REVISED ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT FOR PROPOSED CONSTRUCTIONAND OPERATION OF COOKING OIL MANUFACTURING PLANT IN TRADITIONAL AUTHORITY KALOLO, LILONGWE DISTRICT

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October 2019

Executive Summary

This document serves as an Environmental and Social Impact Assessment (ESIA) Report for the proposed AVC cooking oil and soap manufacturing plant. The proponent of the project is AVC Industries Private Limited, a company incorporated in Malawi in the year 2019. The proposed project site is located off the Lilongwe to Mchinji (M12) road approximately 35 kilometres from Mchinji Round-About in Lilongwe City. The project site situated at a distance of one kilometre on the Nsundwe-Chilobwe road which is two kilometres away from Nsundwe market on the way to Mchinji. The project site is located at the boundary of Katungwa and Chisikwa Villages that are under Group Village Headman Mchilawankhondo, Traditional Authority Kalolo. The project site is on a 17.7135-hectares piece of land, although the actual project will only cover about 11 hectares. The construction of the AVC cooking oil and soap manufacturing plant is estimated to cost USD5,128,000 and is expected to commence in September 2019 and be completed in January 2020, taking a total of six months. The proposed project will involve construction and operation of an oil seed crushing and oil refinery plant to process approximately 200 metric tons (MT) of soya beans per day. The crushing and oil refinery process of soya beans will produce 19% of edible crude oil, 75% of animal feed and 6% of processing waste, which will be used as a raw material in washing soap making. The plant will employ a maximum of 100 and 215 people during construction and operation phases, respectively.

The proposed plant is expected to consume approximately 60,000 MT of soya bean per year. Through this venture the company will provide to about 100,000 farmers a reliable and stable market for their soya beans. The plant will be buying soya beans from local farmers within Lilongwe, Kasungu, Mchinji, Ntchisi, Dowa, Nkhotakota, and Salima districts among others. The target customers for cooking oil will be Malawian households, wholesalers, retailers and export markets to countries within the Southern Africa Development Community (SADC) region. For the animal feed the target will be animal husbandry industry, both local and international. For international companies, a key target will be those within the SADC countries and with a possibility of outside Africa, mainly Asia. For soap the target customers are Malawian households, wholesalers and retailers. The company aims to deliver high quality cooking oil and animal feed to satisfy the local and international market, while reducing the volume of oil in waste water through soap manufacturing.

The scope of the study includes carrying out of environmental and social assessment in line with current laws of Malawi and as required by Environment Management Act (EMA) of 1996 and Guidelines for Environmental Impact Assessment in Malawi of 1997. The study covered the physical extent of the project site and its immediate environs, implementation works of the proposed development that include construction and operation of oil seed crushing and oil refinery plant. The ESIA forms the basis for managing, minimizing, mitigating negative impacts and enhancing positive impacts and also monitoring the environmental and social impacts associated with the project at various phases. Several methods were adopted to conduct the environmental and social impact studies and prepare the ESIA report. Desk study reviews, field visits and stakeholder consultations were the main methods utilised. From the study, a number of positive and negative impacts were identified, and enhancement and mitigation measures for both the positive and negative impacts were proposed.

Positive Impacts

The proposed project is expected to have positive impacts and their enhancement measures include:

a) Increased supply of cooking oil

i. The refinery will endeavour to offer cooking oil and animal feed at affordable prices that can be afforded by Malawian consumers; and
ii. Ensure continuous supply of high-quality cooking oil and animal feed products under strict quality control systems that meet relevant local and international standards.

b) Provide ready market for soya beans from small scale farmers

i. Continuously provide competitive prices for soya beans;
ii. Purchase the soya beans from major soya beans producing area;
iii. Provide agriculture inputs and production support (in the form of agriculture extension services) to soya bean farmers to help them improve yield per hectare; and
iv. Conduct market awareness campaigns to raise production and marketing opportunities for the farmers.

c) Foreign exchange earnings due to export

i. Ensure production of high-quality products that fetch good prices on the international market;
ii. Ensure that production levels are kept at highest quality; and
iii. Participate in international trade fairs and marketing expos to access lucrative international markets.

d) Employment Opportunities

i. Provide priority in employment to women, members of the vulnerable group and the youth within the local communities;
ii. Work with local community leaders in providing employment opportunities to members of communities that would otherwise be disadvantaged. This will be done in a fair and transparent manner;
iii. Provide equal employment opportunity to both men and women where there is merit based competition;
iv. Enforcement of the Malawi labour laws among the employed; and
v. provide and maintain wages that are above government set minimum wage limit and make sure overtime work is rightly remunerated.

e) Availability of market for construction materials and services

i. Pay building material supplies within the agreed time;
ii. Where possible source materials from approved licenced suppliers;
iii. Support and promote entrepreneurship skills amongst communities and business people;
iv. Prompt pay of all associated taxes to the Malawi Revenue Authority; and
v. Where possible buy materials manufactured in Malawi than those manufactured elsewhere.

f) Benefits from capacity enhancement through on-the-job training

i. Maximise employment of local people particularly for the unskilled labour force;

ii. Make deliberate choice to pair skilled and unskilled workers during various construction assignments; and
iii. Formalise on-the-job trainings for local unskilled labour that also includes learning targets and performance monitoring.

Negative impacts and their mitigation measures

There are several potential negative impacts associated with the proposed project. Most of the potential negative impacts are anticipated during the construction phase. The negative impacts and their proposed mitigation measures are follows:

a) Increased Generation of General Waste

Mitigation measures

i. Prepare an Operation Waste Management Plan (OWMP) and implement it as a best practice;
ii. Establish waste management priorities and hierarchy at the outset of activities based on the understanding of potential environmental, health and safety risks and impacts;
iii. Design operation processes to prevent and/or minimise quantities of wastes generated and hazards associated with the waste generated; and
iv. Identify potential opportunities to recycle material into the design /identify products that can be provided to external markets.

b) Increased Generation of Hazardous Waste

Mitigation measures

i. Segregate hazardous waste from non-hazardous waste;
ii. Clearly label hazardous wastes and storage area;
iii. Ensure storage area has an impermeable floor and containment, and has adequate ventilation of capacity to accommodate 100% of the volume of the largest waste container;
iv. Ensure an approved hazardous waste collector is used;
v. All waste to be stored in containers and disposed at EAD approved disposal sites; and
vi. Maintain records on the type and quantity of hazardous waste.

c) Increased generation of sewage

Mitigation measures

i. Appropriately site toilet facilities to minimise potential soil and surface/groundwater contamination impacts;
ii. Construct separate WC with hand washing basins for male and female workers and the total number should correspond to 1 wash basin to 20 employees; and
iii. Conduct routine maintenance of the septic tanks to ensure continual operation. When septic tanks are full, sludge will be pumped and disposed at Kauma Wastewater Treatment Plant in Lilongwe.

d) Increased risk of accidents and exposure to hazardous material

i. Training the workers on the risks associated with operational activities;

ii. Use of Personal Protective Equipment (PPEs) will be encouraged. In-depth training programme on use of PPEs, characteristics of the material to be handled and safety precautions will be arranged;
iii. Installing non-slip surfaces in areas with potentially slippery floors or subject to frequent wetting such as production area;
iv. Cover electricity cables that cross walkways and to keep working areas and walkways well lit;
v. Display Safety precautions in the premises on the banners, boards etc.;
vi. In order to ensure good health of workers, regular health check-up of the plant workers will be carried out; and
vii. Conducting information or awareness campaigns to workers on health and safety.

e) Increased risk to diseases, STIs and HIV and AIDS

i. Develop and implement an HIV & AIDS policy and prevention, treatment, care and support programme;
ii. Employees, however, will not be required to undergo testing for HIV as a precondition for employment. As well, no person shall be denied employment solely on the basis of HIV sero-status;
iii. Sensitize workers on HIV and AIDS prevention;
iv. Free condoms to be made available to workers; and
v. Distribution of Information, Education and Communication (IEC) materials on STIs including HIV and AIDS.

f) Increased generation of particulate matter (especially dust)

i. All transported materials must be covered with tarpaulins and to prevent fugitive dust;
ii. Vehicle speeds shall be limited to 40 km/hr on the gravel access roads to prevent generation of dust;
iii. Ornamental trees will be planted around the plant and perimeter wall which will be constructed to act as wind breaks to prevent dust being blown from open surfaces; and
iv. Ensure continuous maintenance of all paved surfaces in the factory.

g) Increase in combustion emissions

i. Boiler with emission-stack of 30m height to be fitted with filters and scrubbers. At this height and with the existing air parameters such as quality and speed, it is anticipated that the emissions from the stack will be dispersed ensuring that impact is negligible;
ii. Undertake regular maintenance of plant to ensure that the boiler and other plant equipment are operating at design optimal conditions so as to maintain a negligible impact on ambient air quality;
iii. Company vehicles to be maintained and inspected regularly; and
iv. When not in use, vehicles will be switched off, unless impractical for health and safety reasons.

h) Degradation of surface and groundwater quality

i. Undertake regular maintenance schedule of plant to verify that the all provisions for containment and secondary containment on all pump, tank and plastic piping installations are operating at design optimum conditions to ensure no chemical spills into the ground;
ii. Install monitoring or inspection wells for ground water contamination. Three inspection wells will be installed per tank and will be monitored regularly;

iii. Provide adequate toilets and shower-rooms for the workers that will be connected to septic tanks. When septic tanks are full, sludge will be pumped and disposed at Kauma Wastewater Treatment Plant in Lilongwe;
iv. All hazardous materials will be stored in line with the requirements of the Operation Management Plan to prevent contamination of the surface and groundwater;
v. Any accidental chemical, fuel, and oil spills that occur at the site will be cleaned up in the appropriate manner as related to the nature of the spill; and
vi. Storm water run-off will be discharged off the project site through a stormwater drain that will be emptying into Nthazi Stream.

i) Child labour issues

i. Sensitize local leaders, children and the community at large on prohibition of any forms of child labour at the project site;
ii. Display posters at the project site that warn and inform against child labour; and
iii. Put in place proper procedures for reporting and addressing child labour issues.

j) Increased cases of sexual harassment, gender inequality and Gender Based Violence at Work Place

i. Develop a workplace gender equality policy that clearly outlines the companies stated gender equality intent, priorities and practices;
ii. Ensure provision for both women and men access to equal opportunities and outcomes, including equal remuneration for work of equal or comparable value;
iii. Enforce punitive and disciplinary measures, including dismissal from employment on any employee involved in any cases of sexual harassment and GBV;
iv. Developing and enforcing an Anti-Sexual Harassment Policy prohibiting sexual harassment or violation of any kind in the workplace. The policy will include an incident referral and reporting plan;
v. Develop a policy on GBV and workplace that aims at preventing and addressing cases of GBV in any form, whether as an act of workplace violence or as occurs in any employee's personal life;
vi. Training all employees Anti-Sexual Harassment Policy, GBV and national law and regulatory requirements regarding sexual harassment; and
vii. Encouraging employees to report any sexual harassment and GBV related issues or suspected cases at the factory.

Conclusion

The project has the potential to be beneficial and important to the nation at large. Major efforts should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This can be overcome through close follow-up and implementation of the recommended ESMP. The environmental and social assessment evaluated the effectiveness of the environmental considerations to be undertaken by the project proponent in safeguarding the environment to ensure sustainability.

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List of Acronyms

BOP	Balance of Payment
CHAM	Christian Health Association of Malawi
CoC	Code of Conduct
CDSS	Community Day Secondary School
CWMP	Construction Waste Management Plan
DSM	Demand Side Management
D.T.	De-solventiser Toaster
DEA	Director of Environmental Affairs
EMA	Environment Management Act
EAD	Environmental Affairs Department
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESRC	Environmental and Social Research Consulting
IFC	International Finance Corporation
LDC	Lilongwe District Council
L	Litre
MBS	Malawi Bureau of Standards
MT	Metric Tons
NCIC	National Construction Industry Council
NCE	National Council for the Environment
NHBG	National Herbarium and Botanical Garden
NWRA	National Water Resources Authority
NGO	Non-Governmental Organisation
PM	Particulate Matter
PPE	Personal Protective Equipment
SADC	Southern Africa Development Community
SEOR	State of the Environment and Outlook Report
TCE	Technical Committee on the Environment
ToR	Terms of Reference
TA	Traditional Authority
USD	United States Dollar
VEC	Valued Environmental Component
VOC	Volatile Organic Compounds
WHSR	Water Hydrant Service Rings

Chapter One: Introduction

This is an Environmental and Social Impact Assessment (ESIA) report for the proposed construction and manufacturing of cooking oil in Chisikwa Village, Group Village Headman (GVH) Mchira-wa-nkhondo, Traditional Authority (TA) Kalolo, Lilongwe District.

1.1 Background Information

AVC Industries Private Limited is a company incorporated in Malawi in the year 2019. The company intends to construct and operate an oil seed crushing and oil refinery plant to process approximately 200 metric tons (MT) of soya beans per day. The project cost is estimated at USD5,128,000 and will employ a maximum of 100 and 215 people during construction and operation phases, respectively. The seed crushing and oil refinery process of soya beans will produce about 75% of animal feed, 19% of edible crude oil and 6% processing waste to be used as raw material in washing soap making. Currently, the majority of edible oil refining companies in Malawi import edible crude oil from various countries mainly South Africa and Mozambique, which makes edible oil in the country expensive. But with an integrated project like this, it will contribute to import substitution of crude oil and production of animal feed and washing soap from locally produced soya beans. The animal feed may also be exported to South Africa and other neighboring countries but only after the local demand in Malawi first. Of the approximately 35% of the total output of animal feed to be produced by the plant, most of it will serve the growing poultry industry in Malawi.

The preparation of this report is aimed at meeting the provisions of the Environment Management Act (EMA) of 1996. This report addresses the management of environmental and social impacts related to the construction and operation of the Oil Seed Crushing and Oil Refinery Plant by the proponent and beneficiaries. The ESIA will also be used as a basis for managing, mitigating and monitoring the environmental and social impacts associated with the construction and operation phases of the proposed project.

1.2 Scope of the Study

The scope of the study includes carrying out environmental and social assessments in line with current laws of Malawi. This was done in line with the requirements of Environment Management Act (EMA) of 1996 and Guidelines for Environmental Impact Assessment in Malawi of 1997. The study covered the physical extent of the project site and its immediate environs, implementation works of the proposed development that include construction and operation of oil seed crushing and oil refinery plant that will each cover an estimated area of 4,795 square meters.

1.3 Project Relevance to Malawi

The proposed project of setting up an oil seed crushing and oil refinery plant, which is in the agro-processing sector, is very relevant to Malawi. As Malawi tries to migrate from tobacco-based economy, other crops are expected or have already started to emerge as critical crops in addition to tobacco with potential to contribute to the country's economy.

Soya beans have 20% fat including 3% saturated fats and 4% monounsaturated fats as well polyunsaturated fats. Soya Bean is a rich source of the protein and the de-oiled cake obtained after solvent extraction is high protein meal and widely used for the animal food. The demand for the high protein cake is very high in the international market for making of animal food. The soya protein is a very good substitute for the animal protein. There is 18-19 % oil content in the soybean seed which is extracted through mechanical screw press or solvent extraction method by using the food grade commercial hexane.

Soya beans is one of the cash crops that has risen in its production in Malawi with a potential to take a larger market share than other food crops. Soya bean is also earmarked as one of the strategic crops for the replacement of tobacco in the Malawi Export Strategy Policy (2013). AVC Industries Private Limited venturing into the soya bean processing industry will provide a ready market for the produce from small-scale farmers and increase competition for better prices through increased demand. The soya bean yield per hectare is estimated at one metric ton in Malawi. The proposed plant is expected to consume approximately 60,000 MT of soya bean per annum. Through this venture, therefore, the company will provide support to over 100,000 farmers by availing them a reliable and stable market for their soya beans. Secondly, the setting up of this plant will help to generate employment for Malawians, particularly locals in the area. The company is going to provide direct employment to about 100 people during construction and 215 people during operation. The project will offer local Malawians an opportunity to have stable incomes through direct and indirect employment creation. Furthermore, AVC is also interested through its wide experience of the other markets to increase yield per hectare of soya bean that generate more income for the farmers.

Furthermore, the company is geared to export its value-added products (animal feed) to other countries such as South Africa, Zambia and Zimbabwe among other SADC countries and beyond generating good source of foreign currency for the Malawian economy for a better Balance of Payments (BOP).

1.4 Objectives of the ESIA

The ESIA was conducted in line with the Terms of Reference (ToRs) provided in Annex 1. The specific objectives of the ESIA study were, thus, to:

- Determine the compatibility of the proposed project and evaluate the local environmental conditions;
- Examine, in detail, likely adverse environmental and social aspects and associated impacts;
- Propose appropriate enhancement and mitigation measures for the significant positive and negative impacts respectively; and
- Develop an ESMP framework with mechanisms for monitoring and evaluating compliance and environmental performance.

1.5 Location and Land Size

The proposed project site is located off the Lilongwe to Mchinji road approximately 35 kilometres from Mchinji Round-About into Lilongwe City in Chisikwa Village, GVH Mchira-wa-nkhondo, Lilongwe District. When moving towards Mchinji, the project site takes a right turn from the Lilongwe to Mchinji road two (2) kilometres after passing Nsundwe Market into the gravel road to Kasiya Trading Centre; site is a kilometre away from this turnoff (Figure 1-1). The land belongs to AVC Industries who purchased it from the former land owner and is in the process of obtaining Title Deed. The project site is on a flat land that was previously used growing crops and is surrounded by agriculture fields in its immediate boundaries in all directions except the western side where there is a Poultry Farm belonging to CP Feeds (Figure 1-2).The proposed site has water naturally draining to the eastern side where there is a dambo area and a stream called Nthanzi, which is half a kilometre away. The proposed site is also at a safe distance from dwelling houses and other built up working areas with the nearest institution being Khanda Full Primary School about a kilometre to the North-West. The project site is on a 17.7135 hectares' piece of land although it will only cover about 3 hectares and evidence of land ownership is provided in Annex 3. Key landmarks to help locate the site have been shown in Figure 1-3.The proposed site has been found suitable for the project because the topography is ideal, which is flat, well drained and not prone to flooding. The site is also located near to the Lilongwe-Mchinji road, which means the place can be easily accessed and has plenty of usable space to handle trucks manoeuvre comfortably.

1.6 Project Proponent

The name of the proposed project is Construction and Operation of Oil Seed Crushing and Oil Refinery Plant at AVC industries company site and contact details for the developer are:

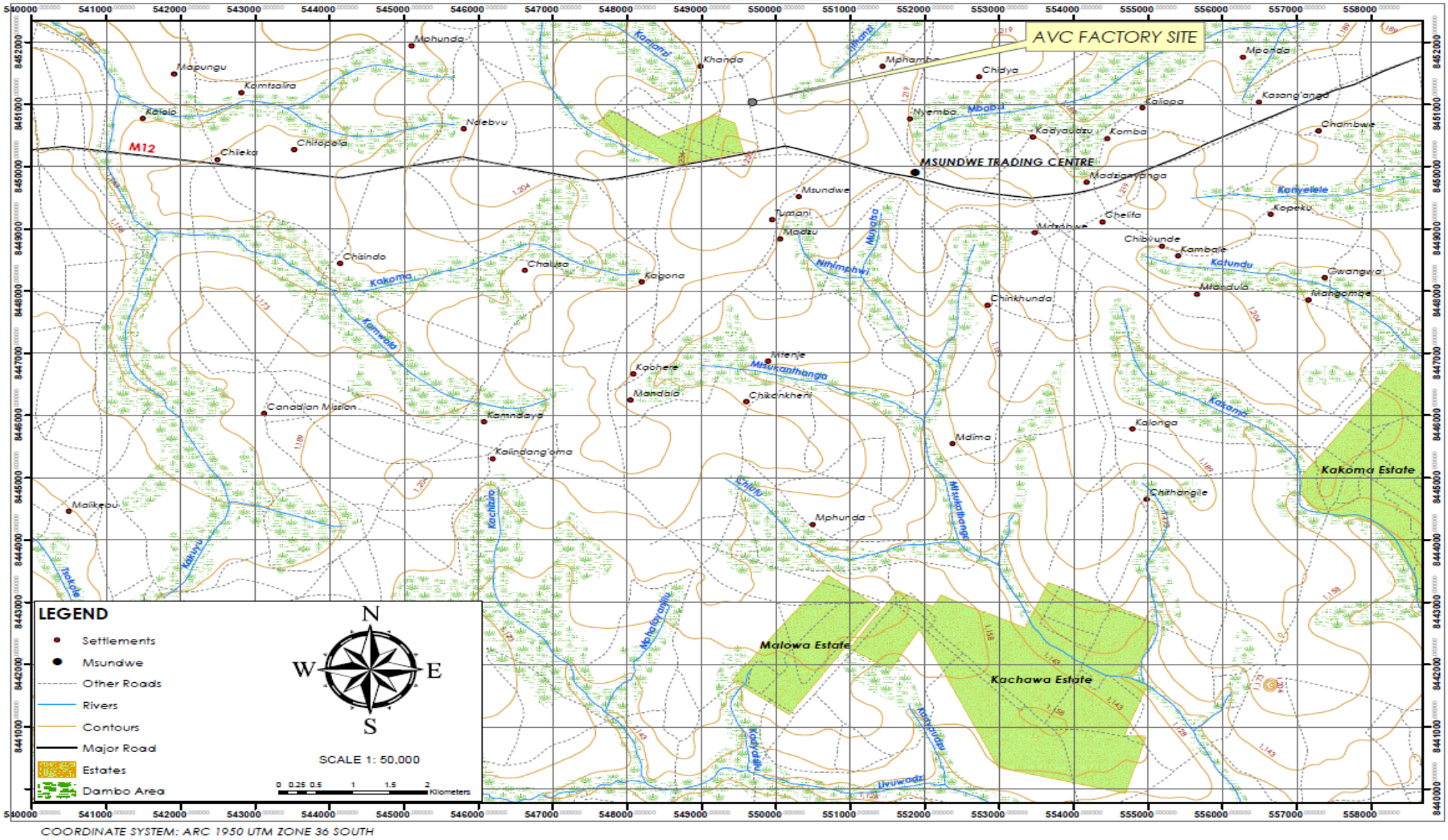
Proponent name:	AVC Industries Pvt Limited
Postal Address:	P.O. Box 51722, Limbe, Malawi.
Contact Person:	Rajneesh Kumar Dabral
Cell-phone Number:	+265994747300
Email Address	rajneesh@agrivalue.com.mw

1.7 Potential Users of the ESIA

This ESIA has been prepared for use by key stakeholders to be involved in the planning, implementation, management and monitoring of construction and operation of Oil Seed Crushing and Oil Refinery Plant. The ESIA contains useful information on policies and legal framework to be adhered to, analysis of potential environmental and social impacts and suggested mitigation measures at various stages of the project activities. The potential users of the ESIA include:

i. AVC Industries Pvt Limited (Project proponent);
ii. Environmental Affairs Department (EAD);
iii. Lilongwe District Council (LDC);

iv. Department of Occupational Safety and Health under Ministry of Labour;
v. Planners, engineers and contractors responsible for preparation of designs and construction works;
vi. The general public and other relevant stakeholders.



COORDINATE SYSTEM: ARC 1950 UTM ZONE 36 SOUTH

Figure 1-1: Location maps of proposed project site

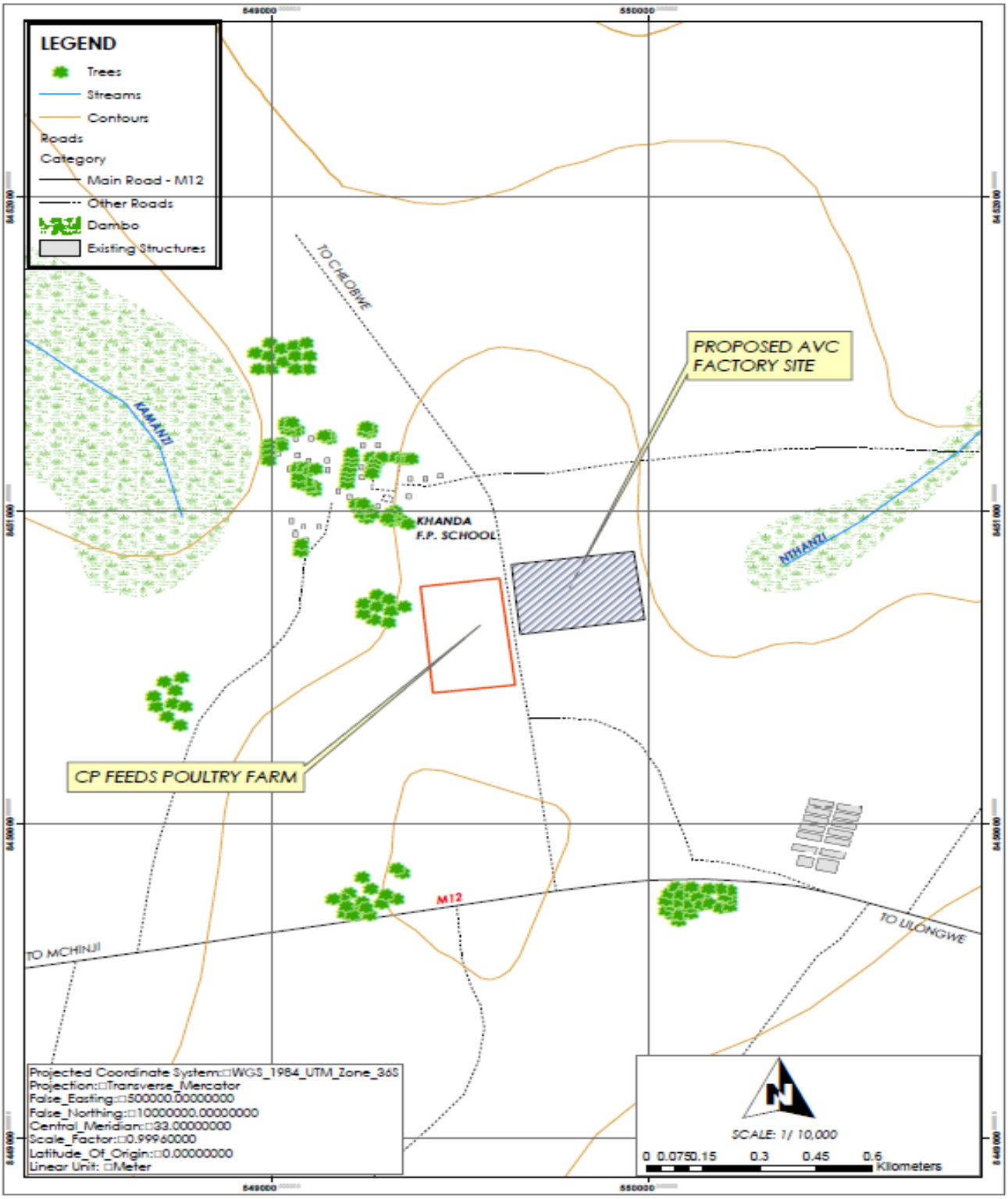


Figure 1-2: Location map of project site indicating surrounding environment

(a)

(b)

Figure 1-3: Landmarks for Locating Project Site with (a) being a signage for the Kasiya road along Lilongwe-Mchinji Road and (b) placard at project site

1.8 Methodology in Preparing the ESIA

The assessment of potential environmental effects resulting from project-related activities was carried out in accordance with EMA (1996), using a methodology framework developed on the basis of internationally accepted practice, and the professional experience of the Study Team. This assessment considered the potential environmental effects of physical works and activities, including environmental changes that may result from the proposed undertaking. This approach has satisfied requirements for environmental impact assessment under the EIA Guidelines of 1997 in the past and public consultation have also been conducted as part of the assessment. Several methods were adopted to conduct the environmental and social impact studies and prepare the ESIA. Desk study reviews, field visits and stakeholder consultations were the main methods utilised.

1.8.1 Desk Study

Some of the information in this report was obtained from previous ESIAs for similar projects and some selected national documents, policies, and pieces of legislation. Among the documents, the desk study looked at relevant project documents, the Water Resources Act, Guidelines for Environmental Impact Assessment, National Environmental Policy, the Environment Management Act, the Land Act, the Occupational Safety, Health and Welfare Act, and the Forestry Act.

1.8.2 Field Visits

The developer together with ESIA experts undertook site investigations to the proposed project site in March 2019 in order to acquaint themselves with the setup of the project site, identify, analyse and assess the potential negative and positive impacts that will be brought about by the project.

1.8.2.2 Stakeholder Consultations

The experts held a series of stakeholder consultations throughout the study period and the drafting of the report. Mode of consultation involved key informant interviews and focus group discussions. The key stakeholders consulted have been indicated in Annex 2 together with the comments raised.

1.8.2.3 Biodiversity Study:

A rapid assessment of vegetation within and around the project site was conduct using transect and observational walks. Samples of the most common plants including pictures were taken for further identification and analysis. Plant identifier online software was used to pre-identify the plant samples collected and results were verified by the National Herbarium and Botanical Gardens of Malawi (NHBG).

Chapter Two: Project Description

This chapter indicates the status of the project in the project cycle to ease understanding with regards to the level of detail and available planning or design options. The chapter describes main activities undertaken in the implementation of the project. In the description the following have been included; the type of machinery used, nature and quantity of wastes generated, facilities for appropriate waste disposal, and management of waste and estimated costs for the activities. All the issues that have been taken into account for avoiding or minimizing impacts, for capturing potential benefits, for compensating for residual impacts, and for impact management are discussed.

2.1 Overview of Project

To make up for the shortfall of edible crude oil in Malawi and ultimately refine vegetable oil from Soya Beans, AVC Industries proposes to construct a soya bean crushing and oil refinery plant that will process approximately 200 Metric Tons (MT) per day at full capacity. The process will produce about 19% edible crude oil, 75% animal feed and 6% processing waste. The plant is also expected to process 60,000 MT of soya beans per annum, which will be bought from local famers within Lilongwe and other districts such as Kasungu, Mchinji, Ntchisi, Dowa, Nkhotakota, and Salima. The farmers will be organised into cooperatives to encourage pooling of pockets of soya to sell to the company directly in the process cutting off middle men that normally take most of the profits meant for the small-scale farmers. The company is expecting that the crushing plant will be operational for about 200 days in a year. The annual estimated consumption of 60,000 Metric Tons of soya beans shall produce about 11,400 MT of cooking oil, 45,000 MT of animal feeds and 3,600 MT of waste.With soya bean yield per hectare estimated at one metric ton in Malawi, it is expected that the company will provide a market to about 100,000 soya farmers by availing them a reliable and stable market for their soya beans.

2.1.1 Technological Applications

There are a number of technological applications that have been employed in this business especially with the modern and improved Solvent Extraction Process 200 TPD. This comprises Elevators, Seed Cleaner, Aspiration System, Cracker, Cooker, Flaker, Roll Grinding Attachment, Hydraulic System, Conveyors, Rotary Air Lock, Feed Bin, Micro Level Indicators, Extractor, Rising Hoppers, Discharge Bin, Bulk Flow Conveyor, Rotary Air Lock, Toaster, Dust Catcher-New Design, Horizontal Tubular Condenser, Sealing Device, Vapor Cooler, Miscellaneous Holding Tank, Water Solvent Separator, Evaporator, Separator, Pre Heater, Condensers, Oil Stripping Column, Heater, Drier, Oil Holding Tank, Vacuum Equipment, Final Vapour Absorber, Heat Exchangers and Final Vertical Stripper. This technology provides efficiency in extraction as one-stop machinery for all processes. Further to this the oil refinery will use modern technologies so that better quality is maintained throughout the production process and deliver the best quality to the consumers.

2.1.2 Project Cost and Duration

The project is estimated at USD5,128,000.00 and a breakdown of major project activities is provided in Table 2-1. The construction phase is estimated to take a period of 6 months before the plant is commissioned for operations.

Table 2-1: Breakdown of Project Cost

Group	Sub Group	Amount in US$
Land and Development	Land & Site Development	200,000.00
	Factory	350,000.00
	Electricals	100,000.00
Furniture and Fittings	Furniture and Fittings	28,000.00
Plant and Machinery	SEP	1,200,000.00
	Refinery	1,000,000.00
	Oil Storage Tank Farms	200,000.00
	Boiler	250,000.00
	Acid Oil / Soap Plant	550,000.00
	Packaging Plant	200,000.00
	Effluent Treatment Plant (ETP)	200,000.00
	Air Pollution Control System	200,000.00
	Tankers	250,000.00
Motor Vehicles	Motor Vehicles & Other Costs	150,000.00
Working Capital	Working Capital	250,000.00
		5,128,000.00

2.1.3 Markets and Marketing

The target customers for cooking oil will be Malawians, wholesalers, retailers and export markets to SADC. For the animal feed the target will be companies in animal husbandry both local and international. International companies will be those within the SADC countries and if market permits outside Africa. The Company aims to deliver high quality cooking oil and animal feed to satisfy the local and international market. The company is going into backward integration that will help to ensure that the final products of cooking oil and animal feeds have the highest quality possible. The animal feed will have a well calculated feed formula that matches with the export market requirements-international market quality. State of the art machinery and proper training of staff are incorporated as the main sources of quality products.

AVC Industries Pvt Limited will extensively invest in training and technical knowledge transfer to its staff. These will be done by experts from different fields across the globe to strengthen and improve skills of local available manpower. This will ensure the company has the best team while at the same time others will look up to AVC Industries Pvt Limited for support in capacity building. Given the size and capacity of the plant, higher volumes of processing help the company to produce the final product at optimum cost of production which will eventually help to price the commodity at a competitive price to the end users.

2.2 Project activities and lifecycle

The project is expected to commence construction activities in September 2019 and is expected to be completed in January 2020, thus taking a total of six months. The project is expected to be on-going until the developer decides to close or is made to close for whatever reason.

The works will include the following:

- Construction of a factory building where various equipment for production of cooking oil, washing soap and animal feed will be installed;
- Construction of an Effluent Treatment Plant (ETP);
- Construction of an area for receiving of feed stock for the SEP;
- Construction of drainage channels around the plant and an oil interceptor; and
- Installation of steel tanks for the storage of the crude oil that will be produced from the plant.

2.2.1 Site Preparation and Construction

The activities envisaged during site preparation are:

- Removal of existing vegetation and shrubs;
- Preparation of the land to required levels and falls. This will entail some topsoil removal;
- Removal from site some construction rubble, excess soil, stones and rocks if present; and
- A temporary fence to act as hoarding will be built around the site during construction.

The site is slightly off the main road and is accessed using the partially gravel road which will need to be watered daily to suppress dust during construction. The activities envisaged during construction are:

- Excavation of trenches for building foundations and plant foundations;
- Construction of a building where the plant machinery will be installed and also where the feed for the plant will be stored; and
- Installation of electric power supply, cables, lighting and other control cables.

The site preparation and construction phases will employ a total of 100 people and a summary of construction material and equipment to be used in this phase has been provided in Table 2-2.

Table 2-2: Summary of construction material and equipment

SN	Raw Material	Source	Mode of Delivery
1	River and building sand	Local suppliers	Road truck
2	Aggregates and Laterite	Local approved suppliers	Road truck
3	Cement	Local	Road truck
4	Concrete blocks	Local suppliers	Road truck
5	Diesel (for operation of the generator and machinery)	Local approved suppliers	Road truck

6	Water	Onsite borehole	Electrical Pump
7	Electricity	ESCOM, builders supply	Existing power mains
8	General building materials (e.g. timber for shuttering, window and door frames, polythene sheeting, sewer pipes, paint etc.)	Local approved suppliers	Road truck
9	Finished products and equipment, structural steel components, sanitary ware, brass ware and finishing, piping, switches, tiles etc.	Local approved suppliers and imported ensuring compliance with Malawian standards and regulations.	Road truck
10	Equipment (Excavator, Poker, Rollers/Compactors, Tippers, Bull dozers, Backhoe loader, Crane, Engine generator)	Local Contractor	

2.2.2 Operation Phase Activities

The operation activities will mainly involve the following activities:

- Operation of the solvent extraction plant to extract the oil from the soya beans;
- Procurement of the soya beans from the local farmers and storing in appropriate storage facilities;
- Supply of the crude oil from the solvent extraction plant to the refinery;
- The delivery of soya beans to the plant site;
- Vegetating of the premises to control erosion and also beautify the site; and
- Maintaining of the drainage system to ensure that any spills from the site is cleaned and the waste disposed of appropriately.

During the operation phase, the plant is expected to employ a total of 215 employees and will ensure that it has at least 30% of females in its workforce. The roles of the employees are presented in Table 2-3.

Table 2-3: Roles and number of people to be Employed

Section / Type of Job	Number of People to be Employed
Finance and Administration	6
Maintenance Team	12
Preparatory Section	25
Extraction	10
DOC Conditioning	7
Boiler Section	15
Refinery Section	15
Effluent Treatment Plant (ETP)	7
Acid Oil Plant	7
Laboratory	8

Section / Type of Job	Number of People to be Employed
Stores	9
Electrical	10
Packaging Section	36
Seed/ DOC Handling	36
General Workers	12
Total	**215**

2.2.3 Decommissioning and Closure Phase

Decommissioning of the plant will occur only after operations at the plant have stopped. This can happen when business is not as anticipated or when the facilities have reached their full life and the facilities will not be ideal for use. The decommissioning will be done so as make the site safe and also to protect the environment. The costs of decommissioning of all equipment and infrastructure would be covered by LWC. General activities that will be involved in the decommissioning of the plant and their estimated costs are presented in Table 2-4.

