

**ENVIRONMENTAL IMPACT ASSESSMENT PROJECT REPORT  
FOR THE PROPOSED EXPANSION OF WIRE ANNEALING AND  
GALVANIZING PLANT AT BLUE NILE ROLLING MILLS LTD, ON**



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*Report prepared and submitted by:*

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**January, 2018**

**REPORT DETAILS**

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**REPORT TITLE:**

Environmental Impact Assessment Project Report for Proposed expansion of wire annealing and galvanizing plant at Blue Nile Rolling Mills Ltd, on LR: 4953/2167.

**PROPONENT DETAILS:**

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**Date:** \_\_\_\_\_

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**Date** \_\_\_\_\_

## CERTIFICATION

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The preparation of this Environmental Impact Assessment Report was commissioned by the management of Blue Nile Rolling Mills Limited in fulfilment of requirements of the EIA/EA Regulations, 2003, and Environmental Management and Coordination Act, 1999.

Blue Nile Rolling Mills Limited as the proponent in liaison with the EIA Expert and Contractor commits themselves to implementing the Environmental Management Plan as contained in the report to ensure sustainable implementation of the project.

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**Proponent: Blue Nile Rolling Mills Limited, Thika**

**Mr. Abhishek Mukherjee**

**Production and Maintenance Manager**

Name of Officer

Designation

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Signature / Date / Official Stamp

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**Mr. Wilson Baru Wachira:**

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### Introduction

Diligence Consultants Ltd, a NEMA approved EIA/EA firm of Experts was commissioned by Blue Nile Rolling Mills, a part of The Blue Nile group to undertake the Environmental Impact Assessment (EIA) of the proposed expansion of annealing and galvanizing plant project.

The group split from one of the country's largest producer of building materials to form a manufacturing outfit in 2006 which now comprises of 2 totally diverse industries. The company's main operating lines of businesses are steel manufacturing, real estate, trading, and export. In the last eleven years the manufacturing outfit has grown from strength to strength to become one of the leading Commercial business houses in Kenya.

Blue Nile Group is composed of:

- Blue Nile Wire Products Limited – Wire products manufacturing factory.
- Blue Nile Rolling Mills Limited – Steel product manufacturing factory.

The Blue Nile group is a well-known success story among the steel manufacturing sector in the country.

The group has grown to have a capacity of 100,000 TPA .The company believes in installing state of the art technology and keeps upgrading its machinery in due time. This helps us to produce high quality steel and helps maintain the safety standards.

The Management of Blue Nile Rolling Mills Limited, hereafter referred to as Proponent proposes to Set up a 1920 MT / month, Low Carbon, High Speed, 32 wires, HOT-DIP, M.S. Wire Annealing & Galvanizing Plant for the production of Low UTS, Commercial coating range Galvanized wires at Blue Nile Rolling Mills Ltd. Thika, Kenya to become self-sufficient for meeting the company's production requirements of Chain-links & Barbed Wires along with becoming one of the leading Manufacturers & Suppliers of Hot Dip Galvanized Wires in East Africa. The project is expected to be undertaken within a period of 12months with an estimated cost of 700 Million Kenya shillings.

The firm of experts has undertaken this EIA in compliance with section 58 of the Environmental Management and Coordination Act (EMCA) No. 8 of 1999 and Environment Impact Assessment and Audit regulations (2003).

This project report presents the findings of Environmental Impact Assessment of Proposed Expansion of Annealing and galvanizing plant at Blue Nile Rolling Mills Limited, Thika. The report provides description of the project, existing baseline environmental conditions, legal and regulatory frame work associated with the project, description of the project alternatives, assess both the positive and negative potential impacts of the proposed project at its various cycles. In addition, it provides recommended mitigation

measures and environmental management plan for the adverse potential impacts of the project. The proposed project site will be at the existing plant sited on approximately 3.0Ha piece of land with reference no L.R. NO. 4953/2167 in Thika.

An Environmental Impact Assessment is a tool for environmental protection & conservation and has been identified as a key component in new project implementation. According to section 58 of the Environmental Management and Coordination Act (EMCA) No.8 of 1999 second schedule 9 (1), and Environmental (Impact Assessment and Audit) Regulation, 2003, such projects as the proposed project must be subjected to an EIA process . The report of the same must be submitted to National Environment Management Authority (NEMA) for approval and issuance of EIA Licence.

### **Methodology**

This EIA was conducted in accordance with the Environment Management and Coordination Act (EMCA), 1999, EIA/EA regulations of 2003. The approach used in carrying out the EIA included; site visit, review of relevant documentation, assessment of relevant baseline information of the project area, assessment of anticipated environment and social impacts and development of appropriate mitigation measures necessary for incorporation into the project implementation, as well as an environmental management plan.

In order to address the various environmental concerns, the study team adopted a participatory approach where the Proponent and the immediate interested and affected surrounding communities were consulted in addition to reviews and references to sources of information including legal statutes, design and relevant project documents. Baseline air quality of the site was obtained from 2016/Env/0670 environmental monitoring report of the plant undertaken by Polucon, a NEMA accredited laboratory. The values of PM<sub>2.5</sub> and PM<sub>10</sub> monitored at different location were within the limits stipulated under Legal Notice no. 34.

Ambient noise levels were monitored at five locations. The noise levels are well within the National Standards prescribed for industrial area.

### **Anticipated impacts**

Both positive and minimal negative impacts are anticipated to be associated with the proposed project development during the installation phase, operation phase and decommissioning phase. The EIA established the following significant Impacts:

- ✓ Creation of direct and indirect employment opportunities during all project phases;
- ✓ Increased revenue to the Proponent, National and County governments amongst others;
- ✓ Creation of market supply for building materials;

- ✓ Reduced cost of production by producing raw material internally instead of importing;
- ✓ Optimal land use.

However, there are some adverse impacts to the environment and the communities living in the area that will require to be addressed during the construction period as well as upon commissioning of the project. These include:

- ✓ Increased Waste generation;
- ✓ health and safety risks:
- ✓ noise and vibrations;
- ✓ soil and water pollution;
- ✓ dust and exhaust emissions; and
- ✓ vehicular traffic along Valley road and Bishop road

The project is expected to be in operation for an indefinite period after which it will be decommissioned. During decommissioning phase, the buildings and infrastructure could be left intact and utilised for other uses or they will be demolished and the site redeveloped for another land use. The former option will generate impacts associated with the activities that will be undertaken at the site. However, if the later option of demolishing the buildings and associated infrastructure is pursued, the following negative impacts are anticipated:

- ✓ Loss of livelihood and economic loss
- ✓ Noise and vibration
- ✓ Air pollution from dust and exhaust emission
- ✓ Health and safety risks
- ✓ Generation of solid and liquid waste
- ✓ Soil erosion

### **Anticipated Impacts**

- **Socio-economic Impacts**

The proposed project will have positive impacts both at a local and national level. The project will create job opportunities (skilled and unskilled labour) during equipment installation and operation phases. Other impacts are associated with procurement of materials and services such as transportation.

### **Waste Generation:**

Limited waste streams are anticipated to be generated during the project cycle. The waste to be generated will include construction rubble; scrap, descaling waste; effluent water; packing materials and general waste produced by site personnel including wrapping from food, bottles and cans. Descaling waste and scrap materials will be used as raw materials

in furnaces. Hazardous waste from the laboratory will be disposed offsite through licensed waste handlers. Waste water will be pretreated in the ETP and recycled back to the process. The domestic wastewater will be channeled to the Sewage Treatment Plant. There is potential for waste to cause environmental pollution if not managed adequately. The Proponent however, intends to manage all wastes in accordance with Legal Notice No. 121 of 2006.

#### **Occupational Health impacts:**

Dust related respiratory problems, noise, heat stress, burns and mechanical injury are the main occupational health problems anticipated in the plant. The proponent has a resident nurse who attends to all cases at the clinic. Any cases which cannot be addressed by the nurse are referred to Thika Level 5 Hospital or St Mulumba Mission Hospital. The occupier conducts annual medical examinations through approved DHPs which include Lung function tests, audiometric tests, and the general medical examinations. The proponent should undertake pre-employment and annual checks as per law.

#### **Health and safety impacts**

The Proposed project is anticipated to pose health and safety risks related to the project activities. The potential H&S risks workers are likely to get exposed to during project phases include: mechanical Injuries resulting from operation of machinery, equipment, and tools, Fire, electrical shocks are the main hazard identified in the plant. Necessary fire fighting measures are in place. Hazards due to mechanical injury and electrical hazard shall be minimized by use of standard equipment, standard design and operating procedures. Personnel protective devices like face shields, ear plugs/muffs, nose masks, aprons, safety gloves, boots, belts and goggles shall be provided to the workers. Emergency response plan shall be strengthened to take care of the additional units. The proponent intends to undertake all the regulatory compliance.

#### **Impacts on air quality**

Vehicles used during all the phases are also anticipated to generate minimal air emissions. Dust pollution is anticipated from demolition works and welding activities during equipment installation.

The emissions during operation would likely not be significant to impact local air quality. There will be little increase in SO<sub>2</sub> and NO<sub>x</sub> and negligible increment in PM emission due to this expansion unit. The proposed technology adopted by the proponent has incorporated anti-pollution system. Acid fumes will be sealed inside the chamber by water channel along the sides and double layer water curtains at the entry and exit.

### Noise Impacts

The project will have minimal impact on the ambient noise quality of the site throughout its cycle. Temporary noise pollution during equipment installation would be from delivery vehicles and welding operations. These activities would increase the ambient noise levels at the site. However, it should be controlled by proper maintenance of equipment and vehicles. Equipment installation works will be completed in a short period of time as the proponent will engage the services of qualified machine manufacturer's engineers.

Ambient noise levels were monitored at five locations. The noise levels are well within the National Standards prescribed for industrial area

Noise pollution during operation phase from material handling, machines and equipment will be located inside the factory. The machines will be acoustically installed to minimize noise emissions. During decommissioning phase, sources of noise will be equipment and vehicles used in demolition of the facility and carting away the materials from the site.

### Environmental Management and Impact Mitigation

**Section 8** of this report presents an environmental management plan which covers the measures for mitigating the adverse potential environmental impacts of the proposed project. The EMP includes measures for addressing the potential adverse environmental impacts of the proposed project.

**Environmental Monitoring Plan:** The firm of experts has developed an Environmental Management and Monitoring Plan (EMMP) to guide the project team in eliminating or reducing the project impacts to acceptable minimum/ standards. The EMMP is based on good environmental practices of project implementation and safety of the operations. The proposed EMMP can be improved through continuous monitoring and audits during project implementation

Regular monitoring of –

- Ambient air quality monitoring at locations outside the plant;
- Re-circulating water quantity and quality;
- Noise monitoring at plant boundary and work environment; and
- Quantity & quality of solid waste and their reuse in various purposes

### Analysis of alternatives

The study considered available annealing and galvanizing technology options and no project scenario alternatives. On the basis of environmental and economic considerations, the proposed technology is highly efficient and viable option. Additionally, the 'No-go option' does not compete with the benefits of proceeding with the project.

**Public Consultation**

Public stakeholder consultation was undertaken in order to obtain the views and concerns of the stakeholders regarding the proposed project. They observed that the proposed project will generate employment opportunities and improve and will not pose any Environmental, health and safety risks apart from one who noted that the noise and dust generation will cause discomfort.

**Conclusion and Recommendation****Conclusion**

The proposed project will generate socio-economic benefits which would not be realized if the no development option is pursued.

The potential adverse impacts associated with the proposed project are possible to mitigate successfully. The impacts before implementation of mitigation measures are assessed as negligible to medium low and the ratings are expected to improve further with the implementation of the proposed mitigation measures.

**Recommendation**

The firm of Experts feels that every effort has been made by Proponent to accommodate the mitigation measures recommended during the EIA process to the extent that is practically possible, without compromising the economic viability of the proposed project. The implementation of the mitigation measures detailed in this report will provide a basis for ensuring that the potential positive and negative impacts associated with the establishment of the proposed project are enhanced and mitigated to a level which is deemed adequate.

Firm of experts finds no reason why the proposed project should not be authorized contingent that the mitigations and monitoring for potential environmental and social impacts as outlined in this report are implemented.

**ACRONYMS/ABBREVIATION**

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DOHSS	Directorate of Occupational Health and Safety Services
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
HSE	Health, Safety, Security and Environment
NEMA	National Environment Management Authority
OSHA	Occupation Safety and Health Act
Pa	Pascal
PPE	Personal Protective Equipment
S&H	Safety and Health
UTS	Ultimate Tensile Strength

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## CHAPTER ONE

### 1 INTRODUCTION

#### 1.1 Project Background

Blue Nile Rolling Mills Limited, hereinafter referred to as the Proponent, is proposing to expand the Annealing and galvanizing plant at Blue Nile Rolling Mills Limited located in Thika Constituency, Kiambu County. The Galvanized Wire will be used for the production of Chain-link fences, Barbed Wires, Gabion boxes, to serve as a raw material for Wire PVC coating line, etc.

The Legal Notice No. 101 of 2003 (EIA/EA Regulations, 2003) requires the Proponent to prepare project report for approval by National Environment Management Authority (NEMA) prior to commencement of a new development. As such, Blue Nile Rolling Mills Limited engaged firm of Experts to undertake environmental impact assessment for the proposed project.

#### 1.2 Project Objectives

The objective of the proposed project is to put up a Hot-Dip Wire Annealing & Galvanizing plant to become self-sufficient for meeting the company's production requirements of Chain-links & Barbed Wires along with becoming one of the leading Manufacturers & Suppliers of Hot Dip Galvanized Wires in East Africa. Presently, Hot-Dip Galvanized wires is being imported from countries like China & Uganda.

