASURES	RESPONSIBLE PERSONNEL	MONITORING / PERFORMANCE INDICATORS	FREQUENCY OF MONITORING	COST OF MONITORING AND MITIGATION
DECOMMISSIONING AND DEMOBILIZATION PHASE							
Operation of equipment at decommissioning stage	Reduced / loss of hearing due to elevated noise levels	Noise pollution	GCL shall ensure provision of suitable PPE for the workers and members of staff. Where workers are exposed to elevated sound levels, use of personal protective equipment such as earmuffs/plugs will be mandatory. Noise levels will be monitored to ensure that they do not exceed 55 dB (WB Environmental, Health, and Safety (EHS) Guidelines, Noise level guidelines) during daytime hours and not more than 45 dB in the night. Operation hours for the construction phase will be limited to daytime hours.	Contractor	Records of PPE issued Noise levels below 55dB during daytime and not more than 45 dB in the night Presence of safety signage showing the required PPE	Weekly	USD 1000
Uninstallation of 20ft shipping containers and other machinery	Risks of equipment related injuries	Mechanical hazards	GCL will install safety guards and emergency stop buttons on machines. Conduct regular maintenance and inspections. Train workers on safe operation procedures. Provide first aid facilities and trained personnel	Contractor	Absence of complaints Absence of accidents	Daily	USD 1200
	Risks of injuries due to uninstallation works	Mechanical hazards		Contractor	Absence of complaints Absence of accidents	Daily	
	Public health and safety	Health and safety hazards	Strict entry to work sites & Install safety signage Limit work hours to daytime only	Contractor	Absence of complaints Absence of accidents	Daily	USD 800
Demobilization activities	Project closure	Loss of income upon demobilization	Where possible, provide alternative employment Train employees in skills to enable them take up new employment	Contractor / GCL	Absence of complaints	Weekly	USD 550

NB: The mitigation budget has been estimated. The source of financing will be EHPMP grant. Greenstretch Consultants Limited (GCL) current activities will also generate resources that will be used to finance mitigation and monitoring costs.

7.0 EMERGENCY RESPONE PLAN AT OPERATIONAL PHASE

The operation of an e-waste recycling facility present hazards /risks with potential to generate an emergency, therefore, the emergency response plan has been prepared to assist project management in case of an emergency during operation stage.

Table 19: *Emergency Response Plan*

No.	Emergency situation	Cause	Proposed response	Respondents
1	Staff injury	Failure to adhere to safety procedure Unskilled labour Faulty equipment Sheer accident	For minor injuries apply appropriate First Aid For major injuries take to hospital Document incidence Immediately inform the World Bank about serious incidents or accidents that occur related to EHS and social matters Notify ZEMA and other relevant local authorities	Key Respondent: Site Supervisor Other Respondents: Facility Manager, Hospital staff, Zambia Police
2	Fire Outbreak	Failure to adhere to safety procedures Faulty electrical connections Poor storage of e-waste materials especially batteries	Sound alarm and instruct all to assemble at Fire Assembly point Conduct roll Call Fight the fire using appropriate tools fire extinguisher, sand, water Inform Zambia Police and Livingstone City Council Identify and implement measures to address emergency events i.e., to address unanticipated incident, arising from implementation of project in the form of fire	Key Respondent: Site Supervisor Other Respondents: Facility Manager, Livingstone City Council, Zambia Police
3	Accidental spillage	Failure to adhere to safety and handling procedures Leaking batteries and their poor storage Leakage from defective containers. Neglect of safety procedures Inadequate waste storage receptacles for hazardous waste	Switch of power, Stop all operations Create sand bunding around spillage point Scoop or sponge/soak out spilled product Clean up site/spill using proper spill kits Document incidence Identify and implement measures to address emergency events i.e., to address unanticipated incident, arising from implementation of project in the form of spills	Key Respondent: Site Supervisor Other Respondents: Facility Manager, Livingstone City Council, ZEMA
4	Eye contact with hazardous materials on site, petroleum products, ingestion and inhalation	No protective clothing Failure to adhere to safety procedures	Eye contact: Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Ingestion: Wash out mouth with water Sodium Sulphate). Give plenty water Chrome Sulphate) do not induce vomiting for both. Seek medical attention as soon possible. Inhalation: Keep victim in well-ventilated area Document incidence	Key Respondent: Site Supervisor Other Respondents: Facility Manager, Hospital staff, Zambia Police

8.0 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

Greenstretch Consultants Limited (GCL) shall have a duty to ensure, so far as is reasonably practicable, the health, safety and welfare of all employees at the workplace, in line with the Zambia's Occupational Safety and Health (OSH) legislation, particularly the Occupational Health and Safety Act and the Factories Act, and also in accordance with the World Bank Environmental Health and Safety (EHS) General Guidelines.

8.1 Hazards Control Measures

Risks are part of everyday life, therefore, GCL shall ensure that the main risks are identified and managed responsibly to safeguard the health and safety of workers. The means by which this will be achieved is by using the hierarchy of controls which starts with elimination as the most effective method, then substitution, isolation, engineering controls, administrative controls and lastly personal protective equipment (PPE), the least effective control measure.
GCL will maintain high standards of OHS at the facility by applying the following safety measures, prioritizing the most effective controls.

Elimination of hazards: Ensuring the hazard no longer exists by:

- Ending the use of a hazardous material
- Doing work at ground level rather than at heights
- Stopping the use of noisy processes

Substitution of hazards: Reducing hazard by changing out a material; via.

- Switching to a less hazardous material
- Switching to a process that uses less force, speed, temperature, or electrical current

Engineering Controls: Reducing exposure by preventing hazards to workers via:

- Noise enclosures
- Local exhaust ventilation
- Machines guards
- Interlocks
- Life equipment

Administrative Controls: Giving workers more information by providing them with.

- Procedures
- Training
- Warning

Personnel Protective Equipment (PPE)

Protect workers by using the following equipment.

- Safety glasses, shoes and gloves
- Respirators
- Hearing protection
- Protective clothing, and Hardhats

Standard Operating Procedures (SOP)

Adhering to the SOP that encompasses

- Comprehensive training for all staff on safety protocols and compliance requirements.
- Regular inspections to identify and address any potential hazards promptly.
- A robust emergency response plan to handle any unexpected incidents effectively.

Safety Signage

Installing clear and appropriate signage throughout the workspace, with.

- Instructions for mandatory PPE use,
- hand washing stations to ensure hygiene, and
- Clearly marked segregation zones to safely manage materials and waste

Risk Assessment

GCL shall assess and control risks and hazards to ensure that storage, transportation and processing of e-waste prevents harm to human health and the environment. A comprehensive risk assessment shall be undertaken bi-annually by a qualified specialist. The assessment will cover the risks and impacts associated with;

- This proposed project in general
- The operation of the e-waste facility with its segments like the receiving, loading, storage, dismantling, and weighing station as well as risks and impacts from shredding and sorting activities, and
- The installation, operation, maintenance and decommissioning of the Collection Centers, and others

After the assessment, corrective actions as well as specific management measures shall be put in place. GCL shall review risk assessments at least annually, or after accidents, near misses and when significant changes in personnel or work practices occur. The following risk assessment form (Table 17) shall be utilized, where necessary the form will be revised accordingly. The main purpose of the risk assessment form as an important tool, will be to identify and assess potential risks that the proposed project to set up and operate an e-waste facility may pose to human life, wildlife and the environment, and to develop effective mitigation measures. This form will also be used to identify and assess potential risks and hazards that the installation, operation, maintenance and decommissioning of the e-waste Collection Centers may pose on human life, wildlife and the environment, and to develop mitigation measures.

The Risk Assessment Form will be used to assist GCL comply with health and safety laws and regulations, and by correctly using this form to carry out the risk assessment process, GCL will be able to make the e-waste facility and the e-waste Collection Centers a safer and healthier workplace.