Table 2-4: Decommissioning activities and their estimated costs

SN	Activity	Estimated Cost (US$)
1	Re-vegetation of disturbed sites	10,500.00
2	Decommissioning of tank farm and dispensers	18,000.00
3	Decommissioning of fuel equipment and associated infrastructure	15,000.00
4	Renovation of the structures so that they can be turned into other alternative use	10,500.00
5	Removal of the forecourt, piping systems and the submersible pumps	20,000.00

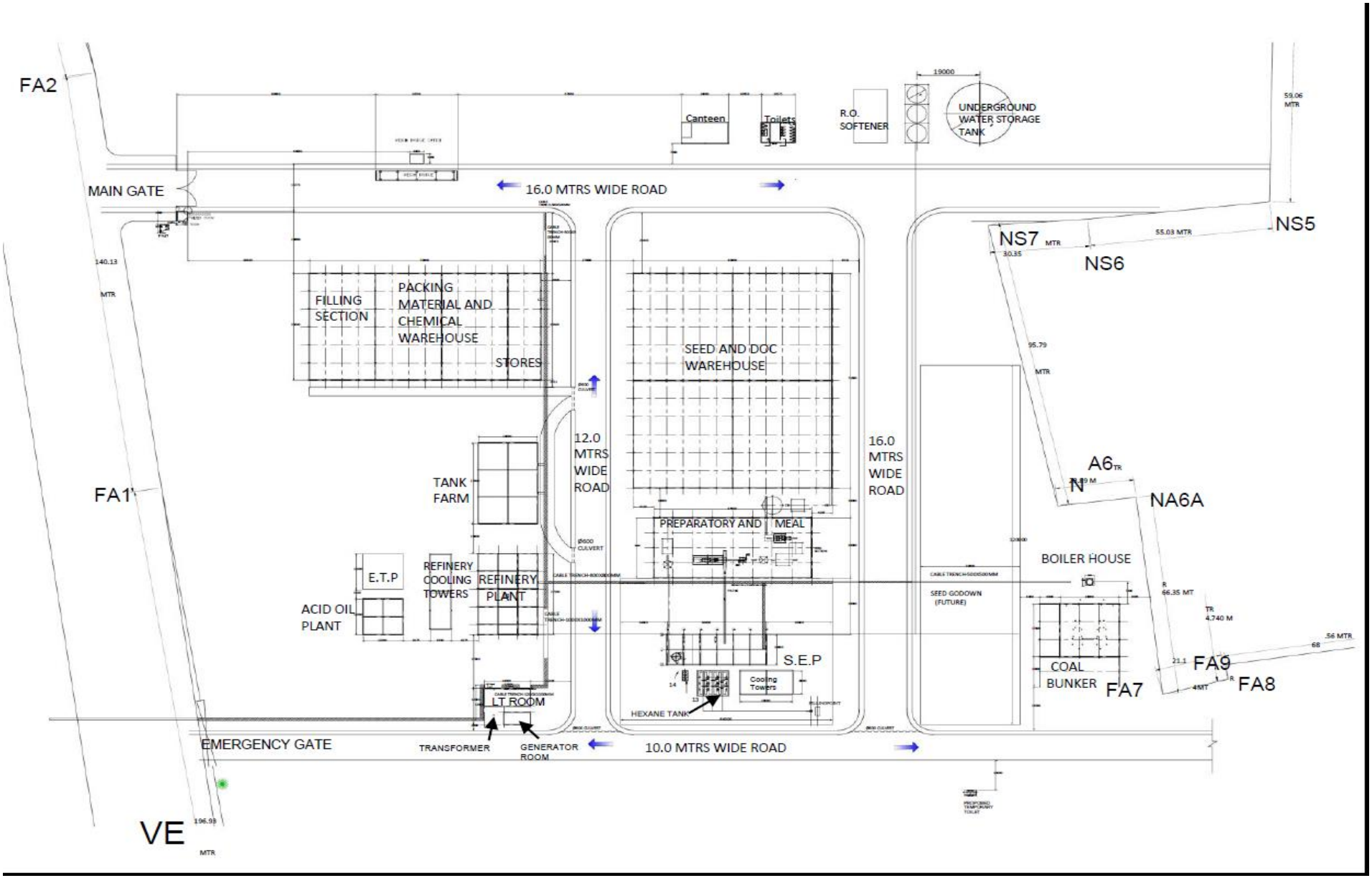
2.3 Production Process

The Cooking Oil plant will be built complete with the following:

- The preparatory section
- Extraction section
- Distillation section
- De-solventising and meal cooling section
- Recuperating section and
- Extracted oil section.

The plant will have several facilities (indicated in Figure 2-1) that will enable for environmentally friendly production system.

Figure 2-1: Layout of the Cooking Oil Manufacturing Project


FA2
Canteen
Toilets
R.O. SOFTENER
19000
UNDERGROUND WATER STORAGE TANK
59.06 MTR
MAIN GATE
16.0 MTRS WIDE ROAD
NS7
NS6
NS5
55.03 MTR
30.35
140.13 MTR
FILLING SECTION
PACKING MATERIAL AND CHEMICAL WAREHOUSE
STORES
SEED AND DOC WAREHOUSE
95.79 MTR
12.0 MTRS WIDE ROAD
16.0 MTRS WIDE ROAD
A6
N
NA6A
FA1
TANK FARM
PREPARATORY AND MEAL
BOILER HOUSE
E.T.P
REFINERY COOLING TOWERS
REFINERY PLANT
ACID OIL PLANT
SEED GODOWN (FUTURE)
66.35 MT
4.740 M
S.E.P
Cooling Towers
COAL BUNKER
FA9
FA8
FA7
.56 MTR
.68
LT ROOM
HEXANE TANK
EMERGENCY GATE
TRANSFORMER
GENERATOR ROOM
10.0 MTRS WIDE ROAD
VE
196.93 MTR

2.3.1 Receiving and Storage of Raw Material

The production process will commence by receiving and storage of the raw material that will mainly be soya bean. The soya seed from the delivery trucks will be off loaded at the receiving bay in the plant. Generally, this seed will contain impurities such as stones, mud, dust, sticks and jute threads etc. The semi-cleaned seed will then be sent to the pre-cleaning section where the soya seed will be cleaned by removing impurities present and thereafter sent to the warehouses for storage.

The warehouses will have a capacity to store approximately 20000 metric tonnes of Soya Bean. PP bags will be used for storage and the stack height in storage will be up to six (6) metres above the floor. For good stock control, the stacks will be in lots that will be separated by 1.5-metre-wide gangways around the stacks and the walls. Several critical areas will be 3-metre-wide, in which incoming or outgoing stocks can be handled. The stored soya seed will then be transported to the Day-bin conditioner from the storage warehouses with pre-weighing arrangement to record the flow of seed in the process.

The warehouse design will consist of a reinforced concrete slab floor, walls made of concrete blocks and painted white, a roof built with aluminium sheeting, and the warehouses will have four sliding doors that will not affect storage capacity. The warehouses will also include basic components such as ventilators, windows, artificial lighting, etc. The design of the warehouses ensures that the quality of the grain to be stored will not be affected by physical factors such as moisture and heat. The design of the warehouse has also taken into consideration protection of grain from attack by rodents and birds. The warehouse shall also be easy to clean and maintain; and it shall provide good working conditions.

2.3.2 Preparatory Section

The semi-cleaned soya seed is then transferred to the preparatory section as elaborated in the flow diagram presented in Figure 2-2.This semi-cleaned soya seed will be delivered to an elevator to feed the secondary seed cleaner in order so as to remove any remaining impurities. The cleaned seed is further separated on basis of small and bigger seeds, in the seed grader. The seed grader sorts the seeds on basis of the size of the seed in order to remove the impurities before processing.

Generally, two sizes of seeds are selected. One above 3 mm and the other below 3mm. The graded seed is further sent to de- stoner where the stones of the size of the soya seed is removed from the seed and the cleaned seed without impurities are transported to the seed cracker.

The cracker breaks the whole seed into four particles. The cracked seed will contain seed particles as well as outer shell known as hulls. The cracked seed with the hulls may contain whole seed which has not been cracked in the cracking machine.

The cracked seed is further sent to hull and seed separator to remove the hulls and cracked seeds. The un-cracked seed is separated and sent back for re-processing to ensure the entire soya seed is probably cracked (broken). The cracked seed with hulls is conveyed to specially

designed hull and seed separator (cracked seed) in the double aspiration system, to ensure complete removal of Hulls from the seed.

The cleaned cracked seed is then conveyed to cooker where the seed is cooked within a certain retention time, with proper moisture and temperature, to ensure that the oil comes to the surface of the seed. The temperature and the moisture should be correctly maintained. The cracked seed is further transported to flacking machine where the cracked cooked seeds are flaked to the thickness of 0.25 mm to 3.5 mm for the proper extraction of oil.

Preparation of oil-bearing material prior to its extraction is often under estimated by many processors. To achieve the best results in solvent extraction, the way in which the raw material is prepared is almost as important as extraction equipment itself. The feed stock should have a particle size small enough to enable the solvent to reach right up to the core, but at the same time not so small as to constitute ‘fines’, should have fairly uniform particle size in order to ‘pack well’ in the extractor and form a homogenous bed and should possess good percolation characteristics. Too big pieces in the feed results in high residual oil content in meal as the solvent may not be able to penetrate to the core. And too small particles or fines will lead to poor percolation and channelling effect, thus resulting in poor performance of the plant.

Fully conscious of the importance of proper preparation, after a long experience, the manufacturer has developed a complete range of preparatory equipment suited for each type of raw material.

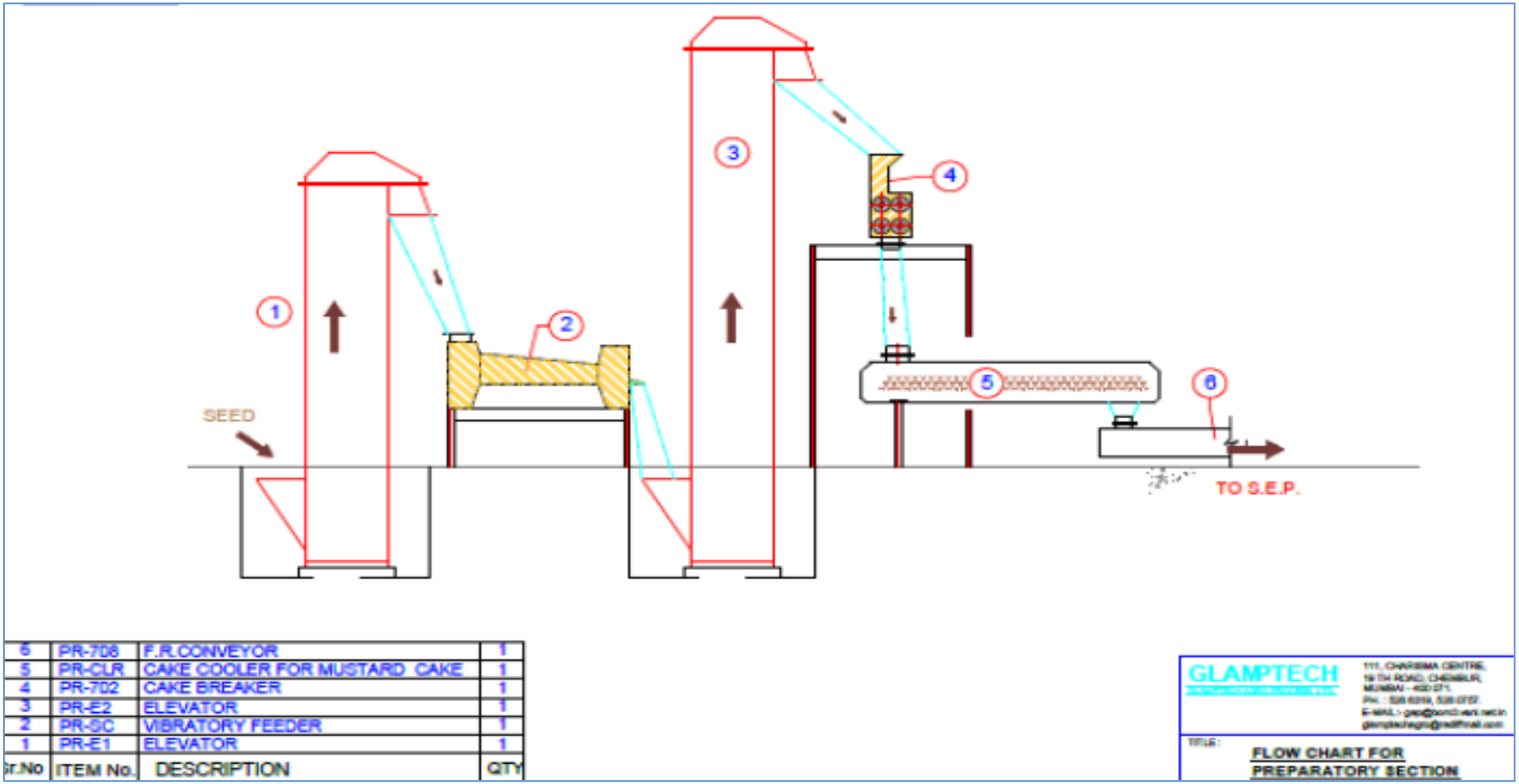


Figure 2-2: Process flow sheet for Preparation Section

Soya bean processing requires cracking, cooking and flaking operations. The cooker is a multistage vertical vessel with steam heated from bottom plates and specially designed live-steam injection arrangement so arranged that the entire surface of material is uniformly covered by steam. The intrinsically designed agitator assembly moves the material and makes it pass from stage to stage. Automatic level adjustment and regulation devices are provided.

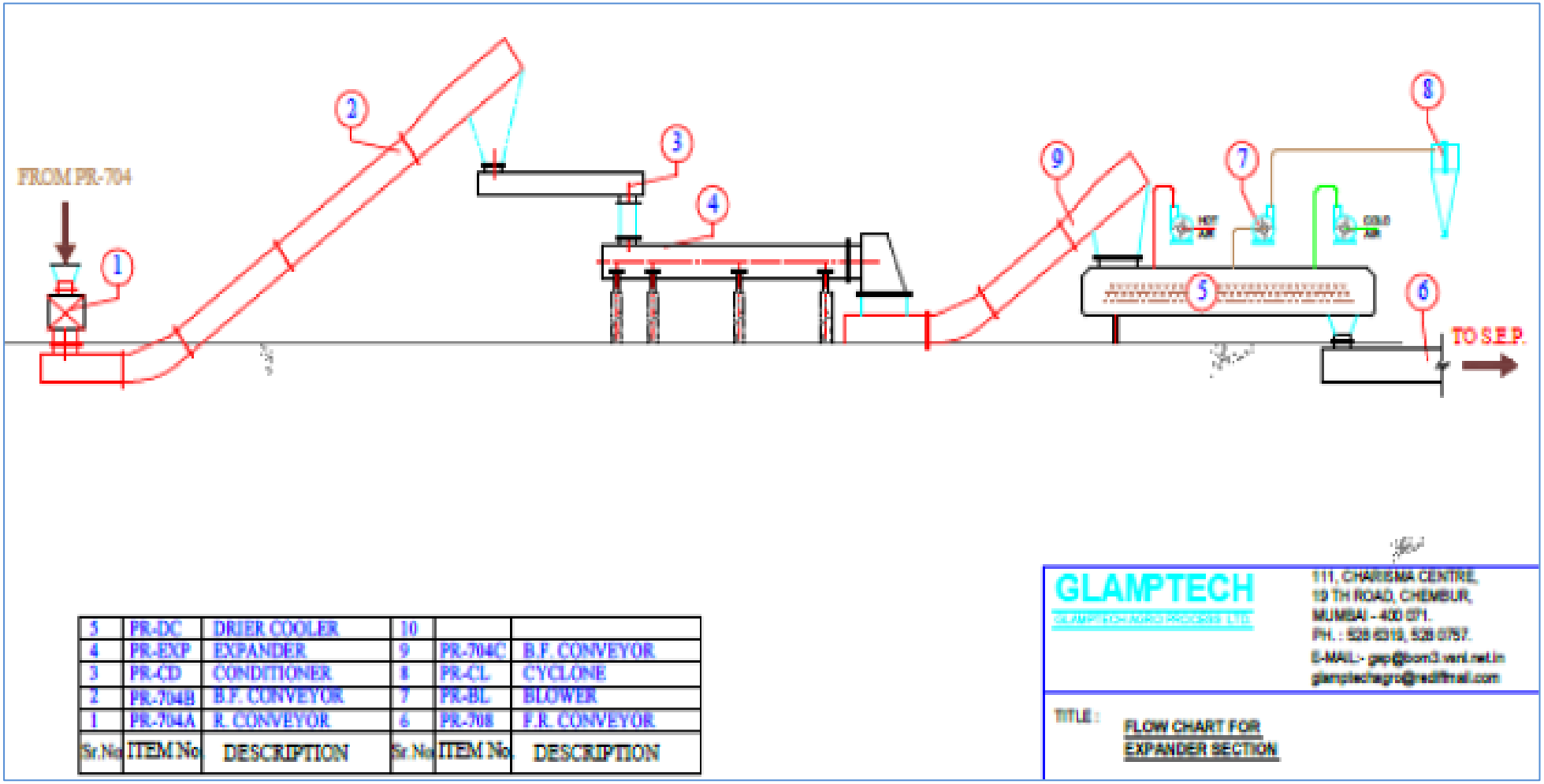
The cracked and cooked soya bean thus obtained is transported to the next operation of flaking. The flaking machine is used for flaking various prepared oilseeds thus breaking down the cellular structures and exposing larger area for efficient oil extraction. The machine comprises of one pair of chilled cast iron, dynamically balanced rolls mounted on the heavy C.I. Housings; supported by suitable bearings. The gap between the rolls is adjusted as per the requirement with the help of hydraulic power pack fitted with pressure switch to generate pre-determined pressing power. Hydraulic flaker produces quality flakes of approximate 0.25 mm to 0.3 mm thickness, which is most suitable for efficient extraction process.

The flaked seeds are passed through the extruder expander which ensures the proper compression as well as porosity, which improves the extractability is ensured coming out of extruded expander. During these process the moisture level as well as temperature of the material increases which is not suitable for extraction of the soya bean collates (extruded meal) to maintain the right condition i.e. temperature and their moisture specially design dryer cooler is provided to removes the moisture and bring down their temperature of soya collets to suit for correct extractions.

2.3.3 Extraction Stage

The prepared material from preparatory section is received at the extraction stage (Figure 2-3) through the feed hopper through rotary valve. The material in the hopper and the rotary valve together constitute an effective vapour seal while the latter also saves to regulate the feed. The hopper is further provided with the special switches for high level and low-level indication. The latte if energized stops the band conveyor of extractor while the high-level indication, transmits an audio-visual signal to preparatory section for preparatory operator to take corrective measures.

The extractor is long horizontal vessel, rectangular in cross section in M.S. construction. An articulated band conveyor inside the extractor will receive the material from feed hopper and transport it at a pre-determined speed from the feed-end to discharge-end. The band conveyor will then move over rails suitably located inside the extractor and ride on specially constructed sprockets at either end. The speed of the band conveyor is easily adjustable within desired limits. An adjustable damper enables the regulation of height of bed of material on band conveyor.



Sr.No	ITEM No	DESCRIPTION	Sr.No	ITEM No	DESCRIPTION
5	PR-DC	DRIER COOLER	10		
4	PR-EXP	EXPANDER	9	PR-704C	B.F. CONVEYOR
3	PR-CD	CONDITIONER	8	PR-CL	CYCLONE
2	PR-704B	B.F. CONVEYOR	7	PR-BL	BLOWER
1	PR-704A	R. CONVEYOR	6	PR-708	F.R. CONVEYOR

Figure 2-3: Process flow diagram for extraction stage

A series of sprayers located above the band conveyor enables perfect spray of the solvent on the moving bed. Special spray breakers facilitate uniform distribution of solvent over the entire width of moving bed. Each spraying section is followed by draining section. Fresh solvent is admitted into the extractor near the discharge end of the moving bed of material and the full micelle is recovered from the initial stage, thus ensuring the perfect counter current flow of material and the solvent.

It is not merely a simple counter current flow. The micelle circulates in a closed circuit in each of the successive section by overflowing from each hopper. So, in each section there is an equilibrium between the oil extracted from the seed in corresponding section and the difference in oil content of solvent overflowing the preceding hopper together with the solvent overflowing the following section. The cleaning of the band conveyors is accomplished by high pressure jet spray of fresh solvent onto the return of ban conveyor at discharge end which ensures perfect cleaning of mesh and eliminates completely the possibilities of choking of mesh and channelling.

2.3.4 Distillation Section

The micelle from micelle tank is pumped through vapour economizer to first evaporator. The economizer unit is specially designed in order to effectively utilize the heat of vapours emerging form the desolventiser toaster (D.T). The vapours from D.T. enter and separate heat to the incoming micelle.

Firstly, it results in reducing the consumption of steam in the plant. Secondly, it greatly increases the capacity of the distillation section, as micelle enters the distillation section at elevated concentrations of approximately 45% instead of the usual concentration of micelle. The concentrated micelle thus obtained from the economizer unit, is rapidly heated in the first evaporator by means of low-pressure steam and enters into flasher where solvent vapours are flashed off. The oil rich micelle thus obtained is charged into the second evaporator and flasher cum stripper. The flashed off solvent vapours are condensed in the condenser and liquid solvent is re-circulated back to the process through solvent water separator.

Distillation system operates under very high vacuum & lower temperature & short distillation period which ensures good quality of oil. Furthermore, the distillation system is coupled with a final drying of oil in final oil heater, which results in production of oil with exceptionally low-volatiles in it.

2.3.5 De-solventising and Meal Cooling

The de-solventising is quite hot and at around more $100^{O}C$. These meal contents at the temperature of $100^{O}C$ contains high moisture in the toasted meal. In such condition, it is improper to take out soya meal from D.T.

Special moisture reducing and meal cooling chambers are provided to reduce the moisture as well as temperature of soya meal. The meal coming out of toaster i.e. D.T is maintained at $100^{0}C$ above ampere. The cooled and dry soya meal is further transported to the bagging go down.

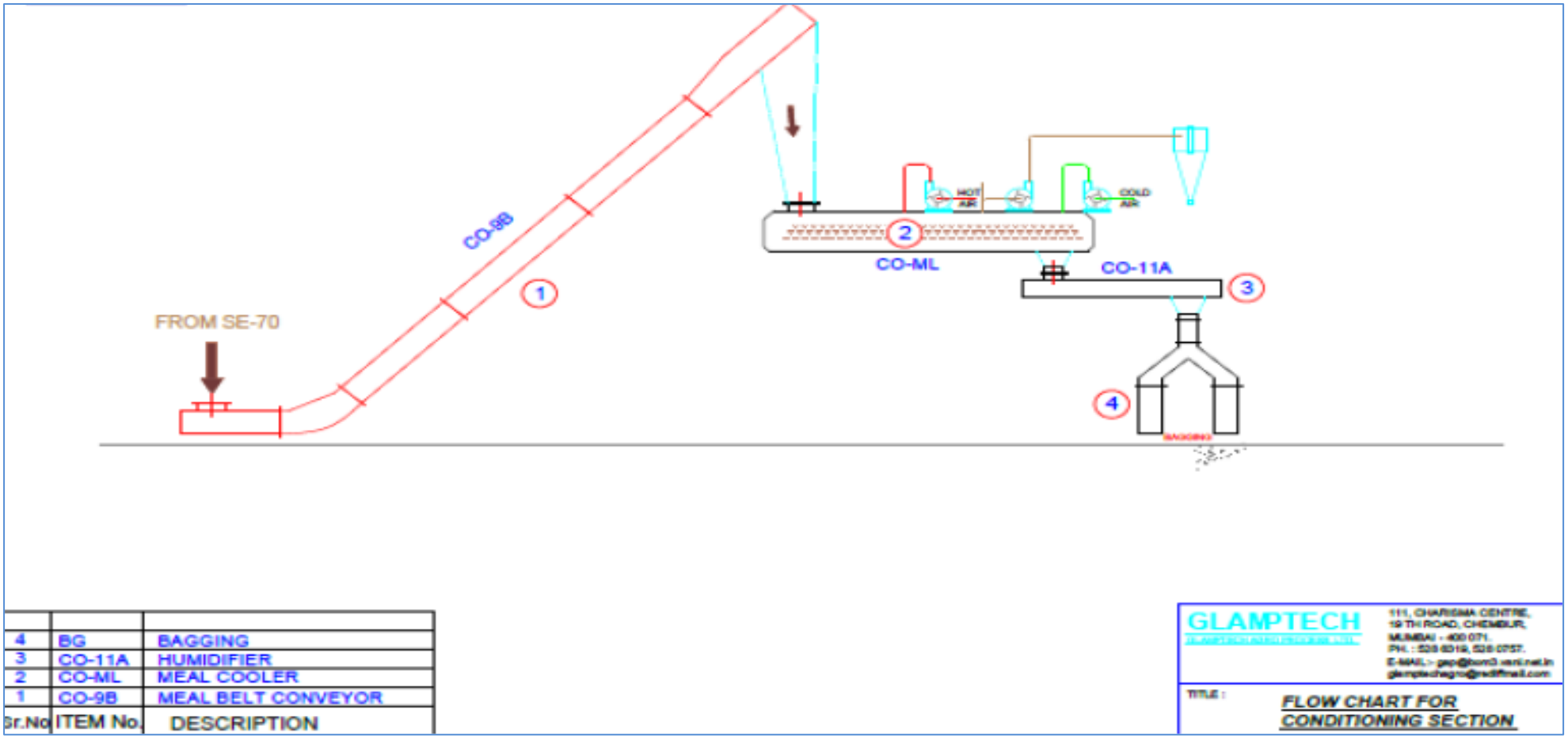


Figure 2-4: Flow Diagram for conditioning section

2.3.6 Recuperation Section

The uncondensed gases from water cooling condensers, after passing through the contact cooler, are allowed to pass through the fine spray of cold mineral oil which absorbs the traces of hexane vapour, which otherwise would escape to atmosphere through vent ejector. The hexane vapours thus absorbed are recovered by heating the oil in absorber heater and the flashed off vapours are again condensed in the water-cooled condensers. In order to reuse the hot mineral oil, it is made to pass through the water cooler and then through the chilled water cooler for obtaining the cold mineral oil for re-spraying and absorption of next hexane vapours. The recuperation system ensures practically NIL escape of hexane to atmosphere

2.3.7 Extracted Oil

The extracted oil from extraction plant is collected in a storage tank for checking the quality as well as ensuring free from Hexane present in the oil if any. The Solvent Extracted Soya Oil is transported by gravity flow to the Soya Crude Oil storage tank. The proposed cooking oil plant will be operational 24-hours a day operating under three eight-hour shift. The project will produce the crude oil that will then be used in the refinery for further processing.

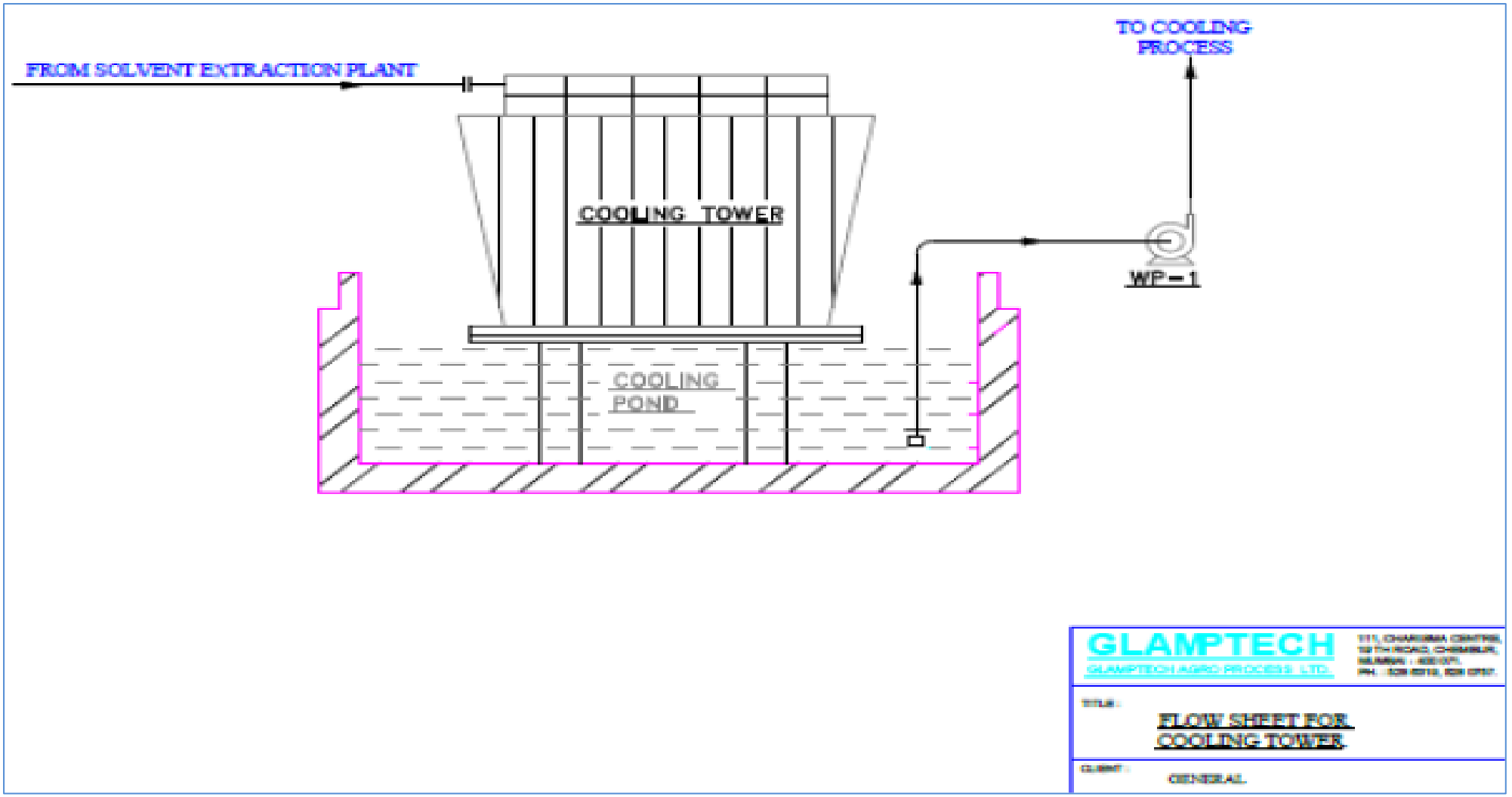


Figure 2-5: Flow diagram for recuperation section

2.3.8 Soap Stock Splitting Process

Soap stock is a by-product of soap, resin acids and wax materials that are separated as a result of washing and neutralization of free fatty acids with caustic and in refining of soya bean oil. Soap stock contains water and low amounts of oil. It is obtained during elimination of free fatty acids (alkaline refining) by caustic soda neutralization of raw oils. It is a mixture of fatty acid soaps, salts, phospholipids, impurities and entrained neutral oil. The EPB plant has in its machines and process embedded fat traps that will be used to capture all the oily waste water and direct it to acid oil plant where soap stock splitting will be done. Soap stock splitting is done with Sulphuric/Hydrochloric acid to obtain acid oil. As a result of usage of acid, soap stock splitting process is a highly corrosive process; as such, LWC will put in place a leak proof and corrosion proof soap stock splitting plant.

Soap stock will be fed in to acid oil reaction vessel, in which it will be heated at 90- 95-degree Celsius temperature with steam. After this temperature is obtained, sulphuric acid will slowly be added in to the soap stock. According to the total fatty acid in the soap stock, its quantity to be added will be determined, normal range will be 12 to 15%. In order to complete the reaction, the mixture of sulphuric acid and soap stock will be kept in the vessel for about 15 minutes. The mixture will then be heated and kept at boiling temperature for 2 to 3 hours. The oil will be heated until the acid oil splits. The mixture will then be kept in the vessel for at least six hours in order to settle down completely. After the solution settles down completely, three layers will be formed in which the upper layer will be of acid oil, middle layer will be acidic sludge and the bottom layer will be of acidic water. Firstly, bottom layer that is of acidic water will be discharged through the outlet valve into the acid oil/water trap tank. Then, it will further be pumped to acidic water storage tank. The acidic water from acidic water storage tank will not be required into the effluent treatment plant, hence, treated in equalization tank with wash water generated from the refinery. Through this treatment, the pH level of the acidic water will get reduced and with it the traces of oil from wash water will also be trapped. After the treatment, the final mixture of wash water and acidic water is discharged through a trap, to catch oil traces, into the effluent treatment plant. After this, second layer of sludge will be pumped into a sludge storage tank through a screw pump. At the last, the final layer of acid oil will be pumped into acid oil storage tank and will be used in the manufacturing of soap. The soap will be manufactured by reaction of the acid oil and caustic soda followed by graining using brine solution.

2.4 Occupation Safety and Health

2.4.1 Fire Protection System

Risks of fire and explosion that may occur at different stages of production and can lead to loss of property, as well as possible injury or fatalities of plant workers. Specific risks are related to the combustibility of soya bean oil and the high volumes of combustible dust present both in grain handling and in storage facilities. The control and removal of this dust and the control or removal of potential ignition sources are key to eliminating the explosion hazard. The storage of grains and seeds represents a combustion risk, owing to the potential for self-heating

and ignition. The oil processing facilities also present the risk of explosions resulting from the volatilization of solvent dissolved in the oil (e.g., hexane), along with the risk of fire from spent bleaching earth with a high iodine-value oil, high ambient temperature, and high circulation-draft of air.

An underground water storage tank of capacity $1000M^3$ will be used for the fire-fighting system. The water storage tank for fire-fighting will always hold water adequate for any anticipated emergency and will be connected to a fire hydrant piping loop. The fire water piping will be laid at an appropriate location to cover the plant and ancillary structures. The water storage tanks will also be fitted with electrical and diesel engine centrifugal pumps that will be exclusively for fire fighting usage and no other connections will be tapped except those for Water Hydrant Service Rings (WHSR). Capacity of the main pump will be $70m^3/h$ and delivery pressure will be 5 bar.

The fire protection system will also have hydrant outlets that will be at least one meter above ground level. Single hydrants will be used where the hydrant main passes around the buildings. Double hydrants and fixed monitors will be used in the factory and warehouse areas. Hose pipes will be kept in glass panel fronted red painted wooden boxes near the hydrants. Each hose box contains two hoses of 15m length each. All hoses will be either unlined canvas as per IS:4927; OR Rubber Lined woven jacketed complying with type II reinforced rubber lined as per IS:636 and permitted to be used up to a maximum of 50 % of the total hose requirement of the hydrant system.

A fire alarm unit will be installed so that all project infrastructure can be alerted in case of a fire. The system consists of an electrically operated siren with an effective audibility over an area of 500m radius.

2.4.2 Safety of Workers

Employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers. During construction, LWC will engage a contractor that has the technical capability to manage the occupational health and safety issues of their employees, which shall be ensured through formal procurement agreements. Occupational health and safety issues during the operational phase will mostly include chemical and physical hazards. Preventive and protective measures will be introduced according to the following order of priority:

- Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc.;
- Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, machine guarding, and acoustic insulating, etc.;
- Minimizing the hazard through design of safe work systems and administrative or institutional control measures. Examples include job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, etc.

- Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

The application of prevention and control measures to occupational hazards will be based on comprehensive job safety or job hazard analyses. The results of these analyses will be prioritized as part of an action plan based on the likelihood and severity of the consequence of exposure to the identified hazards.

2.5 Inputs: Resource Utilisation

2.5.1 Water Consumption

2.5.1.1 Construction

It is estimated that up to $5m^3$ of water is required per day during the initial phases of the construction activities and it is expected that the water use will reduce by 40%. A borehole will be sunk during the construction phase for supply of water.

2.5.1.2 Operation

During the operation phase, the greater demand would be during start up and require up to $10m^3$ per hour during the operations. A borehole sunk in the construction phase will be used during operations as backup to water supplied by Central Region Water Board. In the cooking oil manufacturing plant water will be reused and recycled with condensate from the first two evaporators and exhaust condensate from the turbines being used as boiler feed. Cooling water will be in a closed loop and will be reused.

2.5.2 Energy Requirements

2.5.2.1 Construction

During construction, power will be sourced from the national grid or diesel-powered mobile generation sets.

2.5.2.2 Operations

During operation, the plant will be completely energy self- sufficient and will run on coal that will generate steam which in turn would be used to generate electricity (5 MW). The SEP will require 0.9 MW of power. During off season or in circumstances where the plants turbine alternator is faulty, power will be supplied by ESCOM or a standby generator. Coal will be stored in a bunker that will be made of a concrete slab, a 2-meter-high wall and a roof to avoid contamination with storm water.

2.6 Outputs: Waste and Emissions

2.6.1 Atmospheric Emissions

2.6.1.1 Construction

Emissions during construction will vary in magnitude, frequency and duration for the various construction activities required. It is therefore difficult to accurately quantify emissions

associated with construction of the project components. During construction, air emissions will be associated with the following activities:

- Combustion emissions from operation of construction machinery and generators;
- Particulate (dust) emissions from exposed areas and earthmoving activities;
- Vehicle emissions from supply vehicles and generator operation; and
- Welding operations.