#### 1.3 Objective of EIA


The objectives of this study are;

- i. To establish the existing environmental condition at the project site;
- ii. To identify significant potential impacts of the project to environment and social aspects;
- iii. To seek neighbours and project affected persons views and concerns on the proposed project;
- iv. Formulate recommendations to mitigate against adverse environmental and social impacts through all phases of the project;
- v. Establish a comprehensive environmental management plan covering the construction, operation and decommissioning phase of the project.

The report was undertaken in full compliance with the Environmental Management and Coordination Act, 1999 and its 2015 amendment and also the EIA Regulations, 2003

#### 1.4 SCOPE OF EIA

The scope of the study covers the following aspects:

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- i. Baseline Conditions:
  - ✓ Environmental setting (climate, topography, geology, hydrology, ecology, water resources, endangered species, sensitive areas, etc.),
  - ✓ Socio-economic activities in the surrounding areas (land use, economic activities, institutional aspects, water demand and use, health and safety, public amenities, etc.),
  - ✓ Infrastructural issues (roads, water supplies, drainage systems, power supplies, etc.).
- ii. Legal and policy framework mainly focusing on the national environmental laws, regulations and by-laws.
- iii. Participatory approach was adopted for the immediate neighbourhood in discussing relevant issues including among others:
  - ✓ Land use aspects,
  - ✓ Neighbourhood issues,
  - ✓ Safety issues,
  - ✓ Adequacy of public amenities,
  - ✓ Environmental authorities,
- iv. Environmental impacts:
  - ✓ Physical impacts,
  - ✓ Biological impacts,
  - ✓ Socio-cultural/economic impacts.

## 1.5 Data Collection

The firm of experts employed various approaches in collecting data and information for assessing the impacts of the proposed projects. The following techniques were used:

### 1.5.1 Review of secondary data

A wide range of environmental and socio-economic data were sought to describe the baseline conditions at the project area. These included socio-economic, physical and environmental data and reports from published and unpublished literature and from environmental monitoring at the project area.

### 1.5.2 Interviews

Interviews were conducted during public stakeholder consultation in order to obtain the views and concerns of the interested parties with regard to the proposed projects. A semi structured interview checklist was used to capture the responses of the stakeholders.

### 1.5.3 Assessing significance of Impacts

The first stage of impact assessment is identification of environmental activities, aspects and impacts. The criteria used to determine significance are summarized in Table 1. Once

an assessment is made of the magnitude and likelihood, the impact significance is rated through a matrix process as shown in Table 1.

**Table 1: Impact Magnitude**

Magnitude	
Extent	<p><b>On-site</b> – impacts that are limited to the boundaries of the site.</p> <p><b>Local</b> – impacts that affect an area in a radius of 20km around the development site.</p> <p><b>Regional</b> – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem.</p> <p><b>National</b> – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.</p>
Duration	<p><b>Temporary</b> – impacts are predicted to be of short duration and intermittent/occasional.</p> <p><b>Short-term</b> – impacts that last only for the duration of the construction period.</p> <p><b>Long-term</b> – impacts that will continue for the life of the Project, but ceases when the Project stops operating.</p> <p><b>Permanent</b> – impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.</p>
	<p>For biophysical environment, intensity is assessed in terms of sensitivity of the receptor:</p> <p><b>Negligible</b> – the impact on the environment is not detectable.</p> <p><b>Low</b> – the impact affects the environment in such a way that natural functions and processes are not affected.</p> <p><b>Medium</b> – where the affected environment is altered but natural functions and processes continue, albeit in a modified way.</p> <p><b>High</b> – where natural functions or processes are altered to the extent that it will temporarily or permanently cease.</p> <p>For socio-economic environment, intensity is assessed in terms of ability of project affected persons to adapt or cope with the changes caused by the project.</p>
Likelihood- the likelihood of an impact occurring	
unlikely	the impact is unlikely to occur
likely	The impact is likely to occur
Definite	The impact will occur

Once a rating is determined for magnitude and likelihood, the following matrix (table 2) will be used to determine the impact significance.

**Table 2: Impact Significance**

Significance				
		Likelihood		
		unlikely	likely	Definite
Magnitude	Negligible	Negligible	Negligible	Minor
	Low			
	Medium			
	High			

### 1.6 Purpose of this Report

This report addresses the requirement for preparation of project report in accordance with EIA/EA Regulations, 2003.

The report presents an overview of the proposed project and the environmental regulatory framework from which it operates. It identifies and assesses the significance of the impacts of the project as well as mitigation measures necessary to reduce or prevent impacts from occurring.

## CHAPTER TWO

### 2 DESCRIPTION OF THE PROJECT

#### 2.1 Description of Proposed Project Site

The proposed project will be undertaken in existing plant at Blue Nile Rolling Mills situated approximately 100m off Thika-Garissa highway, in Thika, Kiambu County. Geographically, the site is located on Longitudes 37°5'28.734" East and Latitudes 1°3'32.378" South at an elevation of 4882ft above the sea level. The area is designated as an industrial area.

The site is located approximately 3 Ha piece of land with land reference no L.R. No. 4953/2167 belonging to Ruth Muthoni Kinyanjui (Landlord). The Proponent has entered into a lease agreement with the Landlord. *Copy of lease agreement is appended at the end of this report (Appendix 1).*

The immediate neighbours of the Site are, Bindip Limited, Jubilee Feeds, Capwell Industries Limited, Kings Commodities, open field and other commercial shops/businesses.

The project will be set up in existing Wire drawing plant. The plant manufactures and markets a wide range of wire products including wire rods, wire mesh, BRC, nails, chain link, round wire, barbed wire and binding wire for the construction and fabrication industry. Blue Nile Rolling Mills Ltd. has a number of Automatic, Semi-Automatic & Manual Chain-link fence making machines along with a number of Barbed Wire making machines & a PVC wire coating machine, the raw material for which is Low Carbon, Low UTS, M.S. HOTDIP Galvanized wire with commercial coating, ranging from 50-100 GSM.

**Figure 1** below is a satellite image showing the location of the project site

**Figure 1: Satellite Image showing the location of the Project site: Source Google Earth**



Source Google Earth

## 2.2 Design of the proposed project

The Proponent proposes to install 1920 MT / month, Low Carbon, High Speed, 32 wires, HOT-DIP, M.S. Wire Annealing & Galvanizing Plant and its auxiliary equipment for the production of Low UTS, commercial coating range Galvanized wires. The Galvanized Wire will be used for the production of Chain-link fences, Barbed Wires, Gabion boxes, to serve as a Raw material for Wire PVC coating line, etc

### 2.2.1 Raw materials

The primary raw material is Hot rolled, STELMOR cooled Low Carbon wire rods of diameter 5.50mm & 6.50mm, suitable for Mechanical De-scaling, of Grade SAE 1006 would serve as the primary raw-material for Hot-Dip Wire Galvanizing.

To produce 1920 MT of Hot-dip Galvanized wire, the typical yield from wire rod through the stage of Wire Drawing is estimated to be 98% (*scale loss, coating weight gain, galvanized wire scrap loss*) giving a monthly Wire rod requirement of around 1960 MT ~2000 MT.

### 2.2.2 Proposed design process:

Figure 2 below presents the broad proposed process flow

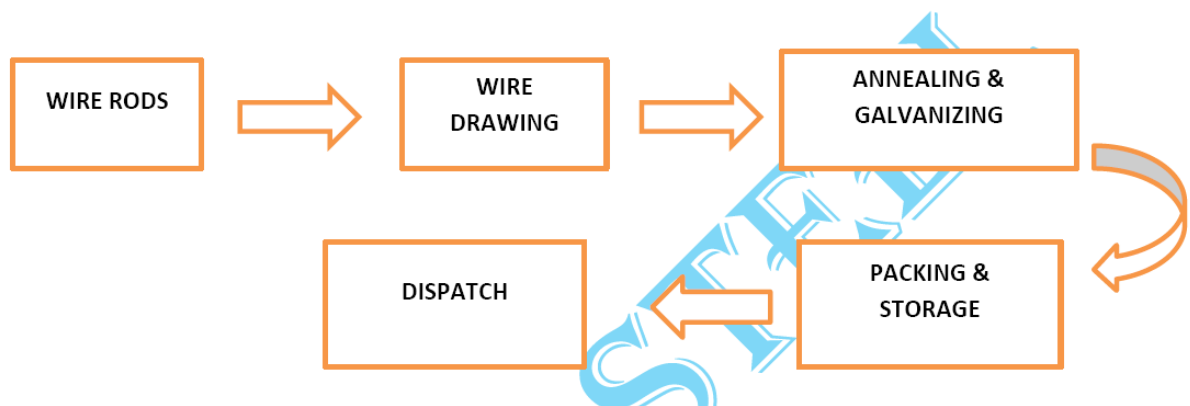


Figure 2: Broad classification of process flow

Source: Technical report for the project.

#### 2.2.2.1 Wire Drawing:

Wire Drawing is a metal working process used to reduce the cross section of the wire rod / wire by pulling it through a single or series of dies. The wire rods will be drawn to the diameter required to serve as raw material for Hot-Dip Wire Galvanizing on various High Speed Wire Drawing machines. Major consumables in wire drawing includes: wire drawing soap / lubricant, wire drawing dies, hydraulic oil, gear oil, de-scaling pulley and brushes, water, sulphuric acid, borax penta-hydrate and electricity.

##### i. Stages of wire drawing

- **Wire Rod paying off.** Vertical Dual station hydraulic tilt pay-off with a top bend pulley for Wire rod bending and scale shedding. The unit will have scale collecting

boxes to collect the shed off scales during wire gliding through the pulleys. The unit will have a set of guide rollers and pulleys to guide the wire rod into the Wire rod preparation section.



*Plate 1: Vertical Dual Station Pay-off with scale collecting boxes*

- Wire rod preparation comprising of online mechanical de-scaling, brushing, and hot water.** On-line Wire Rod Preparation system will involve reverse bending of wire rods through a set of pulleys aligned in horizontal & vertical sheaves to shed off the brittle surface scales (iron-oxide) formed during the cooling process in Wire rod Mills due to surface oxidation. Scales are detrimental to Wire Drawing and their removal is a must before the start of Wire Drawing process. This process of shedding off brittle surface scales by bending them through a set of pulleys is termed as Mechanical De-scaling. The top-most layer being  $\text{Fe}_3\text{O}_4$  is shed off by this process. Rinsing, Electrolytic pickling, Water rinsing, Borax coating & Drying. The next layer of scale i.e.  $\text{Fe}_2\text{O}_3$ , will be removed by passing the wire rods through High Carbon steel brushes, rotating at a very high speed on different planes. The abrasive action of the brushes, will remove this layer of scale which is not removed in the Mechanical De-scaling process. After this, the Wire rod will be passed through a hot water rinse chamber maintained at  $500^\circ\text{C}$  to clean small amorphous residues of scales from where it will be made to enter the Electrolytic Pickling section which will remove the sticky inner-most  $\text{FeO}$  layer. In this section diluted Sulphuric acid at a high concentration will be made to pickle / clean the incoming wire rod. The term "Electrolytic" as electricity is used to speed up the cleaning process of the wire rod travelling at a speed of about  $2.25 \text{ m/s}$  (in our case) in a short length pickling bath. The wire rod will then pass through a water rinse to wash away all the acid to prevent acid carryover to the next section which is the Borax bath in which Borax penta-hydrate solution will be maintained at  $800^\circ\text{C}$ . It prevents hydrogen embrittlement from the atmosphere and neutralizes the wire rods by removing the acids & bases (in our case only acid). It also acts as a

lubricant carrier as it aids the adherence of lubricant to the wire during drawing, producing some fantastic results in high speed drawing. The bath length will be suitable to give a borax coating weight of 4-5 GSM at a wire rod travelling speed of 2.25 m/s. After borax coating, the wire rod will pass through an induction heating coil where the borax solution is dried on to the wire rod surface to prevent wet wire rod from entering the 1st die.

- **Wire drawing machine.** The proponent proposes to have 3 sets of straight line wire drawing machine with a final drawing speed of 23 m/s each, prime duty being 5.50mm – 1.72mm To draw wires for the 1920 MT / month, Hot-Dip Galvanizing plant.

#### **Proposed wire drawing machine configuration**

- Wire rod inlet UTS designed for: 50 kg/mm<sup>2</sup> maximum.
- Final drawing speed: 23 m/s.
- Prime duty: 5.50mm – 1.72mm, Auxiliary duty: (In the product mix sheet)
- 2 sets of machine will have 10 blocks with the 1st block being OTO type and blocks 2nd – 10<sup>th</sup> being straight line type AND 1 set will have 11 blocks with the 1st block being OTO type and blocks 2nd – 11th being straight line type.
- Tuner rolls will be present on blocks 3rd – 10th/11th for tension control and correction of volumetric flow from one block to the other which is a function of diameter & block pulling speed.
- As the wire diameter is reduced with each pass, block pull speed is designed to increase after each pass to compensate for the wire elongation with reduced diameter.
- All the soap boxes will have motorized soap applicators and only the 1st pass will have a rotating die-holder to take care of wire rod ovality in the 1st pass.
- All the blocks having a reduction ratio of 4 or more will be designed with geared motor and the ones having a reduction ratio of less than 4 will have single stage belt reduction through ungeared motor.
- All the motors will be driven by AC variable frequency drives controlled via a common PLC.
- The machine will have automatic controls like length counting, wire break sensing and machine braking, tripping of 1st block and slowing down of machine speed in the event of wire breakage in the Pay-off & Wire Rod Preparation system.
- The drawing dies and pulling capstans / blocks will be water cooled and Tungsten Carbide sprayed over the pulling band.

