ENVIRONMENTAL IMPACT ASSESSMENT
FOR
FRANEMM INDUSTRIES LTD,
PLOT 9-13, RIVERVIEW (LAGOS-IBADAN EXPRESSWAY), ISHERI IN IFO LOCAL GOVERNMENT AREA OF OGUN STATE.

BY

Franemm
INDUSTRIES LTD.

Plot 9-13, Riverview (Lagos-Ibadan Expressway) Isheri Ogun State.

Submitted to the
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Units of Measurement and Abbreviations

cfu	Colony Forming Units
ºC	Degrees Centigrade
dB(A)	Decibel (A)
g/kg	Gramme per kilogramme
kg	Kilogramme
kg/h	Kilogramme per hour
kg/m³	Kilogramme per cubic metre
km	Kilometre
km²	Square kilometer
m	Metre
m²	Square meter
mg/kg	Milligramme per kilogramme
mg/l	Milligramme per litre
ml	Millilitre
mm	Millimetre
ppm	Parts per million
µS/cm^{-2}	Micro Siemens per centimeter
S	Conductance
wt %	Percent Weight
%	Percentage
BAT	Best Available Technology
BOD_5	Biochemical Oxygen Demand
BTEX	Benzene, toluene, ethylbenzene, and xylene
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
COD	Chemical Oxygen Demand
Cu	Copper
DO	Dissolved Oxygen
EA	Environmental Audit
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement

EMP	Environmental Management Plan
FEPA	Federal Environmental Protection Agency
FMEnv	Federal Ministry of Environment
FIL	Franemm Ind Ltd
HC	Hydrocarbon Content
HSE	Health, Safety and Environment
HUB	Hydrocarbon Utilizing Bacteria
HUF	Hydrocarbon Utilizing Fungi
ISO	International Organization for Standardisation
LEL	Lowest Explosive Limit for Volatile Gases
MC	Moisture Content
NESREA	National Environmental Standards and Regulations Enforcement Agency
ND	Not detected
NG	No Growth
NIMET	Nigeria Meteorological Agency
NOx	Oxides of Nitrogen
pH	Hydrogen ion Concentration
PM	Particulate Matter
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
SE	South-East
SO_4	Sulphate
SO_x	Oxides of Sulphur
TDS	Total Dissolved solids
THC	Total Hydrocarbon Content
TOM	Total Organic Matter
TOR	Terms of Reference
TSP	Total Suspended Particulates
TPH	Total Petroleum Hydrocarbon
TSS	Total Suspended Solids
UN	United Nations
VOC	Volatile Organic Carbon
WHO	World Health Organization
Zn	Zinc

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Franemm Industries Limited wishes to acknowledge the Federal Government of Nigeria for the opportunity given to her through its Agencies to conduct this Environmental Impact Assessment (EIA), in support of the facility expansion project at plot 2a, Riverview Road OPIC Industrial Estate, Isheri,

We are grateful to the Ogun State Government and Ifo Local Government for their support for the project.

We also acknowledge the support of Riverview Estate Community in OPIC Industrial Estate during the consultation process. We acknowledge the wonderful support of private, public organizations and individuals too numerous to mention by name.

The contributions of the Environmental Consultant – Ecovantage Integrated Resources Limited commissioned to execute this EIA is also acknowledged and commended.

EXECUTIVE SUMMARY

Franemm Industries Limited [FRANEMM); a foremost toiletries, cosmetics and hair products manufacturer proposes to embark on the expansion of its factory in OPIC Industrial Estate, Lagos. The purpose of this project is to set up a detergent and plastic packaging plant in an existing manufacturing facility on a land of total land area of 12.87 hectares.

The proposed factory will comprises of

- Construction of factory structure measuring 4595m^2.
- Installation of 144000T/year detergent line
- Installation of plastic lines (240T/year PET and 600T/year HDPE)
- Installation of a 2MW CNG fired generator with an 8500scm skid CNG plant for the generator and boilers.

When fully operational; the plant can produce up to 80 % of the take-off capacity. The plant under normal operation would operate for 8 hrs per day and has a life expectancy of 50 years.

Franemm Ind. Ltd commence operations on Plot 9-13, River View (Lagos Ibadan Expressway) OPIC Industrial Estate, Isheri, Ifo Local Government. Ogun State in year 2016. The Company is into manufacturing and marketing of a wide range of medicated and toilet soaps, creams, talc, lotion etc.

The statutory requirements and guidelines relevant to the EIA include National Policy on Environment; Regulations, Standards and Practices/Guidelines of the FMEnv; Regulations and recommended practices of Ogun State Ministry of the Environment/OGEPA; other international standards and guidelines to which Nigeria subscribes and FRANEMM's Environmental Policy.

The project is justified by the Federal Government's invitation to foreign investors to invest in Nigeria's Economy and the deep seated interest of the proponent, FRANEMM, to move from being manufacturer's representative to actual manufacturer products. The Plant is designed to produce with minimal impact on the environment through careful processes and installation of pollution abatement units. The economic recession and security challenges have prompted the initiative to create rooms from the existing facility in Isheri.

The project is projected to provide substantial economic benefits to the Nigerian Government, the National economy and the project owners.

The preliminary assessment of impacts of the proposed expansion project has addressed the three main development options:

These alternatives have been reviewed in consideration of the overall objectives of the plant project and other criteria such as Economic utilization of already existing production plant and equipment; Direct Foreign Investment into the country; An opportunity for a deliberate transfer of Technology to Nigerians, Increase in Government Revenue, Creation of employment opportunities and contribution to the industrialization in Isheri, Lagos and Nigeria and Security of workers and properties. Therefore sitting the plant at the proposed site is optimal.
.
Construction/installation of the project components will be executed in accordance with a standard planning framework that will be reviewed as it becomes expedient by project team to ensure full compliance with regulatory standards.

The processes for the proposed project are detailed as follows:
The synthetic detergent powder production plant is composed of the following section of process units: Solid and liquid raw materials manual dosing (batch type); Slurry preparation and high pressure pumping; Slurry aeration; Spray-drying, complete with hot air generation, exhaust air treatment, air lift and base powder sieving and final perfuming and base powder batch post-blending. The dust coming from belts and process machines is recycled to the process and all valuable liquid waste generated in the manufacturing process are totally reabsorbed into the production system. Therefore an effluent treatment plant will not be needed. However, raw material packaging such as waste drums and bags which will be recycled reused or sold to a competent third party.

The product containers will be PET manufactured Injection Molding of the PET Preform. The process is simple, the heated PET which is in the molten form is injected into the injection chamber by the rotation of screw barrel within the machine, until the chamber is full. Once the chamber is full, the screw pushed forward to fill the injection cavity with molten plastic through the nozzle into the mold. The PET preform is ejected from the mold. Now the preform is reheated to the temperature until it is suitable for the blowing process.

The covers are Polypropylene, High Density Poly Ethylene and Low Density Poly Ethylene, feeding, plasticization, injection, pressure holding cooling and mold release

The existing utilities block comprises of the Generators, transformers, borehole and Water Treatment Plant. The facility is connected to the grid. There is a 33 KVA power line connection from IKDC that connects the facility transformer. The proposed and existing facilities will be powered by a 2MW CNG fired generator while the existing 2 units (1000 KVA and

800 KVA) diesel fired generators serves as power back-up. The proposed project will require a total of 650KW [Detergent Plant (350KW and plastics (350W)] electricity.

There is an existing water treatment plant and will be upgraded to a 5MT/Day capacity.

Climate and Meteorology: The maximum temperature of the area is between 27.7^{o}C. and 37.8^{o}C while the minimum temperature varies between 22.5 and 26.3 ^{o}C. The months August and September are the coolest with temperature of about 22 ^{o} C while the months of January to March are usually the hottest with a mean temperature of 36.5 ^{o} C. The wind direction is basically south westerly. Wind speeds are generally low (2.2-7.7)m/s. The monthly sunshine hours values vary between 51.2 (July) and 165.7hours (January).

The average wind speed of the project area varies within the range of 2.8 — 4.0 ms for most periods of the year within an average speed of 3.5ms.

Total annual rainfall is about 2160 mm with a minimum of between 14.3mm during the "dry" month of December and 312 mm in June. Relative humidity is greater at 9:00hrs (range between76.3 and 86.6%), than during the day (53.5% and 80.3%).

Geology and Hydrogeology: The study area falls within the Dahomey Sedimentary Basin. All these formations are water bearing and hence constitute hydro geologically significant litho logic units either as media for the passage of contaminants, as filter for removal of harmful chemicals and pathogens or as local aquifers for water supply.

Air Quality and Noise Levels: Air quality in the study area (based on TSP

values) is of moderate quality. All other parameters analysed fell within FMENV limits.

The noise levels observed range from 52dB (A) to 89dB (A). The higher noise levels were recorded nearer the highway and the existing power generating set 89dB in the facility. However, the general noise level of the study area is still within the FMEnv Limit for an industrial area.

Water Quality: ground water samples parameters analysed were within permissible limit except for the Iron content (2.1- 2.5mg/l) for both seasons is above the specified limit (0.30mg/l).

Physico-chemical and Microbiology analysis of Opa Aro streem and Ogun River indicated that the surface waters have been impacted by anthropogenic activities.

Generally, the soil in the study area could be broadly categorized as rainforest soils which belong to the incepted, Entisol, oxisols and Alfisols soil order of United States Department of Agriculture (USDA) soil classification scheme. These are mineral soils formed as a result of weathering of siliceous sandstone fragments over varying periods of time.

All soil physicochemical parameters conformed to FMEnv Standard and modest microbial load to sustain biodegradation

The site is heavily built up for industrial and associated activities and most of the undeveloped surfaces have concrete. However, some of the sighted vegetation within these spaces include: Tridax procumbens, Spigellia anthelmia, Gomphrena celosoides, Euphorbia heterophyla, E. hysopiha, Fluerya aestuans, and Luffa aegyptica.

The proposed project site falls within OPIC acquisition and a government approved industrial area and as such subject to frequent modifications As at the time of the studies, rainbow lizard (Agama agama) and birds such as Vinaceous dove (Streptopelia vinacea) and weeping dove (Streptopelia semitorquata) were seen regularly. Also, the notorious household pest, the common rat Rattus rattus were also sighted.

Information drawn from local sources revealed that there are various wildlife resources which include bats and snakes. These were reported to have been sighted at different parts of the site at one time or the other.

Socio-Economic Characteristics- Collection of data was obtained from the following sources: publications: information was obtained from relevant published documents about Ifo Local Government and the official records of National Population Commission; Questionnaire survey: information was collected from people living around the project site in Isheri and stakeholders meeting

The proposed project falls within Ifo LG. There are twenty Local Government Areas in Ogun State. Local Governments & LCDAs in Ogun State are Abeokuta North Abeokuta South, Ado-Odo/Ota, Egbado North, Egbado South, Ewekoro, Ifo, Ijebu East, Ijebu North, Ijebu North East, Ijebu Ode, Ikenne, Imeko-Afon, Ipokia, Obafemi-Owode, Ogun Waterside, Odeda, Odogbolu, Remo North and Shagamu. Ifo LG has a total land area of 82,000 sq km.

Historically, Ifo Local Government Council Area consists of seventy-eight communities and the first settlers are the Awori who migrated from Ogun State.

The physical extent of the towns and settlements runs in a linear fashion

along the Expressway extending inwards to some few kilometres from the Expressway. The proposed project site is falls within the second largest Industrial Estate in Lagos State. The OPIC Industrial Estate is located within the project area. 10.5 % of the total land area. Residential Land use includes Major housing projects are Gateway Estates Riverview Estates, Havillah Estates and Sparklite Estates. Residential use in the peri-urban zone covers 50.9% of the total land area.

The physical development of Lagos-Ibadan corridor is further reinforced by various religious institutions that have taken over the corridor in recent years; and are major flash Point for seasonal traffic congestion.

All the roads in and around the proposed project site are provide with storm water drainages and are well connected discharge points particularly Ogun river. Typical of most Nigerian drainages, the open drains along all streets are clogged with refuse, plastic bottles and failed structures. Isheri area experience perennial floodings due to blockade of ogun river and relase of water from the dams.

Property owners in the area therefore resort to the construct boreholes as alternative or supplementary source of water supply. So far underground water of the coastal plain sands has not yet been depleted as its aquifer is being replenished constantly annually.

All developments in Isheri depend on the conventional septic/ soak away system. Sewage operator services are efficient and effective in the study area.

The services of OGMOE/OGEPA Licensed Private Refuse Operators are well established.

An inventory of health care facilities in the study areas shows adequate provision of government health facilities in the communities. There were private clinics in the area and patent medicine stores. Private medical clinics and patent medical stores are providing healthcare at high prices forcing residents to patronize General Hospitals. Major private hospital with five minutes of reach to the facility are Isheri health clinic, Ojodu Primary Health Centre, Bofab Hospital, alheri hospital, Adigboluja hospital, Bemil hospital, Life Force Medical centre, The Valley Surgical and Medical home, Ewa hospital, Eniolu hospital, Blessing clinic and Maternity home, Funmilola hospital, Yosola hospital, Solan clinic and maternity, Tomade Medical Centre

Consultations have been accorded the utmost priority in the proposed project and all the developmental activities associated with it. Issues raised during the meeting include concern about the need to ensure that the proposed project does not pollute or decrease the quality of ground water, Noise Pollution from Generator, Effluent Management and Air Pollution. Franemm assured the stakeholders that the detergent plant will be environment friendly in that emissions and waste water are totally reabsorbed into the production line. Also, the existing ETP will be upgraded to meet the demand of the existing and proposed plant and the generators shall be sound proofed to attenuate noise.

In studying the impact of the proposed project for the immediate environment, questionnaire administration were employed in eliciting information from workers in neighboring companies, artisans and petty traders with shops outside the company premise and individual persons living in this area. The results obtained from the questionnaire administration and analyses are presented below.

Impact assessment methodology adopted for this project while Project

impacts were quantified using the Risk Assessment Matrix and the ISO 14001 procedure for evaluation and registration of Environmental Aspects and identifying significant environmental aspects/impacts.