The risk assessment form shall be used during operational and decommissioning phases of the project. A competent personnel shall be engaged to undertake risk assessments. The duty holder shall use the said form as a template for recording precautions, controls, training, instructions, the provision of information, systems and procedures, and identify related hazards, potential hazards and risks.

Table 20: Risk Assessment Form

No.	Hazard	Possible effects/harm	Risk rating H, M, L	Detail existing controls	Detail further action required to reduce risk	Revised risk rating H, M, L

The health and safety of all project workers at all project cycle is one of priority areas for GCL. Assessing the risks /hazards associated with the establishment and operation of the e-waste facility in line with the Zambian OSH legislation will be very critical for the success of the project. Section 15 of the Occupational Health and Safety Act states that in determining what is, or was, at any particular time, reasonably practicable in relation to ensuring health and safety at a workplace, regard shall be to the following matters:

i. The likelihood of the hazard or risk concerned occurring
ii. The degree of harm that would result if the hazard or risk occurred
iii. What the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk
iv. The availability and suitability of ways to eliminate or reduce the hazard or risk
v. The cost of eliminating or reducing the hazard or risk.

Risk assessments shall be carried out using the following five-step risk assessment procedure;

- Step 1: Identify the hazards
- Step 2: Decide who might be harmed and how
- Step 3: Evaluate the risks and decide the controls
- Step 4: Record findings and implement them
- Step 5: Review the assessment and update if necessary

Hazards shall be identified using the risk assessment template and form

Risk Assessment Matrix

The three-point (or 3 x 3) matrix is a tool that shall be used to carry out the risk assessment. The 3-point risk matrix outlined in Annex 2 shall be used in determining the risk rating of hazards. The risk matrix is a block diagram with two axes, each ranked Low, Medium and High. The vertical axis represents the likelihood or probability of the event occurring while the horizontal axis represents the severity or seriousness of injury/illness/damage arising from exposure to the hazard. Each of the rankings is numbered as follows: Low – 1; Medium – 2; and High – 3.

To get the risk rating, one multiplies the value representing the likelihood of the event occurring (vertical axis) by the value representing the severity of the injury, illness or damage (horizontal axis). For example, if the likelihood of meeting with a road traffic accident when driving on a

poorly maintained road is High - 3 (accidents are a frequent occurrence on the road in question) and the severity of exposure to such an accident is also High - 3 (potentially fatal or serious injury), a risk rating of 9 (3 x 3) would be obtained.

After risk assessing each of the hazards identified on the project, the hazards shall be grouped into the three (3) zones illustrated in Table 18 below. Hazards with a High-risk rating of 6 – 9 (Red Zone) will receive immediate attention and be subjected to the corresponding recommended action in the table. Hazards with a Medium risk rating of 3 – 4 (Orange/Amber Zone) will be rectified as soon as possible, and Hazards with a Low-risk rating of 1 – 2 (Green Zone) will receive attention once the hazards posing higher risks have been dealt with.

Transferring Hazards to Risk Assessment Form

Table 21: Risk Assessment Table

Risk Assessment Template						
What are the hazards?	**Who might be harmed and how?**	**What are you already doing to control the risks?**	**What further action do you need to take to control the risks?**	**Who needs to carry out the action?**	**When is the action needed by?**	**Done**

An example of the risk assessment template is tabulated above. This template shall be used for carrying out a risk assessment in a systematic manner. Once the risk assessment is done, the hazard will be transferred onto the Risk Assessment Form in Table 17 above.

Table 22: Risk rating and ranking

Evaluation of the potential impact and likelihood of harm occurring.

Risk rating	Ranking	Action required	Recommended Action
High (H) (High Risk Rating 6-9) For example, fatality possible to one or more individuals however infrequent major injury to few individuals occurring frequently Likelihood of long term muscular-skeletal problems affecting significant numbers of staff.	H	Immediate action required.	Rigorous scrutiny of control measures required to ensure risk is as low as reasonably practicable (ALARP), improve control measures where possible; consider stopping work. Conducting activities at this level of risk may require formal approval from the appropriate management level.
Medium (M) (Medium Risk Rating 3 -4) For example, major injury to one/few individuals occurring infrequently Likelihood of long term muscular-skeletal problems affecting some staff.	M	Requires attention as soon as possible.	Review control measures and improve if reasonably practicable to do so, consider alternative ways of working.
Low (L) (Low Risk Rating 1 – 2) For example, minor injury occurring infrequently to few staff.	L	Not a priority, may need attention if not as low as reasonably practicable.	Maintain control measures and review regularly or if there are any changes.

9.0 DECOMMISSIONING AND CLOSURE PLAN

If decommissioning of the facility is inevitable, the major decommissioning and closure activities shall include removal of erected structures and all equipment with commercial value. Greenstretch shall ensure that all health and safety legislation which have a bearing on the decommissioning of the proposed project are considered and reviewed, this shall include the principal environmental regulation including other relevant regulations. The decommissioning of the facility shall be done in consultation with stakeholders and relevant authorities such as ZEMA, Livingstone City Council and other government agencies, who will be notified about the intention to cease project activities. GCL estimates that about 5% of total grant would be required for decommissioning and closure activities. The project closure activities are stated in the table 19 below.

Table 23: Decommissioning and Closure Plan

Phase	Aspect	Activity	Responsible Party
Decommissioning and Demobilization Phase	Buildings	▪ Removal of installed structures (dismantling tables) and other equipment of commercial value including ▪ Painting of the warehouse and handling it back to the property owner ▪ Removal of office furniture, tables, chairs etc. ▪ Clean up works and installing of damaged fittings and warehouse items ▪ Treatment of hydrocarbon contaminated portions covering the project site ▪ Removal of all the reusable items such as the generator, core cutting machines	Contractor
	E-waste Facility Equipment	▪ Removal of all machines such as shredder, baler machines and crushers ▪ Removal all installed twenty-foot shipping containers used as buying points at designated locations across the district	Contractor
	Bioremediation & clean up works	▪ Bioremediation works on all contaminated sites ▪ Restoration of project site to its original state	Contractor / Environmental Expert
	Consultation and engagement of key stakeholders & IAPs	▪ Holding meetings with stakeholder about the project closure ▪ Alerting the public about the decommissioning of the project	GCL
	Supervision	Supervision labour costs	Social Expert
	Environmental Monitoring	Environmental monitoring during decommissioning and closure	Environmental Expert
	Preparation of Closure Reports	Preparation of closure reports for submission to ZEMA and the local authority	GCL
	Post-Closure Monitoring	Post-closure monitoring (1 inspection per year for 3 years	GCL
Operational Phase	Maintenance of Warehouse & Support Facilities	Periodic structure monitoring and maintenance Refurbishing and repainting of the warehouse	GCL / Operations Manager
	Commissioning of processing Equipment	Installation and operationalization of the processing equipment (electronic scrap shredders & crushers, balers, conveyor system etc.)	GCL Management

10.0 ESMP IMPLEMENTATION, SUPERVISION AND MONITORING

Greenstretch Consultants Limited (GCL) management will be responsible for the implementation of the ESMP throughout the project cycle. Implementation of the ESMP will be supervised by the Environmental Health and Safety (EHS) Officer assisted by the Facility / Operations Manager. Any contractor engaged shall be required to adhere to the ESMP or to prepare an updated ESMP as per the tender documents issued.

The monitoring of the implementation of the ESMP will also be done by the following institutions namely:

- The Livingstone City Council (LCC).
- The Zambia Environmental Management Agency (ZEMA).
- The Ministry of Labour and Social Security.
- Greenstretch Consultants Limited (GCL).