2.6.1.2 Operation

Particulate matter (dust) and Volatile Organic Compounds (VOCs) will be the principal emissions from oil production and processing. Dust will result from the processing, including cleaning, screening, and crushing of raw materials, whereas VOC emissions will be caused by the use of oil-extraction solvents, normally hexane. Several sources within vegetable oil processing plants generate solvent emissions, including the solvent recovery unit, the meal dryer and cooler, leaks in piping and vents, and product storage. Small quantities of solvent may be present in the crude oil if the oil has been extracted by a solvent and will volatilize during the oil refining process, particularly during deodorization. Odour emissions will also be produced by multiple sources of the process. The EPB has been embedded with fume scrubbers and air extractors that will be capturing controlling odour inside the factory and releasing to the environment where the dilution factor is much higher.

The oil processing plant will be using auxiliary boilers for the generation of steam energy using coal. Emissions related to the operation of these steam energy sources typically consist of combustion by-products, such as NOx, SOx, PM, VOCs, and greenhouse gases (CO_2).

2.6.2 Noise

2.6.2.1 Construction

The construction phase will be characterised by noise generated by diesel mobile construction and earthmoving equipment, piling, concrete and steel works. Traffic associated with the transport of construction materials, transformers, turbine-generator units etc. and construction workers will also result in increased noise levels along transport routes. It is envisaged that construction activities will be limited to day-time hours.

2.6.2.2 Operation

Noise emissions from the plant include preparation equipment, mill-drive gearboxes, hydraulic pumps, high-pressure fans, boiler feed pumps, steam valves, steam vents and leaks, vacuum-breaking valves, compressors, vacuum pumps, pneumatic tools, workshop and maintenance operations. Some of these noises are highly variable and can include:

- Soya bean delivery and offloading. Noise levels are high and frequently have impulsive components to them;
- The atmospheric venting of steam from main exhaust lines, boiler safety valves, leaks and other small vents; and
- Trucks delivering soya beans, other raw materials and product collection (edible oil and animal feed) generate further noise.

2.6.3 Wastewater

2.6.3.1 Construction

During construction, the primary wastewater will be from onsite sanitary facilities for the construction workers. Temporally pit latrines will be constructed on the project site and will be used to manage this waste.

2.6.3.2 Operation

The technology to be used will allow very little amount of waste-water to be generated by the plant. Waste-water from the production process is estimated to be 1,500 litres per hour and this will be discharged into the effluent treatment plant (ETP). In addition, the workers at the plant are expected to produce 9000 litres of waste-water per day and will be discharged into the septic tank with soakaway. The septic tank will have a total capacity of $100m^3$, which is adequate to sustain and contain the 9000 litres per day as stipulated by the British Standards (BS 6297:2007+A1:2008 - code of practice for the design and installation of drainage fields for use in wastewater treatment) that requires septic tanks to have a minimum capacity of 12.2 cubic meters when they are expected to receive 9000 liters per day of wastewater. When septic tanks are full, sludge will be pumped and disposed at Kauma Wastewater Treatment Plant in Lilongwe.

All wastewater generated by the factory processes will mainly contain quantities of soap liquids (not more than 50 Kilolitres per day (KLD) in volume) similar to wastewater from bathroom. It will also consist of sulphates, ammonium salts, total dissolved solids, suspended solids, and chlorides etc, all of varying pH. The effluent treatment plant (ETP) will be designed to handle a volume of 75,000 kilolitres per day (KLD) of waste water and the waste water is expected to pass through the system in 7 days. The waste-water will be directed into separate ponds after passing each treatment stage and all the ponds are lined with concrete.

Waste-water from the production process will contain a high level of suspended solids (SS), Biological Dissolved Oxygen (BOD), Chemical Oxygen Demand (COD), salts and organic nitrogen. The ETP will have five main facilities of pre-treatment; primary sedimentation, secondary / biological treatment, and tertiary sedimentation (Figure 2-6).

i. Preliminary Treatment

The objective for preliminary treatment is physical separation of large sized contaminants. This is done by placing two screens at different intervals to remove large floating solids.

ii. Primary Treatment

Primary treatments aim is removal of floating and materials that can settle at the bottom such as suspended solids and organic matter. In this treatment both physical and chemical methods are used.

iii. Secondary / Biological Treatment

Secondary or biological treatment aims at the further treatment of the effluent from primary treatment to remove the suspended solids and residual organics. The biological treatment will utilise five ponds constructed in series. The activated sludge process is utilised which uses air and a biological flocculent composed of bacteria. These bacteria will promote aerobic breakdown of organic compounds in the effluent.

iv. Tertiary Treatment

The purpose of tertiary treatment is to provide a final treatment stage to raise the effluent quality to the desired level before it is discharged. In the sedimentation tank, aluminium sulphate is added to coagulate the suspended tiny solids in the effluent into sludge.

v. Treated Waste-water

After the water has been tested to meet the necessary effluent discharge standards after tertiary treatment, the water will be pumped and used for watering flowers and other ornamental plants on the site. The ETP is expected to release a maximum of 1500 litres of water, which will meet the daily requirements of the flowers and ornamental plants to be planted on the project site that is 3 hectares in size. The sludge from the drying bed shall be used as manure by the factory and will also be shared with local farmers to be used as manure in their garden.

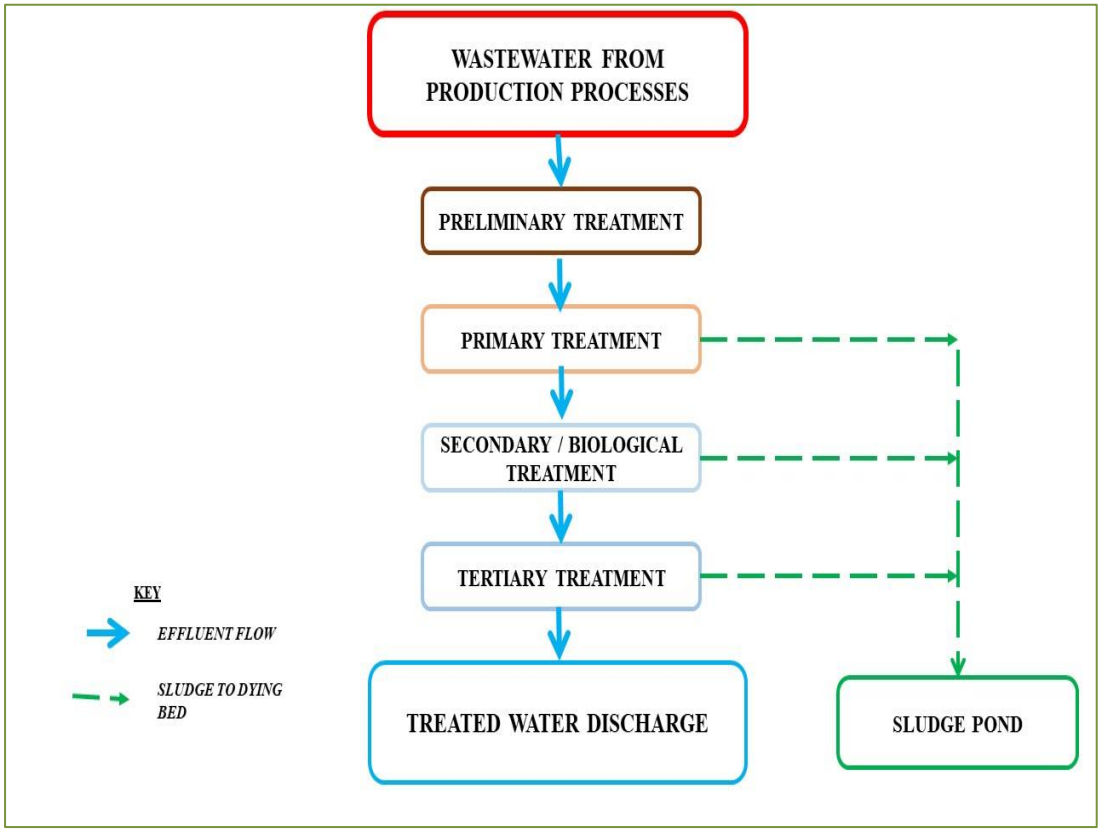


Figure 2-6: ETP Flow diagram

2.6.4 Solid Waste

2.6.4.1 Construction

Solid waste will be generated during this phase will be in the form of construction and domestic waste. Construction waste will include material excavated from earth works, containers, cement bags, metal, glass and other various packing and unused materials. Domestic waste generated will include food and packaging containers. Construction equipment and vehicles will use oil and/ or fuel during construction. Spillage and wastage could result in hazardous waste materials that will need to be managed appropriately.

2.6.4.2 Operations

Solid waste in the form of industrial and domestic will be generated; Soya bean oil processing activities generate significant quantities of organic solid waste, residues and by-products. The amount of waste to be generated is estimated to be 3000 MT per annum and will mainly be composed of impurities and hulls from the preparatory and extraction sections. All solid waste will be collected and stored in hygienic conditions before collection by a yet to be identified private service provider to be contracted by LWC. LWC will ensure that the private waste collector complies to the Environment Management Act (1996), the Environment Management (Waste Management and Sanitation) Regulations (2008), Lilongwe District Council By-Laws and other relevant legislations. The company will segregate waste at source as organic or inorganic waste and dry or wet waste. The waste will be temporally stored in dry, leak proof and well-ventilated area. The waste will be disposed of every other two weeks and the onsite temporally waste storage facilities will have the capacity to handle the waste for such a period. The other main types of solid waste to be generated from the operation phase include domestic waste, boiler ash soap-stock and spent bleaching earth. Domestic waste will include food remains and associated containers generated by workers but there will also be boiler ash. This waste will also be disposed at a solid waste disposal site to be approved by Lilongwe District Council and EAD. Coal fly ash from the boiler will be used to make fly ash bricks (FAB). Before commencement of production, LWC will seek to make formal agreements with FAB manufacturing companies in Lilongwe, such as JTI Malawi, to be disposing their coal fly ash to these companies. A Bunker will be provided for the temporally storage of the coal fly ash.

Spent bleaching earth is another non-toxic by-product in a powder form that comes out during oil breaching process. An estimated 0.2 MT of spent bleaching earth will be generated per day. The spent bleaching earth contains entrained oil in the range of 30 to 50% by weight. The entrained oil is in the form of a thin film spread over the immense surface area provided by the clay particles. Upon exposure to air, rapid oxidation of the oil film occurs and sufficient heat is generated to cause spontaneous combustion. This spent bleaching earth is susceptible to spontaneous combustion; consequently, there are few practical uses for it, and handling and disposing of spent bleaching earth is a fire risk. The spent bleaching earth disposal method will be to bury it at a solid waste disposal site to be approved by Lilongwe District Council and EAD.

Chapter Three: Alternative Developments

3.1 Do-Nothing and Implement the Project

3.1.1 The Do-Nothing Alternative

The do-nothing alternative means that the site remains in its current state and be used for smallholder agriculture. This will mean the project will be located elsewhere or completely abandoned. The project is in a rural part of Lilongwe District that is a high Soya Bean producing area and is also in the outskirts of the City, which would reduce traffic congestion on trucks delivering soya bean from the local area and other surrounding districts. The relocation of the project is not a viable option. There are more benefits that will accrue to society, therefore abandoning the project would deny Malawians employment opportunities and revenue in terms of licences and taxes.

If the project were to be located elsewhere, the developer must identify an alternative site for the project. This has both advantages and disadvantages as follows:

a) Advantages of not implementing the Project

The proposed project would create a certain potential negative environmental impact during the construction and the operational phases. The potential adverse environmental impacts include dust, traffic disruption, soil erosion and noise during construction, increased emissions and waste generation have the potential of adversely affecting the environment. If the Project is not implemented, the impacts cited above may not arise.

b) Disadvantages of not implementing the Project

- The Lilongwe District Council will be denied property tax, fees and licences;
- The Government will be denied taxes;
- The nearby communities will be denied employment;
- Farmers will be denied of a ready market for their soya beans; and
- Transporters will be denied the opportunity to bring raw materials to the factory but also distribute the product.

3.1.2 Undertake Project

a) Advantages

- The implementation of the project will reduce the acute shortage of employment in Lilongwe;
- Increased local revenue through property taxes, fees and licenses;
- Improve the aesthetics of the area through landscaping;
- Increased economic activity thereby stimulating economic growth; and
- Increased revenue/taxes to the government.

b) Disadvantages

- Generation of adverse environmental impacts as already noted earlier including dust, traffic disruption, soil erosion and noise during construction, increased emissions and waste generation;
- Potential to increase HIV and AIDS infection because of increase in wage employment, especially during the construction phase.

3.2 Fully-automated vs Semi-automated

There are several different oil refinery designs and technologies in the industry, some are fully automated with little or no human workforce required while some are semi-automated with human work force requirement but with same output/outcome.

After careful review and considering high unemployment in the country, LWC has opted for a semi-automated machine for the first phase production of crude oil to attract human workforce and reduce unemployment levels while the second phase of crude oil refinery is fully automated with little human work force intervention, to produce high grade cooking oil to meet export quality.

3.3 Use of Fossil Fuel versus Use of electricity as source of energy

Edible oil use energy to heat water and produce steam for process applications and cleaning processes. Other common energy consumption systems include refrigeration and compressed air. In this study, we used at the options of using coal fired boilers versus electric boilers. We noted the following as the advantages and disadvantages of each in the Malawian context as follows:

3.3.1 Coal based boilers

a) Advantages

- Reliable: One of the greatest advantages of coal fired boilers is its reliability. It has ability to supply power during peak power demand either as base power or as off-peak power.
- Energy produced from coal fired plants is cheaper and more affordable than from electricity.
- The production and use of coal as a fuel are well understood as such it is a well-known technology.

b) Disadvantages

- Coal is a major source of greenhouse gasses
- The use of coal increases generation of solid waste in the form of ashes that require disposal;
- Coal based boilers are more prone to causing fire to the building than the electric boiler.

3.3.2 Electric Boilers

a) Advantages

- Its efficient in space requirement as there is no need for fuel storage space as is the case with coal-based boilers;
- Electric boilers are quitter than coal boilers hence producing less noise pollution;

- Electric boilers generally don't need regular servicing as compared to coal powered boilers
- Electric boilers utilise cleaner energy as compared to coal which releases greenhouse gasses.

b) Disadvantages

- Electric boilers are expensive to operate in Malawi due to the high electricity cost; and
- There are regular electricity power cuts in Malawi, which would limit the production process of the plant.

3.4 Alternative building technologies

In the construction industry, there are a number of choices on the building materials. The choice of building materials can determine the durability of the structures to be built, the beauty of the structures, the cost of building the structures and the damage that can be impacted on the environment. Two options, use of burnt bricks using firewood and use of environmentally friendly building material such as eco bricks, stabilized soil blocks and concrete bricks were considered.

In Malawi, use of burnt bricks is cheap because they are locally made and can be close to the project site. The traditional fired/burnt bricks are made from soil that is mixed with water, dried in the sun there after baked using wood fuel. However, production of bricks will use a large amount of firewood and soil will be required to produce adequate amount of bricks. This can lead to destruction of natural forest and land degradation due to formation of borrow-pits. In view of this the project will utilise the environmentally friendly building materials that do not result in environmental degradation in the way burnt bricks do.

Chapter Four: Policy and Legal Framework

This chapter gives a review of the legal framework pertaining to the proposed project and indicates their impacts on the project. Reference has been made to several legislations that include the Environment Management Act, Forestry Act, Water Resources Act, National Water Policy, National Environment Policy, Malawi National Land Policy, Public Health Act, Occupational Safety, Health and Welfare Act, Malawi Development and Growth Strategy, other relevant policies and piece of legislation. Furthermore, the chapter provides an account of all regulatory licenses and approvals that have to be obtained for the proposed project to ensure that they are in line with sound environmental management practices and are in compliance with relevant existing legislation.

4.1 Relevant Malawi Policies and Legislation

Malawi is a signatory to the 1992 Rio Declaration on Environment and Development principle 17 of the declaration commits Malawi to undertaking environmental impact assessments (as a national instrument for environment management), subject to a decision of a competent authority, on all proposed activities likely to have significant adverse impact on environment. Following the declaration, several policies and legislations on environmental management have been developed of which the overarching legislation is the EMA of 1996. The Malawi guidelines for Environmental Impact Assessment were developed in 1997.

The proposed project is responsive to policies and legislation related to water, land, environment, human settlements, gender and others. By implication, therefore the proposed project is obligated to ensure that the requirements in all relevant sectoral policies and legislations are understood and complied with in order to enhance sustainable environmental management and utilization of other resources. This section, therefore, presents an outline of selected policies and legal frameworks that are of direct relevance to the project.

4.1.1 Malawi State of Environment and Outlook Report (2010)

The State of the Environment and Outlook Report (SEOR) acknowledges that despite efforts made environment management and degradation of natural resources continues to be a major threat to the social and economic development of Malawi. High population density and dependence on agricultural production have led to alarming rates of environmental degradation. The result has been deforestation; decreasing soil fertility and increasing erosion; water depletion, loss of biodiversity; and increasing pollution.

The SEOR in section 2.3.3 identifies waste management challenges in Malawi. It is stated that as population density and the rate of urbanization rise, waste management poses a greater challenge. In future, waste management is expected to become more difficult and costly for both the government and residents. Various types of indecomposable wastes are generated, which, if improperly managed, negatively affect the aesthetic value of the environment and increase the prevalence of long-term pollution. Disposal of waste can be problematic and create human and environmental health problems. The proposed project has taken into consideration this challenge to focus on waste reduction, recycling and proper disposal of waste in a manner not to increase this burden.

The SEOR in section 3.2.2 highlights efforts in the industry sector where it is stated that Malawi's industrial production or manufacturing sector has not grown significantly during the last decade. It is further mentioned that Malawi's ambition is to see the sector grows through value addition, export development and employment creation. The SEOR also points that in Malawi, large manufacturing enterprises are concentrated in the cities of Blantyre and Lilongwe; with other large manufacturing establishments in Mzuzu, Mulanje, Thyolo, Dwangwa and Nkhata-Bay. Finally, it is mentioned that Malawi has a narrow export base mostly arising from three products, namely, tobacco, tea and sugar. The proposed plant is designed to address these challenges observed in the SEOR in that the factory will be adding value by processing soya beans into edible oil and animal feed. Furthermore, the plant is located in the rural part of Lilongwe district and not the other major manufacturing centres, hence providing to improved local economy through direct and indirect employment among others. The plant will also contribute to increasing the narrow export base as it will be exporting edible oil and animal fees to countries within the region.

4.1.2 National Environment Action Plan (2002)

The National Environment Action Plan (NEAP) of 2002 is a reference guide for the integration of environmental considerations into development planning. It presents an environmental protection and management plan that defines the roles and responsibilities of various actors (including local communities, government and line ministries) in environmental management. In order to protect the environment from further degradation, the NEAP sets out the actions that need to be considered, to guarantee adequate environmental protection.

The NEAP in section 3.2 explains that the nexus of population growth, poverty and illiteracy has led to a sub-optimal and unsustainable resource utilisation. The poor, being the most affected, have heavily discounted future income and pursue sub-optimal social consumption decisions, leading to environmental degradation. This nexus and its negative implications on the development of the country, represents enormous challenges, which the Government is trying to address. The proposed plant provides a response to these challenges by providing a means for poverty alleviation through various option such as employment, a competitive market for Soya Beans for the local farmers, and a source of foreign exchange. Additionally, this ESIA report has been guided by the provisions stipulated in the NEAP, to promote environment management of the project.

4.1.3 The National Environmental Policy (2004)

The National Environmental Policy (NEP) is the key instrument that provides standards or benchmarks for environmental and natural resources policies and legislation in Malawi. The NEP therefore is a central guide for all environmental and Natural resources sectoral activities.

The overall goal of the NEP is *"The promotion of sustainable social economic development through sound management of the environment in Malawi"* and some of the goals that NEP seeks to accomplish are

a) Securing for all person's resident in Malawi now and in future, an environment suitable for their health and well-being;

b) Promoting efficient utilization and management of the country's natural resources; and
c) Facilitating the restoration, maintenance and enhancements of the ecosystems and ecological processes essential for the functioning of the biosphere and prudent use of the renewable resources.

In view of the above, the NEP relates significantly and directly to the proposed activities of the proposed project.

4.1.4 The Malawi National Land Policy (2002)

The intent of the National Land Policy (2002) as indicated in Section 1.4 is to provide guidance on the management of land in Malawi, to promote optimal utilization of the country's land resources for sustainable social-economic development. With due recognition that land is a basic resource common to all people in Malawi, the policy in section 5 provides that the procedures aimed at protecting and regulating; and tenure rights, land-based investments and developments at all societal levels. Some of the objectives of the policy include: promotion of land tenure practices that guarantee security and fairness in any land resources by communities.

Section 9 of the policy recognises that the concern over Malawi's environment is not necessarily a recent phenomenon. In section 9.1.1 it is stated that the policy lends support to the policies and strategies currently in place and refers to specific attitudes and practices that adversely impact land-based resource management. In section 9.1.2 the policy recognises that management of solid wastes is poor in the country. The Section further highlights that the burning and burying of refuse, which is most common in the rural areas and small towns are unsuitable for high-density residential areas or in the commercial zones.

In response to these concerns highlighted in the policy, the proposed project will protect land resources by adopting recommendations from the policy, which are highlighted in section 9 by doing the following:

- The factory will ensure that its environments are kept clean and that the polluting effects of refuse do not endanger the health of local residents and institutions.
- The factory will work closely with Lilongwe District Council by ensuring that all solid wastes are promptly collected from the plant. The Regulations for the control, collection, transportation and disposal of all hazardous industrial refuse provided for in the Environmental Management Act shall be complied with in affirmation of this land policy; and
- All effluent generating from the extraction and refining plant will have to be pre-treated to environmentally acceptable quality before discharge into the environment.

4.1.5 The National Water Policy (2005)

Section 1.3 of the National Water Policy explains that this policy provides an enabling framework for integrated water resources management in Malawi. The section points that after realising the challenges, threats and opportunities associated with implementation of activities in water and sanitation sector, the government of Malawi through the Ministry responsible of Water Development established the policy tailored at tackling any issues in the sector in

integrated manner, through the involvement of all concerned stakeholders including communities.

The policy comprehensively covers areas of water resource management and development, water quality and pollution control, and water utilization. In section 3.4.15 it is set that all water facilities shall be registered using a numbering system developed and adopted by the Ministry responsible for Water Affairs. The proposed project shall ensure that its factory water facility that utilises ground water is duly registered by the National Water Resources Authority. In section 3.4.9 the policy stresses that pollution control of water resources shall adopt the 'Polluter–Pays' principle in order to ensure water user responsibility. Section 5 of the policy also points that surface and ground water quality has been negatively affected by environmental degradation and industrial practices among other factors. The plant will promote the strategies stipulated in the policy with specific effort placed on the following strategies:

- Section 5.2.2 - Ensuring and promoting proper management and disposal of wastes;
- Section 5.2.5 - Promoting public awareness on guidelines and standards on water quality, public health and hygiene and pollution control mechanisms; and
- Section 5.2.6 - Strengthening of institutional arrangements for environmental management.

4.1.6 The National Gender Policy (2015)

Gender mainstreaming into the social economic development plans is one of the enablers for the sustainable development worldwide. The Malawi Growth and Development Strategy III (MGDS III) and the Millennium Development Goals (MDGs) recognize the importance of gender and women empowerment in socio-economic development.

As stipulated in Section 1.3, the national Gender policy provides guidelines for mainstreaming gender in various sectors of the economy to reduce gender inequalities and enhance participation of women, men and youth for sustainable and equitable development; as well as poverty eradication in the country. According to Section 3.6 of the policy, persistent gender inequalities and under-representation of women in decision making positions at all levels, necessitated development and implementation of the gender policy in order to address such gender imbalances and other related issues. The proposed project will economically empower women so as to increase household income resulting in poverty reduction. Increasing women's labour force participation, productivity and earnings will have a direct impact on poverty reduction and stimulate economic growth and development.

Section 3.7 of the policy recognises that Gender Based Violence (GBV), especially violence against women, girls and the vulnerable groups, is a severe impediment to social well-being and poverty reduction. Eradication of Gender Based Violence is therefore critical for the attainment of national development. The proposed project will ensure and shall put plans that will not allow GBV at the project as a work place area. The implementation of the project will therefore consider mainstreaming gender related issues, thereby ensuring that beneficial impacts and adverse impacts affecting women and girls are appropriately enhanced and mitigated against, respectively.

4.1.7 The National Climate Change Policy, 2016

The Malawi National Climate Change Policy was drafted by the government in recognition of the country's high susceptibility to the climate change effects. It is aimed at promoting climate change adaptation and mitigation for climate change livelihoods, with consideration of economic development that significantly reduces environmental risks and ecological scarcities. Among the specific objectives of the policy, management of impacts of climate change through interventions that build and sustain the social and ecological resilience of Malawians. The Malawi National Climate Change Policy also seeks to promote the stabilization of greenhouse gas concentrations in the atmosphere, to a level that would prevent dangerous human-induced interference with the climate; while ensuring sustainable social, economic and environmental development. The proposed project has been designed and will have to implement its activities that support the requirements of the policy.

4.1.8 The National Energy Policy (2018)

The Government of Malawi (GoM) realises that industrial and socio-economic development of the country depends on access to modern, reliable and sufficient energy. It highlights challenges faced in the energy sector, such as unreliable power supply, low generation capacity and over dependence on biomass. Policy priority area number 8 stresses the need for Demand Side Management (DSM), which is an important means of improving energy efficiency at the end-use level of the energy supply chain. Currently in Malawi, there is a lot of wastage of electrical energy and biomass in end-use activities such as cooking, water and space heating, and lighting occasioned by use of inefficient appliances and devices. This priority area focuses on savings in electricity and biomass consumption. The proposed plant will install energy efficient measures to help reduce its electricity consumption hence reducing its bills and stress on overburdened utility systems. The proposed plant will also consider installation of solar power as alternative source of energy, which may become critical during periods of power outages.

4.1.9 National Sanitation Policy (2006)

The National Sanitation Policy provides a vehicle to transform the hygiene and sanitation situation in Malawi. Section 1.2 of the policy mentions that the policy provides both guidelines and an action plan where, by 2020, all the people of Malawi will have access to improved sanitation, safe hygienic behaviour will be the norm and recycling of solid and liquid waste will be widely practiced leading to healthier living conditions, a better environment and a new way for sustainable wealth creation. One of the policy objectives as highlighted in section 3.1.1 is the improvement of hygiene, sanitation and recycling of waste in the country. The proposed project will, as such, ensure that liquid and solid waste management encourages the reduction, recycling and reuse of waste before final disposal hence complying with the provisions of the policy.

4.1.10 National HIV & AIDS Policy (2004)

The goal of this policy as stated in Section 1.3 is to prevent Human Immunodeficiency Virus (HIV) infections, to reduce vulnerability to HIV, to improve the provision of treatment, care and support for people living with HIV and Acquired Immune Deficiency Syndrome (AIDS),

and to mitigate the socio-economic impact of HIV & AIDS on individuals, families, communities and the nation. Chapter 7 of the policy focuses on responding to HIV & AIDS in the Workplace. Section 7.1 points out that the impact of HIV & AIDS in the workplace is increasingly being felt. Among other factors, absenteeism and death result in low productivity, premature payment of employee benefits and low workplace morale. The section also mentions that discrimination against people living with AIDS has also been perpetuated through practices such as pre-employment HIV testing, dismissal as a result of being HIV-positive and the denial of employee benefits if known to be infected. The proposed project shall endeavour at reducing and managing the impact of HIV and AIDS in the workplace through implementation of an HIV and AIDS policy and a prevention, treatment, care and support programme. Furthermore, the proposed project shall ensure that no person undergoes testing for HIV as a precondition for employment and no person shall be denied employment solely on the basis of HIV serostatus. The AVC management shall not force its employees to disclose their HIV but where an employee chooses to voluntarily disclose his or her HIV serostatus to management or to another employee, such information shall not be disclosed to others without that employee's express written consent.

4.2 Relevant Malawi Legislative Framework

4.2.1 Constitution of the Republic of Malawi (1995)

The constitution of the Republic of Malawi is supreme over any legal policy or Act in Malawi. Any Act of Government or any law that is inconsistent with provisions of the constitution shall be invalid to the extent of such inconsistency (Section 5). As such, the reviewed policies and legislations, relevant to the project, have to be in line with the constitution.

Section 12 of the constitution provides the fundamental principles on which the constitution was founded and part (iii) encourages accountability and transparent decision-making. Section 12, part (iii) states: *"the authority to exercise power of State is conditional upon the sustained trust of the people of Malawi that trust can only be maintained through open, accountable and transparent government and informed democratic choices"*. The principle is based on the premise that while society appoints authorities, they return the right to have an input in decision-making and enforcement processes; and they expect transparency in government decision making. In line with this principle, the proposed project cannot assume that it has power over the communities in the project area of influence, knowing that it will be accountable to its actions.

The constitution provides the foundation that guarantees the welfare and development of all the people of Malawi. Section (e) stresses that one of the roles of the state is to enhance the quality of life in rural communities and to recognize rural standards of living as a key indicator of the success of government policies. The proposed project will ensure that implementing the project does not leave the people in the area worse off, but rather improves their life, for example through, employment opportunities.

Part (d) of section 13 addresses the need for managing environment and sustainable development of natural resources to prevent degradation, provide a healthy living and working

environment for the people of Malawi, accord full recognition to the rights of future generations; and to conserve and enhance the biological diversity of Malawi. The proposed project is therefore complying with the "section" by conducting an Environmental and Social Impact Assessment (ESIA) before commencement of project activities.

The proposed project will promote gender equality and human rights. Under Section 12 (e), Is stated that it is the responsibility of the state to achieve gender equality for women through full participation of women in all spheres of the Malawian society, on the basis of equality with men; Implementation of principles of non-discrimination of policies to address social issues such as domestic violence, security of the person, maternal benefits, economic exploitation and rights to property.

Under section 13(d), the Constitution of the Republic of Malawi provides for responsible management of the environment and paves way for the enforcement of the National Environment Policy. The constitution accords full recognition to the rights of future generations by advocating environmental protection and sustainable development of natural resources. It also calls for the prevention of environmental degradation. The proposed project will have to ensure that activities of the project promote environmental protection and sustainable development of natural resources.

4.2.2 Land Act (2016)

The Land Act is an Act to make provision for land in Malawi and for all matters incidental or connected thereto. Part II of the Act, Section (3) gives powers for the appointment of a Commissioner for Lands whose duties are described in Section (4) as follows:

"*4 (1) Subject to the special and general written direction of the Minister, the Commissioner shall -*

- *a) Administer all land;*
- *b) Make grants, leases or other dispositions;*
- *c) Sign, seal, execute, perfect, deliver and accept—*
    - *i. grants, leases or other dispositions of public land and surrenders;*
    - *ii. agreements or licences in respect of the control of or use of running or stagnant water or affecting the dispositions of interests or rights therein;*
- *d) Sign and issue documents including documents of consent;*
- *e) Grant relief from liability to perform and extend the time for performance or observance of any covenant, condition, agreement or stipulation;*
- *f) Except from any lease any implied covenant or covenants; and*
- *g) Serve notices of determination of any lease.*"

This section implies that the developer of the proposed project must seek authorisation from the Commissioner for Lands to own land through leases but also to seek direction on how the land maybe used. Regarding on the types of land that the developer can own, part III, section 7 provides for the categories and classes of land as described in the following subsections:

(1) Land shall be categorized as either public land or private classes of land and.

(2) Public land shall be classified either as Government land or unallocated customary land.

(3) *Private land shall be classified as freehold, leasehold or customary estate.*

This provision by the Act allows the developer to own private land under leasehold and this requires that the developer satisfies set terms and conditions as provided for in Section 21 that states the following:

1) *The Minister may, upon application by any person in a prescribed manner, grant or allocate leasehold or customary estate to such person on such terms and conditions as the Minister considers appropriate.*
2) *For avoidance of doubt, the Minister shall not grant freehold title:*

In part V, section 21 (1) states that "*The Minister may, upon application by any person in a land which prescribed manner, grant or allocate leasehold or customary estate may grant to such person on such terms and conditions as the Minister considers appropriate*." This Act therefore, clearly provides the requirements that the developer to abide with that mainly involve getting an approval from the Commissioner of Lands to own the land through provision of signed land ownership documents.

4.2.3 Physical Planning Act (2016)

This is an Act that that makes provisions for physical planning and the orderly and progressive development of land in both urban and rural areas. It also makes provisions to preserve and improve amenities thereof, granting of permission to develop land and for other powers of control over the use of land, and for matters connected therewith and incidental thereto. The Physical Planning Act makes provisions for the appointment of planning committees as is stated in Section 19 (1) that *"A local government authority shall appoint a planning committee for its area of jurisdiction which shall be the responsible planning authority for the area and shall exercise any duties as are conferred by this Act*". This provision clearly gives the Lilongwe District Council the mandate to oversee any physical planning developments within the project area. Duties and powers of responsible authority with regard to plans are provided is Section 22 (1) that states *"The responsible authority shall furnish the Minister with such particulars and information as the Minister may require concerning the preparation and content of any plan on the present and future planning needs and the probable direction and nature of development of any area in respect of which a plan may be prepared*". The local councils are as such responsible for formulation of local physical development plans that are approved by the Minister or Commissioner and Section 33 (1) provides the types of local physical development plans as follows:

a) *An urban structure plan, which shall be a land use plan for the whole of an urban area;*
b) *An urban layout plan, which shall be a detailed land use plan of a part of an urban area in which significant physical development is planned or likely to or has begun to take place or there is need for development or redevelopment, or revision or upgrading;*
c) *An urban civic plan, which shall be a more elaborate design of a special area or areas of an urban area showing layout of buildings, car parking lots and landscaping among other details; and*
d) *A subject physical development plan, which shall be a plan concerned with a particular subject matter.*

Sections 44 and 45 mandate any developer to get development permissions and they also define the types of permissions that can be obtained. Section 46 (1) (a) gives provisions for an application for development permission that can be made to:

i. *A local government authority, in case of any development within the area of its jurisdiction; or*
ii. *The Commissioner, in every other case.*

Part (b) of the section requires that an application be made in a prescribed form; and part (c) requires that the application be accompanied by a prescribed fee payable to Government, and shall include such other information as the local government authority or the Commissioner may require. The implication of this Act is that the proposed project will have to be approved by the Lilongwe District Council Planning Committee.

4.2.4 The Water Resources Act (2013)

The water resources Act provides for the management, conservation, use and control of water resources; for the acquisition and regulation of rights to use water; and for matters connected therewith or incidental thereto. Section 4 (c) states the objective of the Act as follows: *"to control pollution and to promote the safe storage, treatment, discharge and disposal of waste and effluents which may pollute water or otherwise harm the environment and human health."*

The Act is administered by the National Water Resources Authority under the ministry of Agriculture, Irrigation and Water Development as provided for in Part II, Section 8. Regarding abstraction and use of water Section 39 (1 and 2) states the following:

1) *No person shall abstract and use water unless authorized to do so under this Part.*
2) *A licence under this Part shall be required for any of the following purposes-*
    a. *the abstraction, impoundment and use of water from a water resource; and*
    b. *the drainage of any swamp or other land.*

This implies that the refinery plant will have to obtain a water abstraction licence from the authority for its underground water system. The refinery will also be required to obtain an effluent discharge permit from the National Water Resources Authority as indicated in Section 92(1) which states the following:

"92. - (1) A person who wishes to discharge effluent shall apply to the Authority for a discharge permit in the prescribed manner."

4.2.5 Water Works Act (1995)

The water Works Act provides for the establishment of Water Boards and water-areas; and for the administration of such water-areas as well as for the development, operation and maintenance of waterworks and water-borne sewerages sanitation system in Malawi; and for matters incidental thereto or connected therewith. Part II of the Act gives authority for the setting up of Water Boards and stipulates the powers and duties as follows:

"3. -(1) There is hereby established for each water-area (in this Act otherwise referred to as the Water Boards "water-area") a Water Board (in this Act otherwise referred to as the "Board") as specified in the Schedule."

(3) The powers of the Board shall include power to levy and enforce payment of rates in accordance with this Act, and power to engage in research or investigation in connexion with water supplies and water-borne sewerage sanitation either alone or by arrangement or in conjunction with other persons.

Part V of the Act also stipulates a provision for the Water Boards to operate public sewers and sewerage disposal works as follows:

26.-(1) The Board may, within its water-area and also, subject or to the prior Provision of approval of the Minister, without its water-area - public sewers and sewerage

(a) construct and maintain a public sewer- disposal work

(i) in, under or over any street, or under any cellar or vault below any street; and

(ii) in, or over any land forming part of a street, after giving reasonable notice to every owner and occupier of that land.

The Act in Section 29(1) prohibits any person to throw, empty, or turn, or suffer or permit to be thrown or emptied not to be passed or to pass, into any public sewer, or into or any drain or private sewer communicating into sewers or with a public sewer. The implication of the act to the project is that the developer will have to be connected to Central Region Water Board (CRWB) for water.