The identified associated and potential impacts from the proposed project are detailed the identified negative impacts are

- Dust and gaseous emissions from excavation of structures leading to high suspended particulates in the atmosphere
- Noise emissions generated by heavy duty vehicles and workers activities and resultant hearing impairment on site workers.
- Soil and ground water contamination from poor handling of fuel, spent oil, paints, wood treatment, insecticides and Spillage of septic liquor from Burst sewage pipes
- Exposed soils in the affected areas which could be vulnerable to erosion.
- Solid waste constituting aesthetic nuisance
- Increase in vehicular traffic in and around Riverview Road (Westerner Street) Street and Lagos -Ibadan Expressway
- Vehicular Accident and reckless driving.
- Sexual laxity

At the Equipment testing and Operational phases, the identified associated and potential impacts include

- Air Quality impacts from Fugitive emissions from tanks used to store petroleum products, Combustion emissions from machine exhausts e.g pumps power generating sets and truck and all forms of open Burning
- Noise emissions generated by construction activities and resultant hearing impairment on site workers.
- Fires and explosions, mechanical or electrical failure, accidental ruptures of tanks, petroleum products leakages, operators

carelessness, static electricity or lightening discharges and sabotage or terrorist attacks
- Disturbance to vehicular traffic flow around the project area
- Solid waste constituting aesthetic nuisance
- Sewage Nuisance from burst pipes
- Health and safety issues due to exposure to noise of heavy machineries
- Facility abandoned without proper decommissioning.

The major positive impacts include technology transfer, retention of foreign exchange and creation of employment.

Adequate mitigation measures were developed for each of the negative impacts identified. In summary, the following mitigating measure will ameliorate the impacts of the proposed project on the physical and social environments.

Environmental Management is part of FRANEMM Quality Management Scheme. It is a planned, integrated program of containing and minimizing unforeseen and unidentified impacts of a proposed project. The long-term objectives include:
- Ensuring compliance with legislation and company policy
- Integrating the environment fully into all activities and
- Encouraging and achieving high performance and response from individual employees and contractors.

FRANEMM' Environmental Management Plan (EMP) for construction and installation of the plant ensures an interaction between the environmental officers and the implementation team. The elements of the plan include monitoring and audit. The EMP also lists the requirements to ensure effective mitigation of each potential biophysical and socio-

cultural impact identified in the EIA and the following information is provided.

A comprehensive listing of the mitigation measures for implementation

- The person(s) responsible for ensuring full implementation of that action;
- The parameters that will be monitored to ensure effective implementation of that action;
- The timing for the implementation of the action to ensure that the objectives to mitigation are fully met.
- Both impact monitoring and compliance monitoring will be adopted for the FRANEMM Plant site for the construction and installation activities. The environmental variables for monitoring, as detailed in the text of this report will include the following:
- Ground Water Quality Status
- Air Quality Status and emissions
- Wastewater characteristics
- Local meteorological conditions

At the end of the life span of the Project, FRANEMM shall employ its standard decommissioning and abandonment programme, which will include the following:

- Ensuring that the decommissioning and abandonment are done with the same care and respect for the environment with which the project was designed, constructed and operated.
- Assessing residual impacts that the project has had on the environment during its life span.
- Monitoring the abandoned environment.
- Restoring the environment to its original state as much as possible.

For this to be done effectively, the decommissioning and restorative/rehabilitative programme shall be executed by a team of competent personnel including the Environmental Liaison Officer as well as Engineering and Operations personnel.

This report concludes that if the proffered mitigation measures are implemented, the facility expansion shall be constructed/ conducted and operated in an environmentally acceptable manner.

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

Franemm Industries Limited [FRANEMM]; a foremost toiletries, cosmetics and hair products manufacturer proposes to embark on the expansion of its factory in OPIC Industrial Estate, Lagos.

The Environmental Impact Assessment (EIA) is a tool for generating information and assessing developmental activities for potential environmental risk that may result from such activities, FRANEMM INDUSTRIES Limited has therefore commissioned Messrs Ecovantage Integrated Resources Ltd to carry out an Environmental Impact Assessment study of her proposed facility expansion project in an existing warehouse/factory blocks on Riverview Road (Westerner Street) Street, Off Lagos -Ibadan Expressway, Isheri.

1.1 PROPONENT

Franemm Industries Limited is a multinational and continental consumer home care, cosmetics, food and nutritional production company. Franemm Ind. Ltd manufactures and distributes some of the best loved brands in Nigeria and around Africa ranging from Petals product lines (Neutralizing Shampoo, Hair Conditioner and Lotion, Lotta Bounce Setting Lotion, Petroleum Jelly, Shampoo, Bath and Laundry Soap, Hair Oil Moisturizer, Weavon Glossifier, Hair Placenta, Herbal Hair Scalp Treatment, Conditioning Crème Relaxer, Styling Gel, Hair Food Cream) Including other product lines of the Beva brands, Wink Ultra Bath and Laundry product line.

Franemm Ind. Ltd is also into Supply and distribution of other products, including the Extract® Product line, SkinWhite® product line, Maxi-Peel® Facial Cleansers and Gypsy Custard; a food and nutritional range of product.

1.2 PROJECT PREMISES

The key premises, which affect the EIA process, were established from the initial stages of the project. The premises are as follows:

- **Environmental Impact Assessment (EIA) Act CAP E12, LFN 2004** The E.I.A Act, as it is informally called, deals with the considerations of environmental impact in respect of public and private projects; Lagos State Environmental Laws at the Local Government level and other laws operating both nationally and internationally.
- The project is being designed and will be operated to comply with these local and national laws, together with all the international guidelines, protocols, agreements and conventions.
- The agreement and understandings made with Government officials, during the course of the EIA process, will be respected and honoured.

An Environmental Management Plan (EMP) will be developed as part of the EIA process. The implementation of the plan will be the responsibility of Franemm Industries Limited.

1.3 LEGAL AND ADMINISTRATIVE FRAMEWORK

In EIA studies such as this, all actions that will result in physical, chemical, biological, cultural and social modifications of the environment as a result of the new project/development are assessed.

There are specific laws, guidelines and standards that regulate all

development activities in Nigeria, some of these include:

- **CONSTITUTION OF THE FEDERAL REPUBLIC OF NIGERIA (1999)**

The constitution, as the national legal order, recognizes the importance of improving and protecting the environment and makes provision for it. Relevant sections are:

- Section 20 makes it an objective of the Nigerian State to improve and protect the air, land, water, forest and wildlife of Nigeria.
- Section 12 establishes, though impliedly, that international treaties (including environmental treaties) ratified by the National Assembly should be implemented as law in Nigeria.
- Section 33 and 34 which guarantee fundamental human rights to life and human dignity respectively, have also being argued to be linked to the need for a healthy and safe environment to give these rights effect.
- ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ACT. CAP E12, LFN 2004.
- The E.I.A Act, as it is informally called, deals with the considerations of environmental impact in respect of public and private projects.
- Sections relevant to environmental emergency prevention under the EIA include:-
- Section 2 (1) requires an assessment of public or private projects likely to have a significant (negative) impact on the environment.
- Section 2 (4) requires an application in writing to the Agency before embarking on projects for their environmental assessment to determine approval.
- Section 13 establishes cases where an EIA is required and
- Section 60 creates a legal liability for contravention of any provision.

- **THE NIGERIAN URBAN AND REGIONAL PLANNING ACT CAP N138, LFN 2004**
  - The Urban and Regional Planning Act is aimed at overseeing a realistic, purposeful planning of the country to avoid overcrowding and poor environmental conditions. In this regard, the following sections become instructive:-
  - Section 30 (3) requires a building plan to be drawn by a registered architect or town planner.
  - Section 39 (7) establishes that an application for land development would be rejected if such development would harm the environment or constitute a nuisance to the community.
  - Section 59 makes it an offence to disobey a stop-work order. The punishment under this section, is a fine not exceeding N10, 000 (Ten thousand naira) and in the case of a company, a fine not exceeding N50, 000.
  - Section 72 provides for the preservation and planting of trees for environmental conservation.

- **LAND USE ACT CAP 202, LFN 2004**

The Land Use Act places the ownership, management and control of land in each state of the federation in the Governor. Land is therefore allocated with his authority for commercial, agricultural and other purposes.

- **HARMFUL WASTE (SPECIAL CRIMINAL PROVISIONS) ACT CAP H1, LFN 2004**
  - The Harmful Waste Act prohibits, without lawful authority, the carrying, dumping or depositing of harmful waste in the air, land or waters of Nigeria. The following sections are notable:
  - Section 6 provides for a punishment of life imprisonment for offenders as well as the forfeiture of land or anything used to commit the offence.

- Section 7 makes provision for the punishment accordingly, of any conniving, consenting or negligent officer where the offence is committed by a company.
- Section 12 defines the civil liability of any offender. He would be liable to persons who have suffered injury as a result of his offending act.

- **EXCLUSIVE ECONOMIC ZONE ACT, CAP E11, LFN 2004.**

The Exclusive Economic Zone Act makes it illegal to explore or exploit natural resources within the Exclusive zone without lawful authority. The Federal Government regulates the activities of the Exclusive Zone.

- **CRIMINAL CODE**

Criminal Code Act 2005, the Nigerian Criminal Code makes it an offense, punishable with up to 6 months imprisonment for any person who:

- Violates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carry on business in the neighbourhood, or passing along a public way; or
- Does any act which is, and which he knows or has reason to believe to be, likely to spread the infection of any disease dangerous to life, whether human or animal.

- **THE ENDANGERED SPECIES ACT, CAP E9, LFN 2004.**

This Act focuses on the protection and management of Nigeria's wildlife and some of their species in danger of extinction as a result of overexploitation. These sections are noteworthy:

- Section 1 prohibits, except under a valid license, the hunting, capture or trade in animal species, either presently or likely to be in danger of extinction.
- Section 5 defines the liability of any offender under this Act.
- Section 7 provides for regulations to be made necessary for

environmental prevention and control as regards the purposes of this Act.

- **FACTORIES ACT, CAP F1, LFN 2004.**

The Factories Act promotes the safety of workers and professionals exposed to occupational hazards. Under this Act, it is an offence to use unregistered premises for factory purposes. In particular:
Section 13 allows an inspector take emergency measures or request that emergency measures be taken by a person qualified to do so in cases of pollution or any nuisance.

- **WATER RESOURCES ACT, CAP W2, LFN 2004.**

The Water Resources Act is targeted at developing and improving the quantity and quality of water resources. The following sections are pertinent:
Section 5 and 6 provides authority to make pollution prevention plans and regulations for the protection of fisheries, flora and fauna.
Section 18 makes offenders liable, under this Act, to be punished with a fine not exceeding N2000 or an imprisonment term of six months. He would also pay an additional fine of N100 for everyday the offence continues

- **NATIONAL ENVIRONMENTAL STANDARDS AND REGULATION ENFORCEMENT AGENCY (NESREA) ACT 2007**

Administered by the Ministry of Environment, the National Environment Standards and Regulation Enforcement Agency (NESREA) Act of 2007 replaced the Federal Environmental Protection Agency (FEPA) Act. It is the embodiment of laws and regulations focused on the protection and sustainable development of the environment and its natural resources. The following sections are worth noting:-

- Section 7 provides authority to ensure compliance with

environmental laws, local and international, on environmental sanitation and pollution prevention and control through monitory and regulatory measures.

- Section 8 (1)(K) empowers the Agency to make and review regulations on air and water quality, effluent limitations, control of harmful substances and other forms of environmental pollution and sanitation.
- Section 27 prohibits, without lawful authority, the discharge of hazardous substances into the environment. This offence is punishable under this section, with a fine not exceeding, N1,000,000 (One Million Naira) and an imprisonment term of 5 years. In the case of a company, there is an additional fine of N50,000, for every day the offence persists.

- ***REGULATIONS (UNDER NESREA)***
  - National Effluent Limitation Regulations.
  - Section 1 (1) requires industry facilities to have anti-pollution equipment for the treatment of effluent.
  - Section 3 (2) requires a submission to the agency of a composition of the industry's treated effluents.
  - National Environment Protection (Pollution Abatement in Industries and Facilities producing Waste) Regulations (1991).
  - Section 1 Prohibits the release of hazardous substances into the air, land or water of Nigeria beyond approved limits set by the Agency.
  - Section 4 and 5 requires industries to report a discharge if it occurs and to submit a comprehensive list of chemicals used for production to the Agency.
  - Federal Solid and Hazardous Waste Management Regulations (1991).
  - Section 1 makes it an obligation for industries to identify solid hazardous wastes which are dangerous to public health and the

environment and to research into the possibility of their recycling.

- Section 20 makes notification of any discharge to the Agency mandatory.
- Section 108 stipulates penalties for contravening any regulation.

- ***PERMISSIBLE NOISE REGULATIONS***
  - The National Environmental Standards and Regulations Enforcement Agency (Establishment) Act of 2007 is the major law on noise pollution in Nigeria. The law 32 provides that:

    (a) The Agency shall on the commencement of this Act, and in consultation with appropriate authorities: (i)identify major noise sources, noise criteria and noise control technology; and (ii)make regulations on noise, emission control, abatement, as may be necessary to preserve and maintain public health and welfare.

    (b) The Agency shall enforce compliance with existing regulations and recommend programs to control noise originating from industrial, commercial, domestic, sports, recreational, transportation or other similar activities.