10.1 ESMP Monitoring and Implementation Arrangements

Table 24: ESMP Monitoring and Implementation Arrangements

Institution	Role
Zambia Environmental Management Agency	▪ To enforce environmental regulations and ensure that the project complies with the Environmental Management Act of Zambia ▪ To approve submitted ESMP and compliance monitoring through periodic inspections and audits and ensure that the ESMP is implemented as approved. ▪ To regularly monitor and ensure compliance with the decision letter / Approval conditions and licenses issued to GCL ▪ To request for updates to the ESMP if there are significant changes in the project scope, activities, or environmental conditions during implementation.
Livingstone City Council	▪ To enforce the Public Health Act including the issuance of trading, fire, health and business permits ▪ To regulate, control and plan for the development and use of land and buildings within its jurisdiction (District). ▪ To prepare and implement integrated development plans, local area plans and sectoral plans in accordance with the Act. ▪ To receive and process applications for planning permission for the development of land; and ▪ To promote and facilitate sustainable land use in accordance with the Act and any other written law.
Greenstretch Consultants Limited	▪ To ensure that tender documents include the ESMP and the cost of ESMP implementation is included in the contract. ▪ To ensure that contracts include a condition to implement and comply with the ESMP, including the preparing of Contractor Environmental and Social Management Plan and Health and Safety Management Plan prior to commencement of works.
The Ministry of Labour and Social Security And the Occupational Health and	▪ To formulate policies on Occupational Health and Safety ▪ To enforce of labour laws ▪ To ensure compliance with the national OHS regulations. ▪ To conduct workplace inspection and audits of the project sites to assess compliance with workplace safety requirements. ▪ To identify and manage workplace hazards, including those related

Safety Services department	to the handling of solid waste materials ▪ To ensure reporting and record-keeping of any workplace accidents, injuries, and health-related issues.

10.2 ESMP Supervision and Monitoring

Supervision and monitoring are a key component of the ESMP during project implementation. Monitoring should be undertaken during the implementation phase to authenticate the effectiveness of impact management, including the extent to which mitigation measures are being successfully implemented. During the implementation, the hired independent verification agency will verify the presence and compliance of ESMP and the implementation of mitigating measures during operation, in addition to verifying the achievement of the agreed results. The aim of monitoring will be to:

- Improve environmental and social management practices.
- Provide the opportunity to report the results on safeguards and impacts and proposed implementation of mitigation measures

Compliance Monitoring

This is to authenticate that the required mitigation measures, which are the environmental and social commitments agreed on are being adhered to. A monitoring checklist will be developed for compliance monitoring. The PIU will be responsible for undertaking compliance monitoring.

Impact Monitoring

Monitoring of the project impacts mitigation measures should be the duty of the PIU. The Environmental and Social Safeguards agreed in the contract specifications should be monitored to ensure that works are proceeding in accordance with the laid down mitigation measures. The PIU will ensure that the project implementers submit reports on work progress and any challenges in observing the Environmental and Social Safeguards. The monitoring results should form a major part of the reports to be submitted to the Monitoring and Evaluation (M&E), PIU and shared with the World Bank.

Cumulative Impacts Monitoring

The impacts of the proposed project on the environmental and social resources within the project areas should be monitored with consideration to other developments which might be established or already existing. There should be collaboration between the PIU and GCL to compare Environmental and Social Safeguards guiding the project implementation to ensure coordinated and comprehensive management of cumulative impacts.

Annual Monitoring and Reviews

Environmental and social monitoring needs to be carried out during the implementation of the project. Monitoring of the compliance of project implementation with the mitigation measures set out in the ESMP will be carried out by the PIU, where relevant, jointly with the support from key stakeholders like the Livingstone City Council. Compliance monitoring comprises on-site inspection of activities to verify that measures identified in the ESMP are being implemented. One of the monitoring tasks is to ensure that the technical supervisor is achieving the required standards and quality of work. The PIU will oversee the inspections. An annual

inspection report must be submitted (together with the monitoring report) to the World Bank for review and approval. Annual reviews may be carried out by an independent consultant or other service provider that is not otherwise involved with GCL. The purpose of the reviews is to: -

- To assess compliance with ESMP procedures, learn lessons, and improve on the ESMP performance.
- To assess the occurrence of, and potential for, cumulative impacts due to project-funded and other development activities.

The annual reviews will be a principal source of information to the PIU for improving performance. Thus, they should be undertaken after the annual report on monitoring has been prepared and before World Bank supervision of the project.

10.3 Proposed Training and Capacity Building

Capacity building will be in the form of training seminars/ workshops and short courses for GCL to be able to successfully implement environmental and social aspects of the project. The proposed training modules will cover among others:

- World Bank safeguards policies and ZEMA environmental regulations and other relevant national legislation including OHS.
- E-waste handling, transportation, dismantling, and processing
- E-waste recovery and recycling
- Environmental and Social (ES) monitoring, safeguards and training
- Code of Conduct, incident reporting, SEA/SH, application of ESMP and Environmental Checklist

10.4 Estimated Budget for ESMP implementation

Table 25: Estimated budget for ESMP Implementation

Activity / Cost Item	**Estimated Cost (USD)**
EHS management plans	5500
Purchase of Personal Protective Equipment (PPE)	3700
Purchase of Environmental Monitoring Equipment	1100
Training, educational programs and capacity building	4500
Community awareness and sensation	9000
Stakeholder Communication and Outreach	2500
Relevant Consultancy Services	15000
Total Cost	41, 3000

10.5 Incident Reporting

The PIU needs to ensure GCL has established incident reporting procedures. In case of an incident or accident related to a project that has or is likely to have a significant adverse effect on the environment, affected communities, the public, or workers, GCL will inform the PIU within 24 hours who should then inform the Bank.

10.6 Notification to the Bank

The PIU will notify the Bank electronically within 48 hours of becoming aware of the incident or accident. Include details about its nature, circumstances, and any actual or potential effects or impacts.

Any severe injury (requiring off-site medical care) or fatality incident shall be reported to the Bank within 24 hours with basic information. A detailed incident report including the following will be submitted within 10 working days:

- Detailed incident report with a root cause analysis.
- Corrective action plan on immediate mitigation measures in case of continuing danger (e.g., fencing, signboard, guards), compensation to the affected family based on a clear rationale, risk assessment and correct application of ESHS management procedures. Medium and long- term mitigation measures including enhancement of safety measures, audits, and additional training.

These procedures ensure that incidents and accidents are managed effectively, and appropriate measures are taken to prevent future occurrences.

11.0 CONCLUSION

GCL management shall ensure that the proposed mitigation measures in this ESMP are implemented and monitored throughout the project lifecycle. Implementation of the ESMP will ensure avoidance or minimization of negative impacts and risks and enhancement of positive impacts. Adequate stakeholder engagement will also be conducted throughout the project lifecycle.

GCL shall promote and adhere to GIIP and applicable WB ESHS, the project will include a number of mechanisms to address concerns and grievances arising in connection to the proposed project. Project-affected parties will have access to project grievance mechanisms and GCL will implement the GRM as described in the World Bank Stakeholder Engagement Plan. Further, GCL shall comply with applicable World Bank EHS Guidelines including the standards (ESSs) that apply to the project. Through application of the ESS, GCL will ensure the following:

- Achieve good international practice relating to Environmental & Social Sustainability.
- Fulfil both national and international Environmental & Social obligations.
- Enhance non-discrimination, participation, accountability, transparency etc.
- Enhance sustainable development outcomes of the project through stakeholder engagement.