4.2.6 Local Government (Amendment) Act (2017)

This is an Act relating to local government and provides for matters connected therewith or Incidental thereto. Part II, section 6(1) the Act mandates all local authorities to regulate planning and development within their jurisdiction and also empowers them to have by-laws for the good governance of the local government area. Regarding by-laws, section 103 states the following:

"The Assembly may make by-laws for the good rule and By-laws government of the whole 'or any part of the local government of area or, as the case may be for the prevention and suppression of nuisances therein and for any other purpose."

This Act also devolves decision-making authority from central government to local authorities, through the process of decentralization. The Act has concrete provisions for participation of communities in development planning, implementation and monitoring. The proposed project will adhere to the requirements of the Act by fully involving Lilongwe District Council and ensuring that any by-laws set by the council are followed throughout.

4.2.7 The Occupation Safety Health and Welfare Act (1997)

The Occupation Safety Health and Welfare Act (OSHWA) is an Act to make provision for the regulation of the conditions of employment in workplaces as regards the safety, health and welfare of persons employed therein; for the inspection of certain plant and machinery, and the prevention and regulation of accidents occurring to persons employed or authorized to go into

the workplaces; and to provide for matters connected with or incidental to the foregoing the provisions for a safe working environment for the people of Malawi.

Part II of the OSHWA gives provisions on registration of a workplace as indicated in Section 6 that the Director shall keep a register of workplaces in which he shall cause to be entered such particulars in relation to every workplace required to be registered under this Act as he may consider necessary or desirable. Section 7(1) continues to stress that premises are not to be used as workplaces unless registered.

Part III of the OSHWA stipulates provisions on the duties and responsibilities of the developer as it is stated as follows:

"13. Duties of employers

(1) It shall be the duty of every employer to ensure the safety, health and welfare at work of all his employees.

(2) Without prejudice to the generality of an employer's duty under subsection (1), the matters to which that duty extends includes in particular—

a) the provision and maintenance of plant and systems of work that are safe and without risks to health;

b) arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage and transportation of articles and substances;

c) the provision of information, instruction, training and supervision in accordance with section 65 to ensure the safety and health at work of his employees;

d) as regards any place of work under the employer's control, the provision of maintenance in a manner that is safe and without risks to health, and the provision and maintenance of means of access to and egress from it that are safe and without such risks;

e) the provision and maintenance of a working environment for his employees that is safe, without risks to health, and adequate as regards facilities and arrangements for their welfare at work."

It is envisaged that various occupational safety and health (OSH) issues will be encountered during the implementation of the proposed project. Hence, it is imperative for the developer to ensure that OSH requirements are adhered to all times. Therefore, this ESIA report will have to outline the interventions that will be required for implementation and monitoring during lifespan and the project.

4.2.8 The Employment Act, 2000

The employment Act of 1999 reinforces and regulates minimum standards of employment with the purpose of ensuring equity necessary for enhancing industrial peace, accelerated economic growth and social justice; and for matters connected therewith and incidental thereto. Part II of the Act states fundamental principles guiding the act and these include:

Section 4(1) - Prohibition against forced labour
Section 5(1) - Anti-discrimination

Section 6(1) - Equal pay
Section 7 - Remedies for infringement of fundamental rights

Part IV of the Act prevents employment of young persons and the restrictions are provided in detail in sections 21(1) and 22(1) as follows:

"*21. (1) subject to subsection (2), no person under the age of fourteen shall be employed or work in any public or private agricultural, industrial or non-industrial undertaking or any branch thereof.*

22. (1) No person between the age of fourteen and eighteen years shall work or be employed in any occupation or activity that is likely to be - (Hazardous work)

(a) harmful to the health, safety, education, morals or development of such a person; or

(b) prejudicial to his attendance at school or any other vocational or training programme."

Therefore, when employing people for the implementation of the project activities, the developer will have to ensure that that the provisions of this Act are complied with.

4.2.9 Gender Equality Act, 2013

The Gender Equality Acts purpose is to take action and address the inequalities that exist between men and women in many aspects of daily life in Malawi. The Act seeks to promote gender equality, equal integration, influence, empowerment, dignity and opportunities for men and women in all functions of society; to prohibit and provide redress for sex discrimination, harmful practices and sexual harassment; to provide public awareness on promotion of gender equality. The Act applies to all persons and to all matters. This means it will apply to private and public institutions; including religious settings and chiefs. It also applies to the Government. It affects all aspects of life in Malawi. The Malawi Human Rights Commission (MHRC) administers and enforces the Act, however all citizens are responsible to ensure it is upheld within their own communities and report any violations to the MHRC. The Act in Part 2 prohibits of sexual discrimination and harmful social or cultural practices; Section 7 calls for all work place policy to ensure that sexual harassment is avoided. The factory is as such obligated to ensure these principles are included in all its activities specifically in relation to employment and providing a conducive environment without sexual harassment and any other types of gender discrimination.

4.2.10 Electricity (Amendment) Act (2016)

The Act in Section 1 makes provisions for the regulation of the generation, transmission, distribution, sale, importation and exportation, use and safety of electricity and for matters connected therewith or incidental thereto. Part IV of the Act gives provisions regarding distribution of electricity and Section 31 states that every distributor shall supply electricity to every consumer who is in a position to make satisfactory arrangements for payment under a contract of supply with that operator. The Refinery Plant is required to have a contract and is

will be supplied by the Electricity Supply Corporation of Malawi (ESCOM). Section 33 states that a consumer shall not be entitled to a standby supply of electricity from the distributor in respect of any premises unless that consumer has agreed to pay and has given security to pay, such minimum annual sum as will give to the distributor a reasonable return. This implies that the refinery will have to source its own standby electricity supply system unless it is willing to enter into an agreement with ESCOM to supply this for them. Section 36 stipulates the following:

"A customer shall ensure that the operations of his/her system does not interfere with the smooth and safe operation of the Licensee's system to which he/she is connected."

This implies that the Refinery is not supposed to make alterations or carry out activities that jeopardise the supply of ESCOMs electricity to other of its clients.

4.2.11 Environment Management (Chemicals and Toxic Substances Management) Regulations, 2008

Part I, Section 3(1) of the regulation mention application by stating that *"these Regulations apply to any person in Malawi whose undertaking involves or includes the manufacturing, repackaging, importation, exportation, transportation, distribution, sale or other mode of handling toxic substances and chemicals and in respect of any activity in relation to toxic substances and chemicals which involves a risk of harm to human health or the environment."* Parts II of the regulations stipulate the management of chemicals and toxic substances. Section 4 (1) puts a requirement for licences as it points the need to obtain a licence issued by the Director for manufacturing, repackaging, importing, exporting, transporting, distributing, sale or other mode of handling chemicals and toxic substances. Section 26 stipulates regulations regarding treating of chemical wastes and requires that no industry shall discharge any chemical wastes in any state into the environment unless such wastes have been treated in accordance with acceptable international methods that are approved by the Director in consultation with the relevant local authority. The refinery will be importing chemicals that are toxic for production processes and will also be handling and storing these chemicals. This implies the need for the factory to obtain importing, handling and storage licences of chemical and toxic substances from the Director of Environmental Affairs.

Section 27 stipulates the need for every industry to develop a voluntary compliance code which shall outline the industry's goal for chemical waste reduction and minimization; chemical waste treatment on site and emission standards; and disposal plans. This requires the Refinery Plant to voluntarily comply by continuously improve the production process to use less amount of chemicals and will promote recycling and proper handling of the chemicals.

4.2.12 Environment Management (Waste Management and Sanitation) Regulations, 2008

The regulations apply to the management of general and municipal waste in Malawi. Part III of the regulations has provisions on management of general or municipal solid waste with Section 7(1) regulating that any person who generates solid waste shall sort out the waste by

separating hazardous waste from the general or municipal solid waste. Section 8(1) regulates that every generator of waste shall be responsible for the safe and sanitary storage of all general or municipal solid waste accumulated on his or her property so as not to promote the propagation, harbourage or attraction of vectors or the creation of nuisances. Section 10(1) has provisions for collection of municipal solid waste as being the responsibility of a local authority. Section 11 has provisions that general or municipal solid waste may be disposed of at any waste disposal site or plant identified and maintained by a competent local authority or owned or operated by any person licensed to do so under these Regulations. Part V of the regulations has provisions on management of municipal liquid waste with a general requirement stipulated in Section 23 that no person shall discharge effluent into the environment unless it meets prescribed environment standards. Section 36 has provisions on hazardous waste that state that:

(1) No industry, business or medical facility shall discharge any hazardous waste in any state into the environment unless such wastes have been treated in accordance with acceptable international methods that are approved by a competent local authority in consultation with the Director.

(2) *Hazardous wastes whether treated or not shall not be discharged into a disposal site or plant unless such disposal site or plant has been approved and licensed for that purpose in accordance with these Regulations.*

These Regulations have a major implication on the refinery with regards to waste management regimes that are to be put in place. The refinery will have to encourage waste separation at sources, provide proper and adequate waste receptacles, suitable waste storage and treatment facilities. The refinery will also have to work with Lilongwe District Council to ensure proper waste collection alternatives are put in place as well as waste disposal.

4.3 Regulatory Licenses and Approvals

Table 4-1 summarises all the regulatory licenses, approvals and standards that have to be obtained or met for the proposed project to ensure that the project activities are in line with sound and environmental management practices and comply with relevant legislation.

Table 4-1: Regulatory licenses and approvals relevant for the project

No	Regulations/ Standards/ Approvals	Description	Reference	Issuing Institution
1	Environmental Impact Assessment Certificate	The Certificate will be provided after approval of the ESA report	EMA, 1996 and EIA Guidelines 1997	EAD
2	Workplace Registration Certificate	Every workplace is required to be registered and must commit to abide by all of the country's labour laws	Occupation Safety Health and Welfare Act (1997)	Ministry of Labour

No	Regulations/ Standards/ Approvals	Description	Reference	Issuing Institution
3	Water Abstraction Licence	No person is supposed to abstract and use water unless authorized to do so by relevant water authority.	Water Resources Act	National Water Resources Authority
4	Permit to Discharge Effluent into the environment	The refinery will result in production of effluent, which will be required to undergo pre-treatment and then be discharged into the environment.	Water Resources Act	National Water Resources Authority
5	Business Licence	This is a permit issued by a local council that allow individuals or companies to conduct business within their area of jurisdiction.	Lilongwe District Council by-laws	Lilongwe District Council
6	Importing, handling and storage licences of chemical and toxic substances	It is a requirement to obtain a licence issued by the Director of EAD for importing, transporting, handling and storage of chemicals and toxic substances.	Environment Management (Chemicals and Toxic Substances Management) Regulations	EAD

4.4 Environmental Standards in Malawi

During construction and operation phase, the project will also trigger a number of Environmental Standards as provided in Table 4-2. The factory must ensure that the standards are met.

Table 4-2: Relevant Environmental Standards

Standard	Title	Year of Implementation
MS 714:2005	Occupational Safety and Health Management Systems – Specifications	2005
MS 719:2005	Hazardous Waste – Management, Classification and Disposal – Code of practice	2005
MS 59:2002	Solid Waste- handling, transportation and disposal- code of practice	2002
MS 539:2013	Industrial effluents – Tolerance limits for discharge into inland surface waters	2013

Chapter Five: Baseline Information

5.1 Baseline Environmental and Social Setting

This chapter contains a description of the environmental setting and is given in only enough details to allow for an understanding of the analysis and assessment of impacts. It describes the spatial and temporal boundaries within which the environmental setting was considered. It also considers the existing condition of the physical and biological environments of the project area, as well as trends and the anticipated future environmental conditions should the project go ahead.

5.1.1 Physical Environment

5.1.1.1 Geology and Seismicity

The underground of the Lilongwe district consists of volcanic and metamorphic rock. The most important rock species are gneiss, granulite and schist as well as important developments of pegmatite rocks. All these are assigned to what is called 'the Malawi Basement Complex'. In some places these hard rock formations surface, forming mountain ranges and Inselbergs. In the east of the district for example, the hard rock formation is very close to the surface, which challenges drilling for groundwater. In the centre and west of Lilongwe however, the rock formations are masked by a variety of superficial deposits ('soil'), which in some places are of considerable thickness. Lilongwe has not recorded any seismic activity in the past four decades. The last earthquake was recorded in 1989 dubbed the Salima – Lilongwe earthquake with a magnitude of less than seven.

5.1.1.2 Climate

The proposed project site is within proximity of Chitedze Research Station where systematic weather measurements are taken daily. In general, weather information is critical because it guides proper planning and timing of project works; not only for the purposes of avoiding or minimizing negative impacts of the project on the environment but also to guide strategic and optimal timing of enhancement measures for the various project activities and operations. The project area has alternating dry and wet seasons. The climatic conditions of the area are characterised by two distinct seasons; wet (rainy) and dry seasons. The wet season stretches from November to April while the dry season ranges from May to October. The weather is a sub-tropical climate characterised by moderate rainfall, hot temperatures and high humidity during the rainy season. There is a long dry season occurring from May to mid-November, and a short-wet season occurring from November and ending mid-April.

5.1.1.3 Soil Resources

The project area has ***sandy clay loamy*** soils which is ideal for agricultural activities. The soils are less exposed to the risk of erosion due to their deep sub layer which encourages infiltration of runoff. Erosion surfaces are not commonly seen in the project area. In general Lilongwe Soil Catena (Figure 5-1) is representative of the ferruginous soil pattern covering central part of the Lilongwe plain including the project zone of influence

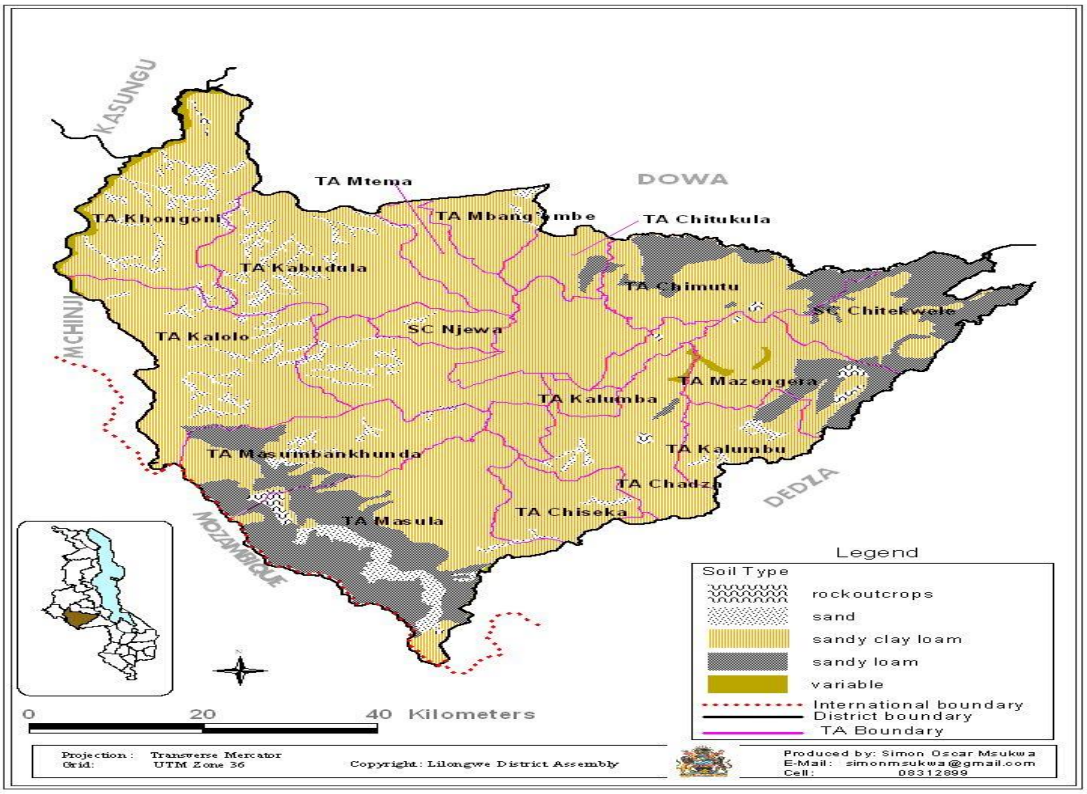


Figure 5-1: Distribution of major soil types in Lilongwe District

5.1.1.4 Hydrology

For the project assessment purposes, the following were considered hydrologically sensitive features:

- Existence of permanent and intermittent streams
- Existence of wetlands or wetland features
- Existence of water seepage areas

All development and site alteration with respect to land within hydrological sensitive feature or related minimum vegetation protection zone should be monitored. The project site has no flowing water bodies and the nearest flowing water body is Chankhandwe River lying about 10km to the north and Namitete river that is a further 30km to the south.

5.1.2 Biological Resource

5.1.2.1 Scope of vegetative resources of the project area

Results from a rapid assessment around the project site and its area of influence identified one distinct vegetation type which could be categories as dwarf bush with patches of grasses (Figure 5-2). The dwarf bush can be defined as a habitat with low growing shrubs and or dwarf trees usually under 0.5m tall, with individuals and clumps touching or interlocking generally with >25% canopy cover. The land may have trees and shrubs greater than 0.5m present but with canopy cover of 10% or less and herbs and nonvascular plans may be present. The site is basically an abandoned agricultural land whose vegetation is a result of re-germination and invasion of pioneer plants.

Figure 5-2: Showing the dwarf bush vegetation at the Project Site

The most common plant species recorded during the rapid vegetation assessment are presented in Table 5-1. The site has some patches which are generally rich in species however the species are not evenly distributed. The majority of plants identified are mainly herbaceous i.e.*Ageratum conyzoide*s, *Rantana camara* L, *Triumfetta rhomboidea Jack. Some of these herbaceous plants are among the known invasive species which are also notorious weeds in cultivated land. Among these areRantana camara* L, *Ageratum conyzoides* and *Solanum campylacanthum*. Presence of invasive species poses great threat to biodiversity and ecosystem stability in general. Thus, the project will in a way contribute to removal of invasive species in the environment. *Brastegia speciformis Benth and Albzia harveyi* were among the few deciduous trees observed within the project site. *Brastegia speciformis Benth are generally dominant in woodlands and are used for making furniture and in construction. Three Poaceae (grass) species were recorded (*Table 5-1*), Cynodon dactylon* is among the well-known grass adaptable and found worldwide. *Cynodon dactylon* is a perennial grass forming thick mat by means of stolon and rhizomes and can be a serious weed rapidly invades cultivated land which is difficult to eradicate. However, it plays an important role in conservation as it prevents soil erosion hence recommended for lawn. To prevent continued soil erosion, it is recommended that grass (*C. dactylon*) be planted around the project area after completion of the proposed project.

Table 5-1: Common Plants within the Project Site

Woody, herbaceous plants	**Grasses**
Solanum campylacanthum	*Cynodon dactylon*
Rantana camara L	*Setaria sphacelata*
Albzia harveyi	*Digitaria spp*
Ageratum conyzoides	
Senna spectabilis	
Rapanea melanophloeos (L.) Mez	
Brastegia speciformis Benth	
Leucas martinicensis	
Triumfetta rhomboidea Jack.	
Emilia coccinea (sims) G. Don	
Acanthospermum hispidum	
Dispyros lyciodes	

5.1.2.2 Extent of Fauna of the project area

The project site and its area of influence are not rich in fauna diversity despite the fact that the area is not very close to human settlement. Livestock droppings observed within the site provides clear evidence that the area is used for grazing. During the transect walk black ants, caterpillars, butterflies were spotted. Scattered termite moulds were also observed with clear indication of human activities (Figure 5-3).

Figure 5-3: Showing human activities around termite mould in the project site

Termites are essential members of the soil ecosystem and are found throughout the world. Ecologically termites have both positive and negative impacts. The main ecosystem services by termites include breakdown and recycling of organic matter, soil loosening, soil formation, improving soil pH, organic carbon content and soil porosity (Ghaly &Edwards 2011). Termites act as source of food for human, domesticated and wild animals including birds, ants, spider just to mention a few. However, termites have several negative impacts whose economic cost outweighs their benefits. They are reported as key pests in agriculture and forestry industries. In agriculture termites can attach crops at any stage of plant growth causing 100% crop loss. This probably explains why the project site was abandoned as a farm land.

5.1.2.3 Project Impact on Biodiversity on the Site

Majority of plant species found in the project area are considered as agricultural weeds while others are known invasive. Invasive species refers to non-native (introduced species) that has a tendency to spread to a degree believed to cause loss of biodiversity. They have specific traits or specific combinations of traits that allow them to outcompete native *species.* *Lantana camara*, *Solanum campylacanthum* and *senna spectabilis* are among the invasive species within the project site. Though some of these species have some benefits their impact on biodiversity has long-term impacts both on human livelihood and ecosystem resilience. Most of the useful trees and herbs present within the project site are widely distributed in the country and are not among the threatened or endangered species. Apart from the termites, very few organisms were observed in the project site. Thus, implementation of the project in the area will have insignificant impact on the environment and biodiversity conservation.

5.2 Social and Economic Environment

5.2.1 Demographic trends within and around the project area

The project impact area is GVH Mchira wa Nkhondo comprising 6 villages (Chamasala, Natali, Msampha, Chisikwa, Chinguwo, and Mchira wa Nkhondo) about 2km from Msundwe trading centre. According to information obtained from the local chiefs in these areas, the impact area has an estimated population of 978 with women making up 65% of the total population. Based on the 2018 Housing and Population census, Lilongwe district has an average mortality rate of 11.9, up from 8 in 2008 (HMIS 2014); and as an indicator of human development, this is attributed to a number of factors including a higher incidence of poverty, lack of nutrition and postnatal care and inadequate medical facilities in the district (NSO, 2010*)*.

Settlement patterns in the project impact are dispersed dwelling nucleated villages. Over 80% of houses in the area are traditional structures characterized by thatched roofs, mud walls or walls made of mud and earth floors. Houses are often clustered around the few schools and social amenities in the area. Most of the semi – permanent housing patterns are around Msundwe trading centre which is the major business centre for the area.

According the National Statistical Office, Lilongwe District has a population of about 1,637,583, of which 51.43 percent are women. From the 2008 National Population Census, the population was reported to be at 1,230,834 representing a growth rate of 2.8%. Number of males has increased by 189,953, while females have increased by 214,653. The district has a

population density of 282 persons per square kilometre up from 212 per square kilometre in 2008. This is greater than the national average of 186 persons per square kilometre. The average number of persons per household in the project area is 4.3.

5.2.2 Livelihoods, Employment and business activities,

Economic activities and livelihoods in project impact area include: agriculture, small scale business and casual employment. The largest numbers of households, estimated at over 90 %, are engaged in agriculture, with about 40% involved in casual labour in farms during the growing season. Retail commerce is undeveloped, being confined to small shops and kiosks. According to information obtained from chiefs in the area, most households are in dire economic constraints despite being involved in various economic activities. Households engaged in farming with groundnuts, soya beans, tobacco, maize and potatoes as major crops. Common animals kept by households in the area include goats, cattle, chicken and ducks. Most households earn their income from sales of their produce to local vendors in the area and directly at Msundwe market during market days.

Women are involved in all activities undertaken by the household. The more common activities undertaken by women are agriculture, household work and looking after children. The high rates of participation by women are also reflected in their involvement in household decision making in all areas including: financial matters; education of children; health care; purchasing of assets; social functions; day to day activities; and, local governance.

4.2.3 Education

Lilongwe district has 462 primary schools of which 343 majority are full primary schools with standard 1-8. There are 74 secondary schools in Lilongwe serving 22, 377 students.

The nearest education institution in the project area is Khanda Primary School. The other primary school in the area is located over 5km from the project area. The statistics for the education institution have been analysed in Table 5-2.

Table 5-2: Khanda Primary School enrolment trend

	2016/2017	**2017/2018**	**2019**
Boys	259	338	358
Girls	248	273	451
Total	**507**	**611**	**809**

The nearest secondary school in the area is Katsumwa CDSS. It is the only secondary school in GVH Mchira wa Nkhondo area data for the school has also been analysed in Table 5-3.

Table 5-3: Katsumwa CDSS enrolment

	2016/2017	**2017/2018**	**2019**
Boys	50	125	157
Girls	45	75	149
Total	**95**	**200**	**306**

The pass rate for the years 2015/2016, 2016/2017 and 2017/2018 are 46.6%, 50% and 40% respectively. The number of girls dropping out of school has decreased from 10 in 2017 to 5 in 2018 with the general dropout rate for the school also reducing from 20% in 2017 to 10% in 2018. The dropout rate is attributed to early marriages among young girls and boys venturing into farming businesses to assist their parents. There has been an increasing trend in the enrolment for the school which was attributed to new school blocks and learning equipment donated by Good Neighbours, an international NGO working in the area. The number of girls has also increased as a result of girls boarding school facilities introduced at the school.

5.2.4 Health situation

The nearest health facility is Nthondo Health Centre that is approximately 4 kilometres from the project site and serves a population of 39,348 people. The most common diseases affecting households according to data obtained from Nthondo Health Centre are malaria and skin diseases especially scabies. There is no specific information on STIs and HIV and AIDS infection rates for the health centre because their data management systems are not efficient. However, information obtained from chiefs indicate that the area is ravaged with the endemic evidenced from increase in HIV and AIDS related deaths in the area.

The health-care system in Lilongwe district, is delivered at the three levels of: district hospital, health centre/dispensary and community levels. Health services are provided by the Ministry of Health, the private sector and Christian Health Association of Malawi (CHAM) health facilities. As of 2018, there were 142 health facilities in the district; 36 for government, 12 for CHAM and 99 are privately owned and by NGOs.

According to the Lilongwe District Socio-Economic Profile, major causes of death in the district include malaria, tuberculosis, pneumonia, malnutrition and anaemia. Malaria is a leading cause of deaths.

5.2.5 HIV and AIDS prevalence rates

HIV prevalence in Lilongwe District for the active age group (15 – 49) is estimated at 7.2 %, lower than the national rating of 8.8% (NSO 2010). There are 89 health centres with HTC and 99 Centres that provide antiretroviral Therapy (ART) for people living with AIDS. The prevalence rate among mothers is at 6% and 5.5% for pregnant women (15 – 49) receiving ANC. HIV and AIDS has significant implications on the environment in the District due to increased demand for natural resources for households that are keeping the chronically ill, due to labour constraints associated with caring for the sick.

5.2.6 Communication

Telephone services in it the district is operated by the Malawi Telecommunications Limited (MTL) which provides fixed line telephone facilities. MTL faces challenges in the provision of quality services to its customers due to theft and vandalism of underground cables and poles amongst others. The area has two major mobile communication networks: Airtel Malawi and Telekom Networks Malawi (TNM).

5.2.7 Main land uses, agriculture and marketing,

The most common land uses in the project impact area are agriculture, grazing and human settlement. The greater part of the project area is cultivated with other areas being used for settlement and grazing.

Common grown crops include groundnuts, soya beans, tobacco, maize, cassava, sweet potatoes and beans. Livestock keeping is also practiced with chickens and goats being the main type of livestock kept. According to information obtained from Chilaza EPA, there is no specific data for the project catchment area. However, data obtained shows there are a total of 16,995 farming households who utilise 11,897 cultivable land representing a land holding of 0.70. Data for farming households for the last 5 years has been analysed in Table 5-4.

Table 5-4: Data for farming households for the last 5 years

Growing season	2012/2013	2013/2014	2014/2015	2015/2016	2017/2018
Farming Households	15450	15450	15450	15450	16995

An analysis of crop production against demand was also obtained to establish the trend the past three years excluding 2016/2017 (Table 5-5).

Table 5-5: Crop production against demand

2013/2014			**2014/2015**			**2015/2016**		
Food requirement	***Production***	***Deficit***	***Food requirement***	***Production***	***Deficit***	***Food requirement***	***Production***	***Deficit***
23175	17691	-5484	23,175	16606	-6569	23175	16420	-6755

According to chiefs in the area, farmers in the area fail to meet their production targets due to lack of farm inputs, a consequence of poverty in the villages and also insufficient extension workers to provide agricultural advice. The area has a recognised agricultural market within 2km at Msundwe trading centre where farmers in the area sell their produce. Deforestation (including firewood and charcoal for sale) and bush fires (for agricultural land clearing and hunting) are common practices in the project area. The main land tenure system is customary, followed by government owned land and titled private land.

5.2.8 Basic infrastructure

Housing in the two villages comprises of houses having brick walls with grass thatched roofs and an estimated 15% or less with iron sheets. Firewood is the most common source of energy in project area. Households with electricity are very few and more than 80% located at areas closest to Msundwe trading centre. As such they use alternative sources including open fires,

torches and candles. The households have no direct access to drinking water hence they source their water from communal boreholes.

Chapter Six: Impact Assessment and Identification

This chapter provides a description of how beneficial and adverse impacts, both direct and indirect, are expected to occur for each feature of the environment in the project site. Possible cumulative and synergistic effects are highlighted. The section includes a discussion of the analytical methods used to forecast impact of how environmental data was gathered, and of the methods and criteria used to judge impact severity and significance. The chapter concludes with a summary of those impacts considered to be of greatest significance and measures proposed to avoid, reduce and/or manage them. It also discusses the distribution of adverse and beneficial impacts locally and regionally. It identifies which impacts the developer is committed to managing during project implementation and which are residual impacts.

6.1 Impact identification

The assessment of potential environmental effects resulting from Project-related activities has been carried out in accordance with EMA (1996), using a methodology framework developed on the basis of internationally accepted practice, and the professional experience of the study team. This approach has satisfied requirements for environmental impact assessment under the EIA Guidelines of 1997 in the past, and public consultation have also been conducted as part of the assessment. The assessment considered the potential environmental effects of physical works and activities, including environmental changes that may result from the proposed undertaking. Specifically, the assessment started by identifying the issues through scoping and selecting of valued environmental components (VECs) on which to focus the assessment. VECs are components of the environment that are valued by society, and upon which the assessment is focused. Thereafter, the assessment identified environmental effects of project activities, by project phase, including those resulting from the interaction of the project with the environmental effects identified for past, present, and future projects that will be carried out, and also the changes to the project caused by the environment.

The scoping methodology involved an evaluation of the potential environmental effects, including cumulative environmental effects, with regard to VECs. The VECs for this project were identified through a process whereby the features and activities (both planned and unplanned) associated with pre-construction, construction and operation of the project have been considered with respect to their potential impact with resources/receptors. The VECs and activities that could reasonably act as a source of impact were identified, and these have been listed down the vertical axis of a Potential Interaction Matrix (Table 6-1).

Table 6-1: Potential Interaction Matrix

Resources/Receptors	Environmental Resources											Socio/Economic Resources									
Project Activity/Hazard	Air Quality & Fugitive Emmissions	Landscape & Visual Amenity	Water Quality & Resource (Surface and Ground)	Land Contamination	Noise & Vibration	Land Degradation	Waste (including Hazardous Waste)	Change of Land Use	Avian Species	Terrestrial Flora/Fauna	Aquatic Species	Community Health and Safety	Occupational Safety and Health	Loss of Land and Property (Physical Displacement)	Economy and Livelihoods	In Migration	Infrastructure and Service	Cultural Heritage	HIV & AIDS	Ecosystem Services	Cumulative Impact
Construction Phase of Factory																					
Land Take and Land Clearance		■				■	■	■	■	■				■					■	■	■
Excavation and Civil Construction	■				■	■	■					■	■						■		
Equipment/Material/Worker Transport	■				■							■	■								■
Waste Storage and Disposal			■	■			■					■	■								■
Accidental Events (Spills/Uncontrolled Releases)			■	■			■					■	■								
Construction Workers Presence												■	■						■		
Water Supply			■	■																	■
Operation Phase of the Factory																					
Operation of Plant and Presence of Workers	■	■			■			■				■	■						■		■
Equipment/Material/Worker Transport	■				■							■	■								■
Waste Storage and Disposal			■	■			■					■	■								■
Accidental Events (Spills/Uncontrolled Releases)			■	■			■					■	■							■	
Water Supply			■	■											■					■	■

Key	
■	Scoped in
	Scoped Out
	Scoped Out with Justification
	Positive Impacts

6.2 Significance Rating of the Impacts

Evaluating environmental effects, including cumulative environmental effects, of the identified VECs was then done using the significance rating criteria in light of proposed mitigation. The factors are ranked using the criteria indicated in Table 6-2.

Table 6-2: Criteria for Ranking Factors for Consequences and Probability

Criteria	Description	Measure
Impact Type	Refers to how an impact has been brought about in relation to project activities.	Direct, Indirect, or Induced.
Impact Duration	This is the period of time over which an impact may occur; it considers the time that is estimated for an affected population or resource to recover. Duration is calculated from the time an impact begins to when it ceases.	Temporary, Short Term, Long Term or Permanent
Impact Extent	Refers to the size of the impact area	Local – Within Area of Impact Regional – Beyond Area of Impact to other districts or Nation International – Beyond the country
Impact Magnitude	Measures the general degree, extensiveness or scale of impact in terms of the observable impact on a resource in the project AoI and wider ecosystem or social domain.	Low, Medium, or High
Sensitivity	Considers the sensitivity of the receptor upon which the impact is occurring.	Low, Moderate, or High
Reversibility	Refers to the ability of the site or the impact receptor to recover after an impact has occurred.	Low, Moderate, or High
Likelihood	The probability of the impact occurring	Unlikely, Possible or Certain
Impact Significance	This indicates the implication or consequence that an impact may have on a resource/receptor	Negligible, Minor, Moderate or High

6.3 Impact Significance Rating for the Identified Impacts

The potential environmental and social impacts were assessed and the significance ratings before the mitigation measures are applied as presented in Table 6-3.