1.4.2.1 Ogun State Environmental Management (Miscellaneous) Provisions Law, 2004

This law was enacted and signed by the State's House of Assembly and the Governor respectively in the year 2004. Sections 3 and 4 of the law, states in clear terms, the function and powers of the Ministry of Environment. According to the sections:

1) The Ministry shall be responsible for administering the provisions of this law and for ensuring within the State, the protection, maintenance and development of the environment, environmental

technology and initiation of policy in relation to environmental research and technology;

2) The Ministry shall formulate and enforce policies, statutory rules, and regulations on waste collection and disposal, general environmental protection, control and regulation of the ecological system and all activities related thereto;
3) Advise the government on environmental policies and priorities and on scientific and technological activities affecting the environment;
4) Establish and take measures to ensure effective environmental structures in the in the State for flood and erosion control, solid and liquid waste collection and disposal, water and air pollution eradication, noise control and general sanitation;
5) Initiate appropriate policy action on the environment impact implications of environment related activities;
6) Initiate measures to ensure pollution free air, water and land throughout the State and take steps to obviate, mitigate or eliminate environmental discomfort to individual or groups, or danger to lives and properties;
7) Establish such environmental criteria, guidelines, specifications or standards for the protection land, water and air as may be necessary to protect to protect the health and welfare of the population from environmental degradation;
8) Establish such procedure for industrial or agricultural activities in order to minimize damage to the environment from such activities.

- **Ogun State Environmental Protection Agency Edict (OGEPA) 1995**

FEPA Decree 58 of 1988, part III, section 24, and allows for the setting up of state and Local Government Environmental Protection bodies. Consequently, the Ogun State Environmental Protection Agency was established. The functions and powers are published in the Ogun State

Official Gazette. The State Government also created a substantive Ministry of Environment in 2003.

All the state in Nigeria has power to make laws with respect to the environment under the Constitution. This is because the subjects relating to the environment are contained in the Concurrent Legislative List.

In accordance with section 5 of the Ogun State Edict of No 1 of 1995 Gazette No 14, vol. 20 of 6th April 1995.

(1) The Agency (OGEPA) subject to this edict, have responsibility for the protection and development of the environment in the State and in consultation with FEPA, ensure implementation and enforcement of FEPA's regulations in the state and in particular shall

a. Ensure the carrying out of the annual state of the environmental report.

b. Collaborate with FEPA in conducting public investigation on major Environmental pollution.

(2) Cooperate with Federal and State Ministries, Local Government Councils, Statutory Bodies, Research and Educational institutions on matters relating to environmental protection.

(3) Carry out such other activities as are necessary or expedient for the full discharge of the functions of the Agency among others to:

- Collect and disseminate such information, acquire such technical data and conduct such experiments as may be required to carry out the purpose of this Edict, including ascertainment of the quantity and nature of discharges from
- any containment source and data on those sources and to operate and arrange for the operation of devices for the monitoring of environmental quality;

- To conduct a programme of continuing surveillance and of regular or periodic inspection of actual or potential contaminant or noise sources, of public water suppliers and of refuse disposal site;
- To enter at all reasonable times upon any private property for the purpose of inspecting and investigating to ascertain possible violations of this Edict or of regulations made there under, in accordance with constitutional limitations.

- **OTHER GUIDELINES**

- **International Regulations**

The Nigerian government has become an important player in the international support for the protection of the environment. As such, the country is a signatory to some international laws and conventions that are targeted towards conservation and protection of the environment to ensure sustainable development. Such conventions and laws state clearly the responsibilities, attitude, contributions, etc. of signatory nations towards that particular cause. For example, "The law for the Sea Convention, 1982" stipulates a general obligation on all states to protect and preserve the marine environment and to take all necessary measures to reduce and control pollution from any source. On the other hand, the Convention on the Continental Shelf and Seas (Geneva, Act 1958) was designed to prevent or minimize oil pollution arising from exploitation of the continental shelf and its natural resources. Another is the Convention for Civil Liability for Oil Pollution Damage (Brussels, 1969). This convention provides that adequate compensation should be paid to persons who suffer damage caused by pollution resulting from the escape or discharge of oil from ships. It also stipulates standardized international rules and procedures for determining questions of liability and adequate compensation in such areas.

Some other International Conventions and Laws that are related to the

present study and to which the Nigerian Government is a signatory include:

(1) African Convention on the Conservation of Nature and Natural Resources of 1968;
(2) International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage of 1971;
(3) Convention on the Protection of the world Cultural and Natural Heritage of 1972;
(4) Convention on the Prevention of Marine Pollution by the Dumping of Wastes of 1972;
(5) Convention on the Conservation of Migratory Species of Wild Animals of 1979;
(6) The Montreal Protocol on Substances that deplete the Ozone layer 1987;
(7) The Convention on Climate Change 1992;
(8) The Convention on Biological Diversity, 1992.

- **World Bank Guidelines on Environmental Assessment (EA)**

The bank requires an EA on a proposed activity/facility (i.e. project) from a borrower as a pre-requisite before granting any financial assistance in the form of loans. The EA report usually forms a part of the overall feasibility study or project preparation.

The bank has categorization for projects based on their EA requirements and it is very similar to that of FMENV discussed in the preceding section.

Checklists of potential EIA issues which apply to this project include:

- Biological diversity
- Cultural properties
- Hazardous and toxic materials and

- International waterways

- **International Union for Conservation of Nature and Natural Resources (IUCN) Guideline.**

Internationally acceptable practices and standards for oil and gas exploration and production in the mangrove areas are presented in this guideline document by IUCN (the World Conservation Union) in conjunction with the Oil industry International Exploration and Production Forum (E&P Forum). The guidelines present practical measures that are aimed at the conservation of mangroves and enhancing the protection of marine ecosystems.

1.4 GUIDELINES ON EIA

Environmental Impact Assessment is a systematic study of impacts of proposed project activities on the physico-chemical, biological, ecological, socio-economic and health components of the environments. Franemm Industries Limited has undertaken this Environmental Impact Assessment (EIA) study, to predict the impacts of the proposed development on the environment and propose mitigation measures that will be incorporated into the project environmental management plan.

The EIA covers the project description, baseline studies, consultation programmes, social and health impact assessment, environmental quality assessment and impact quantification and an Environmental Management Plan.

The EIA study will make an input into the conceptual design of the project, to ensure that any identified adverse impacts are addressed at the early stage of the project and mitigated during the activity stages, involving site preparation, construction/installation, commissioning, operation, decommissioning and abandonment.

The scoping stage, the proponent submitted a Terms of Reference (ToR) for the proposed EIA study. The expansion project was adjudged Category I. This stage is followed by actual implementation of the EIA study; Preparation of Draft Reports; Review process, Preparation of Final Reports and Approval/Certification.

1.5 OBEJCTIVES OF THE STUDY

This EIA study is being undertaken to generate existing environmental data on the project area, predict the impacts of the proposed development on the environment, propose mitigation measures and establish an environmental management plan. This EIA study covers baseline studies with special attention to environmental quality assessment and impact quantification.

The main objectives of the EIA study are outlined as follows:

(i) To provide a reference database for the environment existing around the project location.

(ii) To identify adverse environmental problems that may be encountered in the demolition of the existing shed, the construction of the various components of the project which may cause negative environmental, social, health and economic effects on the immediate environment.

(iii) To incorporate mitigation measures on environmental management program into the project development process.

(iv) To meet the requirements for the issuance of an Environmental Impact Assessment (EIA) Permit by the Federal Ministry of Environment.

1.6 TERMS OF REFERENCES

The Terms of Reference (ToR), specified in this project document, include:

(i) Characterization (qualitative and quantitative) of the baseline

environmental conditions of the study area prior to the commencement of project activities;

(ii) Identification and assessment of potential impacts of the project;

(iii) Identification of cost-effective mitigation plans to palliate or completely eliminate negative impacts;

(iv) Identification and development of appropriate post-development environmental monitoring programme;

(v) Development of site restoration plans after project closure/decommissioning;

(vi) Preparation and submission of an adequate EIA report which can be used as a basis for the issuance of a clearance certificate by the Ministry of Environment.

1.7 PROJECT LOCATION

The proposed project is located within an existing factory facility is located at Plot 2A, Riverview Road (Westerner Street) Street, OPIC Industrial Estate, Ifo Local Government, Lagos State with a geo-referencing coordinates of $6^{o}36'43.06N$ $3^{o}20'31.41E$.

Figure 1.1 Map of Ogun State indicating the project site in Isheri

1.8 THE REPORT STRUCTURE:

This report presents the findings of the EIA study on the proposed facility expansion. The report structure is as follows:

Chapter 1 Introduction
Chapter 2 Project justification
Chapter 3 Process and Project Description
Chapter 4 Description of the Environment
Chapter 5 Associated and Potential Impacts
Chapter 6 Mitigation Measures
Chapter 7 Environmental Management Plan
Chapter 8 Conclusion
References
Appendices

CHAPTER TWO

2.0 PROJECT JUSTIFICATION AND ALTERNATIVES

2.1 INTRODUCTION

Franemm Industries Limited has responded to the ever increasing demands continually placed on consumer products used in personal hygiene and for beautification. Demand for quality detergent and toiletries by the Nigerian fast-growing economy is unprecedented; it is sustained by continued population growth, and increased urbanization and wealth.

The proposed facility expansion will produce quality detergent and toiletries at affordable price for the Nigerian economy, thereby saving the scarce foreign exchange expended on the importation of detergent and toiletries. It is also pertinent to mention that the plant will provide jobs for a lot of skilled and unskilled Nigerians.

2.2 NEED FOR THE PROJECT

The Existing soap and toiletries production capacity together is not sufficient to cover the anticipated increase in demand for detergent and toiletries products in the country. This is the justification for the project. The location, transportation, compatibility, suitability, land use combinations, the impact and effect of the proposed development on employment, the economy and price of commodity when established and operational, have been fully considered in the feasibility and motivation and these are in favour the project.

2.3 VALUE OF THE PROJECT

A substantial sum of money will be injected into the local economy through various contracts and subcontracts. In addition, employment opportunities at various phases of the project, for skilled, semi-skilled and unskilled labour will be created; finally, revenue will be generated from the sale of products. The project will bring about additional revenue generation to all levels of Government in the form of various taxes, tariffs, duties and levies.

2.4 PROJECT OPTIONS

The alternatives considered for this project are briefly discussed below:

2.4.1 No Project Option

The 'no project' option indicates that the detergent and toiletries plant project will not be implemented. This option will be working against the initiative of the Nigerian government to increase industrialization in the country. Also, the potentially accruable revenue to the national economy and returns expected for the investors will not be garnered. This option is therefore not attractive.

2.4.2 Delayed Project Option

This option implies postponing the planned expansion project until a later date. Such options are usually adopted when prevailing conditions are unfavourable for project implementation, such as during a war, when host communities are deeply resentful of the project, or if the economics of the project are unacceptable or unattractive, then a delay may be feasible. But none of these conditions are applicable, on the contrary, both the economics and the political environment are favourably disposed towards the project. Therefore, the implication of delaying the project will mean that all processes that have been put in place for the project design and implementation,

contractors and/or workers that are to be mobilised for this project will have to be put on hold. Also, because of the inflationary trends in the economy, such a delay may result in unanticipated increases in project costs, leading to a decrease in final profit accruable from the project. Also, considering the shortage in the supply of detergent and toiletries products in Nigeria currently makes it imperative for the planned project to commence as soon as possible. These, and other related problems make it unattractive to adopt the delayed project option

2.4.3 Project Alternative

2.4.3.1 Sitting the proposed plant in alternative location

This option implied that the plant will be located in another area to be acquired by the company at another cost after a huge cost had earlier been expended acquiring the present facility. Implementing this scenario will be inflicting unnecessary financial pain on the company and it is also beset with some ironies.

2.4.3.2 Sitting the plant at the proposed site at Isheri.

Executing this project at the proposed site as planned is considered more favourable option for the following reasons:

- The project does not conflict with other land uses especially, social and archaeological interest.
- It is the avowed decision of the proponent to set up this plant that led to the acquisition of the present warehouses and also with the full financing of the importation of the plant and equipment, the coast is clear for the plant to be installed.
- After the level of above capital commitment it is only natural that it will be more cost effective to continue at the present site.
- The stakeholders are fully aware of the project and the immediate benefit to them. They are full of hope that soonest another industry

would spring up in the area with all its attendant benefits.
- The facility is secure and the host community friendly.

The existing site's compatibility, suitability, and land use combinations of OPIC Industrial Estate Isheri. The existing facility and the proposed expansion are in a location which best suits these functions. Therefore, both in terms of economic and environmental consideration, the OPIC Industrial Estate is a credible choice.

2.5 ENVISAGED SUSTAINABILITY

The proposed project will be undertaken using best alternative technology (BAT) and processes in the industry. Sustainability of this project rests on the fact that:

- Environmental sustainability
  All processes and facilities shall be designed and installed in such a way that environmental disruption wills kept to the barest minimum. Environmental considerations have being integrated into all stages of the project and product life-cycle. Handling storage and disposal of waste shall be in accordance with regulatory requirements and company's relevant standard operating process procedures. The proposed site is already a developed area with only grasses; therefore there will be minimal destruction in vegetation and biodiversity.
- Economic Sustainability:
  The product for which the plant is being built is in high demand.
- Engineering: The existing Facilities and structures associated with the project is built to the highest possible engineering, safety and environmental standards and can be expected to last in excess of fifty years.
- Technical: Maintenance of the facilities is planned to take place regularly and as advised by the design consultants.

Environmental, social, safety and health considerations will be given full attention in the implementation of the project.

- Social: The project is an add-on to an existing project in an organised estate. The proponent has demonstrated a handful Cooperate Social Responsibility. Therefore, the project is expected to be beneficial to the Industrial Communities in OPIC Riverview.
- Franemm Ind Ltd shall sustain the cordial relationship with the the host community and most of the labour force is recruited from the community and regular consultations with relevant stakeholders shall be sustained throughout the life of the project.

CHAPTER THREE

3.0 PROJECT DESCRIPTION

The purpose of this project is to set up a detergent and plastic packaging plant in an existing manufacturing facility on a land of total land area of 12.87 hectares.

The proposed factory will comprises of

- Construction of factory structure measuring 4595m^2.
- Installation of 144000T/year detergent line
- Installation of plastic lines (240T/year PET and 600T/year HDPE)
- Installation of a 2MW CNG fired generator with an 8500scm skid CNG plant for the generator and boilers.

When fully operational; the plant can produce up to 80 % of the take-off capacity.