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13.0 ANNEX 1 - HAZARD IDENTIFICATION TABLE

Hazard Identification Table

Table 26: Hazard identification table

Type of Hazard	Hazard identified on the project site / task
Biological	Diarrheal transmission Dust inhalation Exposure to mosquitos (Malaria) and other biting insects Exposure to sewage or human and animal faeces (E. coli, Hep A) Airborne pathogens such as common colds and Covid-19
Chemical	Fuel handling Exposure to wet cement Exposure to other harmful substances Refuse and waste sites
Physical	Hot and cold temperature extremes throughout the year Noise from machinery, power tool or vehicle Electric shock from direct contact with overhead lines, underground cables or faulty machinery Fall from heights (into an excavation, from vehicles, bridge) Hit by moving objects (plant, vehicles – on site and off site) Hit by flying objects (shards from grinder, stones etc.) Hit by falling material (from a vehicle) Trapped or caught in a moving object (plant machinery working parts of a machine working parts) Vibration from the use of equipment or vehicles Burns
Safety	Slips, trips and falls (obstructions on site, spills left unattended, poor condition of footwear) Equipment breakdown Material and manual handling Collapsing excavations Failure to use PPE Over exertion (lifting, pulling, pushing, carrying, repetitive motions)
Other	Working alone Working at night Driving off site and on public roads Violent situation New equipment or vehicle Fire (caused by smoking, electrical faults, fuel ignition etc) Chemical spill or release (i.e. fuel spill) Worker welfare (sanitary, washing facilities, drinking water, rest facilities)

14.0 ANNEX 2 – THREE POINT RISK MATRIX

Three-Point Risk Matrix

Table 27: Three Point Risk Matrix

High	Common, regular or frequent occurrence	3	3 Medium	6 High	9 High
Medium	Occasional occurrence	2	2 Low	4 Medium	6 High
Low	Rare or improbable occurrence	1	1 Low	2 Low	3 Medium
Risk Matrix Likelihood X Severity			1	2	3
			Minor injury	Serious injury or illness	Fatalities, major injury or illness

15.0 ANNEX 3 – CAPACITY GAPS ASSESSMENT

CAPACITY GAPS ASSESSMENT

IN RESPECT TO

THE ENVIRONNMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR THE ESTABLISHMENT AND OPERATION OF AN E-WASTE RECOVERY, COLLECTION, TRANSPORTATION, DISMANTLING AND PROCESSING FACILITY IN LIVINGSTONE DISTRICT BY GREENSTRETCH CONSULTANTS LIMITED

This capacity gaps assessment (CGA) is being carried out to assess the current level of capacity within the organization i.e., Greenstretch Consultants Limited (GCL) and its current team compared with the desired level of capacity needed for GCL to successfully implement the ESMP, thereafter identifying areas where additional training, skills, knowledge, or resources will be required to bridge the capacity gaps.

DESIRED CAPACITIES
The following are the identified key relevant capacities required to successfully implement this ESMP and project:

a) **Human Resources:**
- The necessary skills and expertise relevant to the project will be required for the team that will be set up.
- The nature and magnitude of the proposed project will require more staff levels. The project will involve a lot activities like; collection and transportation of e-waste at district, provincial, or even at country level. Other anticipated activities will involve dismantling and processing of the e-waste materials. The needed staffing requirement for this project is 20 or more staff. Specifically, this project will require professional personnel in areas like procurement, EHS, Finance, Facility operations, Marketing and Sales, Driving, Machine Operations, Security, as well as Monitoring and Evaluation. Additionally, unskilled staff as general workers will also be required.
- Training will be required to build capacity of the project team to be set up.

b) Financial Resources:
- This project will require funding from the World Bank

c) Technical Capacity:
- The project require equipment and machinery like; collection vehicles, e-waste shredding machine, forklift, baling press machine, weighing platform scales, e-waste magnetic separation and conveyor belt technology, and shipping containers, dismantling tools etc.

d) Organizational Processes:
- GCL will require to put in place proper workflows, procedures and decision-making mechanisms and systems. More staff levels with appropriate skills and expertise will be needed, therefore, GCL needs to employ more qualified personnel to ensure this is achieved.

AVAILABLE/CURRENT CAPACITIES AND GAP ANALYSIS

The current GCL capacity across relevant areas like skills, resources and processes may not be adequate to successfully implement this ESMP. Therefore an improvement or adjustment is required in terms of staffing requirements, current financial resources as well as technical capacity in terms of project equipment and technology needs.

Currently, GCL has limited personnel, necessary machinery and equipment, including lack of vehicles for waste collection, as well as limited financial resources that will be required to successfully implement this ESMP. Although some key GCL staff have strong background in environmental management and waste management including OHS with relevant practical basic knowledge in electronic and electrical (e-waste) handling and management, training would be required to build more capacity and for GCL to be able to successfully implement this ESMP and the proposed project.

In a nutshell, the following gaps exist

- Limited financial resources
- Lack of equipment and machinery
- Limited staffing requirements
- Limited skilled professional personnel
- Inadequate technical expertise
- Lack of infrastructure

HOW TO ADDRESS THE CAPACITY GAPS

1) **Training and development:** Through workshops, seminars, and inductions

Proposed Training and Capacity Building

Capacity building will be in the form of training seminars/ workshops, and inductions for GCL to be able to successfully implement the ESMP and effectively manage the environmental and social impacts and risks that are associated with the proposed project for the establishment and operation of an e-waste recovery, collection, transportation, dismantling and processing facility. The proposed training modules will cover among others:

- World Bank safeguards policies and ZEMA environmental regulations and other relevant national legislation including OHS.
- E-waste handling, transportation, dismantling, and processing
- E-waste recovery and recycling
- Environmental and Social (ES) monitoring, safeguards and training
- Code of Conduct, incident reporting, SEA/SH, application of ESMP and Environmental Checklist

Training and Capacity building approach

Table 28: Training and Capacity Building Approach

Responsible Party / Trainer	Participant / audience	Topics / Themes that may be covered
External Consultants / Specialists	GCL employees	Implementation of World Bank (WB) Environmental and Social Framework ESMP, relevant World Bank safeguard policies and checklists WB Group Environmental Health and Safety Guidelines
External Consultants / Specialist	Community members GCL employees	Community health and safety issues SEA/SH issues, prevention, measures Grievance Redress Mechanism
External Consultants / Specialist	GCL employees Community members	Application of grievance feedback mechanism Code of Conduct, incident reporting, SEA/SH, Application of ESMPs, as relevant and the Environmental Checklist Basic OHS measures and Personal Protective Equipment (PPE)
External Consultants / Specialist	GCL staff	Basic environmental and social safeguards, training, including monitoring. Basic Health and Safety Training
External Consultants / Specialist	GCL staff and employees	Facilitate implementation and monitoring process/ procedures. Workshop on the ESMP and relevant World Bank safeguard policies, including GBV and SEA, Health and Safety Training.
External Consultants / Specialists	GCL employees	Labour Management Procedures (LMP)
External Consultants / Specialists	GCL employees Local community members	Proper e-waste dismantling, handling, processing and disposal Training in use of PPE, tools and equipment
Supplier	GCL employees	Onsite user and technical training after successful supply, installation and commissioning of e-waste machinery (shredders, magnetic separation & conveyor belt technology)
GCL EHS Officer	GCL employees	Onsite Health and Safety induction Toolbox Talks

2) Recruitment and hiring

To ensure successful operation of the proposed project and implementation of this ESMP, GCL will put up an effective organization structure that will assist employees to fully understand their roles and the hierarchy of authority. This structure will also assist GCL in terms of decision-making, resource management and workforce planning.

GCL will require additional human resources, it will therefore to recruit and hire the following personnel to be part of the project team.

.

- Human Resources and Administration Manager
- Facility / Operations Manager
- Finance and Accounts Manager
- Procurement Specialist
- Marketing and Sales Officer
- EHS Officer
- Drivers / Mechanics
- M & E Officer
- Part-time workers
- General workers:

3) System and process improvements

This will be achieved through capacity building. In addition to building capacity, professional and skilled labour to be employed will play a critical role in the improvement of systems and processes to ensure successful implementation of the ESMP as well as successful management and mitigation of the E&S impacts and risks.