Table 6-3: Summary of assessment of impacts and their ratings

SN	Category	Impact	Impact Nature	Likelihood	Impact Type	Impact Duration	Impact Extent	Impact Magnitude	Sensitivity	Reversibility	Impact Significance
1	**Construction Phase**										
1.1	***Economy and Livelihoods***	Creation of local employment opportunities and capacity building including.	Positive	Certain	Direct	Short-Term	Local	High	High	High	High
		Availability of market for construction materials and services	Positive	Certain	Direct	Short-Term	Regional	High	Moderate	High	High
		Benefits from capacity enhancement through on-the-job training	Positive	Certain	Direct	Long-Term	Local	Medium	Moderate	High	High
		Increased income to Government through Taxes	Positive	Certain	Direct	Short-Term	Regional	High	Low	High	High
		Increased incidences of child labour	Negative	Possible	Direct	Short-Term	Local	Low	Moderate	Moderate	Minor
		Increased cases of sexual harassment and Gender Based Violence	Negative	Possible	Direct	Short-Term	Local	Low	Low	Moderate	Minor
1.2	***Air Quality & Fugitive Emissions***	Increased generation of particulate matter (especially dust)	Negative	Certain	Direct	Short-Term	Local	Medium	Moderate	Moderate	Moderate
		Increase in combustion emissions	Negative	Certain	Direct	Short-Term	Local	Medium	Moderate	Moderate	Moderate
1.3		Visual scaring of the landscape	Negative	Possible	Direct	Short-Term	Local	Medium	Low	Low	Minor

SN	Category	Impact	Impact Nature	Likelihood	Impact Type	Impact Duration	Impact Extent	Impact Magnitude	Sensitivity	Reversibility	Impact Significance
	Landscape and Visual Amenity	Aesthetic change to the rural nature topography	Negative	Possible	Direct	Short-Term	Local	Low	Low	High	Minor
1.4	***Water Quality and Resource***	Reduced water drainage and increase in flooding	Negative	Certain	Direct	Medium-Term	Local	High	Moderate	Moderate	Moderate
		Degradation of surface and groundwater quality	Negative	Possible	Direct	Medium-Term	Local	Medium	Moderate	High	Moderate
		Reduced water availability	Negative	Unlikely	Direct	Short-Term	Local	Low	Low	Moderate	Minor
1.5	***Soil Degradation***	Contamination of soil with chemicals	Negative	Possible	Direct	Short-Term	Local	Medium	Moderate	High	Minor
		Increased susceptibility of soil to erosion	Negative	Certain	Direct	Short-Term	Local	High	Moderate	Moderate	Moderate
1.6	***Noise and Vibration***	Increase in ambient sound levels	Negative	Certain	Direct	Temporally	Local	High	Moderate	Low	High
		Risk of earth movement	Negative	Unlikely	Direct	Temporally	Local	Negligible	Low	Negligible	Negligible
1.7	***Waste***	Increased generation of non-hazardous and general waste	Negative	Certain	Direct	Short-Term	Local	High	Moderate	Low	Moderate
		Increased generation of hazardous waste	Negative	Possible	Direct	Medium-Term	Local	Medium	Moderate	High	Moderate
		Increased sewage generation	Negative	Possible	Direct	Short-Term	Local	Medium	Moderate	Moderate	Minor
1.8	***Flora and Fauna***	Loss of natural habitat for flora and fauna	Negative	Certain	Direct	Long-Term	Local	High	Low	High	Moderate
		Introduction of invasive and alien species	Negative	Unlikely	Direct	Long-Term	Local	Low	Low	High	Negligible

SN	Category	Impact	Impact Nature	Likelihood	Impact Type	Impact Duration	Impact Extent	Impact Magnitude	Sensitivity	Reversibility	Impact Significance
1.9	***Community Health and Safety***	Increased number of diseases, sexually transmitted infections and HIV and AIDS	Negative	Certain	Direct	Long-Term	Local	High	High	High	High
		Social conflicts resulting from access to jobs	Negative	Possible	Direct	Short-Term	Local	Medium	Low	Low	Minor
		Increased levels of air emissions	Negative	Possible	Direct	Medium-Term	Local	High	Moderate	High	Moderate
		Increased risk of traffic accidents	Negative	Possible	Direct	Long-Term	Local	High	High	High	High
1.10	***Occupational Health and Safety***	Increased risk of accidents and exposure to hazardous material	Negative	Certain	Direct	Long-Term	Local	High	High	High	High
		Increased risk to diseases, STIs and HIV and AIDS	Negative	Certain	Direct	Long-Term	Local	High	High	High	High
1.11	***Physical Displacement***	Permanent loss of agriculture land and property	Negative	Possible	Direct	Medium-Term	Local	Low	Low	Low	Minor
1.12	***Cultural Heritage***	Disturbance of sites of cultural heritage (specifically graveyard)	Negative	Unlikely	Direct	Short-Term	Local	Low	Low	Low	Negligible
		Destroying archaeological artefacts	Negative	Unlikely	Direct	Long-Term	Local	Low	Low	Low	Negligible
2	**Operation and Maintenance Phase**										
2.1	***Economy and Livelihoods***	Provide ready market for soya beans small scale farmers	Positive	Certain	Direct	Long-Term	Regional	High	High	High	High
		Increased supply of cooking oil	Positive	Certain	Direct	Long-Term	Regional	High	High	High	High

SN	Category	Impact	Impact Nature	Likelihood	Impact Type	Impact Duration	Impact Extent	Impact Magnitude	Sensitivity	Reversibility	Impact Significance
		Foreign exchange earning to due export of surplus animal feed and less dependent on edible crude oil import	Positive	Certain	Direct	Long-Term	Regional	High	High	High	High
		Employment generation	Positive	Certain	Direct	Long-Term	Local	High	High	High	High
		Increased income to Government through Taxes	Positive	Certain	Direct	Long-Term	Regional	High	High	High	Moderate
		Increased incidences of child labour	Negative	Possible	Direct	Medium-Term	Local	Low	Low	Moderate	Moderate
		Increased cases of sexual harassment and Gender Based Violence	Negative	Possible	Direct	Short-Term	Local	Low	Low	Moderate	Moderate
2.2	***Air Quality & Fugitive Emissions***	Increased generation of particulate matter (especially dust)	Negative	Certain	Direct	Long-Term	Local	Medium	Moderate	Moderate	Moderate
		Increase in combustion emissions	Negative	Certain	Direct	Long-Term	Local	Medium	Moderate	Moderate	Moderate
2.3	***Landscape and Visual Amenity***	Visual scaring of the landscape	Negative	Unlikely	Direct	Short-Term	Local	Low	Low	Low	Negligible
		Aesthetic change to the rural nature topography	Negative	Certain	Direct	Long-Term	Local	Low	Low	High	Minor
2.4	***Water Quality and Resource***	Reduced water drainage and increase in flooding	Negative	Certain	Direct	Long-Term	Local	Medium	Moderate	Moderate	Moderate
		Degradation of surface and groundwater quality	Negative	Possible	Direct	Short-Term	Local	Low	Moderate	High	Moderate

SN	Category	Impact	Impact Nature	Likelihood	Impact Type	Impact Duration	Impact Extent	Impact Magnitude	Sensitivity	Reversibility	Impact Significance
		Reduced water availability	Negative	Unlikely	Direct	Short-Term	Local	Low	Moderate	Moderate	Minor
2.5	***Soil Degradation***	Contamination of soil with chemicals	Negative	Possible	Direct	Medium-Term	Local	Medium	Low	High	Moderate
		Increased susceptibility of soil to erosion	Negative	Unlikely	Direct	Temporally	Local	Low	Moderate	Moderate	Negligible
2.6	***Noise and Vibration***	Increase in ambient sound levels	Negative	Certain	Direct	Short-Term	Local	Medium	Moderate	Low	Moderate
		Risk of earth movement	Negative	Unlikely	Direct	Temporally	Local	Low	Low	Negligible	Negligible
2.7	***Waste***	Increased generation of non-hazardous and general waste	Negative	Certain	Direct	Medium-Term	Local	Medium	Moderate	Low	High
		Increased generation of hazardous waste	Negative	Possible	Direct	Medium-Term	Local	Medium	Moderate	High	Moderate
		Increased sewage generation	Negative	Certain	Direct	Short-Term	Local	Medium	Moderate	Moderate	Moderate
2.8	***Flora and Fauna***	Loss of natural habitat for flora and fauna	Negative	Unlikely	Direct	Medium-Term	Local	Low	Low	High	Negligible
		Introduction of invasive and alien species	Negative	Unlikely	Direct	Medium-Term	Local	Low	Low	High	Negligible
2.9	***Community Health and Safety***	Increased number of diseases, sexually transmitted infections and HIV and AIDS	Negative	Certain	Direct	Long-Term	Local	High	High	High	High
		Social conflicts resulting from access to jobs	Negative	Possible	Direct	Long-Term	Local	Low	Low	Low	Negligible

SN	Category	Impact	Impact Nature	Likelihood	Impact Type	Impact Duration	Impact Extent	Impact Magnitude	Sensitivity	Reversibility	Impact Significance
		Increased levels of air emissions	Negative	Possible	Direct	Long-Term	Local	Medium	Moderate	High	Moderate
		Increased risk of traffic accidents	Negative	Possible	Direct	Long-Term	Local	High	High	High	High
2.10	***Occupational Health and Safety***	Increased risk of accidents and exposure to hazardous material	Negative	Certain	Direct	Long-Term	Local	High	High	High	High
		Increased risk to diseases, STIs and HIV and AIDS	Negative	Certain	Direct	Long-Term	Local	High	High	High	High
2.11	***Physical Displacement***	Permanent loss of agriculture land and property	Negative	Unlikely	Direct	Temporally	Local	Low	Low	Low	Negligible
2.12	***Cultural Heritage***	Disturbance of sites of cultural heritage (specifically graveyard)	Negative	Unlikely	Direct	Temporally	Local	Low	Low	Low	Negligible
		Destroying archaeological artefacts	Negative	Unlikely	Direct	Temporally	Local	Low	Low	Low	Negligible

6.4 Description of Identified Impacts

This section provides a description of the potential positive and negative environmental and social impacts associated with the construction and operation of the project. The section is organised by stake of project life cycle that include construction and operation.

6.4.1 Identified Positive Impacts During Construction Phase

6.4.1.1 Economy and Livelihoods

The project is expected to have an impact on the economy and livelihoods of the project area. The project is expected to bring impacts on livelihood regarding quality of life for the people and the environment. The identified primary positive impacts that are likely to affect the economy and livelihoods are related to creation of employment opportunities, creation of a market for construction materials and services, and increase income to Government through taxes.

6.4.1.1.1 Creation of local employment opportunities and capacity building including

The construction project will provide employment to 100 people including women, youth and the vulnerable from the surrounding communities. By employing the vulnerable during construction, this project will be of vital importance not only to mitigate the adverse impacts related to the project but also enhance employment inequalities. Some of the skill categories that will be required by the project will include surveying, plumbing, carpentry, bricklaying, steel fixing, plant operation, civil engineering and driving. A rapid skills inventory of the area indicated that the community is composed of unskilled labour with a few community members being skilled as brick-layers and carpenters. This suggested that the majority of skilled labour will have to come from outside the project community area.

Enhancement measures:

i. Match responsibilities of the employed women, members of the vulnerable group and the youth to their abilities;
ii. Developing effective communication through local leaders about employment opportunities targeted to men and women, and this is to be done in a fair, consistent and transparent manner;
iii. Provide equal employment opportunity between men and women;
iv. Enforce the Malawi labour laws; and
v. Wages must be above the minimum wage and overtime must be paid on time.

6.4.1.1.2 Availability of market for construction materials and services, and other trades

The construction phase of the project will be executed by a building contractor registered by the National Construction Industry Council (NCIC). The project will also be buying construction materials from the local market and will provide business for the local businesses. Apart from the construction related materials and services, the people in the project area of impact will be selling food items such as mandazi and Thobwa to construction workers, which

will improve their incomes. Despite this positive impact, the impact is going to be short-term as the construction phase will last six months.

Enhancement Measures:

i. Pay building material supplies within the agreed time;
ii. Where possible source materials from approved licenced suppliers;
iii. Support and promote entrepreneurship skills amongst communities and business people;
iv. Provide safe business shelters for local businesses trading around the area;
v. Pay all associated taxes to the Malawi Revenue Authority; and
vi. Where possible buy materials manufactured in Malawi.

6.4.1.1.3 Benefits from capacity enhancement through on-the-job training

Employment of local people from within the projects area of impact will facilitate capacity enhancement and the acquisition of specific skill sets through on the job and formal training. These skill sets may then be readily replicated after employment termination in other construction related projects.

Enhancement Measures:

i. Maximise employment of local people particularly for the unskilled labour force;
ii. Make deliberate effort to pair skilled and unskilled workers during various construction assignments; and
iii. Formalise on-the-job trainings for local unskilled labour that also includes learning targets and performance monitoring.

6.4.2 Identified Positive Impacts During Operation and Maintenance Phase

6.4.2.1 Economy and Livelihoods

6.4.2.1.1 Increased supply of cooking oil

The project will contribute towards availability of nutritious animal feed and cooking oil that are required for raising animals and preparation of nutritious food respectively. Meat and oil are essential parts of human nutrition that contribute to a healthier population as they add protein and vitamins to the diet of Malawians.

Enhancement Measures

i. The refinery will endeavour to offer cooking oil and animal feed at affordable prices that can be afforded by Malawian consumers;
ii. The factory should put strategies to sell cooking oil at a cheaper price to the communities in the area of impact such as providing of coupons to registered vulnerable families; and
iii. Ensure continuous supply of high-quality cooking oil and animal feed products under strict quality control systems that meet relevant local and international standards.

6.4.2.1.2 Provide ready market for soya beans small scale farmers

The local economy will be supported to help small-scale soya bean farmers make more profit from their soya harvest as they will be organised into cooperatives. These cooperatives will group farmers in communities that will be pooling their harvest together. Such cooperatives will have direct link with the company to procure their crop directly thereby cutting off middle men that normally profit more than the farmers. The practice will help farmers to get best price for their crop and encourage them to enhance the productivity of soya beans in the country to generate more income for the farmers. The additional income generated will give thrust to rural economy. Additionally, the cooperatives will have an opportunity to have group access to improved seed varieties and other modern farming approaches/ technology that will be imparted to such farmers. The company plans to target 100,000 small holder farmers across Malawi. This will have positive impact on the social economic profile of the small-scale farmers thereby improving the rural Malawi economy. It will also have an impact on encouraging more farmers into soya bean farming.

Enhancement Measure:

i. Continuously provide competitive prices for soya beans;
ii. Ensure that purchase of the soya beans is reaching all the major soya growing districts;
iii. Provide agriculture inputs and production support (in the form of agriculture extension services) to soya bean farmers to help them improve yield per hectare; and
iv. Conduct market awareness campaigns to raise awareness to farmers.

6.4.2.1.3 Foreign exchange earnings due to export of surplus animal feed and less dependent on edible crude oil import

The excess products after meeting local demand, the country will export them to countries in SADC among others, which will gain the economy more foreign exchange ranging from US$15- US$18 million during the first two years of operations. The reduction in edible crude oil import into Malawi will also have a significant impact to the economy through reduction in import costs for Malawi. This is as a result of local production of the same edible crude oil locally as opposed to the current import of most of it from other countries. The foreign exchange gains will greatly improve the country's Balance of Payment (BOP). The local crushing of oil seed and extraction of crude oil will act as substitute of import of crude oil and will save precious forex outflows from the country. The soya meal exports from the country will bring in forex into the country.

Enhancement Measures:

i. Ensure production of quality products to fetch good prices on the international market;
ii. Ensure that production levels are kept high; and
iii. Participate in international trade fairs to target lucrative international markets.

6.4.2.1.4 Employment generation

The operation phase of the project will provide employment to people including women, youth and the vulnerable from the surrounding communities. According to information sourced from AVC and presented in Table 2-3 the project will employ about 215 people directly. This

number is likely to be increasing to 400 through engagement of seasonal workers. By employing the vulnerable, this project will be of vital importance not only to mitigate the adverse impacts related to the project but also enhance employment inequalities.

Enhancement measures:

i. Match responsibilities of the employed women, members of the vulnerable group and the youth to their abilities;
ii. Developing effective communication through local leaders about employment opportunities targeted to men and women, and this is to be done in a fair, consistent and transparent manner;
iii. Provide equal employment opportunity to men and women;
iv. Enforce the Malawi labour laws; and
v. Wages must be above the minimum wage and overtime must be paid on time.

6.4.3 Identified Negative Impacts During Construction Phase

6.4.3.1 Economy and Livelihoods

As already alluded to, the proposed project is expected to have impacts related to the socio-economic status in the area of impact. It has also been pointed out that the project area is in the rural part of Lilongwe district where poverty levels are high. The project area is also near a primary and secondary school. In view of this, two negative impacts to the economy and livelihood of the people in the area is in relation to increased incidences of child labour and increased cases of sexual harassment and GBV.

6.4.3.1.1 Increased incidences of child labour

Child labour, which can either be forced or harmful, needs to be addressed as part of the employment plan. According to the International Finance Corporation (IFC, 1998), poverty is the main reason children are forced to work and the supply of child labour is directly linked to the need for children to provide supplemental income for their families or to support themselves. In Malawi, it has been estimated that 1.4% of child labour cases are within the industry sector, with construction being part of the sector (UCW, 2018). In view of this, the impact is expected to be short-term as the construction period will last for a maximum of six months.

Mitigation measures:

i. Inclusion of a clause in the contract with the building contractor that prohibits any forms of child labour on the project;
ii. Sensitize local chiefs, children and the community at large on prohibition of any forms of child labour at the project site;
iii. Display posters at the project site that warn and inform against child labour; and
iv. Put in place proper procedures for reporting and addressing child labour cases.

6.4.3.1.2 Increased cases of sexual harassment and Gender Based Violence

Construction workers will have extra disposable income that may lead to the harassment and sometimes molestation of women in general and specifically their wives. Likewise, some women working at the project sites may harass their unemployed husbands, due to increased disposable incomes. Female workers may also be harassed by the male workers at the project sites in form of abusive language and physical harassment such as demanding sex from them. Some of the community members may also be harassed in the same manner by the construction contractor employees. Similarly issues of GBV are likely to occur as a direct outcome from the project activities. GBV is defined by the United Nations as the physical, psychological, mental, economic or sexual harm or suffering, coercion and other deprivations of liberty (including incidents of Domestic Violence, sexual violence, dating violence, forced prostitution, sexual harassment or intimidation and stalking, but not including acts of self-defence) that are directed against a person based on gender and committed, attempted or threatened by or against employees, and/or against employees' families or property.

Mitigation measures:

i. Enforce punitive and disciplinary measures, including dismissal from employment on any project workers involved in any social malpractices with surrounding communities;
ii. Developing and enforcing an Anti-Sexual Harassment Policy prohibiting sexual harassment or violation of any kind in the workplace. The policy will include an incident referral and reporting plan;
iii. Communicating to all employees and all subcontractors that sexual harassment offences will result into immediate investigation, and/or potential suspension or potential termination of the contract and involvement of the police and the courts more serious offences such as sexual assault;
iv. Training all employees and subcontractors on the Contractors' Anti-Sexual Harassment Policy and national law and regulatory requirements regarding sexual harassment;
v. Conducting routine community and stakeholder sensitization routine community and stakeholder sensitization and awareness campaigns on defence against sexual harassment; and
vi. Encouraging employees to report any sexual harassment-related issues or suspected sexual harassment actions.

6.4.3.2 Air Quality & Fugitive Emissions

Outdoor air pollution is a mix of chemicals, particulate matter, and biological materials that react with each other to form tiny hazardous particles. It contributes to breathing problems, chronic diseases, increased hospitalization, and premature mortality. The concentration of particulate matter (PM) is a key air quality indicator since it is the most common air pollutant that affects short-term and long-term health. Two sizes of particulate matter are used to analyse air quality; fine particles with a diameter of less than 2.5 µm or PM2.5 and coarse particles with a diameter of less than 10 µm or PM10. PM2.5 particles are more concerning because their small size allows them to travel deeper into the cardiopulmonary system. During construction phase, two main sources of air pollutants was identified to be generation of PM especially dust and combustion emissions.

6.4.3.2.1 Increased generation of particulate matter (especially dust)

Dust and particulate matter emission are anticipated during construction and will be a short-term impact. Construction work produces dust because of material and vehicle movement; excavation works and land clearing; and construction activities. Dust and particulates can present respiratory problems as well as potential allergic reactions when inhaled. Project workers, especially those that will be exposed to dust and exhaust gas emissions, may suffer from respiratory disorders. In addition, dust can cause nuisance problems when re-deposited on clothes and surfaces; and can hinder visibility. However, it is considered unlikely that ambient air quality standard will be exceeded.

Mitigation measures

i. All transported materials must be covered with tarpaulins and to prevent fugitive dust;
ii. Restrict the removal of vegetation and soil cover to the construction site for the project;
iii. Apply water to earth and gravel access roads and civil works to suppress dust;
iv. Vehicle speeds shall be limited to 20 km/hr within the construction site and 40 km/hr on community access roads to prevent generation of dust; and
v. Wind breaks will be erected around the key construction activities and if, possible, in the vicinity of potentially dusty works, to minimise impacts at the nearby temporary residential accommodation and permanent residential receptors.

6.4.3.2.2 Increase in combustion emissions

In addition, the vehicle, electricity generators and other machines, which are likely to be used during construction, result in emission of gas and particulate elements during construction, result in emission of gas and particulate elements including carbon dioxide (CO_2), Sulphur dioxide (SO_2), Nitrogen Oxides (NOx) and various other hydrocarbons.

Mitigation measures

i. Avoid burning of cleared vegetation by the workers;
ii. All construction vehicles must be regularly maintained to minimize exhaust emissions; and
iii. When not in use, vehicles will be switched off, unless impractical for health and safety reasons (for example, maintenance of air conditioning).

6.4.3.3 Landscape and visual amenity

The project area of impact is rural in nature and appearance as discussed in Chapter 4. The site is in the middle of agriculture fields that is almost 2 kilometres away from clustered residential dwellings. Due to this, the area of impact has a high sensitivity to aesthetic changes although the impact magnitude is small. Furthermore, construction activities will have visual impact on the scenery of the area.

6.4.3.3.1 Visual scaring of the landscape

The presence of construction vehicles, work force and various construction materials will be a sore site for the local community. This will also be encouraged with clearing of vegetation and

earth works to be done on the site. This is a short-term impact to affect the local community and as such should be easily managed with recommended mitigation measures.

Mitigation measures:

i. No debris or waste material will be left at the work sites;
ii. Conduct ongoing rehabilitation of cleared areas to minimise visual scaring;
iii. Maintenance clearing will be kept to the absolute minimum and should not extend beyond the project site boundary; and
iv. Any excavated or cut and fill areas will be landscaped and allowed tore-grow.

6.4.3.3.2 Aesthetic change to the rural nature topography

The factory will be industrial in appearance, which will be in contrast to the surrounding land uses. These facilities will include high buildings housing the plant and warehouses as well as the chimney stack.

Mitigation measures:

i. Project design to include screening barrier of indigenous trees and vegetation around the Project boundary to mask the immediate view of the factory.

6.4.3.4 Water Quality and Resource

Water resources in the project area can basically be classified into two broad categories namely surface and groundwater resources. Surface water resources comprise all water bodies that are found above the earth's surface whereas groundwater resources are found in aquifers and fracture zones. All water resources in the project area are replenished by rainfall in catchment areas and on the surface of the water bodies in the case of surface water resources and in recharge areas for groundwater resources. The assessment of impact on water quality and resource identified three main types of potential impacts that include reduced water drainage, effect of water quality and availability of water in the area.

6.4.3.4.1 Reduced water drainage and increase in flooding

Earth works, excavations and levelling during construction activities will alter the natural drainage patterns of the project site, which may affect water drainage including flood water pathways. There are no permanent surface water features on the site, hence the potential direct impacts would be to temporary small tributaries and flash flood streams with potential indirect impacts to receiving fields down-slope of the site.

Mitigation measures:

i. Non-contact water (water which has not potentially picked up contaminants such as process chemicals or hydrocarbons) will be allowed to infiltrate the ground, where practical, rather than being collected in impermeable storm water drains where evaporation is enhanced; and
ii. Where possible, earth-works to be scheduled during the dry season.

6.4.3.4.2 Degradation of surface and groundwater quality

Construction of the proposed plant has the potential to affect the water quality of both surface and groundwater. These construction activities have the potential to affect the water quality through introduction of increased sediment loads. Furthermore, chemical spills and improper storage of waste on the site might also lead to water contamination leading to health concerns for various water users. Use of mobile machinery during civil works will lead to water contamination due to burst hydraulic pipes and faulty machinery. Storage of fuel and chemicals may cause spills ground water and adjacent surface water resources.

Mitigation measures:

i. Put in place measures for the control of soil erosion such as minimal site clearing and provision of sand bags and silt fences;
ii. Provide adequate sanitary facilities for the workers on site;
iii. Training vehicle and fuel service truck drivers, mobile machinery operators, and fuel operators from the mobile fuel tanks, and workers working with hazardous chemicals in proper spill prevention and response;
iv. Using spill kit such as drip trays, absorbents and shovels to contain oil spills from vehicles or mobile machinery under service and for removal of contaminated soils;
v. Refuelling and maintenance of vehicles, machinery and equipment to be done on bounded areas;
vi. Labelling all hazardous substances correctly;
vii. Storing hazardous substances in protected areas such as in well ventilated rooms to limit their exposure to rainy conditions; and
viii. Responding and reporting spills promptly.

6.4.3.4.3 Reduced water availability

Water supply in the project area is under the jurisdiction of Central Region Water Board (CRWB). However, the CRWB does not reach out to all the parts of the district hence making piped water distribution non-existent in the area. The main source of portable water in the area is groundwater that is accessed using boreholes and shallow wells. With the boreholes that will be sunk by the project during the construction phase and also during operation phase, it is anticipated that it may result in a temporally net loss to groundwater availability when the site is operational. This may in turn lower the groundwater table or alter groundwater flow dynamics. However, in the absence of modelled or site recorded data, the impact on water availability is assessed to be minor once mitigation measures are put in place.

Mitigation measure:

i. During construction, the contractor will reduce water usage wherever possible so that the project's water consumption does not have significant adverse impacts on others.
ii. In the absence of formal modelling of the proposed abstraction boreholes, on-going communication will be maintained with the nearby communities to determine if there is an associated response observed in the community wells. Should this occur, the

project will take steps to ensure reliable supply is maintained to the affected communities.

6.4.3.5 Soil degradation

6.4.3.5.1Increased susceptibility of soil to erosion

Soil erosion is caused by the removal of soil particles from the landscape as a result of water and wind movement. During the construction phase, all soil forms will be susceptible to erosion to some extent because the natural vegetation will be cleared before construction takes place. Soils with high arable land capability are sensitive to erosion which has the potential consequences of reducing soil quality and the water-holding capacity of the soils.

Mitigation measures:

i. Stripping of topsoil will not be conducted earlier than required (maintain vegetation cover for as long as possible) in order to prevent the erosion (wind and water) of organic matter, clay and silt;
ii. Stripped control measures such as intercept drains and toe berms will be constructed where necessary;
iii. Soil stockpiles will be sampled, ameliorated (if necessary) and re-vegetated as soon after construction as possible. This is in order to limit raindrop and wind energy, as well as to slow and trap runoff, thereby reducing soil erosion. Plant species indigenous to the area are preferred, given both their adaptation to the natural site conditions as well as their lower maintenance requirements. This is in order to maintain the natural biological soil life associated with the indigenous vegetation; and
iv. Access roads will be well drained in order to limit soil erosion.

6.4.3.6 Noise and Vibrations

It is expected that impulsive noises will be generated during the construction phase. This is normally associated with the cutting hammering and reverting of steel structures. Impulsive noises are especially intrusive at night and are frequently the source of maximum noises in the nearby fields. While the geotechnical ground conditions are unknown, it is unlikely that blasting will be required as part of civil works to clear obstacles or to prepare foundations.

6.4.3.6.1 Increase in ambient sound levels

Construction machinery (vehicles, excavators, compactors and concrete mixers) will generate noise that may impair the hearing of workers as well as surrounding community members. Maximum noises generated can be audible over long distance but are generally of short duration. If maximum noise levels exceed 65dBa at a receptor, or if it is clearly audible with a significant number of instances where the noise level exceeds the prevailing ambient sound level with more than 15dBA, the noise can increase annoyance levels and may ultimately result in noise complaints. The potential extent depends on a number of factors, including the prevailing ambient sound levels during the instance the maximum noise event occurred, as well as the spectral character of the noise and the ambient sound-scape in the surroundings. Traffic associated with construction activities is highly variable through the various stages of

construction and depends on the activities taking place. Traffic noise is also considered an impact.

Mitigation measures:

i. Sensitising community members of the anticipated machinery to be used at the project sites before mobilisation.
ii. Limiting civil works and noise generating activities to day time between 08:00 – 17:00hrs.
iii. Monitoring sound levels during civil works using a sound meter. The sound will be monitored at least twice a day and within 10m, 30m and beyond 50m of active mobile machinery.
iv. Ensuring that noise levels for residents does not exceed 55 dB (A) and keeping noise levels for workers below 80 dB (A).
v. Providing hearing protection to workers working in environments where noise levels exceed 80 dB (A).
vi. Concentrating movement of heavy machinery and abnormal trucks during day light and not between 7pm and 6 am.
vii. Placing stationery noise sources away from sensitive locations.
viii. Training drivers and workers in noise control such as avoiding unnecessary idling of vehicles and construction machines; and
ix. Maintaining vehicles and machinery as recommended by the suppliers.

6.4.3.7 Waste

The storage, handling, transport and disposal of non-hazardous construction wastes (including wastes from site clearance, site excavation and formation, construction activities and general refuse) has the potential to result in adverse impacts to the environment and to human health if not managed correctly. Impacts to water quality are associated with poor storage of materials (runoff of stockpiles, runoff from storage areas, leakage of leachate from putrescible waste i.e. waste that will decompose), poor handling, and direct on water quality if waste is dumped on or near a watercourse.

Odour impacts associated with poor storage of waste or inadequate odour control for waste processing. Impacts to terrestrial ecology are associated with inappropriate dumping in sensitive areas and inadequate storage/coverage during transport resulting in windblown litter. Health impacts can be associated with vermin and pathogens associated with poor storage of waste resulting in direct contact, infrequent collection, waste entering watercourses, attraction of pests and vermin.

Activities that will generate waste during the construction phase of the project includes the following:

- Preparatory works including foundation construction;
- Superstructure construction and civil works (drainage systems, waste water collection and treatment systems, site roads and pipelines and utilities);
- Electrical and mechanical installation; and

- Construction site amenities.

The typical types of waste associated with these activities include:

- Excavated material (topsoil, subsoil);
- Construction waste (metal, wood, plastic, concrete and packaging material);
- Hazardous waste (oils, lubricants, paints and adhesives);
- Sewerage sludge; and
- General refuse (amenity waste, canteen waste).

6.4.3.7.1 Increased generation of non-hazardous and general waste

Construction activities will generate construction waste comprising surplus or off specification materials such as concrete, wooden pallets, steel cuttings/fillings, packaging paper or plastic, wood, plastic pipes, metals, etc. Approximately 100 construction workers required during the construction phase of the project will generate general refuse consisting of food waste, plastic glass, aluminium cans and waste paper. Reusable waste can also be collected, reused or recycled. Such waste would mainly include paper, metals, glass, plastics and wood etc. Waste requiring treatment or disposal could include organic waste, domestic wastes that contain chemicals or other solid wastes which cannot be reused.

Mitigation measures:

i. A Construction Waste Management Plan (CWMP) for the project should be prepared and implemented by the Contractor during the construction phase;
ii. Establish waste management priorities and hierarchy at the outset of activities based on the understanding of potential environmental, health and safety risks and impacts;
iii. Periodically review applicable regulations to ensure that the necessary waste disposal permits and licence are obtained;
iv. Design construction processes to prevent/minimise quantities of wastes generated and hazards associated with the waste generated;
v. Identify potential opportunities to recycle material into the design /identify products that can be provided to external markets;
vi. Properly store the construction materials to minimise the potential damage or contamination of materials;
vii. Implement a construction materials inventory management system to minimise over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period (such as ready mixed concrete).

6.4.3.7.2 Increased generation of hazardous waste

Hazardous waste generated from the construction of the project may include:

- Spent batteries or spent acid& alkali from the maintenance of the machinery on site;
- Used paint, engine oil, hydraulic fluids and waste fuel; and
- Spent solvents from equipment cleaning activities.

The contractor will have control over the amount and types of hazardous waste produced at the site.

Mitigation measures:

i. Adopt processes which generate reduced quantities or even no hazardous waste, or less dangerous types of hazardous wastes where practicable;
ii. Store wastes in closed containers away from direct sunlight, wind and rain;
iii. Segregate hazardous waste from non-hazardous waste;
iv. Clearly label hazardous wastes (including providing information on chemical compatibility) and storage area;
v. Ensure storage area has an impermeable floor and containment, and has adequate ventilation of capacity to accommodate100% of the volume of the largest waste container;
vi. Ensure staff are trained to handle and package hazardous wastes;
vii. Prepare spill response and emergency plans that incorporate potential accidental release of hazardous waste
viii. Ensure an approved hazardous waste collector is used;
ix. Ensure transport is conducted to minimise spills, release and exposures to employees;
x. All waste to be stored in containers and disposed at EAD approved disposal sites;
xi. Maintain records on the type and quantity of hazardous waste; and
xii. Records in the form of chain of custody documents should be kept of transfers of hazardous waste (trip tickets) to ensure wastes are transported by suitable carriers and to a permitted disposal facility.

6.4.3.7.3 Increased sewage generation

Sewage sludge will arise during construction phase from amenities throughout the site. It is anticipated that pit-latrines will be used throughout the project site during the construction, and will be combined with proper water, waste and sanitation systems. Assuming a sludge generation rate of 50l per person per day, it is estimated that 5,000l per day of sewage sludge will be generated during the construction phase and will be minimised by the embedded controls. Potential impacts associated with the mismanagement of the sewage will be water pollution, localised land contamination and impacts to health.

Mitigation measures:

i. Appropriately site toilet facilities to minimise potential soil and surface/groundwater contamination impacts;
ii. Construct separate pit-latrines with hand washing basins for male and female workers and the total number should correspond to 1 wash basin to 20 employees; and
iii. Raise awareness among workers regarding hand-washing and general hygiene and sanitation practices.

6.4.3.8 Flora and Fauna

There were no flora and fauna species of conservation importance that were identified within the proposed project site. The areas within the project site that will be affected directly during

construction are agriculture fields that surround the project site. The ecological impact that consists of loss of flora and fauna during construction is therefore expected to be minor and acceptable. Construction activities that will disturb flora and fauna will mainly be through clearing of vegetation that could also result in loss of habitat.

6.4.3.8.1 Loss of natural habitat for flora and fauna

Majority of plant species found in the project area are considered as agricultural weeds while others are known invasive. Invasive species refers to non-native (introduced species) that has a tendency to spread to a degree believed to cause loss of biodiversity. Furthermore, the project site and its area of influence are not rich in fauna diversity despite the fact that the area is not very close to human settlement. Fauna observed included black ants, caterpillars, and butterflies. Scattered termite moulds were also observed with clear indication of human activities. Site clearance for the construction of the Plant could potentially result in the loss of foraging habitat for terrestrial species and avifauna as well as the direct loss of floral species. However, as the site in its current state is identified as Modified Habitat with no species of conservation concern having been identified on site, the sensitivity of the receptor is considered low with the degree of change (impact magnitude) being small.

Mitigation measures:

i. Confining bush and land clearing activities to the project area and minimizing habitat destruction;
ii. Clearly mark out the extent of clearing within the worksite area with pegs at 10m intervals or less;
iii. Ensure that invasive species are not introduced into the area through vehicle movements and any other possible means;
iv. Ensure that construction workers are not allowed to harvest natural resources unless approved by the project's environmental inspectors; and
v. Provide training to construction workers to ensure an understanding of the requirements regarding environmental protection sites.

6.4.3.9 Community health and safety

Some aspects of project activities take place outside of the traditional project boundaries, but none-the-less are related to the project operations, as may be applicable on a project basis. These issues may arise at any stage of a project lifecycle and can have an impact beyond the life of the project. Community health and safety concentrates on public health and safety concerns such as spread of Sexually Transmitted Infections (STIs) and HIV and AIDS, decrease in human health due to air emissions and the risk of traffic accidents.

6.4.3.9.1 Increased number of diseases, sexually transmitted infections and HIV and AIDS

With construction of the plant, trade activities in the area will grows and the movement of people and goods is also expected to increase. The accelerating mobility represents greater risks of spreading disease across Project area of impact. Local people employed as construction workers will have extra disposable income that may be used for casual sex amongst the community.

Mitigation measures:

i. Sensitize communities on the disadvantages of indulging in extra- marital affairs; and
ii. Establish partnerships with the health sector, NGOs, community-based organizations, religious denominations and other organizations for conducting lectures (in schools, neighbourhoods and places of worship, for example), to raise awareness about the modes of transmission and prevention of STIs and HIV and AIDS. This includes risk behaviours, with an approach focussed on the risks associated with the disease, resorting to clear and easy to understand language and the use of qualified personnel for this purpose.

6.4.3.9.2Increased levels of air emissions

As already alluded to, construction activities are likely to result in air emissions. Construction work produces dust because of material and vehicle movement; excavation works and land clearing; and construction activities. Dust and particulates can present respiratory problems as well as potential allergic reactions when inhaled. Project workers, especially those that will be exposed to dust and exhaust gas emissions, may suffer from respiratory disorders.

Mitigation measures:

i. A Construction Site Management Plan and the Traffic Management Plan shall outline mitigation to reduce air emissions from construction activities (such as maintenance of equipment, switching off machines if not used, state of the art equipment) and Project related truck traffic (e.g. tempo limits, switching off engines when feasible, state of the art vehicles);
ii. The project will undertake stakeholder engagement with affected communities and other stakeholders on a range of issues including changes to the visual environment, noise, waste management and social concerns. This engagement will take place during ESIA disclosure and prior to the commencement of operations. Engagement will also take place during construction and prior to the commencement of operations; and
iii. The project will implement a Grievance Mechanism to address stakeholder concerns related to the Project in a timely manner.

6.4.3.9.3 Increased risk of traffic accidents

The construction works will involve the movement of vehicles carrying various construction materials. Civil and structural construction will increase traffic as vehicles will be needed to clear and level the site, early works, and transport of workers. During construction it is expected that there will be an increase in road traffic on the M12 highway due to the transportation of goods, equipment and workers.

Mitigation measures:

i. Conducting routine public safety sensitisation campaigns in schools to civic-educate children of the regulations and legal requirements pertaining road safety awareness;
ii. Fencing or barricading the perimeter of project sites and using spotters to control entry of community members into the project site;
iii. Employ drivers with the right driving licence category and clean driving record;

iv. Hire registered transporters and plant operators with road worthy vehicles and machines; and
v. Construction vehicles to observe speed limits at all times.

6.4.3.10 Occupational Health and Safety

Workers' occupational health and safety needs to be considered to avoid accidents and injuries, labour abuses and to ensure fair treatment and working conditions. These issues should be considered not only for those who are directly employed by the contractor, but also their sub-contractors and those within the supply chain. The potential for occupational health and safety incidents throughout the life cycle of the project is high during construction phase.

6.4.3.10.1 Increased risk of accidents and exposure to hazardous material

Workers involved in construction works will be exposed to various occupational risks, the project activities will bring about hazards such as use of large machinery and equipment, working in close proximity with water, working at height, use of electrical tools, trips and falls, use of hazardous and flammable chemicals just to mention a few.

Mitigation measures:

i. Training the workers on the risks associated with construction activities;
ii. Providing appropriate and recommended Personal Protective Equipment (PPE) for workers' protection; and
iii. Conducting sensitisations or awareness campaigns to workers on health and safety.

6.4.3.10.2 Increased risk to diseases, STIs and HIV and AIDS

Interactions between workers can increase the likelihood of spreading HIV and AIDS.

Mitigation measures:

i. Develop an HIV and AIDS Workplace Policy;
ii. Sensitize workers on HIV and AIDS prevention;
iii. Free condoms to be made available to workers and the surrounding communities; and
iv. Distribution of Information, Education and Communication (IEC) materials on STIs including HIV and AIDS.

6.4.4 Identified Negative Impacts During Operation Phase

6.4.4.1 Economy and Livelihoods

During the operations phase, the proposed project is expected to have impacts related to the socio-economic status in the area of impact, which are similar to those observed during the construction phase. The project area of impact is not an established industrial site and is located in the rural outskirts of Lilongwe city. The project area is in the middle of agriculture fields that belong to smallholder farmers from the nearby village of Chisikwa. In view of this, two negative impacts to the economy and livelihood of the people in the area is in relation to increased incidences of child labour and increased cases of sexual harassment and GBV.

6.4.3.1.1 Increased incidences of child labour

The impact of child labour exploitation in the project area is expected to be medium-term during the operation phase. Child labour may not necessarily be in the form of full-time employees, but may involve the seasonal workers, who are difficult to account for. This calls for the proposed project to take serious measures to control and monitor that this does not happen in the project's area of impact.