- Cast & helix of the drawn wires will be set either by adjusting the die boxes on the horizontal & vertical planes or by a set of killing rollers in between the top & bottom deck of the final block separated by a flange.
- Machine will also have a horizontal dancer after the 11th block and before the spooler to control wire tension and for smooth gliding of the wires to the spooler.
- Compressed air will be required to operate the tuner rolls, brakes (the machine will also have electrical braking) & dancer.
- Dies consisting of Tungsten Carbide (TC) pellets stamped in Mild steel casing will be used for drawing.
- Sodium & Calcium based soap will be used as anti-friction lubricant between the wire and TC pellets.
- Connected load: 1550 KW (Approx. for 3 sets of Wire Drawing machines with utility pumps & motors)
- Production: 2520 MT / month (29 days) @ 80% efficiency with reference drawing of 1.72mm from 5.50mm at a speed of 23m/s.



*Plate 2: Multi-block Straight Line Wire Drawing Machine*

- **Coiling.** (On spools): For coiling of the drawn wires at 23 m/s, HORIZONTAL SPOOLERS is preferred over DBC or RDH. The spools selected for this duty will be DIN-1000 (modified) to accommodate 2300kgs of drawn wires, idea being 1 wire rod to be drawn on 1 spool. The spooler will have a wire traverse guide for uniform distribution of wires along the spool with hydraulic lift-lower device and pneumatic conical pintle locking of the spools. The spooler will have both electrical & pneumatic braking and the motor rating will be selected taking into account the machine stoppage from 23 m/s in 6-8 seconds and starting the spooler with part loaded spool.



Plate 3: Proposed horizontal spooler

- Plastic Wrapping for storage / Hot-Dip Galvanizing plant feeding.** The drawn wires will then be fed to the Hot-Dip Galvanizing plant for Galvanizing. The wire drawn in excess which will be stored for more than 3 days will have to be wrapped with thin plastic sheets to prevent moisture absorption from the atmosphere as the wire is drawn from Borax coated wire rod and Borax is highly hygroscopic in nature

#### 2.2.2.2 (32 Wire) Hot-Dip Wire Annealing & Galvanizing

This is a process where hard drawn wires are annealed to bring down the UTS almost close to the parent material i.e. Wire rod and coated with a layer of zinc by immersing in a bath of molten zinc, comprising of prior cleaning and treatment in solution baths. When exposed to atmosphere, pure zinc reacts with atmospheric oxygen to form ZnO which further reacts with CO<sub>2</sub> to form ZnCO<sub>3</sub>, a shiny grey strong material which protects the wire underneath from corrosion. Major consumable in Hot-Dip Wire Galvanizing includes :LPG, Water, Concentrated Hydrochloric Acid, Distilled Water, Galva Flux (Zinc Ammonium Chloride), Zinc (99.995% purity GRADE), Wiping Pads, Nitrogen, Wax, Iron straps for coil bundling and Polythene & Jute for coil wrapping. The hard drawn wires from the Wire Drawing machines will be brought to the Wire Annealing and Galvanizing plant and will be fed by means of what we refer to as the pay-off units.

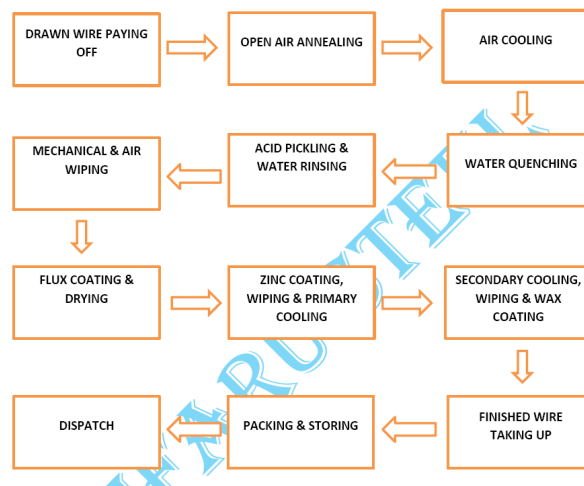


Figure 3: proposed annealing and galvanizing process flow

Source: Technical report

### **Proposed Hot-Dip Wire Annealing & Galvanizing line configuration:**

- Charge Material : Low Carbon Steel Wires (SAE-1006)
- Charge Material UTS: 110 kg/mm<sup>2</sup> (maximum)
- Charging medium: Vertical static Pay-off units
- Wire Range : 1.55 mm to 4.00 mm
- Reference Wire Dia.: 1.72 mm
- No. Of Wires : 32
- D.V.: 150
- Wire Pitch: 32mm (from furnace to dryer) & 40mm (from zinc bath to wax coating)
- Zinc Coating : Commercial Coating from 50 to 100 GSM.
- Line Speed: 37 – 97 mtrs. / min.
- UTS. of Galvanized Wire : 38 – 45 kgs./mm<sup>2</sup>
- Sub-Critical Annealing : Through LPG fired Open Air Annealing Furnace
- Wiping System : Vertical Pad Wiping & Nitrogen wiping
- Cleaning System : Fumeless Turbulent Acid Pickling
- Finished wire removal system: Through Vertical drop coils and pattern laid trolleys.
- Connected Load Required : 450 KW (Approx. with utility pumps & motors)
- Estimated Production: 1920 MT / month @ 85% efficiency with the available product mix & 1810 MT / month @ 85% efficiency with reference wire diameter of 1.72mm and 29 working days a month.

### **Open Air direct annealing**

The proponent proposes to use Direct Annealing method where an LPG fired open air annealing furnace will be present with 5 zones, preceded by a preheating zone from where the flue of combustion will pass to the chimney supported with a recuperator and in

the event of doing so will pre-heat the incoming cold wires. 1st two zones will be excess in Oxygen to heat the incoming wires at a fast pace, 3rd zone being the neutral zone, also termed as transition zone from O<sub>2</sub> excess to CO excess. The last 2 zones will be excess in Carbon monoxide and Oxygen-negative to limit oxidation issues. The first three zones will have nozzle mix burners which will use the hot air for combustion supplied by the combustion blower and the recuperator. The last three zones will have pre-mix burners for controlled oxidation and to provide a reduced atmosphere which will have a positive impact on Annealed wire quality. The pre-mix burners will not use the hot air from as heating the air will cause the Air-gas mixture to expand and due to less volume available for expansion in the mixer, there will be /an explosion. The operating temperature will range from 750-950°C and will be sufficient to anneal the wires and reach the desired UTS. Such high temperature will also burn & melt the borax & soap film developed on Wire Drawing.



**Plate 4: Typical On-line Annealing Furnace**

#### **Air cooling**

Natural cooling by means of atmospheric air for homogenization of lattice structures and also to Lower wire temperature before passing into the Water quenching section; If wire at a very high temperature goes into the quench bath, it will harden due to rapid temperature change and will have an impact on the Annealed wire UTS. Thus, a suitable air cooling length will be provided.

#### **Water quenching**

A process where air cooled, annealed wires are plunged in an SS (Stainless Steel) trough containing water at around 40°C (maintained by timely addition) to further bring down the water temperature and wash free hanging freshly formed oxides from the wire surface. This section is lowers the wire temperature before passing into the next section which is the Acid Pickling & Water rinsing section. If the wire temperature is too high, acid will react

violently with the wires (leading to increased consumption) and apart from removing oxides (both brittle & sticky), will also erode the wire surface adding to the yield loss

### **Acid pickling and acid rinsing**

After water quenching, the wires pass into a fumeless acid pickling section. Acid to be used is concentrated hydrochloric acid with 33% concentration, diluted in water thereby giving a final usable concentration of 18-21%. This section will remove the scales (iron oxides), both brittle and sticky from the wire surface by turbulent flow and agitation in the chamber. It is a very important step in wire surface preparation prior to galvanizing. Negligence in this section can have a direct impact on zinc bond formation strength and lustre of the finished galvanized wires. Acid samples will be taken out from time to time to check its concentration and Fe content by Titration analysis. If the concentration drops to 12%, fresh acid solution will be topped up.

The acid pickling section will be followed with a Water rinsing section to prevent acid carryover to the next section which is the Flux coating section. Acid fumes will be sealed inside the chamber by water channel along the sides and double layer water curtains at the entry and exit.

Expected acid temperature due to pickling and agitation is 40-45°C. The whole pickling and rinsing section will be fabricated with PP (Polypropylene) plate



***Plate 5: proposed Fume-less Acid pickling tank***

### **Mechanical & Air Wiping**

After exit from the water rinse, it will pass through a mechanical wipe section comprising of hard ceramic stones, where the wires will rub, hit & drip off the carried over water. This will be followed with an air wipe which will remove the remaining moisture and water droplets from the wire surface to make it completely dry before it enters the Flux coating section. If water is carried to the flux coating section, the specific gravity of the flux solution will drop and it will under-perform.

### **Flux coating and drying**

The flux coating prevents immediate oxidation of the cleaned wire surface on exposure to atmospheric oxygen and also helps in quicker inhibition of Zinc in the Zinc Bath.

After this, the wires will pass through a Drying Oven to dry the flux onto the wire surface as if wires wet with flux go into the Zinc-Bath, it will affect coating quality, will generate cold spots in the bath and bring down the purity of Zinc.

### **Zinc coating, wiping and primary cooling**

The prime objective of zinc coating / galvanizing is to improve the corrosion resistance and hence longevity of wires used in several applications. This is the heart of the Hot-Dip Galvanizing plant where wires will be plunged into a bath of molten zinc maintained at 445 - 455°C and bond formation between the bare wire and zinc will take place after the formation of several layers of Zinc-Fe alloy namely Gamma, Delta, Zeta & Eta layers. The top-most layer named the Eta layer is not alloy and is pure zinc.

When exposed to atmosphere, pure zinc will react with atmospheric oxygen to form ZnO which will further react with CO<sub>2</sub> to form ZnCO<sub>3</sub>, a shiny grey strong material which will protect the wire underneath from corrosion.

Ceramic coating baths with immersion heating OR top firing, the heating of the bath to melt the zinc will be done by burners fired by LPG.

The Ceramic bath will be tapered toward the operating side from where the dross will be removed from time to time using ladles with sieves. The hood housing the burners will be mounted over the bath towards the non-operating side. Ceramic skids will sink the wires into the molten zinc for a required dip time set by dipping length controlling rollers.

### **Secondary cooling, Wiping & Wax coating:**

After the primary cooling of zinc coated wires, it is recommended to have a secondary cooling as well to further bring down the wire temperature to ensure a very bright finish of Galvanized wires.

The wires will then be made to pass through an air wipe to drip off the water remains before passing into the Wax coating section.

Wax coating section comprises of a small Stainless Steel trough containing wax maintained at 80°C through which the wires will dip & pass to obtain a thin film of wax on the surface for efficient gliding to the Take-up units through guides & rollers and also to prevent corrosion and formation of white rust.

### **Finished Wire Take-Up**

The finished wires after having passed through the wax bath will then pass through a set of guide rollers and pulleys to the winding & releasing capstans. These capstans will pull the



- b) Any excess construction materials brought to the project site by the contractor which can be reused later

- **Waste**

During construction phase, the proposed project is anticipated to generate different waste which shall include:

**a) Domestic Waste**

The domestic wastes anticipated during construction are mainly sanitary waste generated by construction workers. The Proponent has sufficient sanitary facilities.

**b) Site Construction Wastes**

The project will generate wastes from the site construction activities which include:

- ✓ Scrap metals;
- ✓ Packaging materials, e.g. cement bags, empty paint containers,
- ✓ Broken stones

### 2.3.2 Operation Phase

The Plant will produce 1920 MT / month, Low Carbon, High Speed, 32 wires, HOT-DIP, M.S. Wire Annealing & Galvanizing Plant for the production of Low UTS, Commercial coating range Galvanized wires at Blue Nile Rolling Mills Ltd. THIKA, KENYA. The Galvanized Wire will be used for the production of Chain-link fences, Barbed Wires, Gabion boxes etc

#### 2.3.2.1 Raw materials, products and by-products

Hot rolled, STELMOR cooled Low Carbon wire rods of diameter 5.50mm & 6.50mm, suitable for Mechanical De-scaling, of Grade SAE 1006 would serve as the primary raw-material for Hot-Dip Wire Galvanizing to produce Low UTS, Commercial coating range Galvanized wires.

The byproduct includes scales and scraps which will be recycled in the rolling mills.

#### 2.3.2.2 Waste

*a) Waste water*

Little waste water is expected to be generated from the facility. The waste water will be channelled to the effluent treatment plant prior to being recycled to the process.

*b) Redundant equipment*

Anticipated redundant waste will include faulty fuses, sockets, and machine parts. Some of them will be disposed at NEMA approved landfill and others sold to third parties for recycling while others will be recycled onsite.

### 2.3.3 Decommissioning Phase

The proposed project is envisaged to be in operation for an indefinite period. During decommissioning phase, the buildings and infrastructure could be left intact and

utilised for other uses or they will be demolished and the site redeveloped for another land use.

### 2.3.3.1 Product, By-products and Waste

- **Products and By-products**

There will be no product during decommissioning phase, instead by-product will be generated which include:

- a) Metal rods or parts generated from the decommissioning of the facility;
- b) Machines which will be used elsewhere or sold to third parties;
- c) concrete boulders;
- d) power cables;

- **Waste**

Several waste products are expected to be generated during decommissioning phase. They shall include:

- a) Debris from demolition works;
- b) Redundant equipment/machines;
- c) Scrap metals;

- **Dust**

Demolition activities will generate some dust and other particulates that will be released into the atmosphere.

- **Exhaust Emissions**

The vehicles used to transport demolition materials are expected to generate exhaust emissions. The concentration levels of emissions will depend on the maintenance levels of the vehicles.