The plant under normal operation would operate for 8 hrs per day and has a life expectancy of 50 years.

3.1 DESCRIPTION OF THE EXISTING FACILITY

Franemm Ind. Ltd commence operations on Plot 9-13, River View (Lagos Ibadan Expressway) Isheri Ogun State in year 2016.

Notable landmarks around the facility are OPIC, and Riverview Estate

Overview of existing facility

Other sections of the existing facility include:

- Administrative block
- Security Post located at the facility entrance gate
- The finished goods store.

- Raw materials (chemicals) are stored.
- Production Sections: This includes the sections for the production of beauty products. The existing facilities include:
  - Shampoo line shall have a Capacity of 1000kg/Day;
  - Jelly line shall have a Capacity of 500kg/Day;
  - Cream line shall have a Capacity of 500kg/Day;
  - lotion line shall have a Capacity of 500kg/Day
- Laboratory
- Waste Storage Area: for collection of office waste & factory waste
- Generator Area: Operation of the generator
- Water Storage Area: for borehole, treatment and storage of water.
- Generator area
- The main source of energy for both production processes and administrative sections in the company is the connection to the National grid supplied by Ikeja Electric (IE). However, due to the unsteady nature of power supply from the National grid alternative energy is provided by diesel powered generators, with capacities of 1000KVA, 810KVA and 88KVA diesel fired power generating set and 2000KVA IKDC transfer
- Vehicle Park.
- Effluent Treatment Plant.

  This is located onsite where all effluents from the production area are treated prior to discharge. Waste water is pumped into a 5000 L effluent treatment pit. Wastewater from the production floor is generated from the rinsing of tanks utilized for mixing of production materials for the paint production.

Fig. 3.1 Location

The plant under normal operation would operate for 8 hrs per day and has a life expectancy of 50 years.

3.2 PROPOSED PROJECT

The proposed production line is an automated factory for production of detergent for local market that will meet international standards when fully operational.

The dimension of the proposed of the building is 60.82meters x

39.01meters.

The proposed factory will comprise of

(i) The Detergent production line,

(ii) The packaging (plastic) production line

(iii) Stores, Offices/meeting Rooms and toilets

(iv) The utilities block that comprises of the

- Generators,
- 8500scm CNG skid station and gas pipeline connection to the boiler and generators,
- 11Kva power line connections from IE, Fire Hydrant line, compressor line, Chillers Diesel tanks.

(v) New (upgraded) Effluent Treatment Plant

The Raw Material Section and Production line section of the proposed factory shall be on Ground Floor. The Entrance hall, offices, laboratory and the toilets are located at the transition point between the Raw material section and the production line section.

- **Material for construction:**

The material for construction is basically steel (universal columns and beams) with Z-Purlins to receive insulated roof covering and concrete floors. The offices and laboratories on the first floors are on corrugated steel plate with concrete toping as the floor. The steel framed structure will have a sandcrete block work as infill membrane around the perimeter with insulated aluminum cladding above it at height of 3.0meter to the roof fixed to the steel frame with steel channel member.

- **Existing / Foreign service (NITEL cables, gas and water pipes)**

When existing/foreign service is at a depth of less than 300 mm below ground level, the distance between underside of Foreign Service and the new structure foundation shall be such that minimum specimen cover would be maintained. Precast reinforced concrete slabs shall be installed

above existing service where required by the owning authority.

- **Design Codes, Standards and Regulatory Requirements**

The facility will be designed in accordance with the following code, standards and regulatory requirements:
American Petroleum Institute (API)
API 5L Specification for Line Pipe
API 5LC Specification for Corrosion Resistant Alloy Line Pipe
API 5LD Specification for Clad Line Pipe
API 6D Specification for Pipeline Valves

American National Standards Institute (ANSI)
ANSI B 16.5 Specification for Steel Pipe Flanges and Flanged Fittings
ANSI B 16.9 Steel Butt Weld Fittings
ANSI B 16.25 Butt Welding Ends
ANSI B 31.3 Chemical Plant and Petroleum Refinery Piping
ANSI B 31.4 Oil Transmissions and Distribution Piping Systems
ANSI B 31.8 Gas Transmission and Distribution Systems
ASTMA105 Carbon Steel Forgings for Piping Components
AST M A 182 Stainless Steel Fittings
AST M A 193 Alloy Steel and Stainless Steel
American Society of Mechanical Engineering (ASME)
ASME VIII Boiler and Pressure Vessel Code
National Association of Corrosion Engineers (NACE)
MR-01-75 Sulphide Stress Cracking Resistant Metallic Material for Oil Field
DNV RP-B401 Cathodic Protection Design
Manufacturing Standardization Society
MSS SP-44 Steel Pipeline Flanges
MSS SP-75 Specification for High Test Wrought Butt Welding Fittings
Regulatory Requirements

The Mineral Oils (Safety) Regulations of the Federal Republic of Nigeria
The Oil Pipelines Act (1990)
Supplement to the Nigerian Oil and Gas Pipelines Regulations (1995)

Corrosion Protection

(i) Internal Corrosion

To minimize threat of internal pipe corrosion, an inhibitor may be injected into pipes. Furthermore, pigging of the line will prevent the accumulation of debris, which is known contributors to internal corrosion.

(ii) External Corrosion Cathodic Protection

Cathodic protection is based on galvanic corrosion. The efficiency will be improved through the use of an impressed electric current. The design of the cathodic protection scheme would be determined by the findings of the corrosion survey, the pipe diameter, wall thickness and coating material, and application quality.

3.2.1 SITE PREPARATION, PRE-CONSTRUCTION, CONSTRUCTION, AND OPERATIONAL PHASES

- **Site Preparation**

Preparation for the project starts with the delineation of portion of land where the proposed project will be sited. This is followed by site preparation, and the surveyors would mark both the boundaries of the working width with posts. The activities will be carefully planned and co-ordinate by Franemm Nig. Ltd and the construction contractors. Waste disposal activities associated with the above will be handled as described in the Environmental Management Plan (EMP) sections of the EIA report. Within the working width, excavated soil that would be removed would be piled on one side of the trench to prevent excavated materials from washing into the drainages.

- **Construction**

Construction of the facility will be executed in accordance with a standard planning framework that will be reviewed as it becomes expedient by project team to ensure:

- Maximum efficiency in construction
- Minimum adverse environmental and health impacts
- Earliest completion time
- Compliance with the laws of the land and all regulatory requirements

- **Construction Materials**

All materials to be used in the construction and for the gas generator installation shall be tested in accordance with the appropriate international standard and Requirements to verify their suitability for the purpose. The actual quantities of the various bulk materials required will vary depending on the outcome of the detailed design exercise. Sourcing of the materials is the responsibility of Franemm Nig. Ltd contractor, subject to any constraints imposed by this EIA report.

- **Logistics Arrangements**

In consideration of the massive movement of construction equipment, materials and resources during the construction phase of the project, the construction work itself will need proper logistics arrangement. Additional facilities required will be logistics office and cranes for handling material. The logistic support for the project shall be provided mainly by road transport through which all materials and equipment including personnel shall be taken to site.

Considering the massive movement of construction equipment, materials, and resources during the construction phase of the project, logistic arrangement shall be accorded adequate attention. The construction process will comply with the latest edition of international

industry standards.

- **Construction Stage**

The principal wastes expected at this phase of the project include scrap metals, wood, plastics and earth materials. The excavated earth shall be employed in some leveling of the site. Metal will be separated and sold to recyclers

Welding activities may generate atmospheric pollutants in addition to exhaust emissions and dust particles (from internal combustion engines and movement of equipment, materials and workers, respectively); concrete/cement mix from plant base construction and wall dressing activities are anticipated during construction phase of the project. Also expected are packaging cases (steel/wooden/plastic crates, polythene bags and cartons) wastes.

Packaging materials shall be collected, segregated at the site for re-use, recycle or to sold. All items that cannot be re-used, recycled or sold shall be trucked to Government approved disposal site OGMOE/OGEPA Licensed Private Refuse Operators) approved waste dumps by waste operators. The concrete/cement mix shall also serve as wall-dressing materials for soak away pit and other pits at the site.

- **Sewage**

There are adequate toilets in the existing factory. OGMOE/OGEPA accredited sewage service operators shall be deployed to evacuate sewage from the facility during construction if need arises.

- **Traffic management.**

A total area of about 10000$m^2$of parking lot has been allotted to accommodate minimum of 20 trucks and 50 cars. This will discourage parking of vehicles on Riverview Street.

- **Land Acquisition Process**

The proposed project site land is made up of two adjoining plots one 8.8 hectares and the other 3.7 hectares. Both plots combine to make the total land area of 12.5 hectares. The 13.4ha was leased to Franemm Nig. Ltd for a period of 99 years and governed by a deed of lease through a deed of assignment. Prior to acquisition of the land, various family meetings were held wherein the head and principal members of both families were given authority to bind and execute the agreements on behalf of the families in respect of the land. Land was surveyed and registered with the Ogun State Ministry of Lands, Surveys and Urban Development in Warewa.

The State Governor's consent has been sought and obtained for the assigned piece, while the issuance of a Certificate of Occupancy is expected for the 13.4 ha.

It should be noted that there would be no relocation of people, as the area is chiefly OPIC acquisition and a few sections of secondary re-growth. No further compensation was required beyond the fee paid for the transfer of rights and ownership of the land. Prior to change of ownership, no form of economic activity took place on the land.
During land acquisition, community members were fully engaged and there were no issues during the entire process.

3.2.2 PROCESS DESCRIPTION

The synthetic detergent powder production plant is composed of the following section of process units:

- Solid and liquid raw materials manual dosing (batch type).
- Slurry preparation and high pressure pumping.
- Slurry aeration.

- Spray-drying, complete with hot air generation, exhaust air treatment, air lift and base powder sieving and final perfuming.
- Base powder batch post-blending.

3.2.2.1 SOLID AND LIQUID RAW MATERIALS DOSING

The slurry preparation is effected batch-wise manually while the process is continuous downstream the slurry ageing tank.

The liquid components, such as sulphonic acid, caustic soda solution and sodium silicate solution, are weighed and then fed into the slurry preparatory.
The solid components, manually weighed on a separate scale, and the water are fed in the same preparatory and mixed together to prepare a slurry.

3.2.2.2 SLURRY PREPARATION AND PUMPING

The slurry preparation is performed to obtain a homogeneous mixture solid content up to 65% - 70%. Temperature should be such (60-80°C) as to obtain fluid slurry.

The solid and liquid components, are conveyed to the slurry preparator vessel which has been designed to obtain a perfect homogenising of the slurry components mixture and it is provided with a special high turbulence stirrer .The slurry preparation unit is designed also for sulphonic acid neutralization, which will operate batch-wise for quality control .Slurry Preparatory is facilitated with a vapor scrubbing fan to convey the vents to the atmosphere.

The mixture is then discharged into the ageing vessel that is designed to

homogenise the slurry and to ensure the required ageing time to the sodium-tripolyphosphate. In this vessel can charged the recovered water/slurry coming from the collecting vessel pit.

After ageing, the slurry passes through a magnetic filter which retains any eventual ferrous component and then through a self-cleaning filter. By means of a booster pump, the slurry is fed to the high pressure pump. The high pressure pump has been specifically designed to handle viscous and abrasive slurries at a pressure up to 73 bars and to keep the pre-set pressure value constant in order to feed the nozzle circuit in a uniform manner.

From the high pressure pump, the slurry is fed to the spray tower through a special pipe, equipped with a high pressure surge vessel smoothing out flow pulsations due to the pump alternating strokes, before reaching the nozzle circuit.

The slurry making line has been also provided with a stirred vessel which is used to collect the washing water from the slurry circuit after plant cleaning and shut-down, washing water or recovered slurry and the washing waters of mechanical seals from underground pit. The slurry solution is then recycled to the process by means of pump.

3.2.2.3 SLURRY AERATION

The specific gravity of the final base powder is generally controlled by acting on the spray drying tower process parameters as the slurry pressure, the nozzles diameter, the exhaust gas temperature etc.

To further decrease/increase the specific gravity of the final powder it is also possible to act on the slurry density by aerating the slurry before the

spray-drying operation.

The slurry aeration unit is based on a multi-stage air compressors, air filters), air dampener and a static mixer to dilute the slurry with air before drying tower.

3.2.2.4 SPRAY DRYING

Spray drying tower

The slurry is sprayed at high pressure by a nozzles system from the upper part of the spray drying tower and meets the hot air counter-currently. The dry powder is discharged from the bottom of the tower, in form of beads. The special design of the hot air distribution chamber allows operation with high differential temperatures i.e.: air inlet temperature up to 350-450°C, exhaust air outlet temperature down to 85-90°C with consequent optimum drying efficiency.

The exhaust air is sent to a high efficiency dry cyclone in which are collected the fines particles entrained by the exhaust air. The fine particles are recycled in the spray tower, thus ensuring dust free operation and avoiding their manual handling.

The exhaust air is then sent to a wet cyclone by means of fan where the dust content is reduced furthermore by the addition of sprayed water coming from process water pump.

The water discharged from the wet cyclone is collected into the vessel **and** recycled in the process through the collecting pit.

The exhaust air exiting the wet cyclone is sent to the atmosphere.

Base powder handling

The detergent powder is discharged from the tower at a temperature of 60-70°C and is conveyed by means of a belt conveyor to a continuous crystallization unit: the "air lift".

In the air lift, the detergent powder is conveyed upward by a flow of air that cools it and facilitates its crystallization. The transport air is sucked by an independent fan and passes through a high efficiency filter before being discharged to the atmosphere.

The detergent powder, collected in the air-lift expansion vessel, is discharged into a vibrating sieve to remove all the coarse agglomerated/wet material (usually about 1% of the total product). The coarse material recovered from the sieve is re-dissolved and recycled in the slurry preparation unit.

Final perfuming

The stream of powder coming from the sieve is sent to final perfuming where the perfume, coming from the perfume vessel is dosed by pump according to the flow rate of base powder.