Mitigation measures:

i. Sensitize local leaders, children and the community at large on prohibition of any forms of child labour at the project site;
ii. Support school civic education initiatives to keep children in the project area in school;
iii. Display posters at the project site that warn and inform against child labour; and
iv. Put in place proper procedures for reporting and addressing child labour cases.

6.4.4.1.2 Increased cases of sexual harassment, Gender Inequality and GBV at Work Place

Gender inequalities in Malawian workplaces are affecting women and it is these women who have the right to greater equality. The success of promoting gender equality in Malawi is the responsibility of all every Malawian and AVC will ensure gender equality in all its operations. In addition to promoting gender equality, the Project will also aim at tackling incidences of GBV at the factory with the aim of creating a conducive working environment for people of both sexes. With increased recruitment of both males and females at the plant, cases of sexual harassment are likely to take place.

Mitigation measures:

i. Ensure provision of full and genuine access to all occupations, including to leadership roles for women and men;
ii. Develop a workplace gender equality policy that clearly outlines the companies stated gender equality intent, priorities and practices. This is an important tool for communicating to managers and employees the expectations and standards to ensure that women and men are equally represented, valued and rewarded in the organisation;
iii. Ensure provision for both women and men access to equal opportunities and outcomes, including equal remuneration for work of equal or comparable value;
iv. Remove barriers to allow the full and equal participation of women in the workforce;
v. Ensure provision of full and genuine access to all occupations, including to leadership roles for women and men;
vi. Enforce punitive and disciplinary measures, including dismissal from employment on any employee involved in any cases of sexual harassment and GBV;
vii. Developing and enforcing an Anti-Sexual Harassment Policy prohibiting sexual harassment or violation of any kind in the workplace. The policy will include an incident referral and reporting plan;
viii. Develop a policy on GBV and workplace that aims at preventing and addressing cases of GBV in any form, whether as an act of workplace violence or as occurs in any employee's personal life;

ix. Communicating to all employees that sexual harassment and GBV offences will result into immediate investigation, and/or potential suspension or potential termination of the contract and involvement of the police and the courts more serious offences such as sexual assault;
x. Training all employees Anti-Sexual Harassment Policy, GBV and national law and regulatory requirements regarding sexual harassment; and
xi. Encouraging employees to report any sexual harassment and GBV related issues or suspected cases at the factory.

6.4.4.1.3 Increased chances of theft and vandalism due to increased size of infrastructure

The high unemployment rates due to rapid population growth and small economic base contribute to criminal activity in the study area. Cases of vandalism and theft on various institutions are reported in the project area. Vandalism and theft may lead to loss of significant factory equipment and facilities that may result in non-operation of the plant. Vandalism and theft also would have an impact on the maintenance cost of the factory.

Mitigation Measures:

i. Periodically conduct consultations and sensitizations with villages and group village heads and security personnel;
ii. Provide security at the factory site;
iii. Support activities of the neighbourhood watch (community policing);
iv. Reward for reports of vandalism and theft that may lead to capture; and
v. Theft and vandalism cases must be reported to the police.

6.4.4.2 Air Quality & Fugitive Emissions

Air pollution during the operation phase is expected to be of low significance because of the type of production method to be utilised. The two main sources of air pollution are expected to be dust emissions and combustion emissions.

6.4.4.2.1 Increased generation of particulate matter (especially dust)

Dust and particulate matter emission are anticipated to be of low significance and to have short-term impact. The factory area will be covered with paved access roads; however, the dust is expected to be generated by vehicles coming to the factory after branching off the Lilongwe to Mchinji tarmac road and blowing of wind in bare areas of the factory.

Mitigation measures

i. All transported materials must be covered with tarpaulins and to prevent fugitive dust;
ii. Vehicle speeds shall be limited to 40 km/hr on the gravel access roads to prevent generation of dust;
iii. Ornamental trees will be planted around the plant and perimeter wall will be constructed to act as wind breaks to prevent dust being blown from open surfaces; and
iv. Ensure continuous maintenance of all paved surfaces in the factory.

6.4.4.2.2 Increase in combustion emissions

The main source of air pollution during the operation phase is expected to be greenhouse gas and specifically carbon dioxide, which will be released into the atmosphere from the burning of fossil fuels. The factories will need energy source to power the boiler that will be obtained from fossil fuel burning, in particular coal. Air pollutants expected to be emitted by coal-fired boiler include carbon dioxide (CO_2), Sulphur dioxide (SO_2), Nitrogen Oxides (NOx) and various other hydrocarbons. These gasses will also be generated by the vehicles delivering various material to and from the factory area.

Mitigation measures

i. Boiler to be fitted with emission stack of 30m height to be fitted with filters and scrubbers. At this height and with the existing air parameters such as quality and speed, it is anticipated that the emissions from the stack will be dispersed ensuring that impact is negligible;
ii. Undertake regular maintenance schedule of plant to verify that the boiler and other plant equipment are operating at design optimum conditions to maintain a negligible impact on ambient air quality;
iii. Company vehicles to be maintained and inspected regularly; and
iv. When not in use, vehicles will be switched off, unless impractical for health and safety reasons.

6.4.4.3 Water Quality and Resource

Water is one of the major raw materials to be used in the production processes during the operation phase. The water supply to this site will be from the borehole as the Central Region Water Board does not yet supply water to the project area. In addition, there will be water storage tanks constructed to store adequate water to cater for a 24 hour non interruption of supply to the site. The usage of water is envisaged to be no-more-than 10,000 litres/day. Impacts on water quality and resource have been identified to be in two forms of affecting surface and groundwater quality and affect water availability in the Project area.

6.4.4.3.1Degradation of surface and groundwater quality

During the operation phase, there will be continued risk of pollution to water resources on and within the proximity of the Project Site through operation of unplanned events such as accidental oil and fuel spills. The cooking oil manufacturing plants pose a threat of chemical contamination of both surface and groundwater. However, this threat will be dealt with as the project has an embedded control through the provision of containment and secondary containment on all pump and tank installations. Plastic piping (Fluorinated HDPE) with complete containment features to ensure no Chemical spills to ground. This piping ensures no joints are made under the forecourt. The only joints made are made within contained sumps such as tank manholes. In addition, there is also an embedded control that utilises secondary containment of the piping that will be installed which will ensure that if a leak was to occur the hexane would not leak to ground, but flow through to a containment sump and thus be detected and acted upon. It should be noted that no effluent will be discharged from the operations as it will be required in the boiler section of the plant to cool the equipment. All the water within

the plant will be recycled. For the hexane, it will be extracted from the oil within the plant and sent back to the process to be re-used again.

Mitigation measures:

i. Undertake regular maintenance schedule of plant to verify that the all provisions for containment and secondary containment on all pump, tank and plastic piping installations are operating at design optimum conditions to ensure no Chemical spills to ground;
ii. Install monitoring or inspection wells for ground water contamination. Three inspection wells will be installed per tank and will be monitored regularly;
iii. Provide adequate toilets and shower-rooms for the workers that will be connected to septic tanks;
iv. All hazardous materials will be stored in line with the requirements of the Operation Management Plan to prevent contamination of the surface and groundwater. Chemicals and other hazardous liquids will be contained in compatible, appropriately sealed and labelled containers to prevent reaction with containers and spillage during handling;
v. Any accidental chemical, fuel, and oil spills that occur at the site will be cleaned up in the appropriate manner as related to the nature of the spill. At least two containments and clean up kits should be available onsite and clean-up from any spill should be contained and handled as hazardous waste;
vi. Runoff from wash down areas must be passed through a settlement tank to ensure that potentially contaminated water does not enter the surrounding environment; and
vii. Storm water run-off will be discharged off the project site through a stormwater drain that will be emptying into Nthazi Stream.

6.4.4.3.2 Reduced water availability

The project will be extracting 10,000 litres a day when operating at full capacity and this may have a direct impact on water availability in nearby community wells. However, the recycling system of the plant is expected to reduce the volume of water being extracted when the project is fully operational. The impact is anticipated during the later dry season months. Depending on the properties of the aquifers used by local communities, which is unknown, the project abstraction may result in significant short-term drawdown in nearby wells. However, in the absence of modelled or site recorded data, the impact on water availability is assessed to be minor once mitigation measures are put in place.

Mitigation measure:

i. In the absence of formal modelling of the proposed abstraction boreholes, on-going communication will be maintained with the nearby communities to determine if there is an associated response observed in the community wells. Should this occur, the Project will take steps to ensure reliable supply is maintained to the affected communities.

6.4.4.4Noise and Vibration

The operation phase is not expected to have impulsive sounds to have a high risk to the project area. This is enhanced with the observation that potential receptors are located at a safe distance with the nearest dwelling unit or household being located about a kilometre away from the factory site. The potential sources of noise from the factory include high-pressure fans, boiler feed pumps, compressors, vacuum pumps, workshop and maintenance operations; all of which will be housed in the factory buildings. Further noise will be generated by the trucks delivering raw materials and product collection.

Mitigation Measures:

i. Noise levels should not result in a maximum increase in background levels of 3dBA at the nearest receptor location off site or exceed 55dBA during the day time (06:00-18:00) and 45 dBA during the night time (18:00- 06:00);
ii. Follow the grievance mechanism procedure should a grievance be logged regarding noise levels;
iii. Vehicles must adhere to the 40km/hr speed limit on site, and not exceed the national speed limits when using public roads;
iv. Vehicles to be turned off and no engine idling to be permitted;
v. Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures; and
vi. Incorporate sound attenuation lining within the machinery stack to reduce noise as well as in the buildings that will house noise generating equipment.

6.4.4.5 Waste

Wastes generated during the operation of the plant include non-hazardous general refuse, hazardous waste and sewage. Non-hazardous general refuse will consist of impurities, hulls, packaging waste, food waste, plastic and waste paper. Hazardous waste will be generated during the factory operation from the maintenance of the plant and may include used paint, transformer oil, hydraulic fluids, waste fuel oil, spent solvents, oil waste, contaminated chemicals and oil containers and waste from cleaning off accidental spillages or leakages of hazardous waste containers. Waste disposal and handling facilities are lacking in the Project area. General waste is indiscriminately deposited on the roadside or in open spaces and the waste that is disposed at the Lilongwe City Council dump site is comingled with hazardous waste.

6.4.4.5.1 Increased generation of non-hazardous and general waste

Operation phase activities will generate waste comprising impurities, hulls, packaging waste, food waste, plastic and waste paper. Approximately 215 employees will be required during the operation phase of the project. Reusable waste can also be collected, reused or recycled. Such waste would mainly include paper, metals, glass, plastics and wood etc. Waste requiring treatment or disposal could include organic waste, domestic wastes that contain chemicals or other solid wastes which cannot be reused.

Mitigation measures:

i. An Operation Waste Management Plan (OWMP) for the project should be prepared and implemented as a best practice;
ii. Establish waste management priorities and hierarchy at the outset of activities based on the understanding of potential environmental, health and safety risks and impacts;
iii. Train and encourage local farmers to collect husks and use them as manure;
iv. Periodically review applicable regulations to ensure that the necessary waste disposal permits and licence are obtained;
v. Design operation processes to prevent/minimise quantities of wastes generated and hazards associated with the waste generated;
vi. Identify potential opportunities to recycle material into the design /identify products that can be provided to external markets; and
vii. Implement an inventory of materials inventory management system to minimise over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period (such as ready mixed concrete).

6.4.4.5.2 Increased generation of hazardous waste

Hazardous waste generated from the construction of the Project may include spent batteries or spent acid& alkali from the maintenance of the machinery on site and spent solvents from equipment cleaning activities. The production process will have control over the amount and types of hazardous waste produced at the site.

Mitigation measures:

i. Adopt processes which generate reduced quantities or even no hazardous waste, or less dangerous types of hazardous wastes where practicable;
ii. Store wastes in closed containers away from direct sunlight, wind and rain;
iii. Segregate hazardous waste from non-hazardous waste;
iv. Clearly label hazardous wastes (including providing information on chemical compatibility) and storage area;
v. Ensure storage area has an impermeable floor and containment, and has adequate ventilation of capacity to accommodate 100% of the volume of the largest waste container;
vi. Ensure staff are trained to handle and package hazardous wastes;
vii. Prepare spill response and emergency plans that incorporate potential accidental release of hazardous waste
viii. Ensure an approved hazardous waste collector is used;
ix. Ensure transport is conducted to minimise spills, release and exposures to employees;
x. All waste to be stored in containers and disposed at EAD approved disposal sites;
xi. Maintain records on the type and quantity of hazardous waste; and
xii. Records in the form of chain of custody documents should be kept of transfers of hazardous waste (trip tickets) to ensure wastes are transported by suitable carriers and to a permitted disposal facility.

6.4.4.5.3 Increased sewage generation

Sewage sludge will arise during construction phase from amenities throughout the site. It is anticipated that Water Closet (WC) toilets will be used throughout the project site during the

operation phase, and will be combined with proper water, waste and sanitation systems. Assuming a sludge generation rate of 20l per person per day, it is estimated that 4200l per day of sewage sludge will be generated during the operation phase. Industrial wastewater from the production process is estimated to be 1,200 litres and will contain quantities of soap liquids (not more than 50 litres in volume) similar to wastewater from bathroom. The sewage will be discharged into the septic tanks. Potential impacts associated with the mismanagement of the sewage will be water pollution, localised land contamination and impacts to health.

Mitigation measures:

i. Construct separate WC with hand washing basins for male and female workers and the total number should correspond to 1 wash basin to 20 employees;
ii. Raise awareness among workers regarding hand-washing and general hygiene and sanitation practices; and
iii. Conduct routine maintenance of the septic tank to ensure continual operation.

6.4.4.6Occupational Health and Safety

The operation phase may lead to occupational health and safety issues in particular with respect to waste storage and disposal, maintenance of the plant equipment and the operation of various machinery at the project site.

During its lifetime, the Project will be subject to local labour laws and international standards with respect to the responsibility of the employer to safeguard the health and safety of its employees. The Project is therefore expected to abide by these regulations and develop and implement appropriate health and safety measures covering the operations phase including the use of PPEs by the workforce.

6.4.4.6.1 Increased risk of accidents and exposure to hazardous material

Workers involved in the operation phase will be exposed to various occupational risks, the project activities will bring about hazards such as use of machinery and equipment, use of electrical tools, trips and falls, use of hazardous and flammable chemicals just to mention a few.

Mitigation measures:

i. Training the workers on the risks associated with operation activities;
ii. Use of Personal Protective Equipment (PPEs) will be encouraged. Proper training programme on use of PPEs, characteristics of the material handled and safety precautions will be arranged;
iii. Occupational health surveillance programme will be taken as a regular exercise for all the employees and their records maintained;
iv. Installing nonslip surfaces in areas with potentially slippery floors or subject to frequent wetting such as production area;
v. Maintaining frequently transited areas as dry as possible;
vi. Cover electricity cables that cross walkways;
vii. Keep working areas and walkways well lit;

viii. Display Safety precautions in the premises on the banners, boards etc.;
ix. In order to ensure good health of workers, regular health check-up of the plant workers will be carried out;
x. Develop a Code of Conduct (COC) to regulate the performance and behaviour of all workers, including provision for disciplinary action for anti-social behaviour and non-compliance with health and safety regulations such as lack of use of PPE;
xi. Provide adequate clean water and safe food for all workers; and
xii. Conducting information or awareness campaigns to workers on health and safety.

6.4.4.6.2 Increased risk to diseases, STIs and HIV and AIDS

Interactions between workers coupled with increase in disposable income would result in sexual encounters that can increase the likelihood of spreading HIV and AIDS.

Mitigation measures:

i. Develop and implement an HIV & AIDS policy and a prevention, treatment, care and support programme;
ii. Sensitize workers on HIV and AIDS prevention;
iii. Free condoms to be made available to workers; and
iv. Distribution of Information, Education and Communication (IEC) materials on STIs including HIV and AIDS.

6.4.4.6.3 Risk of Fire and Explosion

The factory activities have a potential risk of fire and explosion from various areas. In view of this, it is important that the factory be certified by the Ministry of Labour as being suitable for occupation and having all the necessary fire prevention and fighting equipment.

Mitigation Measures:

i. Conduct routine maintenance of installed fire-fighting equipment;
ii. Establish fire assembly points;
iii. Train employees in firefighting;
iv. Conduct routine fire drills;
v. Install appropriate signage (danger warning signs – No smoking; Flammable; Combustible etc.);
vi. Conduct routine maintenance of installed automatic fire alarm system for the entire development;
vii. Allow for 10000 litres fire reserve water tank attached with an automatic booster pump for hose reel; and
viii. Develop Emergency Management Plan, Incident Management Plan and Fire Prevention Plan.

Chapter Seven: Environmental and Social Management and Monitoring

7.1 Environmental and Social Management Plan

The EIA Guidelines makes provision for the formulation of the Environmental and Social Management Plan (ESMP). The section stipulates actions that should be undertaken by the proponent, communities and government. The plan also guides the process of mitigating negative impacts that have been identified at scoping and screening stages and enhances realization of the positive impacts of the project.

The section has been developed in order to properly implement the ESMP. It includes the following:

- Proposed environmental management measures during pre-construction, construction and post-construction (operation) stages of the Project. For each environmental impact, the corresponding mitigation measure is identified along with the location, timing and responsibility for its implementation and monitoring.
- Institutional arrangements for implementation of the ESMP.
- An outline of an environmental training program for Project proponent and contractor staff.
- Monitoring details, including monitoring indicators and a monitoring plan together with an estimate of costs.
- Reporting procedures including reporting timeframes.

The identified environmental and social impacts in Table 7-1 were derived from the field investigations, consultation with community members, district and national government agents, focus group discussions, a participatory rapid assessment within the project area and professional judgment, with respect to the expected activities and the list of impacts is by no means exhaustive.

During all phases of the project, the developer will be required to adhere to all applicable mitigation measures set out in the ESMP. However, a detailed ESMP has been presented and will be implemented as per the following Table 7-1.

Table 7-1: Environmental and Social Management Plan for Positive Impacts of the Project

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
1	***Environmental and Social Management Plan during Construction Phase***				
1.1	**Impacts on Economy and Livelihoods**				
1.1.1	Creation of local employment opportunities and capacity building including.	Match responsibilities of the employed women, members of the vulnerable group and the youth to their abilities;	During construction phase	LWC; Contractor	MWK 2,000,000.00
		Developing effective communication through relevant institutions about employment opportunities targeted to men and women, and this is to be done in a fair, consistent and transparent manner;			
		Provide equal employment opportunity to women;			
		Enforce the Malawi labour laws; and			
		Wages must be above the minimum wage and overtime must be paid on time.			
1.1.2	Availability of market for construction materials and services	Pay building material supplies within the agreed time;	During construction phase	LWC; Contractor	MWK 2,000,000.00
		Where possible source materials from approved licenced suppliers;			
		Pay all associated taxes to the Malawi Revenue Authority; and			
		Where possible buy materials manufactured in Malawi.			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
1.1.3	Benefits from capacity enhancement through on-the-job training	Maximise employment of local people particularly for the unskilled labour force; Make deliberate effort to pair skilled and unskilled workers during various construction assignments; and Formalise on-the-job trainings for local unskilled labour that also includes learning targets and performance monitoring.	During construction phase	LWC; Contractor	MWK 1,500,000.00
2	***Environmental and Social Management Plan during Operation and Maintenance Phase***				
2.1	**Flora and Fauna**				
2.1.1	Improved wildlife rescue and welfare services	Ensure availability of drugs and other essentials for operation of the clinic; Engage qualified personnel to carry out wildlife rescue and welfare services; and Conduct public awareness campaigns of LWC services amongst communities living in proximity to wildlife reserves to encourage them report cases	Annually during Operation Phase	LWC	MWK 2,000,000.00
2.1.2	Improved provision of environmental education and advocacy services	Continuously update the environmental education programme to be in line with the national curriculum; Raise awareness amongst schools of the environmental education programmes to encourage educational visits from schools in the country;	Annually during Operation Phase	LWC, DNPW	MWK 1,500,000.00

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		Provide disability and child friendly facilities at the LWC;			
		Participate in international and national environmental and wildlife commemorative events; and			
		Engage qualified tour guides and education officers, and continually offer them refresher trainings.			
2.1.3	Provision of natural green space and responsible tourism for the city	Provide protection to the natural forest to prevent cutting down of trees;	Annually during Operation Phase	LWC	MWK 500,000.00
		Ensure that gate fee is affordable to the local residents of the city; and			
		Ensure continuous maintenance of the facilities at the LWC.			
2.2	**Impacts on Economy and Livelihoods**				
2.2.1	increased supply of cooking oil	The refinery will endeavour to offer cooking oil and animal feed at affordable prices that can be afforded by Malawian consumers; and	During Operation Phase	LWC	MWK 2,000,000.00
		Ensure continuous supply of high-quality cooking oil and animal feed products under strict quality control systems that meet relevant local and international standards.			

Table 7-2: Environmental and Social Management Plan for Negative Impacts of the Project

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
1	***Environmental and Social Management Plan during Construction Phase***				
1.1	**Impact on Economy and Livelihoods**				
1.1.1	Increased incidences of child labour	Inclusion of a clause in the contract with the building contractor that prohibits any forms of child labour on the project;	During Construction Phase	LWC; Contractor	MWK 500,000.00
		Display posters at the project site that warn and inform against child labour; and			
		Put in place proper procedures for reporting and addressing child labour cases			
1.1.2	Increased cases of sexual harassment and Gender Based Violence	Enforce punitive and disciplinary measures, including dismissal from employment on any project workers involved in any social malpractices;	During Construction Phase	LWC; Contractor	MWK 500,000.00
		Develop and enforce an Anti-Sexual Harassment Policy prohibiting sexual harassment or violation of any kind in the workplace. The policy will include an incident referral and reporting plan;			
		Communicating to all employees and all subcontractors that sexual harassment offences will result into immediate investigation, and/or potential suspension or potential termination of the contract and involvement of the police and			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		the courts more serious offences such as sexual assault;			
		Training all employees and subcontractors on the Contractors' Anti-Sexual Harassment Policy and national law and regulatory requirements regarding sexual harassment; and			
		Encouraging employees to report any sexual harassment-related issues or suspected sexual harassment actions.			
1.2	**Impact on Air**				
1.2.1	Increased generation of particulate matter (especially dust)	All transported materials must be covered with tarpaulins and to prevent fugitive dust;	During Construction Phase	LWC; Contractor	MWK 400,000.00
		Restrict the removal of vegetation and soil cover to the necessary for the project;			
		Apply water to earth roads and civil works to suppress dust; and			
		Vehicle speeds shall be limited to 20 km/hr within the construction site and 40 km/hr in sanctuary to prevent generation of dust.			
1.2.2	Increase in combustion emissions	Avoid burning of cleared vegetation;	During Construction Phase	LWC; Contractor	MWK 200,000.00
		All construction vehicles and equipment must be regularly maintained to minimize exhaust emissions; and			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		When not in use, vehicles will be switched off, unless impractical for health and safety reasons.			
1.3	**Impact on Water Quality and Resource**				
1.3.1	Reduced water drainage and increase in flooding	Non- contact water (water which has not potentially picked up contaminants such as process chemicals or hydrocarbons) will be allowed to infiltrate the ground, where practical, rather than being collected in impermeable storm water drains where evaporation is enhanced; and	During Construction Phase	LWC; Contractor	MWK 300,000.00
		Where possible, earth-works to be scheduled during the dry season.			
1.4.2	Degradation of surface and groundwater quality	Put in place measures for the control of soil erosion such as minimal site clearing and provision of sand bags and silt fences;	During Construction Phase	LWC; Contractor	MWK 600,000.00
		Provide adequate sanitary facilities for the workers on site;			
		Training vehicle and fuel service truck drivers, mobile machinery operators, and fuel operators from the mobile fuel tanks, and workers working with hazardous chemicals in proper spill prevention and response;			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		Using spill kit such as drip trays, absorbents and shovels to contain oil spills from vehicles or mobile machinery under service and for removal of contaminated soils;			
		Refuelling and maintenance of vehicles, machinery and equipment to be done on bunded areas;			
		Labelling all hazardous substances correctly;			
		Storing hazardous substances in protected areas such as in well ventilated rooms to limit their exposure to rainy conditions; and			
		Responding and reporting spills promptly.			
1.4	**Impact on Soil and Land**				
1.4.1	Increased susceptibility of soil to erosion	Stripping of topsoil will not be conducted earlier than required (maintain vegetation cover for as long as possible) in order to prevent the erosion (wind and water) of organic matter, clay and silt;	During Construction Phase	LWC; Contractor	MWK 400,000.00
		Stripped control measures such as intercept drains and toe berms will be constructed where necessary;			
		Soil stockpiles will be sampled, ameliorated (if necessary) and re-vegetated as soon after construction as possible. This is in order to			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		limit raindrop and wind energy, as well as to slow and trap runoff, thereby reducing soil erosion; and			
		Access roads will be well drained in order to limit soil erosion			
1.5	**Impact on Waste**				
1.5.1	Increased generation of non-hazardous and general waste	A Construction Waste Management Plan (CWMP) for the project should be prepared and implemented by the Contractor during the construction phase;	During Construction Phase	LWC; Contractor	MWK 300,000.00
		Establish waste management priorities and hierarchy at the outset of activities based on the understanding of potential environmental, health and safety risks and impacts;			
		Periodically review applicable regulations to ensure that the necessary waste disposal permits and licence are obtained;			
		Design construction processes to prevent/minimise quantities of wastes generated and hazards associated with the waste generated;			
		Identify potential opportunities to recycle material into the design /identify products that can be provided to external markets;			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		Properly store the construction materials to minimise the potential damage or contamination of materials;			
		Implement a construction materials inventory management system to minimise over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period (such as ready mixed concrete).			
1.5.2	Increased generation of hazardous waste	Adopt processes which generate reduced quantities or even no hazardous waste, or less dangerous types of hazardous wastes where practicable;	During Construction Phase	LWC; Contractor	MWK 300,000.00
		Store wastes in closed containers away from direct sunlight, wind and rain;			
		Segregate hazardous waste from non-hazardous waste;			
		Clearly label hazardous wastes (including providing information on chemical compatibility) and storage area;			
		Ensure storage area has an impermeable floor and containment, and has adequate ventilation of capacity to accommodate 100% of the volume of the largest waste container;			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		Ensure staff are trained to handle and package hazardous wastes;			
		Prepare spill response and emergency plans that incorporate potential accidental release of hazardous waste			
		Ensure an approved hazardous waste collector is used;			
		Ensure transport is conducted to minimise spills, release and exposures to employees;			
		All waste to be stored in containers and disposed at EAD approved disposal sites;			
		Maintain records on the type and quantity of hazardous waste; and			
		Records in the form of chain of custody documents should be kept of transfers of hazardous waste (trip tickets) to ensure wastes are transported by suitable carriers and to a permitted disposal facility.			
1.5.3	Increased sewage generation	Appropriately site toilet facilities to minimise potential soil and surface/groundwater contamination impacts;	During Construction Phase	Contractor	MWK 750,000.00
		Construct separate pit-latrines with hand washing basins for male and female workers			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		and the total number should correspond to 1 wash basin to 20 employees; and			
		Raise awareness among workers regarding handwashing and general hygiene and sanitation practices.			
1.6	**Impact on Flora and Fauna**				
1.6.1	Loss of natural habitat for flora and fauna	Confining bush and land clearing activities to the project area and minimizing habitat destruction;	During Construction Phase	Contractor	MWK 300,000.00
		Clearly mark out the extent of clearing within the worksite area with pegs at 10m intervals or less;			
		Ensure that invasive species are not introduced into the area through vehicle movements and any other possible means;			
		Ensure that construction workers are not allowed to harvest natural resources unless approved by the project's environmental inspectors; and			
		Provide training to construction workers to ensure an understanding of the requirements regarding environmental protection sites.			
1.7	**Impact on Occupational Health and Safety**				

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
1.7.1	Increased risk of accidents and exposure to hazardous material	Training the workers on the risks associated with construction activities; Providing appropriate and recommended personal protective equipment (PPE) for workers' protection; and Conducting information or awareness campaigns to workers on health and safety.	During Construction Phase	LWC; Contractor.	MWK 500,000.00
1.7.2	Increased risk to diseases, STIs and HIV and AIDS	Develop an HIV and AIDS Workplace Policy; Sensitize workers on HIV and AIDS prevention; Free condoms to be made available to workers; and Distribution of Information, Education and Communication (IEC) materials on STIs including HIV and AIDS.	During Construction Phase	LWC; Contractor.	MWK 500,000.00
2	***Environmental and Social Management Plan during Operation and Maintenance Phase***				
2.1	**Impact on Economy and Livelihoods**				
2.1.1	Increased incidences of child labour	Display posters at the project site that warn and inform against child labour; and Put in place proper procedures for reporting and addressing child labour cases.	Biannually during Operation Phase	LWC	MWK 150,000.00

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
2.1.2	Increased cases of sexual harassment and Gender Based Violence	Ensure provision of full and genuine access to all occupations, including to leadership roles for women and men;	Quarterly during Operation Phase	LWC	MWK 120,000.00
		Develop a workplace gender equality policy that clearly outlines the companies stated gender equality intent, priorities and practices;			
		Ensure provision for both women and men access to equal opportunities and outcomes, including equal remuneration for work of equal or comparable value;			
		Remove barriers to allow the full and equal participation of women in the workforce;			
		Ensure provision of full and genuine access to all occupations, including to leadership roles for women and men;			
		Enforce punitive and disciplinary measures, including dismissal from employment on any employee involved in any cases of sexual harassment and GBV;			
		Developing and enforcing an Anti-Sexual Harassment Policy prohibiting sexual harassment or violation of any kind in the workplace. The policy will include an incident referral and reporting plan;			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		Develop a policy on GBV and workplace that aims at preventing and addressing cases of GBV in any form, whether as an act of workplace violence or as occurs in any employee's personal life;			
		Communicating to all employees that sexual harassment and GBV offences will result into immediate investigation, and/or potential suspension or potential termination of the contract and involvement of the police and the courts more serious offences such as sexual assault;			
		Training all employees Anti-Sexual Harassment Policy, GBV and national law and regulatory requirements regarding sexual harassment; and			
		Encouraging employees to report any sexual harassment and GBV related issues or suspected cases at the factory.			
2.2	**Impact on Air Quality**				
2.2.1	Increased generation of	All transported materials must be covered with tarpaulins and to prevent fugitive dust;	Annually during Operation Phase	LWC	MWK 300,000.00

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
	particulate matter (especially dust)	Vehicle speeds shall be limited to 40 km/hr on the gravel access roads to prevent generation of dust; and			
		Ensure continuous maintenance of all paved surfaces in the sanctuary.			
2.3	**Impact on Noise and Vibration**				
2.3.1	Increase in ambient sound levels	Noise levels should not result in a maximum increase in background levels of 3 dBA at the nearest receptor location off site or exceed 55 dBA during the day time (06:00- 18:00) and 45 dBA during the night time (18:00- 06:00);	During Operation Phase	LWC	MWK 300,000.00
		Follow the grievance mechanism procedure should a grievance be logged regarding noise levels;			
		Vehicles must adhere to the 40km/hr speed limit on site, and not exceed the national speed limits when using public roads;			
		Vehicles to be turned off and no engine idling to be permitted;			
		Incorporate sound attenuation in the buildings that will house noise generating equipment.			
2.4	**Impact on Waste**				

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
2.4.1	Increased generation of non-hazardous and general waste	An Operation Waste Management Plan (OWMP) for the project should be prepared and implemented as a best practice;	During Operation Phase	LWC	MWK 600,000.00
		Establish waste management priorities and hierarchy at the outset of activities based on the understanding of potential environmental, health and safety risks and impacts;			
		Periodically review applicable regulations to ensure that the necessary waste disposal permits and licence are obtained;			
		Design operation processes to prevent/minimise quantities of wastes generated and hazards associated with the waste generated; and			
		Identify potential opportunities to recycle material into the design /identify products that can be provided to external markets.			
2.4.2	Increased generation of hazardous waste	Segregate waste at source of generation by disposing of into appropriate colour coded waste receptacles;	During Operation Phase	LWC	MWK 600,000.00
		Store wastes in closed containers away from direct sunlight, wind and rain;			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		Veterinary waste to be disposed in high-temperature incineration at Kamuzu Central Hospital			
		Clearly label hazardous wastes (including providing information on chemical compatibility) and storage area;			
		Ensure storage area has an impermeable floor and containment, and has adequate ventilation of capacity to accommodate 100% of the volume of the largest waste container;			
		Ensure staff are trained to handle and package hazardous wastes;			
		Ensure an approved hazardous waste collector is used; and			
		Maintain records on the type and quantity of hazardous waste.			
2.5	**Impact on Occupational Health and Safety**				
2.5.1	Increased risk of accidents and exposure to hazardous material	Training the workers on the risks associated with operation activities;	Biannually during Operation Phase	LWC	MWK 1,500,000.00
		Use of Personal Protective Equipment (PPEs) will be encouraged. Proper training programme on use of PPEs, characteristics of the material handled and safety precautions will be arranged;			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
		Occupational health surveillance programme will be taken as a regular exercise for all the employees and their records maintained;			
		Display Safety precautions in the premises on the banners, boards etc.;			
		Develop a Code of Conduct (COC) to regulate the performance and behaviour of all workers, including provision for disciplinary action for anti-social behaviour and non-compliance with health and safety regulations such as lack of use of PPE; and			
		Conducting information or awareness campaigns to workers on health and safety.			
2.5.2	Increased risk to diseases, STIs and HIV and AIDS	Develop and implement an HIV & AIDS policy and a prevention, treatment, care and support programme;	Biannually during Operation Phase	LWC; District AIDS Coordinator	MWK 400,000.00
		Sensitize workers on HIV and AIDS prevention;			
		Free condoms to be made available to workers; and			
		Distribution of Information, Education and Communication (IEC) materials on STIs including HIV and AIDS.			

SN	Potential Environmental and Social Impacts	Recommended enhancement / mitigation	Schedule for implementation	Responsible institution	Implementation cost (MWK)
2.6.3	Risk of Fire and Explosion	Conduct routine maintenance of installed fire-fighting equipment;	Biannually during Operation Phase	LWC	MWK 600,000.00
		Establish fire assembly points;			
		Train employees in firefighting;			
		Conduct routine fire drills;			
		Install appropriate signage (danger warning signs – No smoking; Flammable; Combustible etc.); and			
		Develop Emergency Management Plan, Incident Management Plan and Fire Prevention Plan			

7.2 Environmental and Social Monitoring Plan

The monitoring plan (Table 7-3) has been designed to cover all the potential impacts, verifiable indicators, frequency of monitoring, responsible organisations for carrying out the monitoring and those for receiving the reports. The environmental and social monitoring plan provides for monitoring to checking implementation of the enhancement and mitigation measures proposed in the ESMP. The monitoring plan gives monitoring indicators, means of their verification, frequency of monitoring and the stakeholders responsible for monitoring. The costs for carrying out the monitoring activities include travel expense and allowances to get to the project site and to monitor implementation of the ESMP; mainly by Lilongwe District Council officers and other institutions based in Lilongwe city.

The environmental monitoring plan helps to verify the magnitude, duration and scope of the predicted impacts during and after implementing the mitigation measures. It also helps to detect any unforeseen impacts at an early stage so that corrective measures can be taken before significant damage takes place on the society of the environment. Hence monitoring implementation of the ESMP requires dedication and persistent follow up, especially during the construction and operation phases of the project. It requires coordination with professionals from various key stakeholders to verify that all mitigation measures in the ESMP are being implemented on time and as recommended.

Other than environmental monitoring, there is need for a competent consultant to supervise the construction works. This would ensure that the works are carried out according to recommended building standards, design plans and schedules.