### 2.3.4 Power Generation

A Transformer with a total connected load of 2000KW will be installed . The infrastructure already exists in the plant.

## 2.4 Project Cost

The total cost of the proposed project is estimated to cost seven Hundred Million Kenya Shillings (KShs. 700,000,000). This amount will be distributed to various project activities that include; builders work, electrical services installations, mechanical service installations, external works, water reticulation and treatment plant and drainage services, site installations, preliminaries and contingencies.

**CHAPTER THREE****3 BASELINE INFORMATION**

The baseline environmental condition of the proposed project is described in terms of the existing physical, biological, and social-economic aspects.

**3.1 Bio-Physical Aspects****3.1.1 Soils and geology**

The geology of the project area mostly comprises volcanic rock Tertiary to Pleistocene, underlain by ancient (i.e. Pre-Cambrian) Basement rocks that are mostly gneisses. The soils of Thika area are stable and rich in organic matter. At the site are black cotton soils which are known to be poorly drained.

**3.1.2 Hydrology**

Thika area is endowed with both surface and groundwater resources. Most of the rivers flow from highlands in the west towards lowlands in the southeast of the area, where they join the River Tana and form part of the Tana and Athi river drainage system.

The main groundwater resource in the area occurs as shallow aquifers at the contact zones between the Tertiary volcanic sediments and the Basement rocks, with deeper aquifers possibly occurring along fault or fracture zones. The Proponent has a borehole at the project site which supplies water for industrial operations.

**3.1.3 Climate**

The area receives rainfall of between 500 to 1,500mm per year. The rain falls during two distinct seasons: the 'long rains' , driven by the south-easterly monsoon, usually between March and May; and the 'short rains' , driven by the north-easterly winds that predominate towards the end of the northern monsoon, typically occur from October to December. Average minimum and maximum temperatures are 11.5 and 28°C respectively.

**3.1.4 Air Quality**

The area is typically an industrial zone. Baseline air quality of the site was obtained from 2016/Env/0670 environmental monitoring report of the plant undertaken by Polucon, a NEMA accredited laboratory. The values of PM 2.5 and PM 10 monitored at different location were within the limits stipulated under Legal Notice no. 34.

The emissions during operation would likely not be significant to impact local air quality. There will be little increase in SO<sub>2</sub> and NO<sub>x</sub> and negligible increment in PM emission due to this expansion unit. The proposed technology adopted by the proponent has incorporated anti-pollution system. Acid fumes will be sealed inside the chamber by water channel along the sides and double layer water curtains at the entry and exit.

### 3.1.5 Noise Quality

Ambient noise levels were monitored at five locations. The noise levels are well within the National Standards prescribed for industrial area.

### 3.1.6 Ecology

Thika area is characterized by woodland and shrub grassland, comprised of semi-evergreen and deciduous bush lands. However, the Project area and its surroundings have been disturbed and significantly modified. The site is currently occupied by buildings, roads, and few exotic trees and grass.

## 3.2 Socio-economic Aspects

### 3.2.1 Population:

According to 2009 population census, Thika has an estimated population of 472, 334. Approximately 50% of the population is of working age (15-64), with 31% of people falling into the 15-30 age brackets. Women make up approximately 50% of the population.

The total productive labour force in the area is approximately 267,000 people or 56% of the population; however an estimated 170,000 people (37%) live in absolute poverty.

### 3.2.2 Settlement pattern, and land use

Thika town is an industrial town and supports large and small-scale agriculture. The District is also highly urbanised.

### 3.2.3 Local economy:

Agriculture is the main economic activity in the Thika. It is approximated, that 43% of households in the area rely on agriculture. The sector employs an estimated 189,072 people directly or indirectly, 70% of them are women. The main cash crops are coffee, tea, pineapples and macadamia nuts; coffee and pineapples are grown on a large-scale for export. Animal husbandry and fish farming are also practiced. The later employees an estimated 67,700 people and produces 65.5 m tonnes of fish per year.

The trade and industrial sectors provide an important source of employment; according to the Thika District Development Plan, a total of 31 agro-based industries, 16 chemical and 15 engineering industries are operating in the District, while commercial trading employs roughly 3,000 people.

### 3.2.4 Public social services:

The area has relatively poor infrastructure. Road coverage is considered fairly low, with 1,339 km of classified and 123 km of earth roads for the entire area. Poor access to road networks in the interior of the district makes it difficult for farmers to transport products to market, and contributes to higher poverty levels.

## CHAPTER FOUR

### 4 POLICY, LEGAL AND INSTUTIONAL FRAMEWORK

This section of the report outlines Kenya's regulatory framework that set the context in which the Project will operate.

#### 4.1 Policy

##### 4.1.1 National Environment Policy

Kenya is in the process of developing a National Environment Policy. During this study Draft No. 5 of the National Policy was reviewed. The Policy will provide for a holistic framework to guide the management of the environment and natural resources in Kenya. It will also ensures that the linkage between the environment and poverty reduction is integrated in all government processes and institutions in order to facilitate and realize sustainable development at all levels in the context of green economy enhancing social inclusion, improving human welfare and creating opportunities for employment and maintaining the healthy functioning of ecosystem.

##### 4.1.2 The Constitution

Kenya promulgated a new constitution in 2010. The new constitution is hailed as a green constitution as it embodies elaborate provisions with considerable implications for sustainable development. The provisions range from environmental principles and implications of multilateral environmental agreements (MEAs) to the right to clean and healthy environment enshrined in the Bill of Rights. Chapter V covers on land and environment. It also embodies a host of social and economic rights of an environmental character, such as the right to water, food and shelter – among others.

Article 69 on obligations in respect of the environment requires the Proponent to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

#### 4.2 Administrative Context

Kenya's new constitution (2010) has created 47 counties which are administered by the county governments headed by the governors. The Proposed project site is located in Thika Constituency which lies within Kiambu County.

The County Governments are in charge of, among other services: agriculture; health services; public amenities; trade development and regulations at county level; and planning and development.

#### 4.3 Environmental Management in Kenya

Environmental management is currently spearheaded by the Ministry of Environment which is headed by a cabinet secretary. The Ministry is mandated to monitor, protect, conserve and manage the country's environment and natural resources. This is to be

done through sustainable exploitation of natural resources for socio-economic development aimed at the eradication of poverty, improving living standards and ensuring that a clean environment is provided now and sustained in the future. Following the EMCA, the National Environmental Management Authority (NEMA) was set up under the MENR as the principle government authority for managing environmental issues across all sectors in Kenya.

#### 4.4 Regulatory Framework

The proposed project will be undertaken in accordance with all applicable legislation, regulations, approvals and relevant guidelines. Table 5 below provides legislations that are applicable to the proposed project.

**Table 3:** *Applicable legislation and regulations*

Legalisation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
The EMCA, 1999	NEMA	A framework legislation that addresses major issues concerning the environment. The purpose of the Act is to provide for sustainable management of the environment.	Requires the Proponent to: <ul style="list-style-type: none"> <li>• Submit Project Report to NEMA before commencing any new project.</li> <li>• engage NEMA approved expert/firm of experts in conducting EIA studies</li> </ul>
Environment Impact Assessment /Environmental Audit Regulations, 2003	NEMA	Provides for the framework for carrying out environmental impact assessment in Kenya	Requires the Proponent to: <ul style="list-style-type: none"> <li>• prepare project report in accordance with the format specified in Regulation and pay attention to issues specified in the second schedule of the Regulations</li> <li>• carry out corrective measures in the improvement order from NEMA</li> <li>• carry out corrective measures in the improvement order from NEMA</li> <li>• allow a NEMA inspector to enter the facility for the monitoring the effects of its activities on the environment</li> <li>• mitigate trans-boundary impacts taking into account regional and international treaties</li> </ul>

Legalisation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
L.N. 121: Environmental Management and Coordination (Waste Management) Regulations, 2006	NEMA	Formulated for managing various kinds of waste in Kenya	<p>The Regulations requires the Proponent to:</p> <ul style="list-style-type: none"> <li>• to acquire valid EIA licence from NEMA prior to engaging in an activity that can generate hazardous substance</li> <li>• Segregates their waste (hazardous and non-hazardous) by type and then disposes the wastes in an environmentally acceptable manner.</li> <li>• transport waste using a vehicle that has an approved “Waste Transportation License” issued by the NEMA</li> <li>• Dispose off waste in a licensed disposal facility</li> <li>• Labelling of hazardous wastes in accordance with the requirements provided in section 18 of the Regulation.</li> </ul>
L.N. 120: Environmental Management and Coordination (Water Quality) Regulations, 2006	NEMA	Formulated for sustainable management of water used for various purposes in Kenya	<p>The Regulation requires the Proponent to</p> <ul style="list-style-type: none"> <li>• refrain from any activity which might cause water pollution.</li> <li>• Not to discharge any liquid, gaseous or solid into water resource as to cause pollution.</li> <li>• Acquire a valid effluent discharge license to discharge effluent into the environment.</li> <li>• acquire EIA licence prior to abstracting ground water or any activity that is likely to have any adverse impact on the quantity and quality of the water</li> <li>• follow the monitoring guide set out in the Third Schedule to the regulation when discharging</li> </ul>

Legalisation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
			effluent into the environment
<p>Legal Notice No.61 of 2009: The Environment Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations</p>	<p>NEMA</p>	<p>Promulgated for control of Noise and excessive vibration pollution</p>	<p>The regulations:</p> <ul style="list-style-type: none"> <li>• Prohibits the Proponent from making or causing to be made noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety or safety of others and the environment. During renovation and demolition phases of the proposed project, potential sources of noise include construction and demolition vehicles and machinery while during operation phase, the potential sources are standby generator and vehicles used in undertaking corrective and preventive maintenance. The Proponent will ensure that the noises from the above sources comply with the Regulations.</li> <li>• Prohibits the Proponent from making or causing to be made excessive vibration which annoy, disturb, injure or endanger the comfort, response, health or safety of others and the environment</li> <li>• Prohibits the Proponent from causing noise which exceeds any sound level as set out in the First Schedule to the Regulations</li> <li>• Requires the Proponent (if wishing) to operate or repair any machinery, motor vehicle, renovation equipment or other equipment, pump, fan air – conditioning apparatus or similar mechanical device or engage in any commercial or industrial activity which is likely to emit noise or excessive vibrations to do so within the relevant levels prescribed in the First Schedule of the Regulations.</li> <li>• Prohibits the Proponent from operating a motor vehicle which produces any loud and unusual sound and exceeds 85 db(A) when accelerating.</li> <li>• Prohibits the Proponent from</li> </ul>

Legalisation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
			<p>operating construction equipment or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to the Regulations.</p> <ul style="list-style-type: none"> <li>• Requires the Proponent during EIA studies to: <ul style="list-style-type: none"> <li>○ Identify natural resources, land uses or activities which may be affected by noise or excessive vibrations from renovation or demolition;</li> <li>○ Determine the measures which are needed in the plans and specifications to minimize or eliminate adverse renovation or demolition noise or vibration impacts</li> <li>○ Incorporate the needed abatement measures in the plans and specifications.</li> </ul> </li> <li>• Prohibits the Proponent from carrying out activities relating to demolitions without a valid permit issued by the Authority</li> </ul>
Environmental Management and Coordination (Air Quality Standards) Regulations, 2008 - Draft	NEMA	Formulated to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air	<p>These Regulations prohibit the Proponent from:</p> <ul style="list-style-type: none"> <li>• Acting in away that directly or indirectly cause or may cause air pollution to exceed levels set out in the second Schedule to the Regulations</li> <li>• Allowing particulates emissions into the atmosphere from any source not listed in the six schedule of the Regulations</li> <li>• Causing ambient air quality in controlled areas (listed in Schedule Thirteen) to exceed those stipulated under second Schedule.</li> <li>• Allowing emission of particulate matter above the limits stipulated in second Schedule</li> </ul>

Legalisation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
Building Code	Ministry of Local Government	Formulated to provide rules, guidelines and standards to be observed during construction.	The Proponent is required to adhere to the rules, guidelines and standards stipulated in the Code during development of the proposed project
The Public Health Act Cap 242	Ministry of Public Health	The Act regulates activities detrimental to human and environmental health and safety	The Act prohibits the Proponent from engaging in activities that cause environmental nuisance or those that cause danger, discomfort or annoyance to inhabitants or is hazardous to human and environmental health and safety.
The Local Government Act (Cap. 265)	Ministry of Local Government		The Act requires the Proponent to grant the Officers and servants of Local Authority access to their premises to inspect, maintain, alter or repair sewers, drains, pipes, ventilating shafts or other
The Penal Code (Cap. 63)	Judiciary	Formulated to define the penal system in Kenya. It outlines criminal offences and prescribes penalties to them	The Code Prohibits the Proponent from: <ul style="list-style-type: none"> <li>• Voluntarily corrupting or fouling water for public springs or reservoirs, rendering it less fit for its ordinary use</li> <li>• making or vitiating the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighbourhood or those passing along public way.</li> </ul>
The Occupier Liability Act (Cap 34)			The Act Requires the Proponent to ensure that visitors to his premises will be reasonably safe in using the premises for the purposes for which he is invited or permitted by the Proponent to be there
Occupational Health and Safety Act, 2007	DOHSSS	Enacted to provide for the health, safety and welfare of persons employed in workplaces, and for matters incidental thereto and connected therewith	It requires the Proponent to: <ul style="list-style-type: none"> <li>• undertaking S&amp;H risk assessments,</li> <li>• provide notification of accidents, injuries and dangerous occurrences, etc</li> <li>• Provide first aid facilities at the workplace</li> <li>• provide PPEs to the employees</li> </ul>