16.0 ANNEX 4 – E-WASTE MANAGEMENT PLAN (EWMP)

E-WASTE MANAGEMENT PLAN (EWMP)

IN RESPECT TO

THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR THE PROPOSED ELECTRONIC AND ELECTRICAL (E-WASTE) RECOVERY, COLLECTION, TRANSPORTATION, STORAEG, DISMANTLING AND PROCESSING FACILITY IN LIVINGSTONE DISTRICT BY GREENSTRETCH CONSULTANTS LTD

Introduction

Greenstretch Consultants Limited (GCL) intends to establish and operate an e-waste recovery, collection, storage and dismantling facility in the city of Livingstone, Zambia. It is anticipated that the project activities will result in generation of unrecovered e-waste which shall require special handling and safe disposal.

GCL shall ensure that all environmental and social risks and impacts associated with the proposed project throughout the project life cycle are managed in a systematic, environmentally sound manner, proportionate to the nature and scale of the project and to the potential risks and impacts. The generation of all forms of waste including e-waste is one of those risks that must be considered during pre-planning, construction, operations, and the decommissioning phases of the project.

Waste management planning for the project should be conducted as early as possible to identify sound management practices and procedures all within the country's legal and environmental frameworks. The aim of this E-waste management plan is to protect the environment, safeguard the health of the local communities, and comply with applicable ZEMA regulations as well as the World Bank Environment, Safety and Health Guidelines (ESHG) and Good International Industry Practice (GIIP).

Anticipated E-waste Streams

Different types of waste will be generated at operational phase of the project, i.e. e-waste residues from the dismantling processes. Note, E-waste contains some hazardous components which have a potential to contaminate and pollute the environment and affect human healthy. The table below show some components of e-waste and their environmental hazards.

Table 29: E-waste components and their potential environmental hazard

E-Waste Component	Potential Environmental Hazard
Cathode ray tubes (used in TVs, computer monitors, ATM, video cameras, and more)	Lead, barium and other heavy metals leaching into the ground water and release of toxic phosphor
Printed circuit board (image behind table - a thin plate on which chips and other electronic components are placed)	Air emissions as well as discharge into rivers of glass dust, tin, lead, brominated dioxin, beryllium cadmium, and mercury
Chips and other gold plated components	Hydrocarbons, heavy metals, brominated substances discharged directly into rivers acidifying fish and flora. Tin

	and lead contamination of surface and groundwater. Air emissions of brominated dioxins, heavy metals and hydrocarbons
Plastics from printers, keyboards, monitors, etc.	Emissions of brominated dioxins, heavy metals and hydrocarbons
Computer wires	Hydrocarbon ashes released into air, water and soil.
Insulation	Insulation ODS in foam, asbestos, refractory ceramic fiber
Batteries	Lead, Lithium, Cadmium and Mercury
Fluorescent tubes	Mercury, Phosphorus, Flame Retardants
LCD (Liquid Crystal Display)	Mercury
Thermostat	Mercury

Objectives of the EWMP

- To ensure unrecovered e-waste is handled and disposed of in an environmentally sound and safe manner
- To ensure the waste generated from the proposed project does not adversely impact the environment and human health

Collection of e-waste

- E-waste will be collected from various designated collection sites
- The collection system will make use of the take-back program
- Shipping containers will be used as collection centers or sites
- Appropriate vehicles will be used to transport e-waste

Transportation of e-waste

- Appropriate vehicles shall be used to transport e-waste, preferably containerized vehicles shall be utilized with proper labels stating the contents and associated hazards. When shipment is required, the consignment shall be properly loaded and secured into transportation vehicles and shall be accompanied by a shipping paper (i.e., cargo manifest, record, etc.) that describes the load and its associated hazards, and which is consistent with the Transport of Hazardous Materials good practices and guidance.
- GCL shall ensure efficient transport is in place to enable the movement and avoid waste ending up in undesignated places.
- Adherence to the Basel Convention on Control of Trans-boundary Movement of Hazardous Wastes and their Disposal shall be observed.
- GCL will ensure that during the transportation, the e-waste should be properly stored, and that all licenses for transportation of hazardous waste are valid.
- E-waste will be transported in a way to avoid spillage in transit.

Handling of e-waste

GCL shall ensure that handling is conducted in a safe and controlled manner. Improper handling of e-waste can lead to serious complications. Poor e-waste handling at the collection stage this can cause damage to the e waste and eventually poisoning such as lead poisoning from broken CRTs. GCL will generate waste which is unrecoverable for disposal mainly including batteries and the CRT tubes.

The matter of safety and precaution shall be highly observed at all project life cycle, i.e. by ensuring that employees are provided with suitable PPE and that safety signs/symbols are mounted at strategic points. Training and awareness programs for employees in first aid, emergency procedures and on handling of environmental accidents to be conducted.

During handling of e-waste the following unrecoverable waste shall be safely and cautiously removed as a whole unit, during handling of e-waste;

- Cathode ray tubes
- Capacitors containing polychlorinated biphenyls (PCBs)
- Mercury containing components
- Toner cartridges
- Components containing refractory ceramic fibres
- Components containing radioactive substances
- Gas discharge lamps
- Electrolyte capacitors containing substances of concern
- Batteries that can be removed prior to treatment and internal hazardous batteries

Safe and appropriate removal of the above hazardous E-waste components is imperative for ensuring that the e-waste is handled in a sound manner in preparation for disposal.

GCL acknowledges that company or corporate data is too important to compromise, note; computers, electronic devices and hard drives contain sensitive material, which is why appropriate data destruction will be conducted in an efficient way to ensure protection of information. This will be achieved by using a shredding machine.

Plastics from e-waste

It is worth noting that while some parts inside electronics, such as glass or metals, are readily recyclable, another key ingredient, plastics, pose a bigger challenge. That's because the plastics used in electronics have a different polymer composition than recyclable items like soda bottles or milk jugs, which are made from single polymers. Plastics in cellphone cases, for example, are made from a more complex polymer blend, and there are fewer safe or efficient ways to recycle them.

Greenstretch will employer various methods to safely dispose of the plastic fractions of e-waste, either by shredding or crushing the plastic fractions then repurpose them.

Disposal of e-waste

The last option in the management of E-waste is disposal by landfilling. Greenstretch will avoid the disposal of E-waste by reuse, recycle and recover. Where E-waste cannot be reused, recycled, or recovered then the Greenstretch will treat, destroy or dispose of E-waste in accordance with The Environmental Management (Licensing) Regulations (SI. No 112 of 2013) and the World Bank EHSG

The following table shows how Greenstretch will generally handle, store, transport and safely dispose of various e-waste materials.

Table 30: *E-waste management plan*

E-waste	Handling	Storage	Transport	Disposal
Plastic fractions	No burning, burying and landfilling of plastic fractions Plastic parts will be shredded or crushed and recycled where necessary	The plastic fractions will be stored in appropriate bulk bags	To be done using approved vehicles	▪ Recycling and reuse ▪ Adhere to ZEMA regulations for safe disposal ▪ Repurpose
Metal fractions	Metal parts will be recovered and taken to certified local scrap metal dealers for further processing Metal fractions will not be landfilled	All metal fractions including fine fractions or ferrous parts will be temporarily stored separately in containers in readiness for transportation	Trucks will be used	Recycle and reuse Metals fractions sold to local dealers No landfilling
Glass fractions	Shred /crush then recycle or blend to make blocks Use proper PPE during operation	Store in appropriate bags	Transport using appropriate vehicles to avoid any spillage in transit	Recycle glass powder into blocks Shred /crush then mix with sand, cement, water and lime to form a paste. Allow the paste to solidify and then dispose of in a solidified state (encapsulation and innertization method)
Unrecovered e-waste including ▪ Cathode ray tubes ▪ Capacitors containing polychlorinated biphenyls (PCBs) ▪ Mercury containing components ▪ Toner cartridges ▪ Components containing refractory ceramic fibres ▪ Components containing radioactive substances ▪ Gas discharge lamps ▪ Electrolyte capacitors containing substances of concern ▪ Batteries that can be removed prior to treatment and internal hazardous batteries ▪ Printed Circuit Boards	Provide project workers with proper PPE during handling Dismantling should be done in a dry environment Train project workers on proper handling and emergency procedures Prevent breakage of mercury devices Prevent leakage from capacitor bushings Use appropriate spill kit in an event of broken or damaged equipment (CRT)	Use appropriately labeled containers or bags for storage Restrict access to storage area Store batteries in a way to avoid fire outbreaks Ensure fire-fighting equipment is installed and well serviced to use in case of fire Batteries should not be stored for a considerable amount of time as this can cause them to leak	Use proper trucks and vans Install hazardous signage on vehicle during transportation Avoid spillage in transit	Disposal is the last option in the management of e-waste. However, in an event of disposal remove all the mercury containing items and all other hazardous components from e-waste before disposal at a ZEMA approved hazardous disposal site Cathode ray tube televisions and monitors contain too much solid lead in the glass there is need to shield components to allow for safe and legal disposal in a landfill. Dispose of batteries in a manner that will prevent short-circuit (all leads should be