Table 7-3: Environmental and Social Monitoring Plan

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
1	**POSITIVE IMPACTS**						
1.1	***Environmental and Social Management Plan during Construction Phase***						
1.1.1	**Impacts on Economy and Livelihoods**						
1.1.1.1	Creation of local employment opportunities and capacity building including.	Match responsibilities of the employed women, members of the vulnerable group and the youth to their abilities;	Percentage of vulnerable groups in specific job role.	Inspection; Interviews	Monthly during Construction Phase	LWC; Ministry responsible for Labour	MWK 300,000.00
		Provide equal employment opportunity to women;	Percentage of women	Review employment register			
		Enforce the Malawi labour laws; and	Number of labour related cases/ complaints recorded/ reported	Interviews; Review Case/ Complaint report files			
		Wages must be above the minimum wage and overtime must be paid on time.	Amount paid as wages including for over time.	Review pay roll records			
1.1.1.2	Availability of market for construction	Pay building material supplies within the agreed time;	Number of days between delivery and payment	Review procurement records	Quarterly during Construction Phase	LWC; Ministry responsible for Trade;	MWK 150,000.00

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
	materials and services	Where possible source materials from approved licenced suppliers;	Records showing material procured from local suppliers	Review procurement records; Inspections		MRA	
		Pay all associated taxes to the Malawi Revenue Authority; and	Receipts showing Amount of Taxes paid	Review of tax records			
		Where possible buy materials manufactured in Malawi.	Records showing locally manufactured material	Review procurement records			
1.1.1.3	Benefits from capacity enhancement through on-the-job training	Maximise employment of local people particularly for the unskilled labour force;	Number of local people	Review employment register	Quarterly during Construction Phase	LWC; Ministry responsible for Labour	MWK 150,000.00
		Make deliberate effort to pair skilled and unskilled workers during various construction assignments; and	Number of unskilled labours paired with skilled labours	Interviews; Review Training reports			
		Formalise on-the-job trainings for local unskilled labour that also includes	Number of training types being conducted	Review Training Plan and reports			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		learning targets and performance monitoring.					
2	***Environmental and Social Management Plan during Operation and Maintenance Phase***						
1.2.1	**Impacts on Economy and Livelihoods**						
1.2.1.1	Improved wildlife rescue and welfare services	Ensure availability of drugs and other essentials for operation of the clinic;	Quantity of drugs available	Review stores records	Biannually during Operation Phase	DNPW	MWK 120,000.00
		Engage qualified personnel to carry out wildlife rescue and welfare services; and	Number of qualified personnel	Review employment records			
		Conduct public awareness campaigns of LWC services amongst communities living in proximity to wildlife reserves to encourage them report cases	Number of campaigns conducted	Review awareness campaign reports			
1.2.1.2	Improved provision of environmental education and	Continuously update the environmental education programme to be in line with the national curriculum;	Availability of updated education program	Review education program meeting minutes	Annually during Operation Phase	DPNW; EAD	MWK 800,000.00

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
	advocacy services	Raise awareness amongst schools of the environmental education programmes to encourage educational visits from schools in the country;	Number of schools visiting sanctuary	Review visitors' records			
		Provide disability and child friendly facilities at the LWC;	Number of facilities available	Visual inspection			
		Participate in international and national environmental and wildlife commemorative events; and	Number of events commemorated	Review reports			
		Engage qualified tour guides and education officers, and continually offer them refresher trainings.	Number of tour guides and education officers	Review employment records			
1.2.1.3	Provision of natural green space and responsible tourism for the city	Provide protection to the natural forest to prevent cutting down of trees;	Area protected	Conduct biodiversity survey	Annually during Operation Phase	DPNW; EAD	MWK 800,000.00
		Ensure that gate fee is affordable to the local residents of the city; and	Number of visitors	Review financial records			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Ensure continuous maintenance of the facilities at the LWC.	Number of maintenances	Review maintenance records			
1.2.1.4	Employment generation	Match responsibilities of the employed women, members of the vulnerable group and the youth to their abilities;	Percentage of vulnerable groups in specific job role.	Inspection; Interviews	Biannually during Operation Phase	Ministry responsible for Labour	MWK 200,000.00
		Provide equal employment opportunity to women;	Percentage of women	Review employment register			
		Enforce the Malawi labour laws; and	Number of labour related cases/complaints recorded/reported	Interviews; Review Case/Complaint report files			
		Wages must be above the minimum wage and overtime must be paid on time.	Amount paid as wages including for over time.	Review pay roll records			
2	**NEGATIVE IMPACTS**						
2.1	***Environmental and Social Management Plan during Construction Phase***						
2.1.1	**Impact on Economy and Livelihoods**						

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
2.1.1.1	Increased incidences of child labour	Inclusion of a clause in the contract with the building contractor that prohibits any forms of child labour on the project;	Number of clauses	Review Contracts	Quarterly during Construction Phase	Ministry responsible for Labour; Ministry responsible for Child Protection	MWK 250,000.00
		Display posters at the project site that warn and inform against child labour; and	Number of posters displayed	Visual Inspections			
		Put in place proper procedures for reporting and addressing child labour cases	Number of reports	Review reports on child labour cases			
2.1.1.2	Increased cases of sexual harassment and Gender Based Violence	Enforce punitive and disciplinary measures, including dismissal from employment on any project workers involved in any social malpractices with surrounding communities;	Number of disciplinary cases	Review reports on GBV and Sexual Harassment	Quarterly during Construction Phase	Ministry responsible for Labour; Ministry responsible for Gender	*Cost included in 2.1.1.2*
		Developing and enforcing an Anti-Sexual Harassment Policy prohibiting sexual harassment or violation of any kind in the workplace. The policy will include an incident referral and reporting plan;	Availability of policy	Review Policy			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Communicating to all employees and all subcontractors that sexual harassment offences will result into immediate investigation, and/or potential suspension or potential termination of the contract and involvement of the police and the courts more serious offences such as sexual assault;	Number of sensitisation meetings	Review sensitization meeting reports			
		Training all employees and subcontractors on the Contractors' Anti-Sexual Harassment Policy and national law and regulatory requirements regarding sexual harassment;	Number of employees trained	Review Training Reports			
		Conducting routine community and stakeholder sensitization routine community and stakeholder sensitization and awareness campaigns on defence against sexual harassment; and	Number of sensitisation meetings	Review sensitization meeting reports			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Encouraging employees to report any sexual harassment-related issues or suspected sexual harassment actions.	Number of cases reported	Review reports on cases			
2.1.2	**Impact on Air**						
2.1.2.1	Increased generation of particulate matter (especially dust)	All transported materials must be covered with tarpaulins and to prevent fugitive dust;	Number of vehicles with tarpaulins	Interviews; Random checks/inspections	Quarterly during Construction Phase	EAD; Contractor	MWK 200,000.00
		Restrict the removal of vegetation and soil cover to the necessary for the project;	Size of area cleared	Measurement; Visual inspection			
		Apply water to earth roads and civil works to suppress dust; and	absence of dust in the civil works area	Interviews; Random checks/inspections			
		Vehicle speeds shall be limited to 20 km/hr within the construction site and 40 km/hr in the sanctuary to prevent generation of dust.	Vehicle speeds	Interviews; Random checks/inspections			
2.1.2.2	Increase in combustion emissions	Avoid burning of cleared vegetation;	absence of burnt vegetation	Measurement; Visual inspection	Monthly during	EAD; District Land	MWK 250,000.00

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		All construction vehicles must be regularly maintained to minimize exhaust emissions; and	Number of routine maintenances	Review maintenance reports	Construction Phase	Conservation officer	
		When not in use, vehicles will be switched off, unless impractical for health and safety reasons.	Duration engine is left idling	Interviews; Random checks/inspections			
2.1.2.3	Increase in ambient sound levels	Limiting civil works to day time and at night, civil works should strictly be carried out at least 100 m for the nearest institution;	Time for conducting works	Interviews; Random checks/inspections	Monthly during Construction Phase	EAD; Ministry responsible for Labour	MWK 250,000.00
		Conducting noise generating activities during normal work hours during the day time;	Time for conducting works	Interviews; Random checks/inspections			
		Monitoring sound levels during civil works using a sound meter. The sound will be monitored at least twice a day and within 10 m, 30m and beyond 50 m of active mobile machinery;	Sound Level	Measurement			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Ensuring that noise levels for residents does not exceed 55 dB (A) and keeping noise levels for workers below 80 dB (A);	Sound Level	Measurement			
		Providing hearing protection to workers working in environments where noise levels exceed 80 dB (A);	Number of workers with hearing protection	Head counts; Interviews			
		Training drivers and workers in noise control such as avoiding unnecessary idling of vehicles and construction machines; and	Number of drivers trained	Review Training Reports			
		Maintaining vehicles and machinery as recommended by the suppliers.	Number of routine maintenances	Review maintenance reports			
2.1.4	**Impact on Water Quality and Resource**						
2.1.4.1	Reduced water drainage and increase in flooding	Non- contact water will be allowed to infiltrate the ground, where practical, rather than being collected in impermeable storm water drains where evaporation is enhanced; and	Presence of non-contact water	Visual Inspections	Monthly during Construction Phase	EAD; District Water Development officer	MWK 500,000.00

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Where possible, earth-works to be scheduled during the dry season.	Time for conducting works	Interviews; Random checks/inspections			
2.1.4.2	Degradation of surface and groundwater quality	Put in place measures for the control of soil erosion such as minimal site clearing and provision of sand bags and silt fences;	Presence of control measures	Measurements; Visual inspections	Monthly during Construction Phase	EAD; District Water Development officer	*Cost included in 2.1.4.1*
		Provide adequate sanitary facilities for the workers on site;	Number of sanitary facilities	Inspections (facility count)			
		Training vehicle and fuel service truck drivers, mobile machinery operators, and fuel operators from the mobile fuel tanks, and workers working with hazardous chemicals in proper spill prevention and response;	Number of employees trained	Review Training Reports			
		Using spill kit such as drip trays, absorbents and shovels to contain oil spills from vehicles or mobile machinery under service and for removal of contaminated soils;	Number of spill kits available on site	Physical counting; inspections			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Refuelling and maintenance of vehicles, machinery and equipment to be done on bunded areas;	Presence of bunded areas	Measurements; Visual inspections			
		Labelling all hazardous substances correctly;	Number of labelled substances	Physical counting; inspections			
		Storing hazardous substances in protected areas such as in well ventilated rooms to limit their exposure to rainy conditions; and	Number of storage facilities	Physical counting; inspections			
		Responding and reporting spills promptly.	Number of reported incidents	Review reports			
2.1.4.3	Reduced water availability	During construction, the contractor will reduce water usage wherever possible so that the Project's water consumption does not have significant adverse impacts on others;	Volume of water consumed	Review water consumption records	Monthly during Construction Phase	EAD; District Water Development officer	*Cost included in 2.1.4.1*

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		In the absence of formal modelling of the proposed abstraction boreholes, on-going communication will be maintained with the nearby communities to determine if there is an associated response observed in the community wells. Should this occur, the Project will take steps to ensure reliable supply is maintained to the affected communities.	Number of complaints	Review Complaints report			
2.1.5	**Impact on Soil and Land**						
2.1.5.1	Contamination of soil with chemicals	Proper storage facilities for chemicals such as oils, diesel and minimise spillage. Minimise spillage from machinery on site through proper maintenance; and	Volume of storage facilities	Measurements; Visual inspections	Monthly during Construction Phase	Environmental Affairs Department	MWK 200,000.00
		Install a collector in workshops/garages to collect oil during maintenance works.	Presence and Number of oil collectors in place	Physical counting; inspections			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
2.1.5.2	Increased susceptibility of soil to erosion	Stripping of topsoil will not be conducted earlier than required in order to prevent the erosion (wind and water) of organic matter, clay and silt;	Presence of stripped topsoil	Visual inspections	Monthly during Construction Phase	EAD; District Conservation Officer	MWK 300,000.00
		Stripped control measures such as intercept drains and toe berms will be constructed where necessary; and	Presence of intercept drains and toe berms	Measurements; Visual inspections			
		Access roads will be well drained in order to limit soil erosion	Availability of drainage	Measurements; Visual inspections			
2.1.6	**Impact on Waste**						
2.1.6.1	Increased generation of non-hazardous and general waste	A Construction Waste Management Plan (CWMP) for the project should be prepared and implemented by the Contractor during the construction phase;	Availability of CWMP	Review CWMP implementation report	Monthly during Construction Phase	Environmental Affairs Department	MWK 400,000.00
		Establish waste management priorities and hierarchy at the outset of activities based on the understanding of potential environmental, health and safety risks and impacts;	Records on the Amount of waste generated	Measurements; Visual inspections			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Periodically review applicable regulations to ensure that the necessary waste disposal permits and licence are obtained;	Number of reviews conducted	Review of reports			
		Design construction processes to prevent/minimise quantities of wastes generated and hazards associated with the waste generated;	Amount of waste generated	Measurements; Visual inspections			
		Identify potential opportunities to recycle material into the design /identify products that can be provided to external markets;	Amount of waste recycled	Measurements; Visual inspections			
		Properly store the construction materials to minimise the potential damage or contamination of materials;	Size of storage facility area in comparison to materials to be stored	Review storage inventory; Visual inspections			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Implement a construction materials inventory management system to minimise over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period (such as ready mixed concrete).	Amount of construction material	Review inventory			
2.1.6.2	Increased generation of hazardous waste	Adopt processes which generate reduced quantities or even no hazardous waste, or less dangerous types of hazardous wastes where practicable;	Records on the amount of hazardous waste generated	Measurements; Visual inspections	Biannually during Construction Phase	Environmental Affairs Department; Lilongwe District Council	*Cost included in 2.1.6.1*
		Store wastes in closed containers away from direct sunlight, wind and rain;	Volume of waste stored	Measurements; Visual inspections			
		Segregate hazardous waste from non-hazardous waste;	Volume of waste segregated	Measurements; Visual inspections			
		Clearly label hazardous wastes (including providing information on chemical compatibility) and storage area;	Number of labels displayed	Physical count; Visual inspections			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Ensure storage area has an impermeable floor and containment, and has adequate ventilation of capacity to accommodate 100% of the volume of the largest waste container;	Size of storage area	Measurements; Visual inspections			
		Ensure staff are trained to handle and package hazardous wastes;	Number of Trained Staff	Review of reports			
		Prepare spill response and emergency plans that incorporate potential accidental release of hazardous waste	Number of incidences	Review plan implementation reports			
		Ensure an approved hazardous waste collector is used;	Volume of Waste collected	Review waste management reports			
		Ensure transport is conducted to minimise spills, release and exposures to employees;	Number of successful transportations	Review waste management reports			
		All waste to be stored in containers and disposed at EAD approved disposal sites;	Volume of waste disposed	Review waste management reports			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Records in the form of chain of custody documents should be kept of transfers of hazardous waste (trip tickets) to ensure wastes are transported by suitable carriers and to a permitted disposal facility.	Volume of waste captured data	Review waste management reports			
2.1.6.3	Increased sewage generation	Appropriately site toilet facilities to minimise potential soil and surface/groundwater contamination impacts;	Location of toilet facilities	Visual Inspections	Biannually during Construction Phase	Environmental District Office; District Environmental Health Office	MWK 200,000.00
		Construct separate WC with hand washing basins for male and female workers and the total number should correspond to 1 wash basin to 20 employees; and	Number of pit-latrines constructed	Physical count			
		Raise awareness among workers regarding handwashing and general hygiene and sanitation practices.	Number of sensitisation meetings	Review sensitization meeting reports			
2.1.7	**Impact on Flora and Fauna**						

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
2.1.7.1	Loss of natural habitat for flora and fauna	Confining bush and land clearing activities to the project area and minimizing habitat destruction;	Size of area cleared	Measurements; Visual inspections	Biannually during Construction Phase	District Land Conservation Officer	MWK 200,000.00
		Clearly mark out the extent of clearing within the worksite area with pegs at 10m intervals or less;	Size of area marked	Measurements; Visual inspections			
		Ensure that construction workers are not allowed to harvest natural resources unless approved by the project's environmental inspectors; and	Number of cases reported	Review Training Reports			
		Provide training to construction workers to ensure an understanding of the requirements regarding environmental protection sites.	Number of workers trained	Review Training Reports			
2.1.8	**Impact on Community Health and Safety**						
2.1.8.1	Increased number of diseases, sexually transmitted	Sensitize communities on the disadvantages of indulging in extra- marital affairs; and	Number of sensitisation meetings	Review sensitization meeting reports	Monthly during Construction Phase	District AIDS Coordinator	MWK 250,000.00

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
	infections and HIV and AIDS	Establish partnerships with the health sector, NGOs, community-based organizations, religious denominations and other organizations for conducting lectures to raise awareness about the modes of transmission and prevention of STIs and HIV and AIDS.	Number of partnerships established	Review partnership agreements			
2.1.8.2	Increased levels of air emissions	A Construction Site Management Plan and the Traffic Management Plan shall outline mitigation to reduce air emissions from construction activities and Project related truck traffic;	Construction Site Management Plan in place	Review Management Plans	Quarterly during Construction Phase	Environmental District Office; District Environmental Health Office	MWK 250,000.00

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		The Project will undertake stakeholder engagement with affected communities and other stakeholders on a range of issues including changes to the visual environment, noise, waste management and social concerns. This engagement will take place during ESIA disclosure and prior to the commencement of operations. Engagement will also take place during construction and prior to the commencement of operations; and	Number of community meetings	Review meeting minutes			
		The Project will implement a Grievance Mechanism to address stakeholder concerns related to the Project in a timely manner.	Number of grievances	Review Grievance Redress Mechanism reports; Interviews			
2.1.8.3	Increased risk of traffic accidents	Conducting routine public safety sensitisation campaigns in schools to civic-educate children of the regulations and legal	Number of sensitisation meetings	Review sensitization meeting reports	Quarterly during Construction Phase	Malawi Police; Ministry responsible for Child Protection	MWK 150,000.00

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		requirements pertaining road safety awareness;					
		Fencing or barricading the perimeter of project sites and using spotters to control entry of community members into the project site;	Area barricaded	Measurements; Visual inspections			
		Employ drivers with the right driving licence category and clean driving record;	Number of drivers employed	Review employment records			
		Hire registered transporters and plant operators with road worthy vehicles and machines; and	Number of registered operators/ transporters	Review procurements records			
		Construction vehicles to observe speed limits at all times.	Vehicle speeds	Interviews; Random checks/inspections			
2.1.9	**Impact on Occupational Health and Safety**						
2.1.9.1	Increased risk of accidents and exposure to	Training the workers on the risks associated with construction activities;	Number of workers trained	Review Training Reports	Monthly during	Ministry responsible for Labour;	MWK 200,000.00

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
	hazardous material	Providing appropriate and recommended personal protective equipment (PPE) for workers' protection; and	Number of workers with appropriate PPE	Interviews; Random checks/inspections; Physical counts	Construction Phase	Environmental District Office	
		Conducting information or awareness campaigns to workers on health and safety.	Number of campaigns	Review campaign reports			
2.1.9.2	Increased risk to diseases, STIs and HIV and AIDS	Develop an HIV and AIDS Workplace Policy;	Availability of policy	Review Policy	Monthly during Construction Phase	District AIDS Coordinator	MWK 300,000.00
		Sensitize workers on HIV and AIDS prevention;	Number of workers sensitised	Review sensitization meeting reports			
		Free condoms to be made available to workers; and	Number of condoms distributed	Inspections			
		Distribution of Information, Education and Communication (IEC) materials on STIs including HIV and AIDS.	Number pf IEC material distributed	Inspections			
2.2	***Environmental and Social Management Plan during Operation and Maintenance Phase***						
2.2.1	**Impact on Economy and Livelihoods**						

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
2.2.1.1	Increased incidences of child labour	Sensitize local chiefs, children and the community at large on prohibition of any forms of child labour at the project site;	Number of sensitisation meetings	Review sensitization meeting reports	Biannually during Operation Phase	Ministry responsible for Labour; Ministry responsible for Child Protection	MWK 150,000.00
		Display posters at the project site that warn and inform against child labour; and	Number of posters displayed	Visual Inspections			
		Put in place proper procedures for reporting and addressing child labour cases.	Number of reports	Review reports on child labour cases			
2.2.1.2	Increased cases of sexual harassment and Gender Based Violence	Ensure provision of full and genuine access to all occupations, including to leadership roles for women and men;	Percentage of leadership position in terms of gender	Review Human Resource records	Quarterly during Operation Phase	Ministry responsible for Labour; Ministry responsible for Child Protection	*Cost included in 2.2.1.1*
		Develop a workplace gender equality policy that clearly outlines the companies stated gender equality intent, priorities and practices;	Availability of Policy	Review policy			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Ensure provision for both women and men access to equal opportunities and outcomes, including equal remuneration for work of equal or comparable value;	Proportion of wage structure across genders	Review financial records			
		Remove barriers to allow the full and equal participation of women in the workforce;	Number of women employees	Review employment records			
		Enforce punitive and disciplinary measures, including dismissal from employment on any employee involved in any cases of sexual harassment and GBV;	Number of cases	Review case reports			
		Developing and enforcing an Anti-Sexual Harassment Policy prohibiting sexual harassment or violation of any kind in the workplace. The policy will include an incident referral and reporting plan;	Availability of Policy	Review policy			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Develop a policy on GBV and workplace that aims at preventing and addressing cases of GBV in any form, whether as an act of workplace violence or as occurs in any employee's personal life;	Availability of Policy	Review policy			
		Training all employees Anti-Sexual Harassment Policy, GBV and national law and regulatory requirements regarding sexual harassment; and	Number of trained employees	Review training reports			
		Encouraging employees to report any sexual harassment and GBV related issues or suspected cases at the factory.	Number of cases reported	Review case files			
2.1.3	Increased chances of theft and vandalism	Periodically conduct consultations and sensitizations with villages and group village heads and security personnel;	Number of sensitisation meetings	Review sensitisation reports			
		Provide security at the factory site;	Number of security personnel	Review employment records	Annually during	Malawi Police	MWK 120,000.00

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Support activities of the neighbourhood watch (community policing);	Number of activities supported	Review activity reports	operation phase		
		Reward for reports of vandalism and theft that may lead to capture; and	Amount of rewards handed out	Review reported cases of theft and vandalism			
		Theft and vandalism cases must be reported to the police.	Number of cases reported	Review police reports			
2.2.2	**Impact on Air Quality**						
2.2.2.1	Increased generation of particulate matter (especially dust)	All transported materials must be covered with tarpaulins and to prevent fugitive dust;	Number of vehicles with tarpaulins	Interviews; Random checks/inspections	Quarterly during Construction Phase	EAD	MWK 200,000.00
		Vehicle speeds shall be limited to 40 km/hr on the gravel access roads to prevent generation of dust;	speed limits signs in place	Interviews; Random checks/inspections			
		Ornamental trees will be planted around the plant and perimeter wall will be constructed to act as wind breaks to prevent dust being blown from open surfaces; and	Number of trees planted and survived	Measurements; Inspections			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Ensure continuous maintenance of all paved surfaces in the factory.	paved surface in place	Inspections			
	Increase in combustion emissions	Boiler to be fitted with emission stack of 30 m height to be fitted with filters and scrubbers. At this height and with the existing air parameters such as quality and speed, it is anticipated that the emissions from the stack will be dispersed ensuring that impact is negligible;	Stack Height in place	Visual Inspection	Quarterly during Operation Phase	Environmental Affairs Department	MWK 200,000.00
		Undertake regular maintenance schedule of plant to verify that the boiler and other plant equipment are operating at design optimum conditions to maintain a negligible impact on ambient air quality;	Number of maintenances	Review maintenance records			
		Company vehicles to be maintained and inspected regularly; and	Number of maintenances	Review maintenance records			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		When not in use, vehicles will be switched off, unless impractical for health and safety reasons.	Amount of time engine is left idling	Interviews; Random checks/inspections			
2.2.3	**Impact on Water Quality and Resource**						
2.2.3.1	Degradation of surface and groundwater quality	Undertake regular maintenance schedule of plant to verify that the all provisions for containment and secondary containment on all pump, tank and plastic piping installations are operating at design optimum conditions to ensure no Chemical spills to ground;	Number of maintenances	Review maintenance records	Biannually during Operation Phase	District Environmental Officer; District Water Development Officer	MWK 200,000.00
		Install monitoring or inspection wells for ground water contamination. Three inspection wells will be installed per tank and will be monitored regularly;	Number of monitoring wells	Visual inspection			
		Provide adequate toilets and shower-rooms for the workers that will be connected to septic tanks;	Number of sanitary facilities	Inspection			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		All hazardous materials will be stored in line with the requirements of the Operation Management Plan to prevent contamination of the surface and groundwater. Chemicals and other hazardous liquids will be contained in compatible, appropriately sealed and labelled containers to prevent reaction with containers and spillage during handling;	Availability of Plan	Inspection			
		A Method Statement is required for all wash areas where hydrocarbon and hazardous materials or other pollutants are expected to be used. This includes, but is not limited to, vehicle washing, workshop wash bays and paint equipment cleaning;	Availability of statement	Visual inspection			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Runoff from wash down areas must be passed through a settlement tank to ensure that potentially contaminated water does not enter the surrounding environment; and	Volume of settlement tank	Measurements; Inspections			
		Storm water run-off will be discharged off the project site through a stormwater drain that will be emptying into Nthazi Stream.	Presence of drainage lines	Inspection			
2.2.3.2	Reduced water availability	In the absence of formal modelling of the proposed abstraction boreholes, on-going communication will be maintained with the nearby communities to determine if there is an associated response observed in the community wells. Should this occur, the Project will take steps to ensure reliable supply is maintained to the affected communities.	Number of complaints	Review Complaints report	Biannually during Operation Phase	District Environmental Officer; District Water Development Officer	*Cost included in 2.2.3.1*
2.2.4	**Impact on Noise and Vibration**						

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
2.2.4.1	Increase in ambient sound levels	Noise levels should not result in a maximum increase in background levels of 3 dBA at the nearest receptor location off site or exceed 55 dBA during the day time (06:00-18:00) and 45 dBA during the night time (18:00-06:00);	Records of Sound Level	Interviews; Measurements	Quarterly during Operation Phase	Environmental District Office	MWK 200,000.00
		Follow the grievance mechanism procedure should a grievance be logged regarding noise levels;	Number of grievances	Review GRM reports			
		Vehicles must adhere to the 40km/hr speed limit on site, and not exceed the national speed limits when using public roads;	Speed limit signs displayed	Interviews; Random checks/inspections			
		Vehicles to be turned off and no engine idling to be permitted;	Duration engine is left idling	Interviews; Random checks/inspections			
		Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures; and	Number of maintenances	Review maintenance records			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Incorporate sound attenuation lining within the machinery stack to reduce noise. Incorporate sound attenuation in the buildings that will house noise generating equipment.	Sound Level	Interviews; Measurements			
2.2.5	**Impact on Waste**						
2.2.5.1	Increased generation of non-hazardous and general waste	An Operation Waste Management Plan (OWMP) for the project should be prepared and implemented as a best practice;	Availability of CWMP	Review CWMP implementation report	Biannually during Operation Phase	EAD	MWK 160,000.00
		Establish waste management priorities and hierarchy at the outset of activities based on the understanding of potential environmental, health and safety risks and impacts;	Amount of waste generated	Measurements; Visual inspections			
		Periodically review applicable regulations to ensure that the necessary waste disposal permits and licence are obtained;	Number of reviews conducted	Review of reports			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Design operation processes to prevent/minimise quantities of wastes generated and hazards associated with the waste generated;	Amount of waste generated	Measurements; Visual inspections			
		Identify potential opportunities to recycle material into the design /identify products that can be provided to external markets;	Amount of waste recycled	Measurements; Visual inspections			
2.2.5.2	Increased generation of hazardous waste	Adopt processes which generate reduced quantities or even no hazardous waste, or less dangerous types of hazardous wastes where practicable;	Amount of hazardous waste generated	Measurements; Visual inspections	Biannually during Operation Phase	EAD	*Cost included in 2.2.5.1*
		Store wastes in closed containers away from direct sunlight, wind and rain;	Volume of waste storage	Measurements; Visual inspections			
		Segregate hazardous waste from non-hazardous waste;	Volume of waste segregated	Measurements; Visual inspections			
		Clearly label hazardous wastes (including providing information on chemical	Number of labels displayed	Physical count; Visual inspections			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		compatibility) and storage area;					
		Ensure storage area has an impermeable floor and containment, and has adequate ventilation of capacity to accommodate 100% of the volume of the largest waste container;	Size of storage area	Measurements; Visual inspections			
		Ensure staff are trained to handle and package hazardous wastes;	Number of Trained Staff	Review of reports			
		Prepare spill response and emergency plans that incorporate potential accidental release of hazardous waste	Number of incidences	Review plan implementation reports			
		Ensure an approved hazardous waste collector is used;	Volume of Waste collected	Review waste management reports			
		Ensure transport is conducted to minimise spills, release and exposures to employees;	Number of successful transportations	Review waste management reports			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		All waste to be stored in containers and disposed at EAD approved disposal sites;	Volume of waste disposed	Review waste management reports			
		Maintain records on the type and quantity of hazardous waste; and	Volume of waste captured data	Review waste management reports			
2.2.5.3	Increased sewage generation	Construct separate WC with hand washing basins for male and female workers and the total number should correspond to 1 wash basin to 20 employees; and	Number of toilets	Visual Inspections Physical count	Biannually during Operation Phase	Environmental District Office; District Environmental Health Office	MWK 200,000.00
		Raise awareness among workers regarding handwashing and general hygiene and sanitation practices.	Number of sensitisation meetings	Review sensitization meeting reports			
2.2.6	**Impact on Occupational Health and Safety**						
2.2.6.1	Increased risk of accidents and exposure to	Training the workers on the risks associated with operation activities;	Number of workers trained	Review Training Reports	Quarterly during	Environmental District Office; Ministry	MWK 300,000.00

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
	hazardous material	Use of Personal Protective Equipment (PPEs) will be encouraged. Proper training programme on use of PPEs, characteristics of the material handled and safety precautions will be arranged;	Number of workers with appropriate PPE	Interviews; Random checks/inspections; Physical counts	Operation Phase	responsible for Labour	
		Occupational health surveillance programme will be taken as a regular exercise for all the employees and their records maintained;	Number of employees screened	Review surveillance reports			
		Installing nonslip surfaces in areas with potentially slippery floors or subject to frequent wetting such as production area;	Number of related accidents	Visual inspection; Review accidents reports/records			
		Maintaining frequently transited areas as dry as possible;	Number of related accidents	Visual inspection; Review accidents reports/records			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Cover electricity cables that cross walkways;	Number of related accidents	Visual inspection; Review accidents reports/records			
		Keep working areas and walkways well lit;	Number of related accidents	Visual inspection; Review accidents reports/records			
		Display Safety precautions in the premises on the banners, boards etc.;	Number of related accidents	Visual inspection			
		In order to ensure good health of workers, regular health check-up of the plant workers will be carried out;	Number of employees	Review medical records			
		Develop a Code of Conduct (COC) to regulate the performance and behaviour of all workers, including provision for disciplinary action for anti-social behaviour and non-compliance with health and safety regulations such as lack of use of PPE;	Availability of COC	Review CoC; Interviews			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Conducting information or awareness campaigns to workers on health and safety.	Number of campaigns	Review campaign reports; Interviews			
2.2.6.2	Increased risk to diseases, STIs and HIV and AIDS	Develop and implement an HIV & AIDS policy and a prevention, treatment, care and support programme;	Number of workers sensitised	Review sensitization meeting reports	Biannually during Operation Phase	District AIDS Coordinator	MWK 160,000.00
		Employees will not be required to undergo testing for HIV as a precondition for employment. No person shall be denied employment solely on the basis of HIV serostatus;	Number of complaints	Interviews; Review employment records			
		An employee living with HIV shall not be unfairly discriminated against or in any way prejudiced within the employment relationship or within any employment policies or practices;	Number of complaints	Interviews; Review employment records			
		Sensitize workers on HIV and AIDS prevention;	Number of workers sensitised	Review sensitization meeting reports			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Free condoms to be made available to workers; and	Number of condoms distributed	Inspections			
		Distribution of Information, Education and Communication (IEC) materials on STIs including HIV and AIDS.	Number pf IEC material distributed	Inspections			
2.2.6.3	Risk of Fire and Explosion	Conduct routine maintenance of installed fire-fighting equipment;	Number of maintenances	Review maintenance records	Quarterly during Operation Phase	Environmental District Office; Ministry responsible for Labour	*Cost included under 2.2.6.1*
		Establish fire assembly points;	Number of Points established	Inspection			
		Train employees in First Aid firefighting;	Number of employees	Review training reports			
		Conduct routine fire drills;	Number of employees	Review training reports			
		Install appropriate signage (danger warning signs – No smoking; Flammable; Combustible etc.);	Availability of signage	Inspection			
		Conduct routine maintenance of installed automatic fire alarm system for the entire development;	Number of maintenances	Review maintenance records			

SN	Potential Impacts	Recommended enhancement / mitigation	Performance Indicator	Means of Verification	Monitoring Frequency	Responsible institution	Monitoring cost (MWK)
		Allow for 10000 litres fire reserve water tank attached with an automatic booster pump for hose reel; and	Volume of water	Measurements; Inspections			
		Develop Emergency Management Plan, Incident Management Plan and Fire Prevention Plan.	Availability of Plans	Inspection			

Chapter Eight: Conclusion and Recommendations

8.1 Guiding concluding remarks

From the environmental assessment conducted for the proposed construction and operation of the Cooking Oil Manufacturing plant at Msundwe in Lilongwe district, it is evident that the project potentially has some significant negative impacts, which relate to the surrounding environment.

It should be noted, however, that despite the above probable negative impacts, it is possible with adequate design and implementation measures advanced in this report to mitigate the environmental effects and reduce them to acceptable levels. It is recommended that strict monitoring measures are instituted both from engineering and environmental standpoints considering the need to protect the environment while achieving economic development. This will ensure that the project adheres to acceptable practices and standards. The project will bring significant benefits in terms of fostering economic growth in the areas of trade. It is the consultant's view that the project be allowed to proceed on condition that the measures proposed in this report are fully implemented.

8.2 Overall recommendations

i. It is important that this ESIA is implemented according to the set schedules and targets. It is also important that implementation is done in all phases of the project;
ii. LWC and Lilongwe District Council should make resources available to facilitate the implementation of the ESMP and the monitoring plan;
iii. All major stakeholders of the project should be fully engaged and given full access to the premises for purposes of monitoring;
iv. LWC and Lilongwe District Council should ensure that all important data is regularly collected and analysed to assist management in making informed decisions and the same should be made available to monitoring authorities for evaluation of the performance; and
v. Occupational safety and health issues are critical in projects of this nature as such the Developer should make appropriate investments in training as well as provision of adequate equipment for successful implementation.

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Annex 1: Terms of Reference (ToRs)

TERMS OF REFERENCE FOR THE PROPOSED FOR MANUFACTURING OF COOKING OIL AND ASSOCIATED WORKS, T/A KALOLO, LILONGWE

1. Provide a full description of the nature of the project with respect to the name of the proponent, the postal and physical address, the spatial location with respect to natural resources and human settlement of the project site, the estimated project cost, size of land for the project site (include letter of approval), life span of the project, scope and magnitude of the operation, resources requirements (raw materials, equipment), including water reticulation, cooking oil production with illustrations such as flow diagrams, and the number of people to be employed for at all stages of the project (planning, construction and operation),and types of waste that will be generated and waste disposal methods.
2. Provide a site-specific visible map of the area (Scale 1:50,000) on A3 paper and in colour showing the proposed factory site and a site plan for the project. Font type should be Times Roman and font size 12 throughout the report.
3. State the reason for selecting the proposed sites for the cooking oil manufacturing Plant as opposed to other sites.
4. Provide a concise description of the existing biophysical environment, resource and characteristics, current and future land uses of the area, land tenure and the socio-economic environment status, including:
    - Site topography and drainage system (water courses);
    - Temperature and rainfall pattern;
    - The scope of vegetative resources of the project area;
    - The scope of fauna within the project area;
    - Existing human land uses adjacent to the project area; and
    - Any changes anticipated during implementation of the project area.
5. Describe the major activities to be undertaken during the project implementation covering pre-construction and construction phase of the cooking oil manufacturing Plant. State the operational activities including the size and capacity of the Plant, the source of raw materials, the nature and quantity of wastes that will be generated, facilities for appropriate waste disposal and management of wastes.
6. Identify the potential short and long term environmental and social impacts associated with the proposed project, focusing on both the positive and negative effects as well as the effects to the biophysical,

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social, economic and cultural components of the environment. The potential impacts must include those related to:

- Project location;
- Project construction (e.g. soil erosion, disposal of construction spoils);
- Project operation; rehabilitation of the project area.

7. Describe mitigation and enhancement measures that will be put in place and determine whether they are adequate in addressing the existing environmental impacts or not. If not provide additional mitigation/mitigation measures that would address the gaps.
8. Propose an Environmental and Social Management Plan (ESMP) in tabular format by which all of the measures prescribed above, will be carried out. Indicate the budget for the recommended mitigation measures, specifications of who will be responsible for these measures and the schedule when these measures will take place during construction and operation of the project.
9. Propose an Environmental and Social Management and Monitoring Plan (ESMP)in tabular format by which all mitigation measures recommended in Environmental and Social Management Plan will be monitored. The plan should include the activities, frequency of monitoring, the key monitoring indicators, resources required and the authorities responsible for monitoring the exercises.
10. Provide an account of all regulatory licences and approvals obtained for the proposed project to ensure that they are in line with sound environmental management practices and are in compliance with relevant existing legislation. Reference should at least be made to the Environment Management Act, Water Resources Act, National Water Policy, National Environment Policy, Malawi National Land Policy, Malawi Development and Growth Strategy, Occupational Safety, Health and Welfare Act and other relevant policies and piece of legislation.
11. Undertake stakeholder consultation to ensure key interested and affected stakeholders are involved in the Environmental Impact Assessment process. Incorporate their views in the report and indicate a record of consultations in the appendices parts of the report. Only senior officers should be consulted.
12. The preparation, presentation and structure of the ESIA report should follow the format in the Guidelines of Environmental Impact Assessment

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for Malawi (1997) as stipulated on Pages 33-37. The minimum content of required information in an ESIA Report is outlined in Pages 53-59.

13. Provide the names of the ESIA Team and their respective fields as annex of the ESIA report. In order to adequately address the core issues of the study, it is advisable that the team should at least be composed of:
    - ESIA Expert
    - Physical Planner
    - Food Quality assurance specialist
    - Social Expert
14. Ensure that the Environmental District Officer (EDO) and the District Commissioner for concerned District are consulted on the project.
15. Submit 15 hard copies and a soft copy of the ESIA report to the Director of Environmental Affairs.

Annex 2: Public Consultations

Stakeholder participation involved engaging institutions within the project impact area and selected public institutions who expressed their views about the proposed projects. The stakeholder participation process tried to ensure that due consideration will be given to stakeholder values, concerns and preferences when decisions regarding the project are made. The purpose of stakeholder involvement was to:

- Inform the stakeholders about the proposal and its likely effects;
- Canvass their inputs, views and concerns; and
- Take account of the information and views of the public in the EIA and decision making.