Legalisation	Responsible Institution/Lead Agency	Main Purpose	Relevance to the Proposed Project
Legal Notice No. 25: Noise Prevention and Control Rules	DOHSS	Promulgated for work related noise exposures	<p>It requires the Proponent to:</p> <ul style="list-style-type: none"> <li>• Comply with the following permissible noise levels : <ul style="list-style-type: none"> <li>a. <i>Workplace Noise</i>- 90 Db (A) over an 8-hour TWA period over 24-hours; and 140 Db (A) peak sound level at any given time.</li> <li>b. Community noise level emanating from a workplace -50 Db (A) during the day; and 45 Db (A) at night.</li> </ul> </li> <li>• ensure that any equipment brought to a site in Kenya for use shall be designed or have built in noise reduction devices that do not exceed 90 Db(A).</li> <li>• medically examine those employees that may be exposed to continuous noise levels of 85 Db (A) as indicated in Regulation 16. If found unfit, the occupational hearing loss to the worker will be compensated as an occupational disease.</li> </ul> <p>It is expected that during equipment installation phase of the project, there may be plant and equipment that exceeds the threshold levels of noise stipulated under the Rules. It will therefore be incumbent on the selected contractor to ensure that their equipment is serviced properly and/or use equipment that complies with the threshold noise values given above. Alternatively the selected contractor will be required to develop, rollout and implement a written hearing conservation program during the renovation.</p>

#### 4.4.1 EMCA 1999 INSTITUTIONS

The EMCA, 1999, make provisions for creation of environmental administrative structures under MENR. The institutions that have been created under the Act for environmental management in Kenya are:

- *NEMA* - the principal government authority established under MENR to exercise general supervision and coordination over all matters relating to the environment in Kenya.
- *NEC*- The apex body under the Act charged with the responsibility of developing the national environmental policy in Kenya as well as to set annual environmental goals and objectives.
- *PCC* - formed to investigate environmental complaints against any person, submit their findings/recommendations to the NEC and to submit periodic reports of its activities to the NEC.
- *SERC*- established to advise the NEMA on the criteria and procedures for the measurement of environmental quality in Kenya. Environmental quality relates to air quality, wastewater quality, waste quality, noise quality, land use quality, etc. Additionally the SERC is required to recommend to the NEMA minimum environmental quality standards for all environmental parameters for which subsidiary legislation is or has been promulgated.

## CHAPTER FIVE

### 5 ENVIRONMENTAL IMPACT ASSESSMENT

Several environmental impacts (positive and negative) associated with the proposed project were identified through the use of experts' judgment method. The following section highlights the impacts anticipated throughout the lifecycle of the proposed project. The associated impact assessment tables for each impact will be categorized according to project phases, prior. Effects of activities are categorized as negative impact and or positive impact.

#### 5.1 Assessment of impacts

Section **one** of this report presents the methodology used in assessing the potential impacts of the proposed project. The key impacts identified for the proposed project are highlighted according to the relevant project phases.

The lead expert utilized precautionary principles to establish the significance of impacts and their management and mitigation.

#### 5.2 Potential impacts of the proposed project

The proposed project is anticipated to generate the following impacts, however the significance of the impacts will range between low to moderate before mitigation and will further reduce with mitigation. The following impacts are anticipated from the proposed project:

##### 5.2.1 Air quality Impacts

The potential impacts likely to arise during the phases of the proposed development are summarised in Table 6, below. During construction phase, impacts on air quality is not anticipated as the activities undertaken, installing of machines in the will not generate any air contaminants. The emissions during operation would likely not be significant to impact local air quality. There will be little increase in SO<sub>2</sub> and NO<sub>x</sub> and negligible increment in PM emission due to this expansion unit. The proposed technology adopted by the proponent has incorporated anti-pollution system. Acid fumes will be sealed inside the chamber by water channel along the sides and double layer water curtains at the entry and exit.

Temporary, minor impacts to air quality may result during Operation and decommissioning phases, from the operation of construction equipment and vehicles. Impacts to ambient air quality are likely to arise from the following:

- dust generated during decommissioning phase when demolished materials is being catered away;
- exhaust emissions from vehicles during construction, operation and decommissioning phases;

**Table 4: Air Quality Impact Characteristics**

Project Phase	Project Aspect/activity	Impact type	Stakeholder/Receptor Affected
Construction phase	Installation of extraction machines	No air quality impacts anticipated	n/a
Operation phase	The proposed technology adopted by the proponent has incorporated anti-pollution system. Acid fumes will be sealed inside the chamber by water channel along the sides and double layer water curtains at the entry and exit.	No air quality impacts anticipated	n/a
Decommissioning phase	<ul style="list-style-type: none"> <li>Dust generated during demolition work especially of partitioned office spaces</li> <li>Emissions from construction vehicles and equipment.</li> </ul>	negative	<ul style="list-style-type: none"> <li>Demolition personnel</li> </ul>

### Construction Phase Impacts

The ambient dust levels are not likely to be exceeded during construction phase as there are no activities that will generate a lot of dust. Minimal dust from cement could be generated from construction of foundation for mounting milling plant. Vehicles delivering construction materials and equipment are anticipated to generate exhaust emissions.

However, the amount of emissions would likely not be sufficient to significantly impact on the local air quality. Therefore, impact of dust and air emissions generated during the construction phase is not considered any further. Therefore, impacts to local residents are not expected and the impact is considered to be **negligible**.

### Operational Phase Impacts

The equipment and machinery will be installed by professional engineers and will be fitted with a complete anti-pollution system hence air emissions from the equipments are expected to be minimal. Table 8 below presents air quality impacts during the operation phase.

**Table 5: Operation Phase Impact: Air Emissions**

<b>Nature</b>	The process will generate minimal particulates, acid fumes
<b>Impact Magnitude</b> <b>Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> The extent of the impact is site specific.</li> <li>• <b>Duration:</b> The duration would be long-term- throughout operational life of the Plant.</li> <li>• <b>Intensity:</b> since the equipment will be fitted with a complete anti-pollution system the intensity can be considered low.</li> </ul>
<b>Likelihood</b>	There is a <b>definite</b> likelihood of particulate generation, acid fumes during the operation phase

**Decommissioning phase impacts**

Minimal dust and exhaust emissions are expected to occur during the decommissioning phase of the project by demolition works and carting away of materials which will be done within a short-period of time. Therefore, impact of dust and emissions generated during the decommissioning phase is not considered any further.

**Mitigation Measures**

Inherent to the management of construction activities and to best practice in construction, typical dust mitigation measures will be put in place and are listed below:

*Operation phase*

- The Proponent will install a complete anti-pollution system in the to control particulates, acid fumes emissions from the processes;
- Vehicles are to be kept in good working order and serviced regularly to minimize emissions;
- The employees will be provided with overalls and boots, as well as items such as dust masks for those emptying the scaling boxes;
- Employees will undergo annual health examinations;
- The Proponent will ensure employees undergo training.

*Decommissioning phase*

- Stockpiles of dusty materials will be enclosed or covered by suitable shade cloth or netting to prevent escape of dust during loading and transfer from site.
- Vehicles are to be kept in good working order and serviced regularly to minimize emissions.

**5.2.2 Waste generation**

The project will lead to the generation of limited waste streams. The origin of waste and effluent associated with the project phases and the stakeholders or receptors likely to be affected are identified in the table 6 below:

**Table 6: Impact Characteristics: Waste**

Project Phase	Project Aspect/activity	Impact type	Stakeholder/Receptor Affected
Construction phase	Waste generated from construction activities: construction waste from construction works	negative	Surrounding areas
Operation phase	Effluent generated from cleaning operations and cooling process  Packaging waste  Scaling and scrap	Negative  positive	Surrounding areas
Decommissioning phase	Waste generated from demolition activities:	negative	Surrounding areas

*Construction phase impacts*

The proposed projects will generate few waste streams during construction phase such as construction rubble and packaging materials, general waste and sanitary waste. Construction rubble will be generated throughout construction phase from activities such as partitioning of office cabin and construction of foundation for mounting the machines.

Packaging material will be accumulated from unpacking of cement. General waste will be produced by site personnel including wrapping from food, bottles and cans. Sanitary waste will be generated by construction workers. The facility has existing sanitary facilities which will be used by construction workers and also operation phase staff.

It is anticipated that solid waste will be temporarily stored on site before it is removed by a NEMA approved waste handler and others recycled. Table 8 below present's construction impact (waste generation).

**Table 7: Construction Impact: Waste Generation**

<b>Nature</b>	Construction activities that produce wastes that are likely to result in a <b>negative direct</b> impact on the site.
<b>Impact Magnitude</b> – <b>Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> The extent of the impact is site specific.</li> <li>• <b>Duration:</b> The duration would be short-term as the impacts will not persist after construction phase.</li> <li>• <b>Intensity:</b> the intensity can be considered <b>low</b> as construction is temporary.</li> </ul>
<b>Likelihood</b>	There is a <b>definite</b> likelihood of waste generation from construction work.

### Operation phase

Several waste streams are similarly anticipated during the operation phase of the Project. The wastes anticipated include general waste, such as office waste, effluent from onsite toilet facilities and the processes and waste associated with plant maintenance. Descaling waste and scrap materials will be used as raw materials in furnaces.

Hazardous waste from the laboratory will be disposed offsite through licensed waste handlers.

Waste water will be pre-treated in the ETP and recycled back to the process.

The domestic wastewater will be channelled to the public sewer. The other wastes will be managed in accordance with Legal Notice No. 121 of 2006. Waste produced during the operation phase of the project will be minimal. Table 8 below presents waste generation impact during operation phase.

**Table 8: Impact of Waste Generation during operation phase**

<b>Nature</b>	Operation activities mainly annealing and galvanizing process will produce waste that can have <b>negative direct</b> impacts.
<b>Impact Magnitude</b> – <b>Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> The extent of the impact is onsite as impact will be limited to the site.</li> <li>• <b>Duration:</b> The duration would be long-term as the impacts will last the entire operation period of the project which is indefinite.</li> <li>• <b>Intensity:</b> the intensity can be considered <b>low</b> as the waste will be properly managed</li> </ul>
<b>Likelihood</b>	It is unlikely the waste will impact on the soil and ground water as they will be properly managed.

### Decommissioning phase impacts

Decommissioning of the project is anticipated to generate limited waste streams. Demolition/alteration of the buildings and removal or dismantling of machines will generate solid waste. Demolition rubble will be generated throughout decommissioning phase from activities such as demolition of stone walls, demolition of concrete foundation.

General waste will be produced by site personnel including food wrappings. Effluent will be produced from toilet facilities.

It is anticipated that solid waste will be temporarily stored on site before it is removed by a NEMA approved waste handler. Table 9 below presents impact waste generation during decommissioning phase.

**Table 9: Impact of Waste generation during Decommissioning Phase**

<b>Nature</b>	Construction activities that produce waste and effluent would result in a <b>negative direct</b> impact on the site.
<b>Impact Magnitude</b> – <b>Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> The extent of the impact is onsite as impact will be limited to the site.</li> <li>• <b>Duration:</b> The duration would be short-term as the impacts will not persist after decommissioning phase.</li> <li>• <b>Intensity:</b> the intensity can be considered <b>low</b> as decommissioning is temporary.</li> </ul>
<b>Likelihood</b>	There is a <b>definite</b> likelihood of waste generation from decommissioning the project.

### Mitigation Measures

The potential impacts associated with waste generation can be minimized through proper mitigation measure, as described below:

#### *Construction*

- The generation of waste materials will be avoided or minimized as far as practicable, where it is not practical to avoid generation, waste materials should be reused or recycled as far as practicable.
- All waste to be separated into respective streams for disposal by a licensed contractor.

#### *Operation phase*

- Descaling waste and scrap materials will be used as raw materials in furnaces.
- Hazardous waste from the laboratory will be disposed offsite through licensed waste handlers.
- Waste water will be pre-treated in the ETP and recycled back to the process.
- The domestic wastewater will be channelled to the Sewage Treatment Plant. General waste must be removed from site by a licensed contractor.

#### *Decommissioning Phase*

- All waste to be separated into skips for recycling, reuse and disposal.
- All unwanted solid waste materials will be stored in a bunded area and disposed of by a licensed contractor.
- Components of the machines will be re-used or recycled, as far as possible. Materials that cannot be re-used or recycled will be placed in a skip and removed from site by a licensed contractor to a NEMA approved disposal site.

### 5.2.3 Residual Impacts

If mitigation measures given above and listed in the EMP are implemented, the overall significance will remain negligible during the project cycle.

### 5.2.4 Health and Safety Impacts

The various activities of the project can potentially pose health and safety risks. The health and safety risks associated with the proposed project are identified in the table 12 below.

**Table 10: Impact Characteristics: Health and Safety**

Project Phase	Project Aspect/activity	Impact type	Stakeholder/Receptor Affected
Construction phase	Construction activities	negative	<ul style="list-style-type: none"> <li>Construction personnel</li> <li>Onsite personnel</li> </ul>
Operation phase	Operation activities	negative	<ul style="list-style-type: none"> <li>Onsite personnel</li> </ul>
Decommissioning phase	demolition activities:	negative	<ul style="list-style-type: none"> <li>Demolition personnel</li> </ul>

#### *Construction Phase*

Construction activities will include; construction of foundation for mounting machinery and assembling the machine. These construction activities can pose safety risks if not managed appropriately. Table 12 below presents health and safety impact during construction impact phase.

**Table 11: Health and Safety during Construction Phase**

<b>Nature</b>	Health and safety impacts associated with the proposed projects will be direct <b>negative impact</b> .
<b>Impact Magnitude – Low</b>	<ul style="list-style-type: none"> <li><b>Extent:</b> The health and safety risks associated with construction activities will be site specific and others will be activity specific.</li> <li><b>Duration:</b> The duration would be short-term as the impacts will not persist after construction activities.</li> <li><b>Intensity:</b> the intensity can be considered <b>low</b> as those affected will mostly adapt.</li> </ul>
<b>Likelihood</b>	It is <b>unlikely</b> that accidents will occur on site during the construction phase as potential accidents can be mitigated through implementation of a health and safety plan. The proponent will also engage qualified professionals.