	Avoid incineration of the unrecovered e-waste to avoid air pollution All batteries should be removed from their devices placing them separate and carefully packaged Leaking batteries (if any), i.e. those spilling electrolyte, must be stored inside acid-resistant containers to avoid contaminating the environment and causing health damage. Therefore these containers should be sealed and used as the transport container. No burning, incineration of batteries or other e-waste Store PC-Boards, batteries in appropriate labelled containers separately			cut-off and the terminals taped). Disposal of spent batteries should be performed by authorized, professional disposal company, which has the knowledge in the requirements of the State and the Local authorities regarding hazardous materials, transportation and waste disposal. Where applicable Greenstretch will use encapsulation /inertization method and the e-waste shall be disposed of in a solidified state to prevent seepage and contamination of the environment
Hard drives	Properly delete or erase hard drives content Avoid reuse of hard drives for security reasons Shred to dismantle and recover separate parts like metal fractions for reuse Avoid burning the hard drives	Use appropriate containers for storage Store and box the different part types in a container.	Use appropriate vehicles to transport to desired destinations	Dispose of in line with ZEMA regulations Recycle /reuse metal fractions recovered

Summary

Greenstretch Consultants Limited (GCL) acknowledges that landfill disposal is the last option in the management of e-waste. However, if disposal is required, GCL shall ensure that the Environmental Management (Licensing) Regulations (SI. No 112 of 2013) is adhered to, and this E-Waste Management Plan (EWMP) is followed to ensure e-waste does not enter the ecosystems. GCL will ensure that the World Bank Environmental, Health and Safety (EHS) General Guidelines including applicable Environmental and Social Standards (ESS) and Good International Industry Practices (GIIP) are applied.

Should need arise, this EWMP shall be regularly updated at operational phase of the project to include any missing information or required methods or technical issues required for safe and environmental sound management of e-waste.

17.0 ANNEX 5 – BASELINE SURVEY ON HEAVY METALS

Greenstretch
Consultants Limited

Baseline Survey on Heavy Metals

In respect to

The Proposed Establishment and Operation of the Electronic and Electrical Waste (E-Waste) Recovery, Collection, Transportation, Storage, Dismantling and Processing Facility in Livingstone District by Greenstretch Consultants Limited

October, 2025

Name of Beneficiary	Greenstretch Consultants Limited
Project Title and Code	Environmental Health and Pollution Management Program (EHPMP) - P167788
Project Location	Cold Storage Area, Livingstone District

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ABBREVIATIONS AND ACRONYMS

Ag	-	Silver
As	-	Arsenic
Au	-	Gold
Cr	-	Chromium
Cu	-	Copper
EMA	-	Environmental Management Act
GCL	-	Greenstretch Consultants Limited
Mg/Nm3	-	Milligram per cubic metre
Pb	-	Lead
pH	-	Potential Hydrogen
PPE	-	Personal Protective Equipment
PM	-	Particulate Matter
SI	-	Statutory Instrument
SP	-	Sampling Point
UNZA	-	University of Zambia
WHO	-	World Health Organization
ZABS	-	Zambia Bureau of Standards
ZEMA	-	Zambia Environmental Management Agency
CDC	-	Centre for Disease Control
UNEPA	-	United Nations Environmental Protection Agency

1.0 INTRODUCTION

1.1 Background

Greenstretch Consultants Limited (GCL) is currently implementing an electronic and electrical waste (e-waste) management project in Livingstone District. This project involves the recovery, collection, transportation, storage, dismantling and processing of e-waste. The e-waste management facility is located in an Industrial Area of the District on plot number 1411, along Sambono Road near Cold Storage Area.

GCL is committed to ensuring that all project operations are conducted in a safe and environmentally friendly manner, in compliance with all applicable regulations. The e-waste recycling process will involve three main steps which include collection, sorting/dismantling and pre-processing activities.

E-waste contains both valuable components and toxic substances including heavy metals. The valuable parts i.e., gold, copper, aluminium, steel, among others will be extracted and taken for further processing. The toxic substances and heavy metals including mercury, lead, cadmium, and flame retardants contained in e-waste may pose risks to health and the environment if improperly handled. Therefore, effective e-waste management can prevent pollution and contamination associated with e-waste management activities.

The soil and water heavy metal pollution can not only directly affect the structure and function of soil ecosystem, but also cause serious harm to human health through the food chain. Hence, this survey has been undertaken particularly to investigate heavy metal contents in soil and water at the operation facility prior to full project operation.

This assessment of the soil and water samples at the project site, involved onsite collection of both soil and water samples which was conducted on the 2nd of September 2025. Thereafter, the samples were taken for laboratory analysis at the University of Zambia (UNZA), to determine and analyse the pollution levels prior to full project operation. The baseline survey was conducted primarily to ensure that activities being carried out by GCL are in compliance with the both local and international environmental laws and standards.

1.2 Assessment Objectives

The main purpose of the baseline survey was to:

- Assess the existing environmental conditions in terms of heavy metal concentration levels in soil and water in order to keep track and formulate corrective measures where applicable.
- Provide recommendations for improvement and formulate mitigation measures where applicable.

1.3 Scope of Work

The assessment conducted included taking samples of soil and water from two sampling points i.e., the interior and exterior of facility premises and delivering them to UNZA laboratory for analysis.

2.0 LEGAL FRAMEWORK AND REGULATIONS IN ZAMBIA

The Environmental Management Act (EMA) No.12 of 2011 is the cornerstone of environmental management in Zambia. An act to continue the existence of the Environmental Council and re-name it as the Zambia Environmental Management Agency (ZEMA); provide for integrated environmental management and the protection and conservation of the environment and the sustainable management and use of natural resources. The Zambia Environmental Management Agency was established under this Act to enforce the provisions of the Act and the subsidiary Statutory Instruments (SI) so as to provide for the health and welfare of persons, animals, plants and the environment in general. As provided for under the Act, specific regulations, standards and guidelines are also formulated as SI and enforced by ZEMA.

The Environmental Management Act No.12 of 2011 part IV Section 32 and 33 prohibit discharges of any contaminant or pollutant into the environment and licencing of emission of pollutant or contaminant into the environment. Therefore, GCL will ensure that appropriate measures are put in place to prevent heavy metal pollution by conducting quarterly analysis/monitoring of the heavy metal levels in soil and water at the operation site. GCL shall further ensure that all the necessary licenses are renewed in a timely manner.

Zambia Bureau of Standards (ZABS) is a statutory body responsible for standardization, quality assurance, and metrology in Zambia which was created by Zambia's Standards Act of 2017. ZABS's mandate under this Act includes developing national standards, providing conformity assessment services such as testing and certification, and ensuring that products and services meet these standards. Zambia Bureau of Standards also sets permissible limits for heavy metals in drinking water and soil. GCL will comply with these standards by conducting regular environmental monitoring activities.