The perfumed powder is stored in movable buggies by a diverting valve

3.2.2.5 BATCH POST-BLENDING

The detergent powder coming from the spray drying tower can be used as such or can be mixed, in preset quantities and proportions, with perborate, enzymes, nonionics and/or other solid and liquid components according to the required final formulations, mainly in case of product dedicated to washing machines. These components are usually added to the base spray dried powder since, due to their physical properties, they

cannot be added into the slurry or heated in the spray drying tower.

The plant includes a very simple blending system that can be adopted, considering the small plant capacity and the fact that generally only a part of the production is mixed with other components. This system is designed to blend the content of some buggies of base powder per batch, therefore the buggy of already perfumed base powder is weighed on the weighing scale and discharged into the blender.

Sodium perborate and the other minor ingredients are weighed on the scale and added into the mixer, which is also provided to slowly spray another liquid component (i.e. non-Ionics) during the blending operation.

The non-ionic additive is sprayed by dosing pump and is stored into the non-ionic vessel which is refilled from drums. At the end, the product is discharged into buggies, which will be manually sent to feed the packaging lines

Process description of the units of base plant configuration is given here-below:

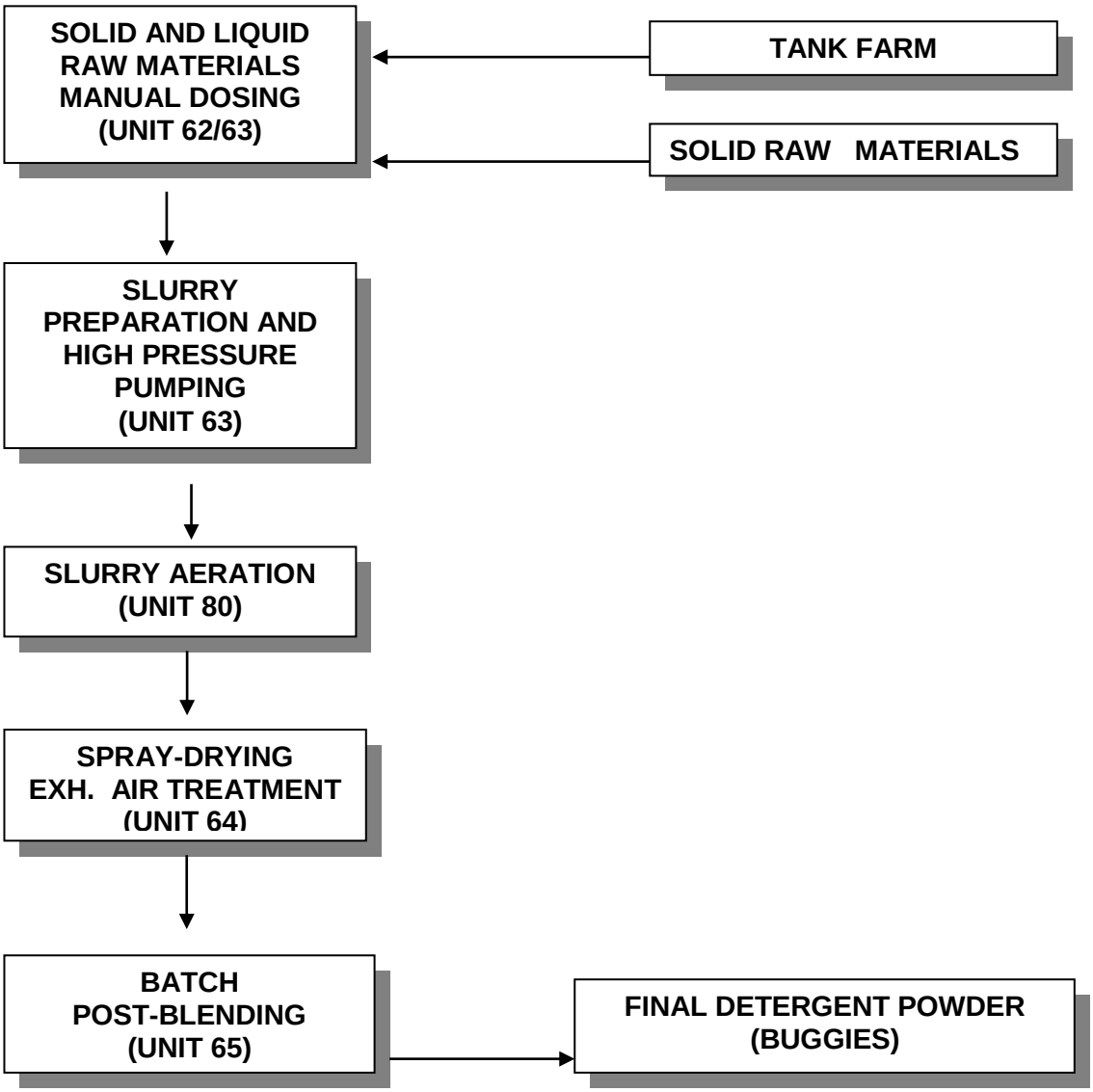

Fig.3.2. Process description for detergent production

3.2.2.6 ANTICIPATED WASTE

Plant is designed on total recycle basis for any solid or liquid waste. There is no liquid effluent in normal operation. The powder separated into the dry cyclone is recycled directly to the spray tower.

3.2.2.6.1 Effluents Characteristics

There are no liquid waste water during normal plant operation.

The water coming from the seals flushing and wet cyclone is recovered into the collecting pit and recycled into the process.

3.2.2.6.2 Solid Waste

Typical of powder materials, particulate are anticipated during manufacturing and handling

Table 3.1 Solid Waste

S/L	Service	Waste Characteristics	Temp. [°C]	Flow [kg/h]	Quantity of solid waste /Mode of disposal
1.	Exit Air Lift Fan 64K4	Air + Solid	50	9700 kg/h (Air)	Solid < 20 mg/m3 (0.237 kg/h) to Atmosphere
2.	Exit Wet Cyclone 64S2	Air + Solid	90	29000kg/h (Air)	Solid < 50 mg/m3 Expected 40 mg/m3 (1.776 kg/h) and arrested in Process water.
3.	Exit 64SR1 Sieve (coarse powder)	Solid	40	(About 1% Total product) of Sieve 64SR1 capacity.	The solid is recycled to the process(25 to 30kg/h)

The dust coming from belts and process machines is recycled into the process.

Apart from above there will be generation of Waste drums and Bags which will either be recycled or sold to the third competent party approved.

Table 3.2 List of equipment for detergent plant

Name of Equipment	Capacity

Solid Charging Vessel	700 Ltr
Liquid Charging Vessel	1125 Ltr
Solid Dial Scale	60 kg
Liquid weighing scale	1000 kg
Slurry preparator stirrer	rpm:0-105
Slurry preparator vessel	2.05 m^3
Slurry Ageing vessel stirrer	4KW
Slurry Ageing vessel	4.95 m^3
Magnetic Filter	25L
Slurry Feeding Filter	47L
Vapor scrubbing Fan	1000kg/h
Recovered slurry Collection stirrer	1.1KW
Recovered slurry Collection Vessel	900L
Pulsation Dampener	30L
Slurry Booster Pump	5.5m^3/h
Slurry feeding High Pressure Pump	5.5 m^3/h
Recovered Pit water Pump	6 m^3/h
Recovered slurry Feed Pump from 63V3	6 m^3/h
Aeration Static Mixer	
Compressed Air Unit	40kg/h
Slurry Spray Drying Tower	Ht-22.415m,Dia-4.5m
Drying Air extraction Fan	29000 kg/h
Nozzle Washing Vessel	0.14 m^3
Process water Pump	0.5 m^3/h
Dry Cyclone	130°C/-0.015Barg
Water Collection Vessel	0.5 m^3
Nozzle Circuit	N°12,CS
Spray Drying Tower Cleaning Ring	CS/SS316
Cleaning Ring Electric Hoist	1.1KW
Dry Cyclone Discharger	CS/Nylon
Air lift Deducting Filter	14810kg/h
Airlift Feeding belt	3300kg/h, 2.2KW
Air lift Fan	9700kg/h
Air lift charging Hopper	75°C/-0.02Barg
Air lift Vessel	50 m^3

Detergent Powder vibrating Sieve	5500kg/h
Static Perfume vessel	170L
Perfume feeding Vessel	123L
Perfume dosing Pump	20L/h
Airlift vessel Discharger	CS/Nylon
Diverting Valve	75°C/0Barg
Blender	5M5
Non-Oinic dosing Pump	700L/h
Drum emptying Pump	2M3/h
Non-Oinic Feeding Vessel	710L
Bugies Unloading Hopper	40L
Buggies weighing scale	600kg
Bags weighing scale	150kg
Combustion Air fan	4100 kg/h
Drying air feeding fan	23200kg/h
Hot air generator burner	3800KW
Hot air generation chamber	25mBars/1100°C
Fuel Oil Tank	1.1 m^3
Sodium Silicate Tank	278 m^3
Sodium Silicate charging Pump	30 m^3/h
Sodium silicate transfer Pump	15 m^3/h
Process Water storage tank	55 m^3
Process water Transfer Pump	15 m^3/h
Caustic Lye Tank	55 m^3
Caustic Lye Charging Pump	25 m^3/h
Caustic Lye transfer Pump	3 m^3/h
LABS Storage Tank	210 m^3
LABS Drum Emptying Tank	6 m^3
LABS Charging Pump	25 m^3/h
LABS s transfer Pump	8 m^3/h
Diesel Oil storage tank	55 m^3
Diesel Oil Transfer Pump	8 m^3/h
Instrument Air Compressor	500NM3/hr, press: 8barg, Dew Pt:-20°C
Packing Machines, 6 Nos	

3.2.3 PLASTIC PACKAGING PRODUCTION

3.2.3.1 PET CONTAINERS PRODUCTION

Plastic Bottles nowadays is something that is in high demand, is it mainly because of its durability. Majority of people around the world use it in a daily basis. Containing innumerous uses, plastic bottles or plastic to be specific, must be one of the greatest discoveries in the recent centuries.

Polyethylene terephthalate, otherwise known as PET, is the most commonly used plastic nowadays. Polyethylene terephthalate is made by the reaction of two chemicals known as Purified terephthalic acid (PAT) and ethylene glycol (EG).

These two chemicals form Polyethylene terephthalate along with other types of plastic, used in variety of applications such as engineering, nylon production, etc.

Below are some Properties of Polyethylene terephthalate

- Density: 1.38~1.40g/mm3
- Melting Temperature: 254-256°C
- Crystallinity: >=45%
- Glass Tempurature: 82°C

PET is a long chained molecule with the repeating unit displayed above, resin, a bluish white substance, is made from poly condensation of terephthalic acid and ethylene glycol. Resin manufacturers supply PET in the form of small pellets, each weigh about 0.05 grams. Being transparent, PET can reach a tensile strength of about 1/3~1/2 of steel's.

The number of PET repeating units per chain, used in the bottle industry to make plastic bottles is about 100 to 155, usually labeled in terms of resin IV.

Production of PET bottles

This process has distinct machines to perform the injecting and blow moldings. The preform is injected into shape on the first machine, and then the preform is reheated as it isn't brought directly to the blow molding machine and blown on the second machine. This method is not very efficient as the heat lost is considered as a loss of energy. But this machines are fully automated. This method is used in most medium to large scale PET production companies. This machine is 200% more efficient than the one-step machine.

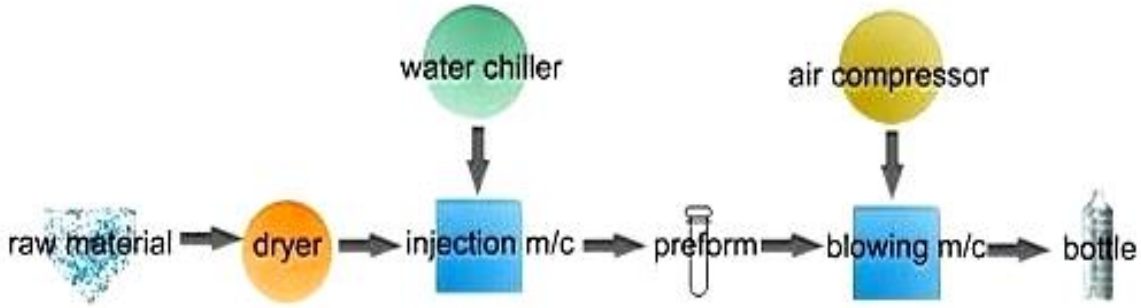

Fig 3.3. Flow diagram for pet bottle production

Usually the Two-Step Method is used in production of PET bottles.

Drying and Dehumidifying of PET

PET is a type of plastic that absorbs moisture with an average water content of 0.05%. To increase the quality of the preform in transparency and physical performance the PET is dried to reduce the water content of the PET resin to less than or equal to 0.005%. The following drying methods are used. Hopper dryer is the widely used method of drying

PET as it very economical and works along with an autoloader, therefore the process is continuous and automatic.

Injection Molding of the PET Preform

The heated PET which is in the molten form is injected into the injection chamber by the rotation of screw barrel within the machine, until the chamber is full.

Once the chamber is full, the screw pushed forward to fill the injection cavity with molten plastic through the nozzle into the mold.

The temperature within the injection molding machine are different, at the rear end of the machine the temperature should be around 275°C, at the middle of the machine about 282°C, at the nozzle about 280°C and at the runner the temperature should be around 270°C for the bottle formed to have optimum specifications. (These temperatures may vary a little depending on the design of the mold)

Subsequently the molten plastic within the mold, called the preform, should be cooled. The cooling water used to cool the perform should be in the temperature range between 15~20°C, the pressure also has to be controlled, therefore a water chiller is used. The pressure should be kept around 500,000 Pa or 5Bar.

The PET preform is ejected from the mold. Now the preform is reheated to the temperature until it is suitable for the blowing process.

Stretch Blow Molding of the PET Preform to Container

The Following process in production of PET is a type of Blow molding

called Stretch Blow molding, as air is blown into the preheated PET Preform.