#### *Operation Phase Impact*

Potential health and safety impacts during operation phase will be associated with activities such as operating the machines and preventive and corrective maintenance; and handling of raw materials, products and wastes.

Operation of machines and preventive and corrective maintenance may results in non-fatal accidents such as minor injuries to hands and in the worst case, fatal accidents through electrocution. Similarly machine failure might result in injuries which can also be

fatal or non-fatal. Table 14 below presents health and safety impact during operation phase.

**Table 12: Health and Safety Impact during Operation Phase**

<b>Nature</b>	Health and safety impacts associated with operating the machines and wastes will be direct <b>negative impact</b> .
<b>Impact Magnitude Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> The health and safety risks associated with operation activities will be site specific and others will be activity specific.</li> <li>• <b>Duration:</b> The duration would be long-term as the impacts will persist through out operation phase.</li> <li>• <b>Intensity:</b> the intensity can be considered <b>low</b> as the employees will be trained.</li> </ul>
<b>Likelihood</b>	It is <b>likely</b> that minor injuries such as bruises will occur during the operation phase. However, the proponent will provide all the appropriate PPEs

#### *Decommissioning Phase*

Decommissioning phase activities will include demolition of structures and disassembling of equipment. These activities will involve working with heavy machinery and tools. Heavy vehicles will be used to cart away heavy components of disassembled plant from the site. These decommissioning activities can potentially cause bodily injuries to the workers involved in demolition work if not managed appropriately. Table 14 below presents health and safety impact during decommissioning phase.

**Table 13: Health and Safety Impact during Decommissioning Phase**

<b>Nature</b>	Health and safety impacts associated with the decommissioning of the proposed project will be direct <b>negative impacts</b> .
<b>Impact Magnitude Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> The health and safety risks associated with decommissioning activities will be site specific and others will be activity specific.</li> <li>• <b>Duration:</b> The duration would be short-term as the impacts will not persist after decommissioning.</li> <li>• <b>Intensity:</b> the intensity can be considered <b>low</b> as those affected will mostly adapt.</li> </ul>
<b>Likelihood</b>	It is <b>unlikely</b> that accidents will occur on site during the decommissioning phase as potential accidents can be mitigated through implementation of a health and safety plan

#### *Mitigation Measures*

The objective of mitigation is to manage proposed project so that impacts on health and safety risks to contractors, employees and other receptors are reduced.

#### *Construction*

- The Proponent will develop health and safety plan prior to the commencement of construction to identify and avoid work related accidents. This plan must be adhered to by the appointed contractors and meet Occupational Health and Safety Act (OSHA), of 2007, requirements.
- Appropriate Personal Protection Equipment (PPE) must be worn by all construction personnel.

*Operation phase*

- Regular maintenance of processing machines and all other infrastructure must be undertaken to ensure optimal functioning and reducing the chance of failure.
- Training of new and old employees on health and safety;
- Appropriate Personal Protection Equipment (PPE) must be worn by all operation personnel.

*Decommissioning phase*

- A health and safety plan must be developed prior to the commencement of decommissioning/demolition to identify and avoid work related accidents. This plan must be adhered to by the appointed contractors and meet Occupational Health and Safety Act (OSHA), of 2007, requirements.
- The health and safety plan must be adhered to by the appointed contractors.
- Appropriate Personal Protection Equipment (PPE) must be worn by all demolition personnel.

**5.2.5 Socio-economic impacts**

The proposed project is anticipated to generate positive socio-economic impacts. The project will create short term job opportunities (skilled and unskilled labour) during the entire project phases. The Proponent will **hire 20 employees** on permanent basis during operation phase of the project contract. Other impacts are associated with procurement of materials. The socio-economic impacts of the project are identified in table 16 below:

**Table 14: Impact Characteristics: Socio-economic**

<b>Project Phase</b>	<b>Project Aspect/activity</b>	<b>Impact type</b>	<b>Stakeholder/Receptor Affected</b>
Construction phase	Employment of Procurement materials and machinery	Direct, indirect induced positive impacts	<ul style="list-style-type: none"> <li>• Construction personnel and engineers</li> <li>• Local and international suppliers</li> </ul>
Operation phase	Employment of Procurement materials e.g. operating and processing materials	Direct, indirect induced positive impacts	<ul style="list-style-type: none"> <li>• Operation personnel</li> <li>• Local and international suppliers</li> </ul>
Decommissioning phase	employment	Direct, indirect induced positive impacts	<ul style="list-style-type: none"> <li>• Demolition personnel</li> </ul>

### Construction Phase

The capital investment required for project is at approximately Kenya Shillings 700 million which would be spent in construction and acquisition of machinery. During the construction phase the civil, and building construction sectors would benefit the most. Local procurement would primarily benefit the civil and construction industry. Most machinery and technical components associated with it will be obtained from international suppliers.

Whereas the total number of workers required for construction phase is not yet known at this stage, the project will have semi-skilled and skilled employees from within the Kiambu County and engineers from the equipment suppliers. It is intended that Proponent and its contractor would source the majority of the skilled and unskilled workers from the local area. In the local municipal context, this translates into a benefit to the local economy, even though these opportunities will only be for the short term i.e. for the duration of the construction phase.

Hiring of construction personnel will be at the discretion of the contractor. The construction work will create an opportunity for 'on-the-job' training thus increasing general skills levels of the workforce, for skilled and unskilled personnel. Table 15 below presents socio-economic impacts during construction.

**Table 15: Socio-economic impact during construction phase.**

<b>Nature</b>	The benefit to the local economy will be <b>positive direct</b> through employment and procurement of services and <b>indirect</b> through spending in the local economy due to increase in wages.
<b>Impact Magnitude</b> <b>Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> the project will create employment and procurement to the local, regional and international suppliers.</li> <li>• <b>Duration:</b> employment created will only last to the end of construction phase and thus is short-term.</li> </ul> <p><b>Intensity:</b> The intensity will be <b>low</b> as a few jobs will be created locally with approximately 30 percent of the total investment being spent on goods and services obtained from the local area during the construction phase.</p>
<b>Likelihood</b>	There is likelihood that the impact will occur

### Operation Impact

The annealing and galvanizing plant will generate opportunities for building and fabrication materials for local, regional suppliers and even international suppliers. The Proponent will install a Hot-Dip Wire Annealing & Galvanizing plant to become self-sufficient for meeting the company's production requirements of Chain-links & Barbed Wires along with becoming one of the leading Manufacturers & Suppliers of Hot Dip Galvanized Wires in East Africa.

In terms of job opportunities, the project will generate few opportunities; **about 20 personnel will** be hired to operate the processing plant.

The above opportunities created by the project during operation phase are anticipated to generate other positive indirect effects on the local and regional economy. For example it might results in growth of local supply chain especially for manufacturers of Chain-links & Barbed Wires along with farming activities. Table 16 below presents socio-economic impact during operation phase.

**Table 16: Socio-economic Impact During Operation Phase**

<b>Nature</b>	The benefit to the local economy and the company will be <b>positive direct</b> through employment and procurement of raw materials and <b>indirect</b> through spending in the local economy due to increase in wages.
<b>Impact Magnitude</b> – <b>Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> the project will create employment and procurement to the local, regional and international suppliers.</li> <li>• <b>Duration:</b> employment created will last indefinite life time of the project and thus is long-term.</li> </ul> <p><b>Intensity:</b> The intensity will be high as 1920 MT / month Low UTS, Commercial coating range Galvanized wires will be developed to enable the plant to become self-sufficient for meeting the company's production requirements of Chain-links &amp; Barbed Wires and jobs will be created.</p>
<b>Likelihood</b>	There is high likelihood that the impact will occur

#### *Decommissioning Phase*

The proposed project is anticipated to generate both positive socio-economic impacts during decommissioning phase. The project will be short-term procurement of services. Services of demolition and transport suppliers will be required. Table 17 below presents socio-economic impact during decommissioning phase.

**Table 17: Socio-economic Impact: Decommissioning Phase**

<b>Nature</b>	There will be both direct positive through procurement of services
<b>Impact Magnitude</b> – <b>Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> the decommissioning phase will affect both local and regional suppliers.</li> <li>• <b>Duration:</b> procurement of services for demolition will be short-term</li> </ul> <p><b>Intensity:</b> The intensity will be <b>low</b> as a few jobs will be created locally.</p>
<b>Likelihood</b>	There is likelihood that the impact will occur

#### 5.2.6 Noise impacts

The potential noise impacts associated with the construction and operational phases of the proposed projects are summarized in the table 18 below.

**Table 18: Characteristics of Noise Impacts**

Project Phase	Project Aspect/activity	Impact type	Stakeholder/Receptor Affected
Construction phase	Noise resulting from construction vehicles, equipment and activities such as drilling, welding, concrete mixing and steel works.	Direct	Equipment installation personnel and staff working at the existing plant

Operation phase	Noise from processing equipment	Direct	<ul style="list-style-type: none"> <li>• Operation personnel</li> </ul>
Decommissioning phase	Noise resulting from demolition vehicles, equipment and activities such as excavation, demolition and disassembling of equipment.	Direct	<ul style="list-style-type: none"> <li>• Demolition personnel</li> </ul>

### *Construction phase*

The construction activities will be a source of noise during construction phase. Although, construction activities are temporary by nature, the noise they generate can cause disturbance or inconvenience to the neighbors. During construction the main sources of noise will be as a result of equipment installation, drilling activities and welding works. Noise emitted during construction activities would increase the ambient noise levels at the site. It is expected that the noise emitted during the construction phase has the potential to impact on onsite employees within the site boundary. It should be noted however, that there are no residential buildings within close proximity to the site. Increased noise during the construction phase would be short-term. Operations will be limited to day light hours. Table 19 presents impact of noise during construction phase.

**Table 19: Noise Impacts during construction phase**

<b>Nature</b>	Construction activities will result in negative noise impact
<b>Impact Magnitude</b> – <b>Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> The extent of the impact would be <b>site specific</b>, as it will likely extend beyond the premises</li> <li>• <b>Duration:</b> the impact will be short-term as it will only last the duration of construction</li> <li>• <b>Intensity:</b> The intensity of the impact will be <b>low</b> since ambient noise level are fairly low</li> </ul>
<b>Likelihood</b>	There is likelihood that the impact will occur

### *Operation phase*

The sources of noise during operation phase will be the production process which may generate continuous broadband noise, noise with a noticeable tone, as well as impulsive noise. Human hearing is particularly sensitive to tonal and impulsive sounds.

Table 20 presents noise impacts during operation phase.

**Table 20: Noise Impacts during operation phase**

<b>Nature</b>	Operation activities will result in negative noise impact
<b>Impact Magnitude</b> – <b>Low</b>	<ul style="list-style-type: none"> <li>• <b>Extent:</b> The extent of the impact would be limited to the premise</li> <li>• <b>Duration:</b> the impact will be long-term as it will last the duration of operation</li> <li>• <b>Intensity:</b> The intensity of the impact will be <b>low</b> since the walls of the</li> </ul>

	premise will act as barriers and the equipments are modern hence limiting the amount of noise reaching outside
<b>Likelihood</b>	There is likelihood that the impact will occur

#### *Decommissioning phase*

The demolition activities will be a source of noise during decommissioning phase. Although, demolition activities are temporary by nature, the noise they generate can cause disturbance or inconvenience to the neighbors. During decommissioning phase the main sources of noise would be transport vehicles and demolition equipment for cutting metals and excavation. Noise emitted during demolition activities would increase the ambient noise levels at the site. It is expected that the noise emitted during the demolition phase has the potential to impact on demolition personnel. Demolition activities will be limited to day light hours.

#### *Mitigation Measures*

- Construction, operation and demolition workers and personnel should wear hearing protection when required;
- Vehicles and machines would be properly serviced and well maintained;
- A grievance procedure would be established whereby noise complaints by neighbors are recorded and responded to.

## CHAPTER SIX

### 6 ANALYSIS OF ALTERNATIVES

Several alternative aspects were considered for the proposed project. They included: annealing and galvanizing technologies, alternative land and no-go option. Evaluation of the alternatives is governed by a “rule of reason,” which requires the evaluation of alternatives “necessary to permit a reasoned choice.”

#### 6.1 Alternative technologies

##### 6.1.1 Annealing Technologies

After wire drawing, which is a cold working process, the molecules / crystals are displaced from their actual position / lattice points and re-distributed in a non-homogeneous pattern giving non uniform density to the wire. The result is a hard and brittle wire which easily breaks if further bent, formed or cold worked. The solution to this problem in Low Carbon is annealing.

Annealing process in Galvanizing line can be Off-line (annealed from furnaces and brought to the Galvanizing line) or On-line (annealed on the Galvanizing line itself). The off-line annealing can be done on Bell-type or Pit-type furnace which is a batch process and the online annealing can be done using different types of annealing modes like **Direct Annealing:** Lead Bath Annealing, Open Air Annealing, Fluidized bed annealing OR **Indirect Annealing:** passing the wires through pipes of hole-bricks etc. using different types of fuels namely Furnace Oil, LPG, NG, Diesel etc.

##### **Open air annealing**

Wires drawn from Low Carbon Wire rods of UTS around 340MPa, become hard & brittle due to work hardening / cold working. The final UTS of drawn wires is foreseen to be as high as 110MPa which if Galvanized directly will not be suitable for the production of Galvanized wire products like Chain-links, Barbed Wires & Gabion boxes. Also it will not meet the UTS prescribed by KEBS. The objective is to bring the UTS of drawn wires close to the UTS of the parent material i.e. Wire Rods.