3.0 METHODOLOGY AND APPROACH

3.1 Location of Study Site

The samples were collected from the project site in Livingstone District of Southern Province, on plot number 1411, along Sambono Road, in Cold Storage Area in the Industrial Area. Geographically, the site lies between latitude 17º52'08.64"S and longitude 25º50'53.10"E and can be accessed through the Belewa road and Sambono road.

3.2 Locational GPS Coordinates

Table 31: GPS Coordinates for the samples collected.

Point	Sample collected	Location Coordinates	
		Latitude	Longitude
A	Soil 1	-17.868549	25.847696
B	Soil 2	-17.868871	25.847610
C	Water	-17.869447	25.848206

3.3 Sampling Points

The sampling points were named as follows:

Table 32: Sampling points

Sample Point	Sample Taken
Point A (Outside)	Soil 1
Point B (Inside)	Soil 2
Point C (Inside)	Water

The sampling of soil and water was undertaken on 2nd September 2025. The results of the assessment is shown in Annex 5 herein.

3.4 Sampling Equipment

Soil and water samples were collected randomly from two designated points using a soil auger sampler and sterile water sampling bottles, respectively.

3.5 Sampling procedure

The soil auger sampler was driven to a plough depth of 15 cm to scoop the soil sample after removing the surface litter at the sampling spot.

For water sample the tap/outlet was cleaned using a clean cloth to remove any dirt afterwards the tap was turned on to let the water run at maximum flow for 2 minutes; then turn it off. After sterilising the tap outlet for a minute with the flame of fire the tap was turned on again and allowed the water to flow for 2 minutes at a medium flow rate then filled the sterile sample bottle up to three quarters while holding the bottle under the water jet.

3 .6 Measured Parameters

The following parameters were measured.

- Arsenic (As)
- Gold (Au)
- Potential of Hydrogen (PH)

- Lead (Pb)
- Chromium (Cr)
- Silver (Ag)
- Copper (Cu)

3.7 Measurement of Results

The table below illustrates the permissible limits in soil and water for each of the above specified parameters, comparing World Health Organization (WHO) guidelines with the Zambia Bureau of Standards (ZABS) as implemented through ZEMA enforcement.

3.7.1 Permissible limits in water for WHO vs. ZABS

Table 33: Permissible limits in water for WHO vs. ZABS

Parameter	WHO Guideline	ZABS Limit
Arsenic (As)	0.01 mg/L	Not specified
Gold (Au)	Not established	Not established
Ph	No health-based limit	6.5 – 8.0
Lead (Pb)	0.01 mg/L	0.05 mg/L
Chromium (Cr)	0.05 mg/L	0.05 mg/L
Silver (Ag)	0.1 mg/L	Not specified
Copper (Cu)	2 mg/L	2 mg/L

From the table above it is noted that gold (Au) is not given a permissible limit by either WHO or ZABS because it is generally not considered a contaminant of concern. Arsenic (As) is strictly regulated by WHO (0.01 mg/L). Despite ZABS not indicating a limit, WHO's value remains the critical reference for health. For Lead (Pb) WHO limit is much stricter (0.01 mg/L) than ZABS's 0.05 mg/L, meaning the Zambian permissible levels are more lenient. For Chromium (0.05 mg/L) and Copper (2 mg/L) both WHO and ZABS limit values align. Silver is only given a limit value of 0.1 mg/L by WHO. For pH, only ZABS specifies a practical operational range (6.5–8.0).

3.7.2 Permissible limits in soil

Table 34: Permissible limits in soil

Parameter	Guideline Source	Approximate Value / Remarks
Arsenic (As)	UNEP	50 mg/kg (admissible limit)
Chromium (Cr)		Vary by toxicity
Lead (Pb)	CDC	400 ppm
Copper (Cu)	UNEP / Dutch target	30 mg/kg target value
Silver (Ag)		No common soil limit available
Gold (Au)		Not regulated in soil due to low environmental risk
pH		No standard value found in soil guidelines

4. THE RESULTS

The following table shows the summary of the laboratory analysis

Table 35: UNZA results and ZABS specifications

Sample name	Sample unit	Sampling point	Measured Parameters						
			Arsenic (As)	**Gold (Au)**	**Potential Hydrogen (PH)**	**Lead (Pb)**	**Chromium (Cr)**	**Silver (Ag)**	**Copper (Cu)**
Soil Sample 1	Ppm	Point A	<0.0001	<0.0001	7.20	<0.01	<0.01	<0.0001	<0.003
Soil sample 2	Ppm	Point B	<0.0001	<0.0001	7.20	<0.01	<0.01	<0.0001	<0.003
Water	Mg/l	Point C	<0.0001	<0.0001	7.24	<0.01	<0.01	<0.0001	<0.003
ZABS Specification	**Soil (ppm)**		1500	5	6.5-8.0	1000	-	500	500
	Water (Mg/l)		1500	5	6.5-8.0	1000	-	500	500
Comments			Below	Below	Below	Below	-	Below	Below

Copies of the original results from UNZA are attached down in the appendices. The above table is showing the summary of the sampling results:

5. DISCUSSION OF RESULTS

The results obtained are discussed below.

5.1 Levels of Arsenic (As)

The Zambia Bureau of Standards (ZABS) specification for arsenic (As) in soil is 1500 ppm whereas in water is 1500 Mg/l. The UNZA results for Arsenic in soil was less than 0.0001 ppm while in water samples was less than 0.0001 Mg/l. Therefore, the results indicate that the levels of Arsenic in both soil and water samples were below the ZABS specification.

5.2 Levels of Gold (Au)

Gold (Au) specification at the Zambia Bureau of Standards (ZABS) in soil is 5 ppm and 5 Mg/l in water. The UNZA results indicate that the levels of gold in soil samples were less than 0.0001 ppm while the levels in water sample were less than 0.0001 Mg/l. This entails that the results for both soil and water samples are below the ZABS specification.

5.3 Levels of Potential of Hydrogen (pH)

The Zambia Bureau of Standards (ZABS) specification for Potential of Hydrogen (PH) in soil range from 6.5 to 8.0 and in water from 6.5 to 8.0. The UNZA results for pH in soil is at 7.20 while the pH of water was at PH is 7.24. This means the results for pH in both soil and water is below the ZABS specification.

5.4 Level of Lead (Pb)

Lead (Pb) specification of the Zambia Bureau of Standards (ZABS) is 1000 ppm in soil and 1000 Mg/l in water. The UNZA results for both soil samples is less than 0.01 ppm and for water sample is less than 0.01 Mg/l. The results for both soil and water samples are below ZABS specification.

5.5 Level of Chromium (Cr)

The Zambia Bureau of Standards (ZABS) have no specification of Chromium (Cr) in soil and water. The UNZA results for both soil samples Chromium (Cr) is less than 0.01 ppm and for water sample is less than 0.01 Mg/l. Since there are no ZABS specifications for both soil and water the results specification for both samples are considered to be within the normal range.

5.6 Level of Silver (Ag)

Silver (Ag) specification of the Zambia Bureau of Standards (ZABS) is 500 ppm in soil and 500 Mg/l in water. The UNZA results for both soil samples is less than 0.0001 ppm and for water sample it is less than 0.0001 Mg/l. The results for both soil and water samples shows that silver metal below ZABS specification.

5.7 Level Copper (Cu)

The Zambia Bureau of Standards (ZABS) specification for Copper (Cu) in soil is 500 ppm and in water is 500 Mg/l. The UNZA results for both soil samples is less than 0.003 ppm and for water sample is less than 0.003 Mg/l. The results for both soil and water samples are below ZABS specification.

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The results indicate that the levels of heavy metals were below the ZABS and ZEMA stipulated permissible limits. Therefore, at the time of the assessment there was no heavy metal pollution at the project site.

6.2 Recommendations

The recommendations and management measures include a monitoring plan and implementation of corrective measures. The following are the recommendations;

- Conducting sorting and dismantling operations strictly within the warehouse facility on impermeable surface and ensuring that dismantling and sorting processes are dry processes.
- Monitoring and assessment to be done periodically to ensure compliance with all relevant environmental regulations and standards to prevent legal and environmental issues.