Blow molding is a process of forming hollow object by blowing a blowing into thermoplastic, in this case PET Preform, which is heated and in its maximum elastic condition. The blow molding process used in production of PET Bottles is Stretch Blow Molding.

This process is also called Biaxial orientation blow molding as the preform is first stretched by the blowing device, for the reason that the molecules of the preheated preform is aligned in one direction and all parallel to each other, then blown in right-angles to the direction of the molecules being aligned.

The theory behind the how this works is, when the PET is heated the long-chained molecules can loosen then as an alternative to breaking, they orient when stretching. Therefore, this (stretch blowing) is also called biaxial orientation as it deals with two axes stretching.

This stretching increases the strength of the material because instead of the molecules in the material act separately, they act as one whole unit.
The following characteristics are improved or increased as a result of this stretching the PET Preform before blowing into it.

The ideal temperature for orientation for PET is 105°C. The compressed air blown into the PET Preform is first cleaned through an air purifier (). The air must be cleaned since air contains moisture and oil, which will directly affect the quality of the bottle. The PET preform is mounted on to the blowing machine. After purifying, the air is blown into the preheated PET preform using a blower on to the mold.

The thickness of the Stretched blown bottles is 0.25~0.38mm. This thickness is sufficient as the orientation will increase the products' quality.

3.2.3.2 THE PROCESS OF PLASTIC INJECTION MOLDING

During the molding process, the plastic pellets will be first delivered into the high-temperature injection barrel through the hopper, where they are heated, melted and plasticized into a sticky molten flow, which will then be injected into a lower temperature closed mold through the injection nozzle at a high speed under the great pushing pressure exerted by the plunger or the screw. Under the great pressure, the molten plastic will fill the entire cavity and will also be compacted. After that, the plunger or the screw will return after a period of pressure holding. At this point, it is possible for the molten plastic to flow back from the cavity into the sprue and runner system. When the mold opens after cooling and forming, the product will be released from the mold cavity.

Fig 3.4 The flow chart of plastic injection molding

The plastic injection molding process usually includes the following steps: feeding, plasticization, injection, pressure holding, cooling and mold release.

Feeding

Plastic pellets or powders are fed into the injection hopper.

Plasticization

The plastic is heated in the barrel and turned from solid pellets into a molten flow, which possesses great plasticity. This process is referred to as plasticization.

Injection

The plasticized molten flow will be pushed to the forepart of the barrel by the plunger or the screw, and then injected to fill the mold cavity through the injection nozzle and sprue & runner system of the mold. This step is called injection.

Pressure holding

When the molten plastic is shrinking inside the mold due to cooling, the plunger or the screw will continuously force the molten material in the barrel into the mold for replenishment, to ensure that a complete structured and dense textured plastic product is produced. This step is known as pressure holding.

Cooling

The in-mold cooling process of the plastic part usually refers to the entire process from the moment the molten plastic at the gate is fully solidified to the plastic part is ejected from the mold cavity; but actually the cooling step starts the minute the molten plastic flows into the cavity, covering the time period from completion of injection, pressure holding to the moment before mold release starts.

Mold release/Ejection

Mold release is allowed when the plastic part is cooled to a certain

temperature, through which the plastic part is pushed out of the mold by the ejectors. Equipment requirement for the plastic lines are detailed below.

Table 3.3 List of Equipment for plastic plant

Equipment	**Units**
PET blow molding machine	1
Injector Molding Machine	2
Chillers	3
Material Dryer	1
Mould Dryer	1
Mould Temperature Controller	1
Hopper loader	2
Material mixer	2
Granulator	1

3.2.3.3 SUMMARY OF THE OPERATION PROCESS AT THE EXISTING FACILITY.

The existing facility is "sandwiched" between the proposed detergent factory (North) and the proposed plastic packaging lines and future developments (South). It is imperative the proposed projects share resources and infrastructures with the existing facility. Fig 3.5 details the areas in the existing facility.

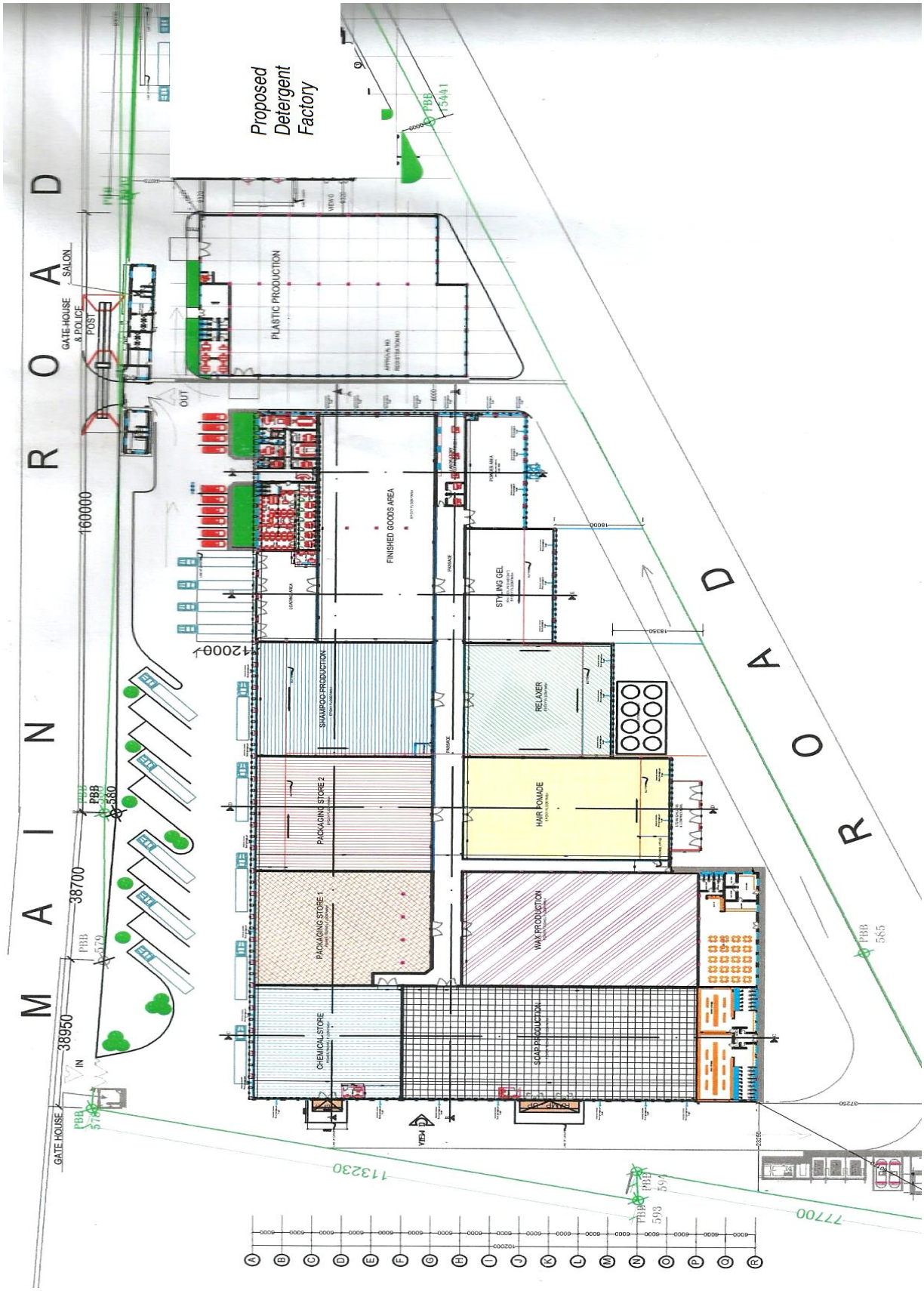

Fig.3.5. Existing Facility Layout

- **Cream Relaxer (Regular & Super), Shampoo, Lotion and Jelly Production Lines**

The Relaxer (Regular & Super), Shampoo, Cream, Lotion and Jelly Production Lines for Franemm Industries Limited is an automated factory. It is intended to be housed in an existing "warehouse- like" building with a floor area of 48 meters x 21.336 meters.

Production hall entrance of sufficient size to cater adequately for the movement of worker and materials within the factory.

The roofs are made of steel, aluminum roofing sheets and transparent roofing sheets to provide natural illumination. Lightings are also fitted on the roofs. The roof and fitting appear to be in good condition.

The floor to ceilings height is more than 10m high to create room for equipment. The floors are concreted, impervious and free.

The walls are concrete, impervious and painted white to maintain the utmost hygienic condition. There are several windows and openings on the wall to provide natural illumination and ventilation. Lightings, Fans and heat extractors are fitted on the wall.

- **Soap line**

There is an existing raw material store next to the soap finish line.

Entrance of sufficient size to cater adequately for the movement of worker and materials within the factory.

The roof is made of steel, aluminum roofing sheets and transparent roofing sheets to provide natural illumination. Lightings are also fitted on the roofs. The roof and fitting appear to be in good condition. The

floor to ceilings height is more than 10m high to create room for equipment.

The walls are concrete, impervious and painted white to maintain the utmost hygienic condition. There are several windows and openings on the wall to provide natural illumination and ventilation. Lightings, Fans and heat extractors are fitted on the wall. The floors are concrete and impervious.

It is noteworthy that the existing hair lines share the same structural characteristics with the proposed soap finishing line.

3.3 UTILITIES

The existing utilities block comprises of the Generators, transformers, borehole and Water Treatment Plant.

3.3.1 Electricity.

In order to ensure there is minimal emission to the environment,
the facility proposes to adopt a cleaner emission electricity generation system. A proposed 2MW CNG fired generator will be installed whilst DPR and NGC perfects the gas pipelines connection into the facility, a 8500scm CNG tube skid plant will be installed to fire the generator and boilers. See appendix for CNG station layout.

The facility is connected to the grid. There is a 33 KVA power line connection from IKDC that connects the facility transformer.

There are 2 units diesel fired generators for power back-up. 1000 KVA and a 800 KVA. The proposed project will require a total of 650KW [Detergent Plant (350KW and plastics (350W)] electricity.

The walls provide sound proofing and floors are concreted. The floors are solid and impervious, clutter free, spill free, clean and dry

3.3.2 Water

The borehole Area and Water Treatment Plant is next to the Power House. It is reported to be 150ft deep. There are four large tank in the borehole area. Two large pumps and a submersible pump are used to abstract ground water. 15 million litres is consumed by the existing facility while the expansion will require another 15 million litres.

3.4 WASTE WATER TREATMENT

The existing treatment plant will comprise of the following treatment units

- Screening
- Aerated Collection/ Equalization Tank
- Constant Flow Pumping Station
- Chemical Treatment/Reaction Tank
- Sedimentation Tank
- Sludge Thickening/ Dewatering Tank
- Filtration Tank
- Chlorination Tank

The wastewater generated from the production hall is conveyed via pipe networks to the Equalization/ Homogenization Tank through static screens, which serve the purpose of allowing only the wastewater into the system. The Equalization/ Homogenization Tank is where the different hydraulic and wastewater characteristics are equalized and homogenized. This tank serves as a Buffer by ensuring the rest of the treatment plant is fed with constant flow with the aid of a pumping station. In order to prevent odour and settling of solids in the tank, air is supplied in the bottom through the aid of coarse air blower.

Next, the homogenized wastewater enters the Reaction Tank, which is the chemical treatment stage. Here, the chemical treatment of the homogenized wastewater is carried out with the addition of a coagulant for proper reaction.

Adequate mixture and proper reaction of the wastewater and coagulant is achieved with the aid of coarse bubbles supplied by a blower.

Thereafter, the wastewater enters the sedimentation tank where the reacted mixture of coagulant and wastewater is kept under calm conditions in order for the coagulated suspended solids to settle at the bottom of the tank as sludge. The sludge produced is transported to the sludge thickening/ dewatering tank for drying prior to disposal as solid waste by OGMOE/OGEPA Licensed Private Refuse Operators accredited waste collector.

The clarified water is transferred to the filtration tank for the achievement of a colourless treated effluent. The final treatment unit is the Chlorination Tank for disinfection which is achieved by dosing a solution of Calcium hypochlorite, $Ca(OCl)_2$.

Treated waste water will be discharged into the public drains.

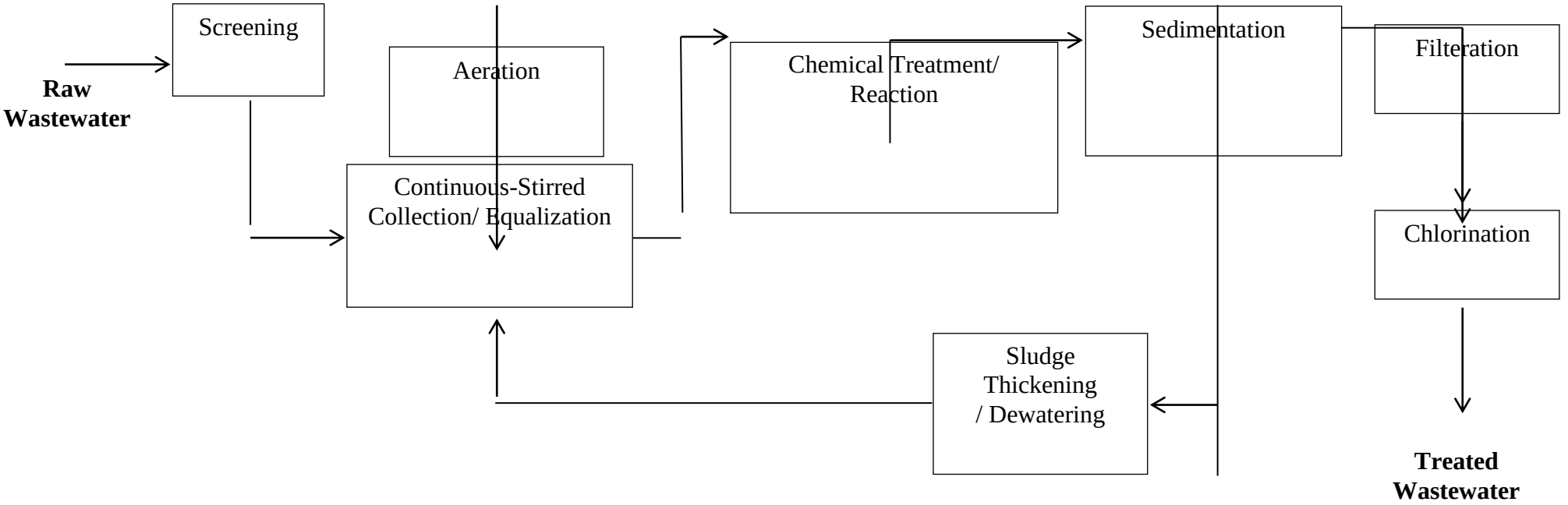

Fig. 3.6 Block Diagram of Processes for the Proposed Wastewater Treatment Plant

3.5 OPERATIONAL MANNING

The installation (construction Phase) will require 10 personnel while 30 personnel will be required for the startup phase of the proposed lines. There are 75 employed in the existing facility. Franemm Industries Limited only considers the operational manning requirements; the non-production staff is particularly dependent on the requirements of the company's senior management.