After an extensive research on the environmental and economic perspective, the proponent proposes to use **Direct Annealing** method where an LPG fired open air annealing furnace will be present with 5 zones, preceded by a preheating zone from where the flue of combustion will pass to the chimney supported with a recuperator and in the event of doing so will pre-heat the incoming cold wires. 1st two zones will be excess in Oxygen to heat the incoming wires at a fast pace, 3rd zone being the neutral zone, also termed as transition zone from O<sub>2</sub> excess to CO excess. The last 2 zones will be excess in Carbon monoxide

and Oxygen-negative to limit oxidation issues. The first three zones will have nozzle mix burners which will use the hot air for combustion supplied by the combustion blower and the recuperator. The last three zones will have pre-mix burners for controlled oxidation and to provide a reduced atmosphere which will have a positive impact on Annealed wire quality. The pre-mix burners will not use the hot air from as heating the air will cause the Air-gas mixture to expand and due to less volume available for expansion in the mixer, there will be an explosion. The operating temperature will range from 750-950°C and will be sufficient to anneal the wires and reach the desired UTS. Such high temperature will also burn & melt the borax & soap film developed on Wire Drawing.

### 6.1.2 Alternative Zinc coating baths

Different coating baths are available for Zinc coating such as DSQ (Deep Soft quality) Steel tank or Ceramic baths with immersion heating OR top firing. The heating of the bath to melt the zinc can be done by burners fired by Furnace Oil, LPG, NG, Diesel etc.

The proponent opted to use Ceramic bath which has a comparatively low Dross formation rate as compared to the quantity formed with the use of DSQ bath. The Ceramic bath will be top fired which will of course form more Ash than immersion heating & using DSQ steel bath but will negate the hassles of immersion heater's expensive & frequent tube replacements.

Ceramic Bath has been selected over DSQ Steel bath because of less Dross formation and to negate the expenditure and hassles involved in bath replacement after every 2.5 – 3 years in the case of DSQ Steel bath. Ceramic bath gives a minimum life of 15 years.

DROSS is a mass of solid impurities floating over or dispersed within the molten zinc. It forms due to oxidation of the zinc & on the solubility of 0.03% iron in the zinc starting from a temperature of 430°C.

## 6.2 No go option

The No Action Alternative in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses both to the project proponent and the Kenyan society and Government. The property will remain under-utilized.

The No Project Option is the least preferred from the socio-economic and partly environmental perspectives since if the project is not done:

- The proponent will continue importing Hot-Dip Galvanized wires from countries like China & Uganda instead of becoming self-sufficient for meeting the

company's production requirements of Chain-links & Barbed Wires along with becoming one of the leading Manufacturers & Suppliers of Hot Dip Galvanized Wires in East Africa;

- The economic benefits especially during construction and operation i.e. provision of much needed jobs for skilled and non-skilled workers will not be realized;
- There will be no generation of income by the suppliers and the government;
- The government's development policy may not be realized;
- The socio-economic status of Kenyans and the local people would remain unchanged;
- The local skills would remain under utilized;
- No employment opportunities will be created for Kenyans who will work in the project area;
- Discouragement for investors to produce this level of standard and affordable developments;

From the analysis above, it becomes apparent that the No Project Alternative is not the appropriate alternative to the local people, Kenyans, and the government of Kenya. The No Project Scenario is therefore not considered as a viable option.

### **Conclusion**

On the basis of the above considerations, the lead expert concludes that potential benefits of the proposed project outweigh potential negative impacts.

Finally, the lead expert believes that the 'No-go option' does not compete with the benefits of proceeding with the project.

### **6.3 Project site alternative**

Relocation option to a different site is an option available for the project implementation.

At the moment, there are no alternative sites for the proposed development. The proponent has to look for the land if relocation is proposed. Looking for the alternative land to the project and completing official transaction on it may take a long period. In addition, it is not guarantee that such land would be available and it will be costly for the proponent as transporting the product from one location to the other.

Additionally, it would discourage both foreign and local investors especially in the building sector. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option

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**CHAPTER SEVEN**

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**7 PUBLIC STAKEHOLDER CONSULTATION**

Public participation is an essential and legislative requirement for environmental authorization. The expert undertook the public stakeholder consultation (PSC) for the proposed project in accordance with the requirements for an EIA Study stipulated in the EMCA, 1999 and EIA/EA Regulations 2003.

**7.1 Objective of Public Stakeholder Consultation**

The objectives of public participation in an EIA are to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner to assist them to identify issues of concern, and provide suggestions for enhanced benefits and alternatives.

**7.2 Approach used in carrying out the PSC**

The Expert consulted the neighbours of the project site. The responses from the neighbours were captured using the public stakeholder checklist while others were recorded in the field note book. *Copies of completed checklists are appended at the end of this report.*

**7.3 Comments and Responses from the Stakeholders**

Generally, all the stakeholders consulted at the project site have no objection to the establishment of proposed project. They observed that the proposed project will generate employment opportunities and increase security of the Property. However one stakeholder noted that noise emission can cause discomfort and dust generation.

## CHAPTER EIGHT

### 8 ENVIRONMENTAL MANAGEMENT PLAN

The purpose of this EMP is to ensure that environmental impacts identified during environmental assessment process are effectively managed during the project phases. This EMP specifies the mitigation and management measures to which Proponent is committed, and shows how the Project will mobilize organizational capacity and resources to implement these measures. The EMP also shows how mitigation and management measures will be scheduled.

The key objectives of the EMP are to:

- Formalize and disclose the programme for environmental and social management; and provide a framework for the implementation of environmental and social management initiatives;
- Provide mitigation measures;
- Specify roles and responsibilities for implementing the EMP.

The EMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts in respect of:

- construction activities;
- operation activities; and
- closure and decommissioning activities;

It is important to note that the EMP is a living document that must be periodically reviewed and updated.

#### 8.1 Responsibility and Accountability

##### 8.1.1 Environmental Management Structure

The Proponent will maintain general responsibility for the implementation of the EMP during project phases. The Proponent is accountable for ensuring that resources are made available to effectively implement the EMP and necessary environmental management measures arising from the project. **Figure 4** shows the proposed organizational structure for the proposed Project, showing the reporting lines of staff to be involved in environmental management of the project. The directors will be responsible for the day to day running of the project and will oversee the detail of implementation of the EMP during construction phase while during operational and decommissioning phases, will be managed by the Production Manager. The directors and the production manager will collaborate in the implementation of the EMP.

Figure 4: Proposed Environmental Management Structure

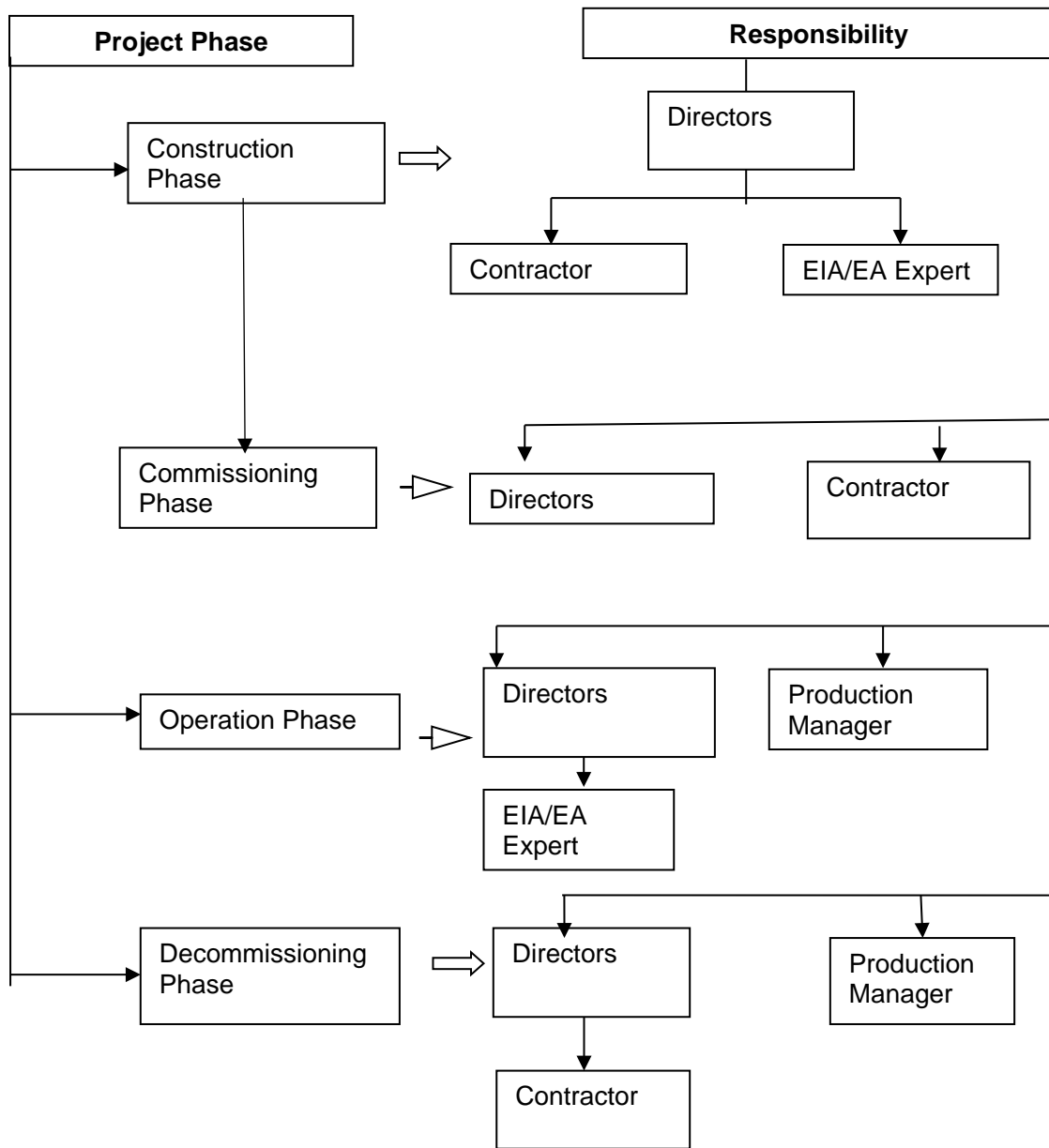


Table 21 provides details on the functions of each staff member. The environmental, health and safety management of the project will be the responsibility of the Health, Safety and Environment (HSE) Executive who will be supported by Safety Officer who will act as the focal point for all matters of health, Safety, Security and Environment (HSSE).

Environmental monitoring will be undertaken by the HSE Executive, and independent audits of environmental performance will be conducted from time to time by independent NEMA approved environmental expert.

**Table 21: Functions of Staff in implementation of EMP**

Position	Responsibility
Directors	<ul style="list-style-type: none"> <li>performing organizational role of installation of plant</li> <li>overseeing Implementation of EMP</li> </ul>
Contractor	<ul style="list-style-type: none"> <li>implementing measures in the EMP relevant to the contractor</li> <li>supervising contractor staff to ensure they undertake the work in accordance with contract agreement, relevant legislation and EMP</li> </ul>
Installation Manager	<ul style="list-style-type: none"> <li>Will act as the focal point for all matters of HSE</li> <li>Preparation of environmental monitoring reporting and any permit applications (if any)</li> <li>Running of day-to-day requirements for EMP implementation</li> <li>Conducting monitoring and review of EMP implementation by contractors</li> <li>inspect the renovated facilities after completion</li> <li>Prepare, program and carry out regular inspections of all areas.</li> <li>Develop a program for and carrying out in-house HSSE audits carried out with line management.</li> <li>Report accidents /near misses to the plant directors.</li> <li>Prepare daily inspection sheet for safety, file and make available for inspection by Proponent at all times.</li> </ul>
NEMA Approved EIA/EA Expert	<ul style="list-style-type: none"> <li>Periodically commissioned to undertake statutory environmental audits</li> </ul>

	<ul style="list-style-type: none"> <li>• Guide the Proponent during implementation of the Environmental Management Plan</li> </ul>
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### 8.1.2 Management of Contractors

The Contractors will be responsible for implementation of some of the EMP commitments. However, the Proponent fully recognizes that it is not absolved from those management responsibilities. Ultimate responsibility for meeting all commitments lies with the Proponent.

The Proponent will commit contractors to meeting the relevant responsibilities by means of specific conditions in the contracts of appointment. Where there is concern over the capacity of contractors to undertake specific activities according to the system stated here, the Proponent will provide additional training to improve the capacity of the contractors.



Activities of contractors will be overseen by the directors and staff as appropriate.

The Proponent will put in place the following contractor arrangements to support EMP implementation:

- Contractor will have certain key environmental line functions included in their job descriptions and performance criteria. Critical among these is the Installation Manager.
- The Company directors will be accountable for environmental (including social) management during the construction. Specific responsibilities will include:
  - Effective implementation of the EMP
  - Regular performance reviews
  - Corrective and/or remedial action where this may be required.
- A code of practice for construction team will be prepared and implemented. This code will guide the management and behavior of construction workers. The code will include items relating to health safety and community relations.
- Information on the implications of construction work will be disseminated before construction starts
- Contracts will be key tools in managing many potential negative impacts such as transport related incidents. They will specify required environmental and social practices.

### 8.1.3 Training, Awareness and Capacity Building

The Proponent will ensure that all contractors' staff are inducted on health and safety, environmental and emergency response procedures. The Proponent will use written

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(posters/toolbox talks) and verbal (as part of routine briefings) communication methods to raise awareness on a range of health, safety and environmental issues. This will be done in both Kiswahili and English languages (as appropriate) to ensure that all members of the workforce are made aware.