The key objectives of stakeholder involvement were to:

- Facilitate consideration of alternatives, mitigation measures and trade-offs (if any);
- Ensure that important impacts are not overlooked and benefits are maximized;
- Reduce chances of conflict through early identification of contentious issues;
- Provide an opportunity for the stakeholders to influence project design in a positive manner (thereby creating a sense of ownership of the proposal);
- Improve transparency and accountability of decision-making; and
- Increase public confidence in the Environmental and Social Impact Assessment process.

Stakeholder participation in this project was facilitated through interviews and was guided by a checklist of questions that are presented in following sections.

A2.1 Stakeholder Consultation Checklist for the ESMP

1. What type of environmental and social positive impacts will result from this proposed project and how will these impacts be enhanced (State positive impacts for each phase of construction and operation)?
2. What type of environmental and social negative impacts should be expected during the construction of the proposed project and what are the proposed mitigation measures?
3. What type of environmental and social negative impacts should be expected during the operation and maintenance phase of the proposed project and what are the proposed mitigation measures?
4. Who else should be consulted regarding the environmental and social impacts of the proposed project?

A2.2 Stakeholders Comments

The comments stakeholders raised were collated and analysed to see which issues are of concern and should be addressed through the ESMP and are presented in Table 16. The following subsections list these stakeholders and the comments they raised, whilst referencing

to the impact assessment section and the proposed mitigation measures to elaborate how they contributed to the formulation of the ESMP of this report. This was done in respect to the fact that public concern is fundamental to the delineation and management of the project's significant risks.

Table 0-1: Summary of comments from various stakeholders

SN	Issue Raised	Mitigation/ Enhancement	Section and Page number in Report
1	**Construction Phase**		
1.1	**Positive Impacts**		
1.1.1	Employment opportunity to the community	Good payments to workers	Page 10 section 2.2.1; Page 65, section 6.4.1.1.
		Employ mostly those from communities around the site	
		Involving chiefs in recruiting capable locals from within the community and surrounding areas.	
1.1.2	Advantage to students to learn at construction site	Company to provide opportunity to learners to learn at construction site	Page 67, section 6.4.1.1.3
		Teachers should organise lessons to be learnt at the site	
1.1.3	Community may benefit through Corporate Social Responsibility e.g. construction of school blocks	School Management Committee should follow up/ask for assistance	Not possible as construction phase is short
1.1.4	Opportunity for small scale business around the construction site	Loans or good payment to workers to help boost those businesses	Page 66, Section 6.4.1.1.2
		Provide safe business shelters for local businesses trading around the area.	
		Small local businesses should be allowed to trade around the construction site	
1.2	**Negative Impacts**		
1.2.1	Low attendance in school and disturbance to girl child education (Dropouts, Pregnancies) due to outsiders/workers who may come with money to	Company should have initiative	Page 68, section 6.4.3.1.1; Page 79, Section 6.4.3.10.2
		Civic education and sensitisation to girls and community in general	
		By-laws to protect girls	

SN	Issue Raised	Mitigation/ Enhancement	Section and Page number in Report
	convince girls into sexual relationships	Children/Pupils should not be allowed at construction site	
1.2.2	Spread of HIV and AIDS	Provide awareness to community	Page 79, Section 6.4.3.10.2
		Distribute condoms	
		VDC and Chiefs to conduct awareness t families	
		Strict laws on relationships among co-workers	
1.2.3	Noise from construction site	Should work in the afternoon after classes on school days	Page 73, Section 6.4.3.6.1
		Work during busy hours not at night	
		Construction vehicles should be well serviced	
		Construction should not be too close to villages	
		Plant, machinery and other construction vehicles should well service.	
1.2.4	Loss of arable land / Land Conflicts	Buy land at good prices to enable owners find equal or larger piece of land	Page 2, Section 1.5
		Provide those from which land has been bought with alternatives	
		Developer to compensate land owners with involvement of chiefs in the area	
1.2.5	Clearing of trees/vegetation	Replanting trees	Page 76, Section 6.4.3.8.1
		Planting trees around the factory area to compensate for the cleared trees	
1.2.6	Disturbance to school going children who may come to see/watch construction works	children should not be allowed at site	Page 71; Section 6.4.3.3.2
1.2.7	Dust emissions	Using water browsers to sprinkle water around construction premises	Page 69, Section 6.4.3.2.1
		Cordoning off the area with iron sheets to trap some dust emissions.	

SN	Issue Raised	Mitigation/ Enhancement	Section and Page number in Report
1.2.8	Generation of waste	Proper disposal as recommended by district council	Page 74, Section 6.4.3.7
1.2.9	Injuries to workers	Using PPE	Page 78, Section 6.4.3.10.1
1.2.10	Child labour issues	Ministry of labour should be involved during the employment procedures to regulate and police child labour issues	Page 68, section 6.4.3.1.1
2	**Operation Phase**		
2.1	**Positive Impacts**		
2.1.1	Access to market for Soya Beans	Buy in large quantities from local farmers	Page 67, Section 6.4.2.1.1
		Offer competitive prices for produce	
		Encouraging farmers to invest in Soya Bean farming	
2.1.2	Employment Opportunities	Employ educated youth form community	Page 11, section 2.2.2; Page 67, section 6.4.2.1.4
		Employ more people from the community	
		Good payments	
2.1.3	Easy access to the company's products e.g. cooking oil	Better and reasonable payments	Page 68, Section 6.4.2.1.2
		Sell products to community at better prices	
2.1.4	Improvement in farming e.g. access to by-products which may be used as manure	Local communities should be allowed to access manure from the factory	Page 29, Section 2.6.3.2; Page 85, Section 6.4.4.5.1
		Sensitizing farmers on use of manure	
2.1.5	Increase in economic activity for the area	Workers should be well paid and on time	Page 67, section 6.4.2.1.4
		Employees of the factory should be encouraged to find housing around the area	
2.1	**Negative Impacts**		
2.1.1	Spread of STIS and HIV and AIDS	Community/ Worker sensitisation	Page 87, Section 6.4.4.6.2
		Provision of condoms	

SN	Issue Raised	Mitigation/ Enhancement	Section and Page number in Report
		Conduct awareness on sexually transmitted diseases	
2.1.2	Change in lifestyle (Money from casual work may exacerbate beer consumption which is already rampant	Civic education on dangers of beer consumption	
2.1.3	Cases of new diseases/illness due to smoke/effluent from factory	Use more environmentally friendly equipment than diesel engines	Page 81, section 6.4.4.2
2.1.4	Dropout of girls due to pregnancy	Civic education and encourage girls in school	Page 80, Section 6.4.3.1.1
2.1.5	Low productivity of households in farming	Pay huge sums of money to support families	Page 67, section 6.4.2.1.4
2.1.6	Risk of injury to workers	Protective/Safety wear	Page 86, section 6.4.4.6.1
2.1.7	Generation of waste and toxic substances	Proper waste disposal at planned sites	Page 84, Section 6.4.4.5
		Factory should have a district council approved waste and toxic management system	
2.1.8	Lifestyle changes among employed locals	Educating and sensitizing employed locals on the consequences of reckless behaviour	Page 87, Section 6.4.4.6.2
2.1.9	Increased cases of theft or vandalism to equipment	Provide more security	Page 81, Section 6.4.4.1.3
2.1.10	Contamination of farms by toxic emissions from factory	Farm should be enclosed in a brick wall fence	Page 81, section 6.4.4.2
		The factory fence and nearest farm should be separated by an access road around the factory	

A2.3 Evidence of Stakeholder Consultations

STAKEHOLDER CONSULTATIONS SIGNING SHEET

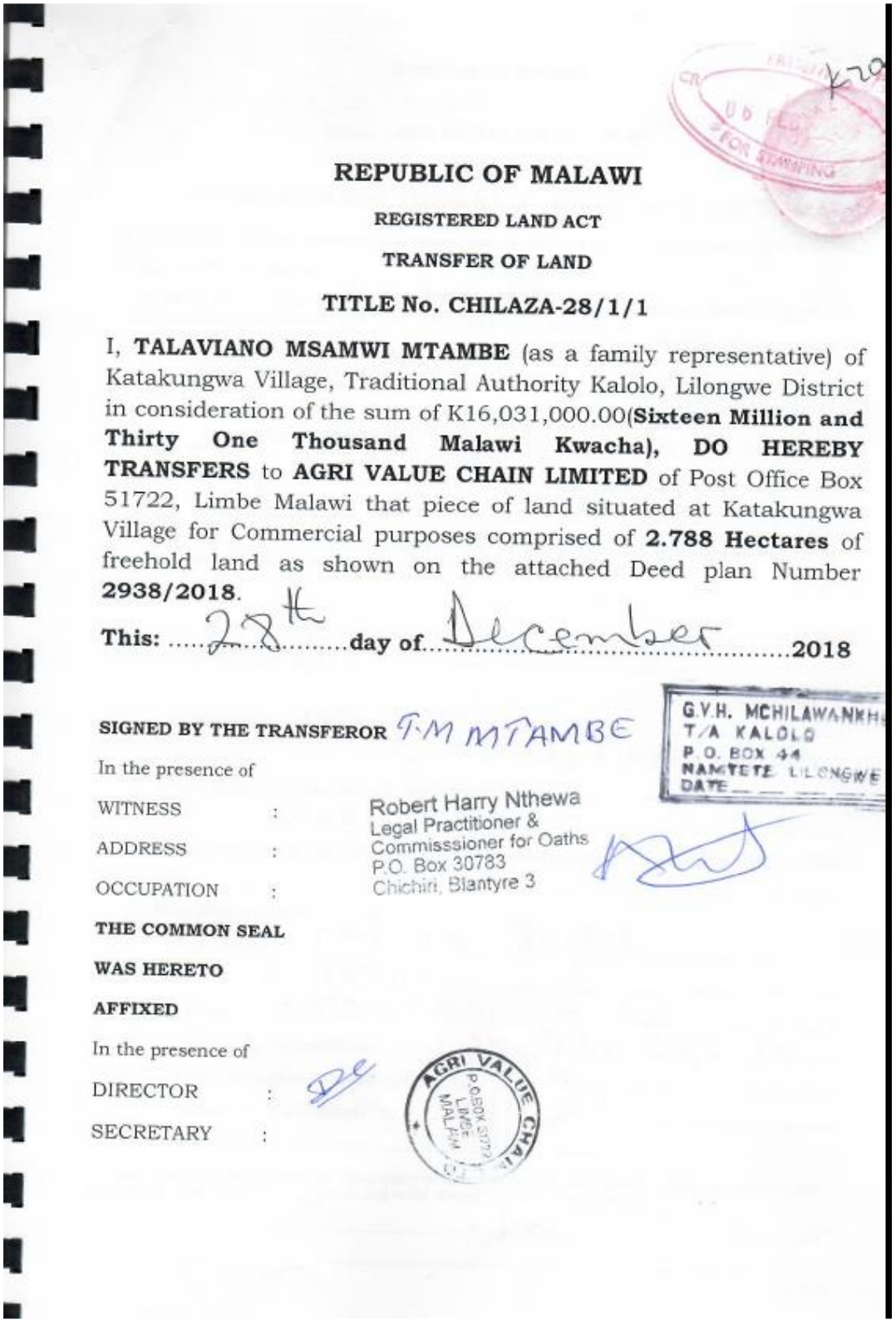
No	Name	Institutions/Designation	Contact	Signature
1	Rachael Maphamtambo	Nurse (Nthondo clinic)	08881151811	
2	Foster Matiki	C. member (Nthondo)	0998446365	
3	Iness Maponda	Environmental Health (Nthondo clinic)	09992832955	
4	Robin Makanga	Community member	0999178019	
5	Numeri Sasu	Vge Chamasala	R. Chamanga	
6	Samulani Ponde	Vge Natali	0993923127	SC Ponde
7	Billy Khombe	Vge Msampha		B Nkhoma
8	Samson Masni	Vge Mchirasamkhondo	0997901271	Samson M
9	Rodwell Chabuka	GP Chisikwa		Abiuti
10	Yembekezani Mangwende	Vge Chinguwo	0991288361	Chingwe
11	Andrew Mtoso	Snr Vgett. Mchirasamkhondo	0995146002	SGUIL Mthilaw
	Legiss B. Chirwanda			

STAKEHOLDER CONSULTATIONS SIGNING SHEET				
No	**Name**	**Institution/Designation**	**Contact**	**Signature**
1	Pearson Mitengo	KATBUMOA CDSS T/T	0882939675	
2	EVASON	Student	0887727825	
3	BLESSINGS KAPUTER	Student	0281930139	
4	Austain Banda	Students	0884366506	
5	RASHID JAMES	Student	—	
6	Spiwe K Gracian	Student	0881079153	
7	JESTER Mulali	student	—	

PUBLIC CONSULTATIONS SIGNING SHEET		
NAME	SIGNATURE	CONTACT DETAILS
Enida Manfawi [illegible]	E.M	099[illegible]900972 Chibwngo village
CLEMENT SHADRACK	Shadreck	0888672834[illegible] 0996508454 Chibwngo
Legiss [illegible] Chiwanda	[illegible] VDC Secretary	0999067064
Mikwind [illegible]	[illegible] VDC Chair	—

Annex 3: Evidence of Land Ownership

A3.1 Title No. Chilaza-28/1/1



REPUBLIC OF MALAWI

REGISTERED LAND ACT

TRANSFER OF LAND

TITLE No. CHILAZA-28/1/1

I, **TALAVIANO MSAMWI MTAMBE** (as a family representative) of Katakungwa Village, Traditional Authority Kalolo, Lilongwe District in consideration of the sum of K16,031,000.00(**Sixteen Million and Thirty One Thousand Malawi Kwacha), DO HEREBY TRANSFERS** to **AGRI VALUE CHAIN LIMITED** of Post Office Box 51722, Limbe Malawi that piece of land situated at Katakungwa Village for Commercial purposes comprised of **2.788 Hectares** of freehold land as shown on the attached Deed plan Number **2938/2018**.

This: ....28th.....**day of**.....December.....**2018**

SIGNED BY THE TRANSFEROR T.M MTAMBE

G.V.H. MCHILAWANKHA
T/A KALOLO
P.O. BOX 44
NAMYETE LILONGWE
DATE

In the presence of

WITNESS : Robert Harry Nthewa
Legal Practitioner &
Commisssioner for Oaths
P.O. Box 30783
Chichiri, Blantyre 3

ADDRESS :

OCCUPATION :

THE COMMON SEAL

WAS HERETO

AFFIXED

In the presence of

DIRECTOR :

SECRETARY :

AGRI VALUE CHAIN

REPUBLIC OF MALAWI

REGISTERED LAND ACT
(Chapter 58:01)

Land Certificate

Registration District
LILONGWE

Title No.
CHILAZA-28/1/1

This is to certify that **AGRI VALUE CHAIN LIMITED OF POST OFFICE BOX 51722, LIMBE, BLANTYRE** is registered as the absolute proprietor of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 27 of the Registered Land Act as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the
LILONGWE District Registry
This 8TH Day of FEBRUARY, 2019

APENDEZI KACHIWALA
Land Registrar

A3.2 Title No. Chilaza-28/1/2

REPUBLIC OF MALAWI

REGISTERED LAND ACT

TRANSFER OF LAND

TITLE No. CHILAZA-28/1/2

I, **TALAVIANO MSAMWI MTAMBE** (as a family representative) of Katakungwa Village, Traditional Authority Kalolo, Lilongwe District in consideration of the sum of K610, 075.00(**Six Hundred and Ten Thousand and Seventy Five Malawi Kwacha), DO HEREBY TRANSFERS** to **AGRI VALUE CHAIN LIMITED** of Post Office Box 51722, Limbe Malawi that piece of land situated at Katakungwa Village for Commercial purposes comprised of **0.1061 of a Hectare** of freehold land as shown on the attached Deed plan Number **2941/2018**.

This: ....23rd.....**day of**....December.....**2018**

G.V.H. MCHILAWANKHO
T/A KALOLO
P.O. BOX 44
NAMITETE. LILONGWE
DATE

SIGNED BY THE TRANSFEROR T.M.MTAMBE

In the presence of

WITNESS : Robert Harry Nthewa
ADDRESS : Legal Practitioner &
OCCUPATION : Commisssioner for Oaths
P.O. Box 30783
Chichiri, Blantyre 3

THE COMMON SEAL

WAS HERETO

AFFIXED

In the presence of

DIRECTOR :

SECRETARY :

AGRI VALUE CHAIN P.O.BOX 51722 LIMBE MALAWI

REPUBLIC OF MALAWI

REGISTERED LAND ACT
(Chapter 58:01)

Land Certificate

Registration District
LILONGWE

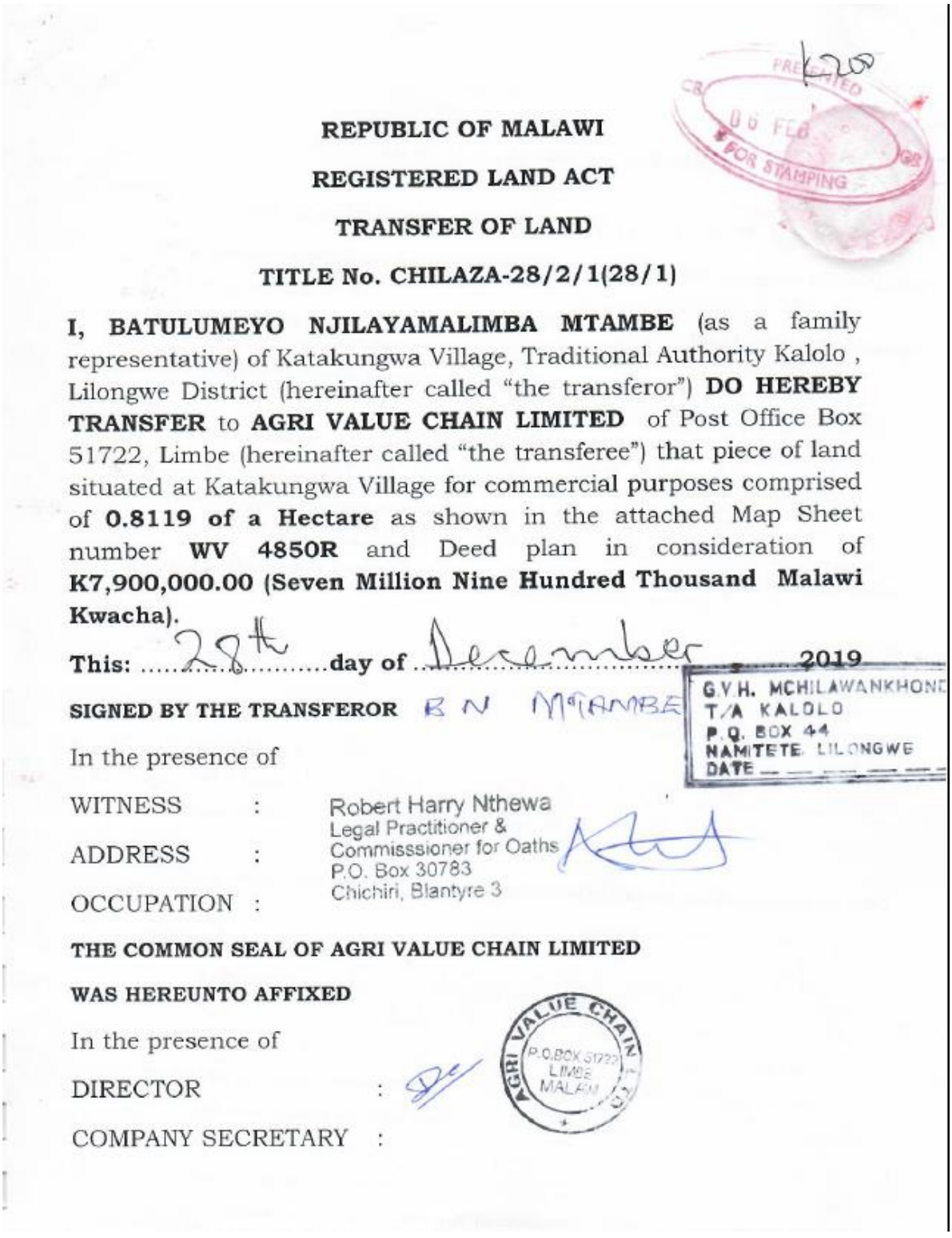
Title No.
CHILAZA-28/1/2

This is to certify that **AGRI VALUE CHAIN LIMITED OF POST OFFICE BOX 51722, LIMBE, BLANTYRE** is registered as the absolute proprietor of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 27 of the Registered Land Act as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the
LILONGWE District Registry
This 8TH Day of FEBRUARY, 2019

APENDEZI KACHIWALA
Land Registrar

A3.3 Title No. Chilaza-28/2/1(28/1)



PRESENTED FOR STAMPING 06 FEB

REPUBLIC OF MALAWI

REGISTERED LAND ACT

TRANSFER OF LAND

TITLE No. CHILAZA-28/2/1(28/1)

I, BATULUMEYO NJILAYAMALIMBA MTAMBE (as a family representative) of Katakungwa Village, Traditional Authority Kalolo , Lilongwe District (hereinafter called "the transferor") **DO HEREBY TRANSFER** to **AGRI VALUE CHAIN LIMITED** of Post Office Box 51722, Limbe (hereinafter called "the transferee") that piece of land situated at Katakungwa Village for commercial purposes comprised of **0.8119 of a Hectare** as shown in the attached Map Sheet number **WV 4850R** and Deed plan in consideration of **K7,900,000.00 (Seven Million Nine Hundred Thousand Malawi Kwacha).**

This: 28th **day of** December **2019**

G.V.H. MCHILAWANKHOND
T/A KALOLO
P.O. BOX 44
NAMITETE LILONGWE
DATE

SIGNED BY THE TRANSFEROR B N MTAMBE

In the presence of

WITNESS : Robert Harry Nthewa

ADDRESS : Legal Practitioner & Commisssioner for Oaths P.O. Box 30783 Chichiri, Blantyre 3

OCCUPATION :

THE COMMON SEAL OF AGRI VALUE CHAIN LIMITED

WAS HEREUNTO AFFIXED

In the presence of

AGRI VALUE CHAIN P.O.BOX 51722 LIMBE MALAWI

DIRECTOR :

COMPANY SECRETARY :

REPUBLIC OF MALAWI

REGISTERED LAND ACT
(Chapter 58:01)

Land Certificate

Registration District
LILONGWE

Title No.
CHILAZA-28/2/1 (28/1)

This is to certify that **AGRI VALUE CHAIN LIMITED OF POST OFFICE BOX 51722, LIMBE, BLANTYRE** is registered as the absolute proprietor of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 27 of the Registered Land Act as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the
LILONGWE District Registry
This 8TH Day of FEBRUARY, 2019

APENDEZI KACHIWALA
Land Registrar

A3.4 Title No. Chilaza-38/1/1

PRESENTED FOR STAMPING 06 FEB

REPUBLIC OF MALAWI

REGISTERED LAND ACT

TRANSFER OF LAND

TITLE No. CHILAZA-38/1/1

I, **MISS LABETA JELEMIYA KAMDELU CHISIKWA** (as a family representative) of Chisikwa Village, Traditional Authority Kalolo, Lilongwe District in consideration of the sum of K2, 380,500(**Two Million Three Hundred Eighty Thousand and Five Hundred Malawi Kwacha), DO HEREBY TRANSFERS** to **AGRI VALUE CHAIN LIMITED** of Post Office Box 51722, Limbe Malawi that piece of land situated at Chisikwa Village for Commercial purposes comprised of **0.4140 of a Hectare** of freehold land as shown on the attached Deed plan Number **2942/2018**.

This: 28th **day of** December **2018**

G.V.H. MCHILAWANKHONDE
T/A KALOLO
P.O. BOX 44
NAMITETE LILONGWE
DATE

SIGNED BY THE TRANSFEROR

In the presence of

WITNESS :

ADDRESS :

OCCUPATION :

Robert Harry Nthewa
Legal Practitioner &
Commisssioner for Oaths
P.O. Box 30783
Chichiri, Blantyre 3

THE COMMON SEAL

WAS HERETO

AFFIXED

In the presence of

DIRECTOR :

SECRETARY :

AGRI VALUE CHAIN LTD P.O.BOX 51722 LIMBE MALAWI

REPUBLIC OF MALAWI

REGISTERED LAND ACT
(Chapter 58:01)

Land Certificate

Registration District
LILONGWE

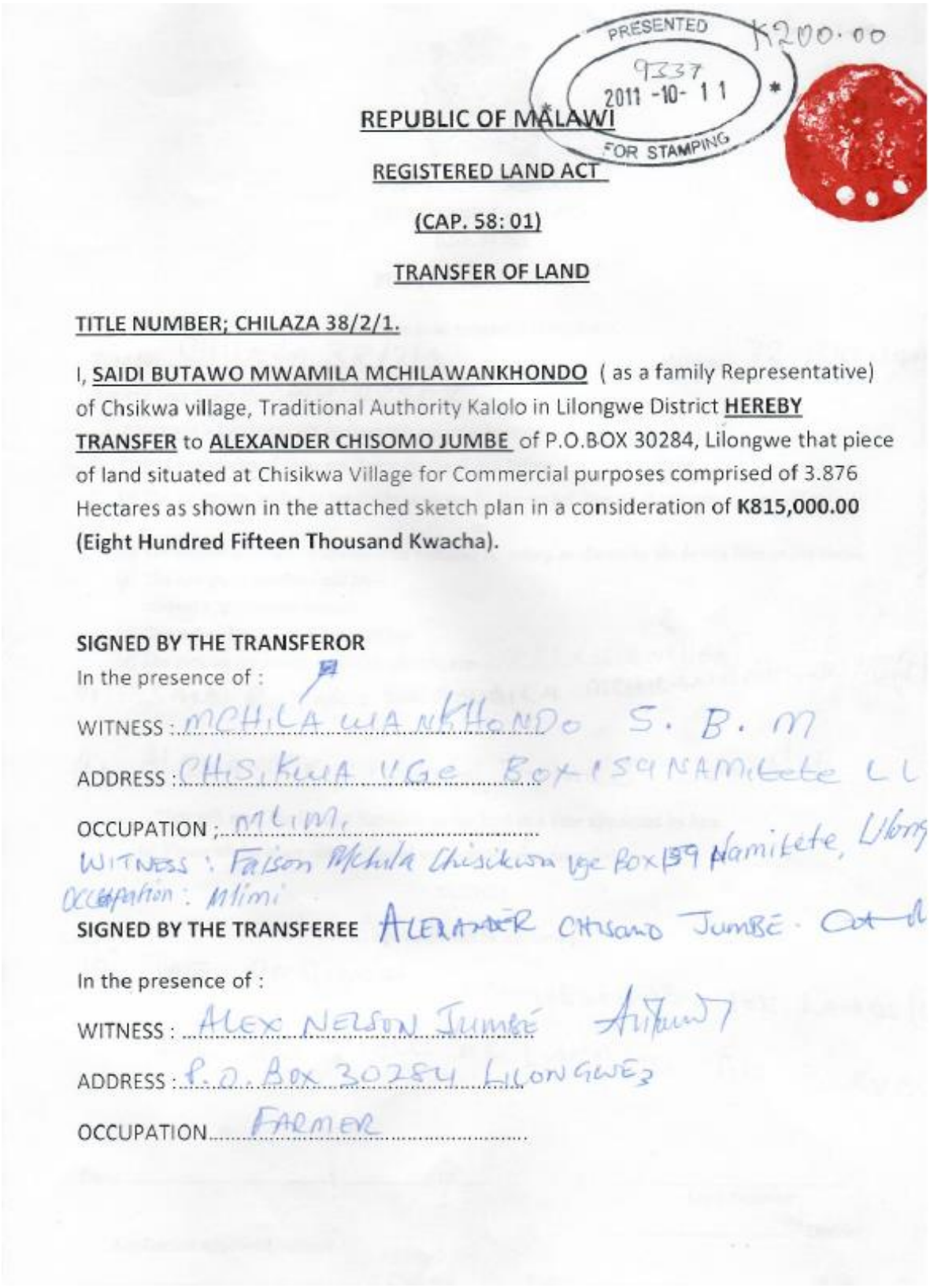
Title No.
CHILAZA-38/1/1

This is to certify that **AGRI VALUE CHAIN LIMITED OF POST OFFICE BOX 51723, LIMBE, BLANTYRE** is registered as the absolute proprietor of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 27 of the Registered Land Act as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the
LILONGWE District Registry
This 8TH Day of FEBRUARY, 2019

APENDEZI KACHIWALA
Land Registrar

A3.5 Title No. Chilaza-38/2/1



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REPUBLIC OF MALAWI

REGISTERED LAND ACT

(CAP. 58: 01)

TRANSFER OF LAND

TITLE NUMBER; CHILAZA 38/2/1.

I, SAIDI BUTAWO MWAMILA MCHILAWANKHONDO (as a family Representative) of Chsikwa village, Traditional Authority Kalolo in Lilongwe District **HEREBY TRANSFER** to **ALEXANDER CHISOMO JUMBE** of P.O.BOX 30284, Lilongwe that piece of land situated at Chisikwa Village for Commercial purposes comprised of 3.876 Hectares as shown in the attached sketch plan in a consideration of **K815,000.00 (Eight Hundred Fifteen Thousand Kwacha).**

SIGNED BY THE TRANSFEROR

In the presence of :

WITNESS : MCHILAWANKHONDO S. B. M

ADDRESS : CHISIKWA VGE BOX 159 NAMITETE LL

OCCUPATION : MLIMI

WITNESS : Faison Mchila Chisikwa Vge Box 159 Namitete, Lilongwe

Occupation : Mlimi

SIGNED BY THE TRANSFEREE ALEXANDER CHISOMO JUMBE

In the presence of :

WITNESS : ALEX NELSON JUMBE

ADDRESS : P.O. BOX 30284 LILONGWE 3

OCCUPATION FARMER

REPUBLIC OF MALAWI

REGISTERED LAND ACT
(Chapter 58:01)

Land Certificate

Registration District
LILONGWE

Title No.
CHILAZA-38/2/1

This is to certify that **AGRI VALUE CHAIN LIMITED OF POST OFFICE BOX 1092, LILONGWE** is now registered as the absolute proprietor of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 27 of the Registered Land Act as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of
LILONGWE District Registry
This12TH DAY of FEBRUARY, 2019

APENDEZI KACHIWALA
Land Registrar

A3.6 Title No. Chilaza-38/2/3

REPUBLIC OF MALAWI

REGISTERED LAND ACT

TRANSFER OF LAND

TITLE No. CHILAZA-38/2/3

I, SAIDI MWAMWILA MCHILAWANKHONDO (as a family representative) of Chisikwa Village, Traditional Authority Kalolo, Lilongwe District (hereinafter called "the Transferor") **HEREBY TRANSFERS** to **AGRI VALUE CHAIN LIMITED** of Post Office Box 51722, Limbe Malawi (hereinafter called "the transferee" that piece of land situated at Chisikwa Village for Commercial purpose comprised of **8.233Hectares** as shown in the attached **Deed plan No. 2939/2018** in consideration of **K47, 339, 750.00 (Forty Seven Million Three Hundred Thirty Nine Thousand Seven Hundred and Fifty Malawi Kwacha).**

This: .....28th.....**day of** .....December.....**2018**

SIGNED BY THE TRANSFEROR MCHILAWANKHONDO

G.V.H. MCHILA...
T/A KALOLO
P.O. BOX 44
NAMITETE, LILONGWE
DATE

In the presence of

WITNESS :

ADDRESS : Robert Harry Nthewa
Legal Practitioner &
Commisssioner for Oaths
P.O. Box 30783
Chichiri, Blantyre 3

OCCUPATION :

THE COMMON SEAL WAS HERE TO AFFIXED

In the presence of

DIRECTOR :

SECRETARY :

AGRI VALUE CHAIN
P.O.BOX 51722
LIMBE
MALAWI

REPUBLIC OF MALAWI

REGISTERED LAND ACT
(Chapter 58:01)

Land Certificate

Registration District
LILONGWE

Title No.
CHILAZA-38/2/3

This is to certify that **AGRI VALUE CHAIN LIMITED OF POST OFFICE BOX 51722, LIMBE, BLANTYRE** is registered as the absolute proprietor of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 27 of the Registered Land Act as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the
LILONGWE District Registry
This 8TH Day of FEBRUARY, 2019

APENDEZI KACHIWALA
Land Registrar

A3.7 Title No. Chilaza-38/2/4

REPUBLIC OF MALAWI

REGISTERED LAND ACT

TRANFER OF LAND

TITLE NO: CHILAZA - 38 / 2 /4

I, **SAIDI MWAMWILA MCHILAWANKHONDO** (As a family representative) of Chisikwa Village, Traditional Authority **Kalolo,** Lilongwe District in consideration of the sum of k4,901,875.00 **(Four Million Nine Hundred and One thousand Eight Hundred and Seventy five Malawi Kwacha), DO HEREBY TRANSFER to AGRI VALUE CHAIN LIMITED** of Post Box 51722, Limbe, Malawi that, a piece of land situated at Chisikwa village for Commercial purposes comprised of **0.8525 of a Hectare** of freehold land as shown on the attached Deed plan Number:2940/2018

This 28th **Day of** December **2018**

SIGNED BY THE TRANSFEROR: M'CHILAWANKHONDO

G.V.H. MCHILAWANKHONDO
T/A KALOLO
P.O. BOX 44
KAMITETE LILONGWE
DATE

In the presence of:

WITNESS: Robert Harry Nthewa

ADDRESS: Legal Practitioner & Commissioner for Oaths P.O. Box 30783 Chichiri, Blantyre 3

OCCUPATION:

THE COMMON SEAL

WAS HERETO

AFFIXED

In the presence of:

DIRECTOR

AGRI VALUE CHAIN LTD P.O. BOX 51722 LIMBE MALAWI

REPUBLIC OF MALAWI

REGISTERED LAND ACT
(Chapter 58:01)

Land Certificate

Registration District
LILONGWE

Title No.
CHILAZA-38/2/4

This is to certify that **AGRI VALUE CHAIN LIMITED OF POST OFFICE BOX 51722, LIMBE, BLANTYRE** is registered as the absolute proprietor of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 27 of the Registered Land Act as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the
LILONGWE District Registry
This 8TH Day of FEBRUARY, 2019

APENDEZI NACHIWALA
Land Registrar

A3.8 Title No. Chilaza-38/2/5

REPUBLIC OF MALAWI

REGISTERED LAND ACT

TRANSFER OF LAND

TITLE No. CHILAZA-38/2/5

I, SAIDI BUTAWO MWAMWILA MCHILAWANKHONDO (as a family representative) of Chisikwa Village, Traditional Authority Kalolo , Lilongwe District (hereinafter called "the transferor") **DO HEREBY TRANSFER** to **AGRI VALUE CHAIN LIMITED** of Post Office Box 51722, Limbe (hereinafter called "the transferee") that piece of land situated at Chisikwa Village for commercial purposes comprised of **0.6335 of a Hectare** as shown in the attached Map Sheet number **WV 4850R** and Deed plan in consideration of **K2,750,000.00 (Two Million Seven and Fifty Hundred Thousand Malawi Kwacha).**

This: 28th **day of** December **2019**

SIGNED BY THE TRANSFEROR S.V.H. MCHILAWANKHONDO

G.V.H. MCHILAWANKHONDO
T/A KALOLO
P.O. BOX 44
NAMITETE, LILONGWE
DATE

In the presence of

WITNESS :

ADDRESS : Robert Harry Nthewa
Legal Practitioner &
Commisssioner for Oaths
P.O. Box 30783
Chichiri, Blantyre 3

OCCUPATION :

THE COMMON SEAL OF AGRI VALUE CHAIN LIMITED

WAS HEREUNTO AFFIXED

In the presence of

AGRI VALUE CHAIN P.O.BOX 51722 LIMBE MALAWI

DIRECTOR :

COMPANY SECRETARY :

REPUBLIC OF MALAWI

REGISTERED LAND ACT
(Chapter 58:01)

Land Certificate

Registration District
LILONGWE

Title No.
CHILAZA-38/2/5

This is to certify that **AGRI VALUE CHAIN LIMITED OF POST OFFICE BOX 51722, LIMBE, BLANTYRE** is registered as the absolute proprietor of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 27 of the Registered Land Act as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the
LILONGWE District Registry
This 8TH Day of FEBRUARY, 2019

APENDEZI KACHIWALA
Land Registrar

Annex 4: Consultancy Team

Name	Key Qualification	Experience	Key Role
Tananga Mathews Nyirenda (Team Leader)	PhD. Environmental Science; MSc Environmental Science; BSc Environmental Science.	Has over 10 years' experience in relation to the EIA Process in Malawi both as a reviewer and writer of Environmental assessment reports (EIAs, ESMPs, Environmental Audits and ESMFs).	Environmental and Social Expert
Meya Mkandawire	Master's in Business Administration; BA in Banking and Financial Management.	Has 7 years of work experience social and business development expert. She has been involved as a social expert in several EIA and ESMP reports.	Social and Business Expert
Francis Kuweruza	MSc Human Nutrition; BSc Human Nutrition and Food Science.	Has over 10 years' experience of working with Agro-processing industries in Malawi	Food Quality Assurance Expert
Chimwemwe Bob Banda	BSc in Land Surveying	Has 12 years' experience of working as a physical planner.	Physical Planning Expert

ESRC
Environmental & Social Research Consulting