It is assumed that the plant will operate on a single shift of 8 hours daily.

3.6 PROJECT SCHEDULE

The project activity schedule is detailed in figure 3.6. Franemm Industries Limited Installation of equipment and electrification of the facility runs concurrently. Considering the present pace of the project, the project is due will be commissioned in 14 months i.e. one (1) year and two (2) months.

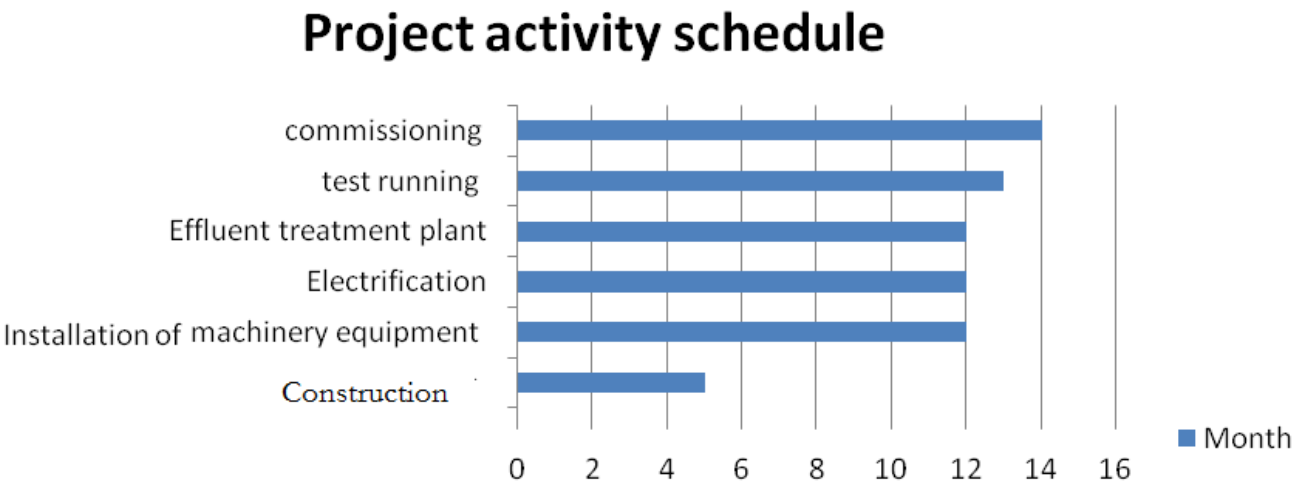

Figure 3.7 Project activity schedule

CHAPTER FOUR

4.0 DESCRIPTION OF PROJECT ENVIRONMENT

4.1 INTRODUCTION

This section details the description of the physical, chemical, biological and socio-economic characteristics of the proposed Franemm Industries Limited plant area located at Isheri, Ogun State. It provides information on the features, quality and sensitivity of the proposed project environment. These studies were carried out in order to establish a reference platform against which environmental changes and impacts resulting from the project could be judged and monitored during the operational phase.

4.2 BASELINE DATA ACQUISITION METHOD

The approach adopted in collecting the baseline data incorporates all relevant disciplines. The baseline data of the project areas was acquired through the following methods.

- Literature/desktop research
- Field Observations
- Sampling and measurements
- Laboratory analysis of samples collected in the field.

4.2.1 LITERATURE/DESKTOP RESEARCH

This involves the consultation of relevant textbooks, journals, articles, research publications and previous study reports on similar projects. The data generated from this process include meteorological data, maps, geologic/hydrogeological data and geographic data of the area.

4.2.2 FIELD SAMPLING AND OBSERVATIONS

Data gathering exercise was carried out between 9th and 10th April 2018

while the Laboratory Analysis/witnessing exercise took place between 16th and 19th April, 2018 All water and soil samples were analysed at Jawura Environmental Services Ltd Laboratory, Awolowo Way, Ikeja Lagos.

Visual observation were made and documented in the field notebook. Photograph of important feature were taken with a digital camera. The Environmental components observed include:

- Air Quality and Noise Measurements
- Soil characteristics
- Vegetation/forestry
- Land Use
- Geology/Hydrogeology Hydrobiology
- Socioeconomic setting

4.2.3 Sampling Points and Co-ordinates

The spatial boundaries for the EIA are within the area with the following coordinates below:

Sampling points and Co-ordinates are presented in table 4.1

Table 4.1 Sampling points and coordinates

Location	Sampling Code				GPS
	Air	Soil	Ground Water	Surface Water	
Proposed detergent factory	A1	S1			6°39′59.09N 3°24′20.68E
Proposed detergent factory	A2	S2			6°39′56.78N 3°24′19.92E
Proposed detergent factory	A3	S3			6°39′54.16N 3°24′19.5E
Proposed detergent factory	A4				6°39′52.68N 3°24′18.41E
Existing	A5				6°39′52.02N 3°24′20.56E
Existing	A6				6°39′51.13N 3°24′18.26E
Existing	A7				6°39′49.34N 3°24′16.85E
Existing	A8				6°39′46.55N 3°24′15.84E
Existing	A9				6°39′45.00N 3°24′19.63E
Existing			GW		6°39′44.45N 3°24′20.35E
Existing	A10				6°39′48.48N 3°24′20.46E
Existing	A11				6°39′49.75N 3°24′20.40E
Proposed Expansion	A12	S4			6°39′45.61N 3°24′15.77E
Proposed Expansion	A13	S5			6°39′44.40N 3°24′17.29E
Proposed Expansion	A14				6°39′ 42.80N 3°24′13.55E
Proposed Expansion	A15	S6			6°39′ 37.47 N 3°24′18.03 E
Proposed Expansion	A16	A16			6°39′ 38.34 N 3°24′14.34 E
Proposed Expansion	A17	S7			6°39′ 38.20 N 3°24′11.46 E
Proposed Expansion	A18	S8			6°39′ 37.74 N 3°24′10.15 E
Proposed Expansion	A19				6°39′ 36.69 N 3°24′09.11 E
Proposed Expansion	A20	S9			6°39′ 35.71 N 3°24′11.80 E
Proposed Expansion	A21				6°39′ 32.94 N 3°24′14.36 E
Proposed Expansion	A22	S10			6°39′ 31.71 N 3°24′11.18 E
Proposed Expansion	A23	S11			6°39′ 33.52 N 3°24′06.79 E
Proposed Expansion	A24				6°39′ 30.69 N 3°24′06.12 E
Proposed Expansion	A25	S12			6°39′ 27.76 N 3°24′07.59 E
Proposed Expansion	A26	S13			6°39′ 28.08 N 3°24′12.50 E
Opa Aro Stream				SW1	6°39′ 31.65 N 3°24′04.95E
Opa Aro Stream				SW2	6°39′ 36.99 N 3°24′11.33E
Ogun River					
Control	A27	S14	GW2		6°39′ 06.24 N 3°24′07.93E

Source: EIRL, 2019

The coordinate (spatial location) of each sampling point was determined using a GPS. The sampling map is detailed in figure 4.1 below.

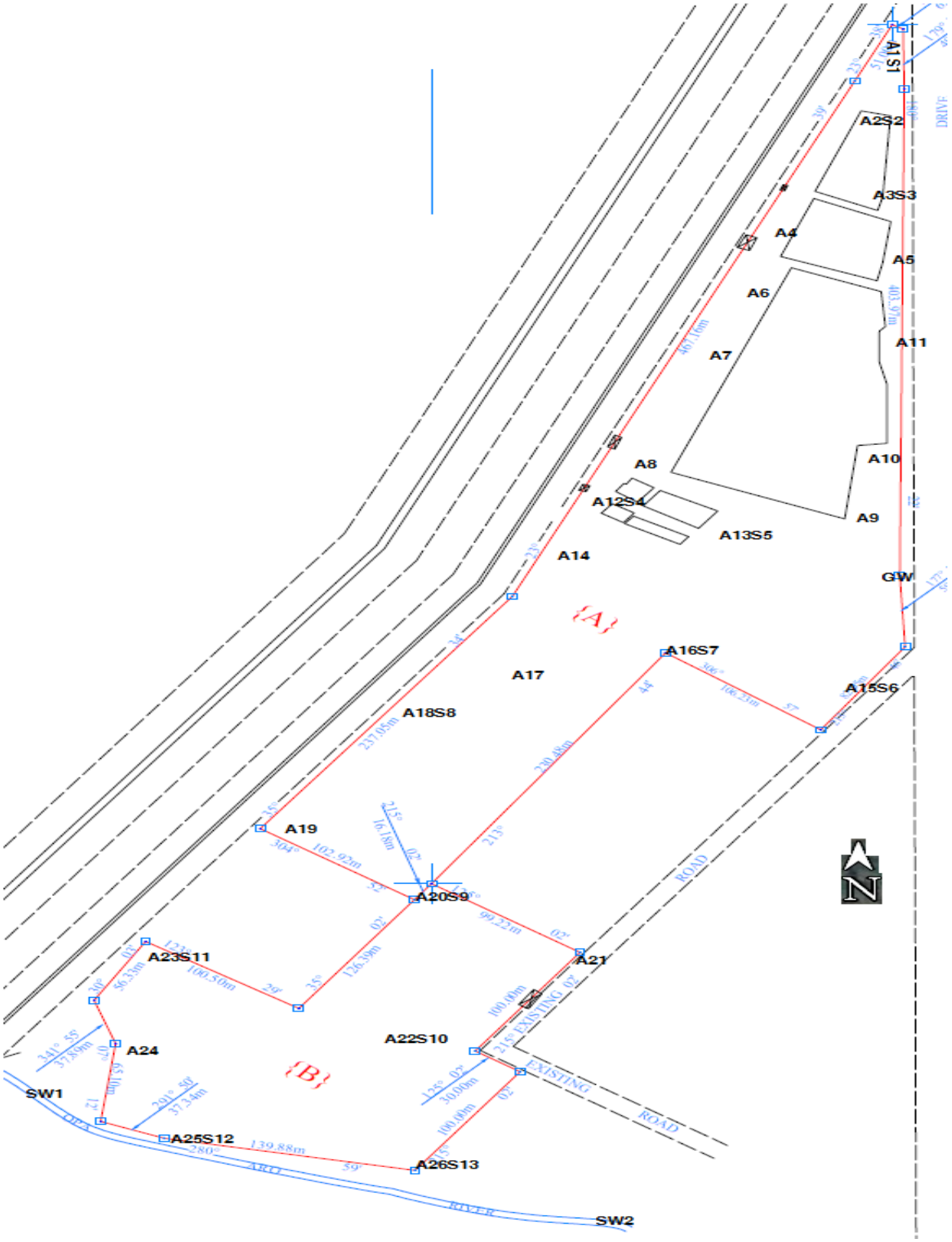

Figure 4.1 Sampling Map

4.2.4 Air Quality and Noise Measurements

Ambient air quality parameters (volatile organic compounds, SO_2, NO_2, CO, etc.) were measure in-situ using QRAE handheld Monitors and noise level were measured using CEL 231 noise meter. The detection range for each parameter is detailed in appendix 5.

Particulates were measured using laser particulate counter.

4.2.5 Soil sampling

Surface soil was investigated through visual observation and sampling. Soil samples were obtained from three different designated sampling point locations.

Hand Auger of uniform cross section was used to ensure that uncontaminated and reproducible units of soil samples were collected from depths of 0-l5cm and l5-30cm. This ensured high quality representative data collection.

Samples for microbiological analysis were collected in sterile bottles and kept under 4°C. Soil biological observations were carried out in quadrants. Soil samples were collected in appropriately labeled and sealed polythene bags.

Samples for physico-chemical analysis were stored using vacuum free desiccators while those for microbiological analysis were stored in ice-packed cooler in the field and transferred to the refrigerator at 4°C.

4.2.6 Ground water sampling

There is an existing borehole on the proposed site. Sample was collected in a 5litres container. Some of the water quality parameters (temperature, conductivity, salinity, pH and turbidity) were measured

in-situ (using Hanna water quality checker).

Samples for heavy metals analysis were acidified to pH 2 using nitric acid in a separate set of sample bottle. Samples for microbiological analysis were collected in sterile glass bottle and stored in ice-packed containers and later in the refrigerator.

4.2.7 Quality Assurance/Control Procedure.

The Quality Assurance/Control for laboratory analysis is in accordance with FMEnv recommended methods and it include blank analysis to establish analytic level, duplicate analysis to establish analytical precision, spiked and blank sample analyses to determine analytical accuracy. It covers all aspects of the study, and includes sample collection, handling laboratory analysis, data coding and manipulation, statistical analysis, presentation and communication of results. Sample chain custody form was used for the registration and tracking of sample from the field to the laboratory.

4.2.8 Sample Collection, Handling and Storage.

The handling and sampling of air, soil and water were carried out in line with the recommended procedures and practices of environmental data collection in Nigeria. See appendix 5 for further details.