6.3 List of Personnel Involved

Table 36 Personnel Involved

NAME	DESIGNATION	Organization	CELL NO.
Mr. Bernard Musukuma	CEO	Greenstretch	+260979618731
Mr. Gravy Sinkamba	COO	Greenstretch	+260978308683
Ms. Lushomo Sialeka	EHSS Officer	Greenstretch	+260975920690
Mr. E. Mutati	Acting Chief Engineer	UNZA - Lab	

7.0 REFERENCES

Government of the Republic of Zambia, (2011). The Environmental Management Act of 2011. Lusaka, Zambia.

Government of the Republic of Zambia, (2013). The Environmental Management (licensing) regulations (SI No 112 of 2013)

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McLean E.J and Bledsoe E.B (1992) Ground Water Issue; Behaviour of Metals in Soils, UNEPA, United States.

World Health Organization (2017) Guidelines for drinking-water quality, 4th ed., World Health Organization, Geneva.

Zambia Bureau of Standards (2019) Zambia Standard KS ZS 693: Drinking water - Specifications, Zambia Bureau of Standards, Lusaka.

8.0 APPENDICES

Appendix 1: Soil sample results from UNZA Laboratory
Appendix 2: Water sample results from UNZA Laboratory
Appendix 3: Photo gallery

8.1 Appendix 1; Soil samples result from UNZA Laboratory

SCHOOL OF ENGINEERING
CIVIL ENGINEERING DEPARTMENT
ENVIRONMENTAL ENGINEERING LABORATORY

P.O Box 32379, Lusaka
Direct Telefax: 260-1-290962

SOIL TEST

Attn : Greenstretch Consultants LTD

Sampled by : Client
Sampling date : 02.09.2025
Report date : 20.09.2025

Laboratory Results

Parameter	Sample 1	Sample 2	ZABS Specifications
Arsenic (ppm)	<0.0001	<0.0001	6.5-8.0
Gold (ppm)	<0.0001	<0.0001	5
pH	7.20	7.20	1500
Lead (ppm)	<0.01	<0.01	1000
Chromium (ppm)	<0.01	<0.01	-
Silver (ppm)	<0.0001	<0.0001	500
Copper (ppm)	<0.003	<0.003	500

Tests carried out in conformity with "Standard Methods for the Examination of water and Wastewater APHA, 1998".

Tested by: D. Muwowo ..... Checked & Approved by: E. Mutati.....
Lab. Technician Acting Chief Engineer

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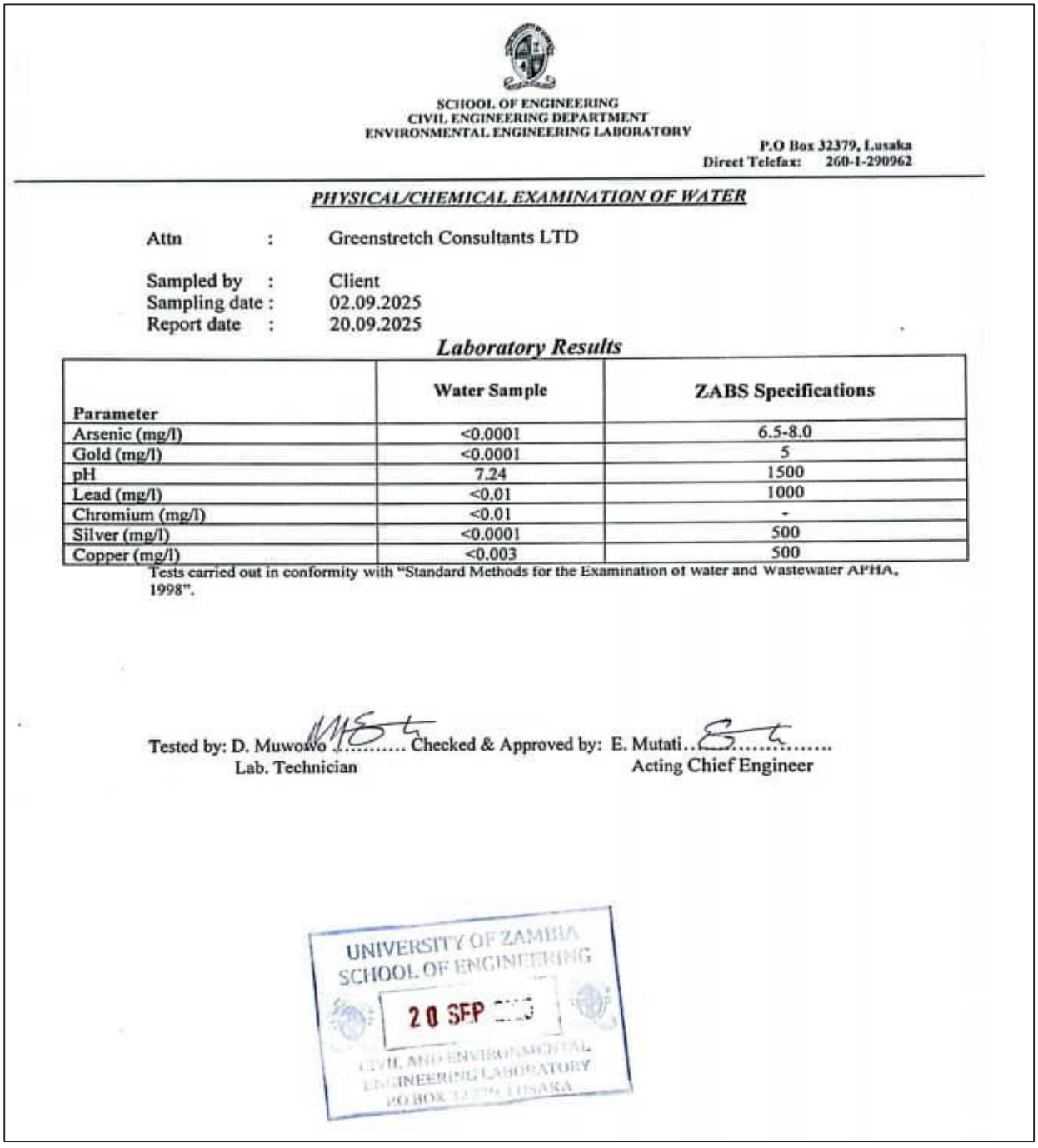
20 SEP
CIVIL AND ENVIRONMENTAL
ENGINEERING LABORATORY
PO BOX 32379 LUSAKA

Figure 14: Soil samples result from UNZA Laboratory

8.2 Appendix 2: Water sample results from UNZA Laboratory



SCHOOL OF ENGINEERING
CIVIL ENGINEERING DEPARTMENT
ENVIRONMENTAL ENGINEERING LABORATORY

P.O Box 32379, Lusaka
Direct Telefax: 260-1-290962

PHYSICAL/CHEMICAL EXAMINATION OF WATER

Attn : Greenstretch Consultants LTD

Sampled by : Client
Sampling date : 02.09.2025
Report date : 20.09.2025

Laboratory Results

Parameter	Water Sample	ZABS Specifications
Arsenic (mg/l)	<0.0001	6.5-8.0
Gold (mg/l)	<0.0001	5
pH	7.24	1500
Lead (mg/l)	<0.01	1000
Chromium (mg/l)	<0.01	-
Silver (mg/l)	<0.0001	500
Copper (mg/l)	<0.003	500

Tests carried out in conformity with "Standard Methods for the Examination of water and Wastewater APHA, 1998".

Tested by: D. Muwowo ..... Checked & Approved by: E. Mutati.....
Lab. Technician Acting Chief Engineer

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Figure 15: Water sample results from UNZA Laboratory

8.3 Appendix 3: Photo Gallery

Pictures from the soil samples collection at the cold storage e-waste facility

Figure 16: Soil sample collection