#### **8.1.4 Monitoring and Compliance Assessment**

During construction, the Proponent will monitor and inspect contractors' written records to demonstrate compliance with the EMP. This compliance monitoring will verify that the responsible parties are implementing the specifications contained in the EMP. Compliance will mean that the contractor is fulfilling contractual obligations.

To determine the effectiveness of the EMP, the Proponent will use a series of internal inspections and audits:

- Internal environmental, health and safety inspections will be carried out once every week by Construction/equipment installation Manager;
- Minor non-conformances will be discussed during the inspection and recorded as a finding in the inspection report. Major non-conformances will be formally reported as an incident and will be subject to the Proponent's existing incident reporting and handling procedures
- The management will arrange for initial and subsequent environmental audits and will provide relevant information required by relevant authorities including NEMA. The audit will be carried out in accordance with EMCA, 1999 and its subsidiary legislation, EIA/EA Regulations, 2003. Any negative findings arising from the audits will be addressed accordingly.

#### **8.1.5 Incident handling and Reporting**



An incident can arise from the following:

- Significant non-conformance with the EMP identified during an internal inspection
- Any non-conformance identified by either the authorities or an external audit
- Accidents or releases resulting in potential or actual environmental harm
- Accidents or near misses that do or could result in injury to staff, visitors to site or the surrounding communities
- Significant complaints received from any source.

All incidents will be formally recorded and noted in the General Register in accordance with requirements of OSHA 2007.

#### **8.1.6 Checking and corrective action**

Checking and if necessary implementing corrective action, to ensure that required EMP management activities are being implemented and desired outcomes are achieved. As such this component includes four key activities namely:

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- Monitoring selected environmental quality variables as defined in the objectives and targets;
- Ongoing inspections of the operational controls and general state of the operations;
- Internal audits to assess the robustness of the EMP or to focus on a particular performance issue; and
- External audits to provide independent verification of the efficacy of the EMP.

#### **8.1.7 Corrective Action**

There are several mechanisms for implementing corrective action, during the project cycle. The main mechanisms to address transgressions include verbal instruction (in the event of minor transgressions from established procedure, usually following a site inspection); written instruction (identifying source(s) of problems, usually following an audit) and contract notice (following possible breach of contract).

#### **8.1.8 Reporting**

The findings of all of the above will be structured into instructive reporting that provides information to all required parties on EHS performance, together with clearly defined corrective action where this is seen to be required. Both the monitoring and inspections are to be reported continuously.

#### **8.1.9 Management review**

The Proponent will organize for formal management review at defined intervals during the project phases. The purpose of the management review is for senior project management to review the environmental management performance during the preceding period and to propose measures for improving that performance in the spirit of continuous improvement.

#### **8.1.10 Liaison**

Throughout the project cycle, the Proponent will liaise with authorities especially NEMA to ensure ongoing feedback on the environment performance of the project.

### **8.2 Approach to environmental impact management**

Table 22 below presents the range of approaches that will be used to manage potential impacts of the proposed project.

**Table 22: Approaches for managing potential impacts of the proposed projects**

<b>Approach</b>	<b>Description</b>
Avoidance	Avoiding activities that could result in adverse impacts and/ or resources or areas considered sensitive
Prevention	Preventing the occurrence of negative environmental impacts and/ or preventing such an occurrence having negative impacts.
Minimization	Limiting or reducing the degree, extent, magnitude or duration of adverse impacts through scaling down, relocating, redesigning and or realigning elements of the project
Mitigation	Measures taken to minimize adverse impacts on the environment
Enhancement	Magnifying and/ or improving the positive effects or benefits of a project
Rehabilitation	Repairing affected resources
Restoration	Restoring affected resources to an earlier (possibly more stable and productive) state, typically “background or ‘pristine’ condition.

### Construction Phase

In order to ensure compliance with EHS legislation requirements and best practice the following actions are applicable to the construction phase and are the responsibility of the Proponent.

Activity		Objective	Action to Mitigate Potential Impact		Parameters to be Monitored	Cost Estimate (KES)	Responsibility	Frequency/Timing
			Commitment/ Required Action/Key Controls					
No.	Description of Activity		No.					
1	Health and Safety	Ensure the health and safety of contractors	1.1	A Health and Safety Plan must be developed prior to the commencement of construction to identify and avoid work related accidents. This plan must be adhered to by the appointed construction contractors and meet Occupational Health and Safety Act (OHSA), of 2007, requirements.	Signed Health and Safety Plan	No material cost is anticipated	Proponent	During Construction
			1.2	Appropriate Personal Protective Equipment (PPE) must be worn by all construction personnel.	Signed Health and Safety Plan			

3	Noise Pollution	Avoid noise related health impacts	3.1	Construction workers and personnel should wear hearing protection when required;	Photographic evidence	No additional cost is anticipated above the budget for construction work	Proponent	During Construction
			3.2	Vehicles and machines would be properly serviced and well maintained;	Vehicles maintenance records			
			3.3	A grievance procedure would be established whereby noise complaints by neighbors are recorded and responded to.	Grievance procedure logbook			
4	Waste generation	Prevent environmental pollution associated with waste generation	4.1	The generation of waste materials will be avoided or minimised as far as practicable, where it is not practical to avoid generation,	Photographic evidence  Waste transfer note	50,000.00	Proponent	construction

			4.2	<p>waste materials should be reused or recycled as far as practicable.</p> <p>All waste to be separated into skips for disposal by a licensed contractor.</p>				
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**Operation Phase**

In order to ensure compliance with environmental legislation requirements the following generic and specific requirements are applicable during the operational phase of the CLD project.

Activity		Objective	Action to Mitigate Potential Impact		Parameters to be Monitored	Cost Estimate	Responsibility	Frequency/Timing
			Commitment/ Required Action/Key Controls					
No.	Description of Activity		No.					
1	Health and Safety	Ensure the health and safety of employees	1.1	Ensure Health and Safety Plan is adhered to by the operation employees and meet Occupational Health and Safety Act (OHSA), of 2007, requirements.	Safety and health inspections and audits	No material additional cost is required	Proponent	During Operation
			1.2	Regular maintenance of machines/equipments and tools to ensure failures that can lead potential safety hazards are avoided.	Inspection and maintenance records			
			1.3	Appropriate Personal Protective Equipment (PPE) must be worn by all operation personnel.	Safety and health inspections and audits			
2	Particulate and air emissions	Minimize acid fumes, particulates and	2.1	The equipments and machines will be	Plant Manager records	Cost of installation of the	Proponent	During Operation

Activity	Objective	Action to Mitigate Potential Impact	Parameters to be Monitored	Cost Estimate	Responsibility	Frequency/Timing
	exhaust emissions	<p>2.2 installed by professional engineers and will be fitted with a complete anti pollution system.</p> <p>2.3 Vehicles will be kept in good working order and serviced regularly to minimise emissions.</p> <p>2.4 The employees will be provided with PPEs</p> <p>2.5 Employees will undergo annual health examinations;</p> <p>2.6 The Proponent will ensure employees undergo safety training</p>	<p>Maintenance records</p> <p>Safety and health inspections and audits</p>	<p>machines and equipment</p> <p>No additional cost is anticipated</p> <p>50,000.00</p> <p>20,000.00</p> <p>40,000.00</p>		

Activity		Objective	Action to Mitigate Potential Impact		Parameters to be Monitored	Cost Estimate	Responsibility	Frequency/Timing
3	Noise Pollution	Avoid noise related health impacts	3.1	Operation personnel should wear hearing protection when required;	Annual Noise Surveys in accordance with Noise Control and Prevention Rules	50,000.00	Proponent	During Operation
			3.2	Vehicles and machines would be properly serviced and well maintained;	Maintenance records			
			3.3	A grievance procedure would be established whereby noise complaints by neighbors are recorded and responded to.	Grievance procedure			
4	Waste generation	Prevent environmental pollution associated with waste generation	4.1	Descaling waste and scrap materials will be used as raw materials in furnaces.	Photographic evidence	20,000.00 per month	Proponent	During Operation
			4.2	Hazardous waste from the laboratory will be	Waste transfer note Waste transfer note			

Activity		Objective	Action to Mitigate Potential Impact	Parameters to be Monitored	Cost Estimate	Responsibility	Frequency/Timing
			<p>4.3 disposed offsite through licensed waste handlers Waste water will be pre-treated in the ETP and recycled back to the process.</p> <p>4.4 The domestic wastewater will be channelled to the Sewage Treatment Plant. General waste must be removed from site by a licensed contractor</p>	Material records	<p>No additional cost is anticipated</p> <p>10,000.00</p>		

**Decommissioning Phase**

In order to ensure compliance with environmental legislation requirements the following generic and specific requirements are applicable during the Decommissioning phase of the project.

Activity		Objective	Action to Mitigate Potential Impact		Parameters to be Monitored	Cost Estimate (KES)	Responsibility	Frequency/Timing
			Commitment/ Required Action/Key Controls					
No.	Description of Activity		No.					
1	Health and Safety	Ensure the health and safety of contractors and onsite users	1.1	A Health and Safety Plan must be developed prior to the commencement of decommissioning to identify and avoid work related accidents. This plan must be adhered to by the appointed contractors and meet Occupational Health and Safety Act (OHSA), of 2007, requirements.	Signed Health and Safety Plan	No additional material cost is anticipated	Proponent	During Decommissioning
			1.2	Appropriate Personal Protective Equipment (PPE) must be worn by all construction personnel.	Signed Health and Safety Plan			

2	Dust and air emissions	Limit fugitive dust and exhaust emissions	2.1	Stockpiles of dusty materials will be enclosed or covered by suitable shade cloth or netting to prevent escape of dust during loading and transfer from site.	Plant Manager's records	No material additional cost is anticipated above the budget of demolishing the plant	Proponent	During Construction
			2.2	Vehicles are to be kept in good working order and serviced regularly to minimise emissions.	Grievance procedure documentation			
3	Noise Pollution	Avoid noise related health impacts	3.1	Demolition workers and personnel should wear hearing protection when required;	Inspection records	No material additional cost is anticipated above the budget of demolishing the plant	Contractor	During Decommissioning phase
			3.2	Vehicles and machines would be	Maintenance records			

			3.3	properly serviced and well maintained; A grievance procedure would be established whereby noise complaints by neighbors are recorded and responded to.	Grievance procedure logbook			
4	Waste generation	Prevent environmental pollution associated with waste generation	4.1	All waste to be separated into skips for recycling, reuse and disposal.	Waste transfer note	No additional cost is anticipated above the cost budgeted for demolition works	Contractor	During Decommissioning phase
			4.2	All solid and liquid waste materials will be stored in a bunded area and disposed of by a licensed contractor.				
			4.3	Components of the maize milling				

				<p>machine will be re-used or recycled, as far as possible.</p> <p>Materials that cannot be re-used or recycled will be placed in a skip and removed from site by a licensed contractor to a NEMA approved disposal site.</p>				

## CHAPTER NINE

### 9 CONCLUSION AND RECOMMENDATION

#### 9.1 Conclusion

The proposed project will generate socio-economic benefits which would not be realized if the no development of option is considered. The benefits will include: enabling the proponent to become self-sufficient in meeting the company's production requirements of Chain-links & Barbed Wires along with becoming one of the leading Manufacturers & Suppliers of Hot Dip Galvanized Wires in East Africa; creation of job opportunities (skilled and unskilled labour) and reducing operation cost thus increasing generation of revenue to the Proponent, contracted suppliers and government.

The negative impacts before implementation of mitigation measures are assessed as negligible to medium low and the ratings are expected to improve further with the implementation of the proposed mitigation measures: These impacts include:

- Impact on air quality due to acid fumes;
- Impact on ambient noise quality due to use of renovation vehicles and machinery;
- potential health and safety risks to the workers; and
- impact of waste generation

The above potential adverse impacts associated with the proposed project are possible to mitigate successfully. They can be mitigated through implementation of recommended mitigation measures highlighted in **section 8** of this report. The projects will be undertaken in accordance with local and international legislations and guidelines. Successful implementation of the proposed EMP will minimize or reduce the environment impacts to the acceptable levels.

#### 9.2 RECOMMENDATION

The firm of experts feels that every effort has been made by Proponent to accommodate the mitigation measures recommended during the EIA process to the extent that is practically possible, without compromising the economic viability of the proposed project. The implementation of the mitigation measures detailed in this report will provide a basis for ensuring that the potential positive and negative impacts associated with the establishment of the proposed project are enhanced and mitigated to a level which is deemed adequate.

In summary, based on the findings of this assessment, the firm of experts finds no reason why the proposed project should not be authorised contingent that the mitigations and monitoring for potential environmental and social impacts as outlined in this report are implemented.

**REFERENCE**

- A. Government of Kenya (1999): Environmental Management and Coordination Act .Government Printer
- B. Government of Kenya (2003): EIA/EA Regulations. Government Printer
- C. Government of Kenya (2005): Factories and Other Places of Work (Noise Prevention and Control) Rules, Legal Notice No.25. Government Printer
- D. Government of Kenya (2007): Factories and Other Places of Work (Fire Risk Reduction) Rules, Legal Notice No.59. Government Printer
- E. Government of Kenya (2007):The Occupational Safety and Health Act
- F. Kenya National Bureau of Statistics (2009): Kenya Census 2009
- G. Technical report; Abhishek Mukherjee

**ATTACHMENTS**

The following attachments provide supplementary information used in the preparation of this Project Report.

<b><u>Attachment No.</u></b>	<b><u>Description</u></b>
1	Copy of Lease Agreement
2	Copies of Site Layout Plans
3	Copies of Public Stakeholder Consultation Checklists
4	Nema Licenses