4.2.9 Land Use Studies

The land use pattern around the project site in OPIC Industrial Estate Ifo LG is considered.

4.3 ENVIROMENTAL CONDITIONS OF THE SITE

4.3.1 Climate Condition

The location of the project falls under the tropical coastal (wetland)

climate of Nigeria. Major climate elements of the area include Rainfall and temperature and are influenced by two wind systems, the south westerly monsoon wind and the north westerly, win and humidity. The former is hot and humid tropical maritime air mass blowing in from the Atlantic Ocean while the later is due to the continental air mass that is cold, dusty and dry mass from the Sahara desert. The proposed facility expansion falls under the tropical coastal (wetland) climate in Nigeria.

The two air masses meet along a slanting surface known as intertropical front where they rub against each other. The point in the intertropical front where the two air masses mix is called intertropical convergence zone (ITCZ) which oscillates north-south depending on which of the two air masses are predominant following the movement of the sun. The north-south oscillation of the ITCZ gives rises to the basic variations (rainy and dry season) in the weather, climate condition prevailing in the north westerly wind is characterized by the dry season, which last from December to March, also the rainy season, begins in April and end in November and this is characterized by sought westerly wind.

The rainy season, which is the dominant season within the zone under study begins in April and ends in October. It is characterized by the tropical maritime air mass (south west wind), which blows across the Atlanta Ocean. The wind is usually warm and wet and so it brings rainfall within the study area.

4.3.1.1 Temperature

Temperature and thermal characteristics of the area depend on the apparent movement of the sun, the wind regime and the distance of the area to the Atlantic Ocean. Two peaks (Major and minor) characterizes the annual temperature cycle. The major peak occurs in February – March and the variation in the annual temperature range is about 5^{o} C.

The temperature is usually higher is usually higher during the rainy season but lower during the harmattan. The temperature was measured using a thermometer.

The changes in temperature invariably affect the rate of evaporation of the surface water in the area, and so the higher the temperature the higher the rate of evaporation. Also the rate of evaporation is found to be high during the dry season than in the wet season.

The maximum temperature of the area is between 27.7 ^{o} C. and 37.8^{o} C while the minimum temperature varies between 22.5 and 26.3 ^{o} C. The months August and September are the coolest with temperature of about 22 ^{o} C while the months of January to March are usually the hottest with a mean temperature of 36.5 ^{o}C.

4.3.1.2 Wind System

The prevailing winds along the project area are the persistent southwesterly. The wind direction follows two main seasonal patterns in the area. They are mostly southwesterly during the rainy seasons and they account for about 60% of the quantum of winds in the area. They are more southerly in the mornings while in the afternoons, south easterly and south westerly prevail for more than 65% of the time like most part of Ogun State wind speeds are generally low usually between 2.8m/s and 4.0/s relatively higher wind speeds occur mainly in the afternoon.

4.3.1.2.1 Wind Speed and Direction

The average wind speed of the project area varies within the range of 2.8 — 4.0 ms for most periods of the year within an average speed of 3.5 ms. The prevailing wind is usually south-westerly due to its geographic location. The highest Wind speed is recorded at the onset of wet season

when early rains are torrential and accompanied by squalls, lightning and thunder. The Wind speed tends to reduce in the nights than during the day. Extreme wind conditions, most especially wind speed and direction, determine the transport and dispersion of air pollutants (gaseous and particulates) from the source to the recipient sites. Wind is therefore an important climatic element in any study relating to atmospheric emissions, pollutant or contaminants. Table 4.2 shows the mean monthly Wind speed for the study area.

Table 4.2 Mean Monthly Wind Speed (Knots) For Ogun State

Month Year	Jan.	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind	3.4	3.1	3.3	3.4	3.4	3.7	3.7	3.0	3.3	3.7	4.5	4.9

Source: NIMET, 2018

The wind pattern follows the dynamic migratory movements of the ITD. During the wet season, the most dominant Wind directions are the South Westerly and Westerly, which are usually moisture bearing. In the harmattan months, the dominant Wind direction is mostly north-easterly and easterly.

The wind Ross for project area is presented in figure 4.2

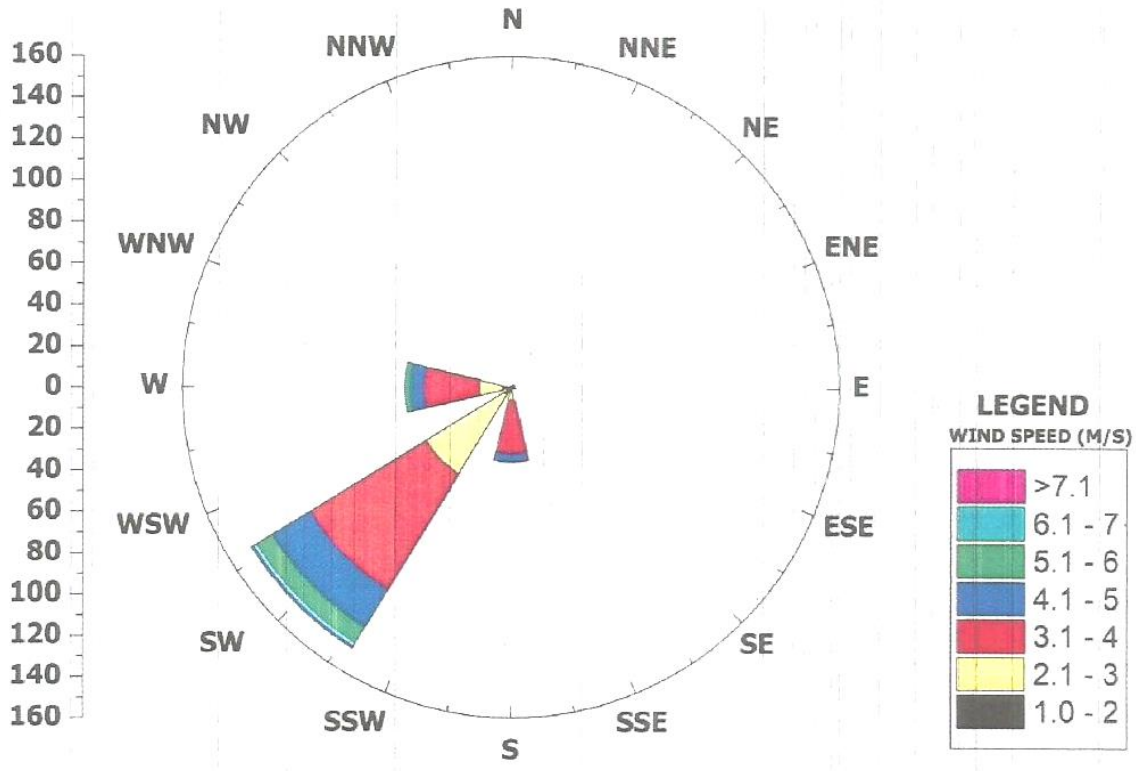

Figure 4.2 Wind Ross

Source: NIMET

4.3.1.3 Sunshine Hours

The mean Monthly Sunshine Hours for Lagos is presented in table 4.3. The monthly values vary between 51.2(July) and 165.7 (January). The Sunshine hours per month in the project area are influenced by the amount of rainfall. Low sunshine hour is usually recorded around July at the peak of the rains while high valves are recorded in January.

Table 4.3 Mean Monthly Sunshine Hours For Lagos.

S/N	MONTHS	SUNSHINE HOURS
1.	January	165.7
2.	February	158.7
3.	March	139.0
4.	April	141.1
5.	May	146.3
6.	June	99.9
7.	July	51.2
8.	August	81.0
9.	September	67.8
10.	October	112.8
11.	November	137.2
12.	December	165.7
	Mean	121.9
	Max	165.9
	Min	51.2

Source Nimet 2018

4.3.1.4 Rainfall

Rainfall distribution in Lagos State, as in all part of Nigeria, is bimodal with peaks in June and July and a two-week break in August. Mean Rainfall Pattern for the period of 2000-2015 is presented Figure 4.3.

The rainy season begins in *(March)* - April, when there is significant precipitation, and last till October or early November. From April to May, there are violent storms which destroy crops and houses. Rainfall is often at its maximum at night and during the early morning hours. It rains all year round even in the dry season. However, variations occur in rainfall amount from year to year.

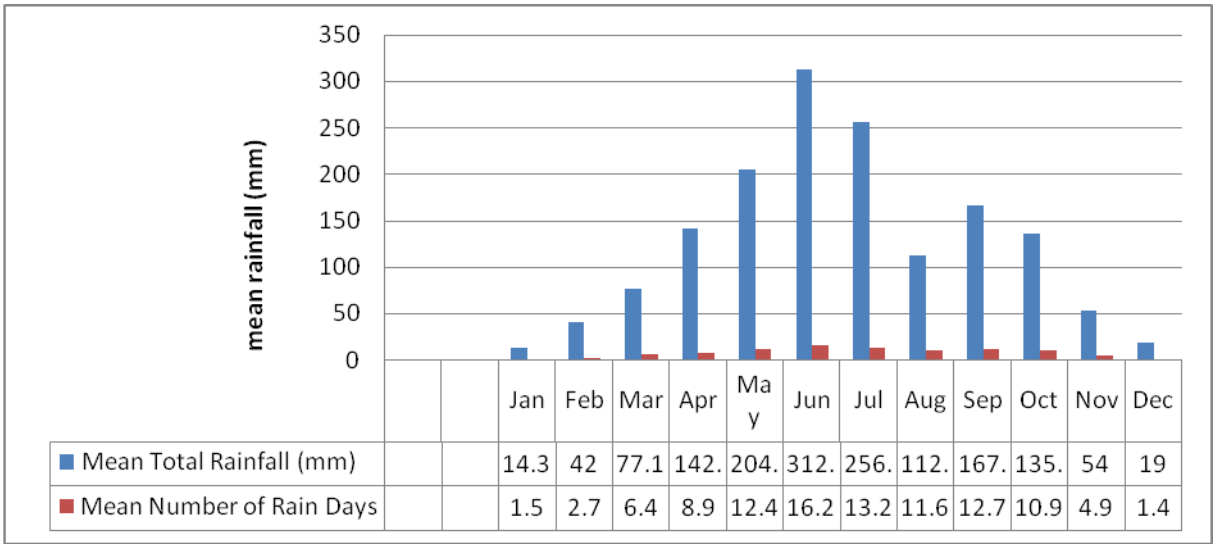

Figure 4.3 Mean Rainfall Pattern for the period of 20yrs
Source NIMET (2015)

4.3.1.5 Relative Humidity

Lagos State has an average annual relative humidity of 71 % which is highest during the rainy season, when it rises to about 86% at 9.00 hrs. The high relative humidity experienced in the State favour luxuriant Station growth, which produce the Lagos State's rich and beautiful vegetation of the mangrove and rain forest. Fig 4.4. Show the relative humidity taken at 0900hrs and 1500hrs.

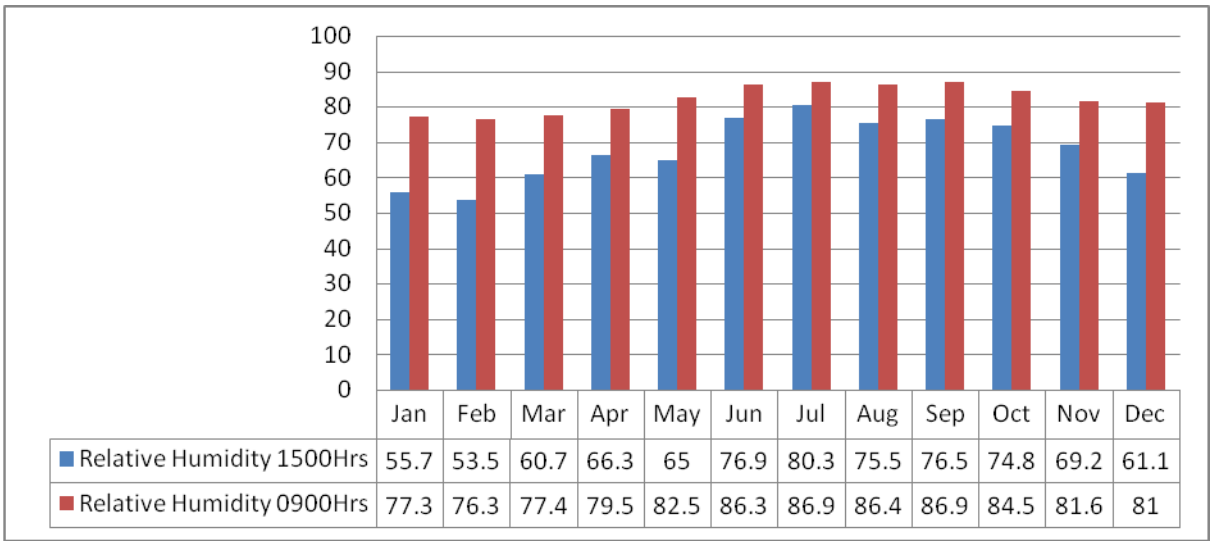

Figure 4.4 Relative Humidity taken at 0900hrs and 1500hrs
Source NIMET (2018)

4.3.2 Air Quality

The concentration of air pollutants were measure in the project area on the following impact indicators- nitrogen oxide (NO_2), Sulphur Oxide (SO_2), Carbon Monoxide (CO), Ammonia (NH_3) and suspended particular matter (SPM).

Possible effects of air pollutant above tolerant levels are detailed in Table 4.4

Table 4.4 Ambient Air Quality

Code	CO (ppm)	NO_X (ppm)	SO_X (ppm)	H_2S (ppm)	CO_2 (ppm)	VOC	PM ($\mu g/m^3$)
A1	ND	ND	ND	ND	550	ND	8
A2.	ND	ND	ND	ND	450	ND	11
A3.	3.2	0.02	ND	ND	780	ND	100
A4.	ND	ND	ND	ND	780	ND	90
A5.	1	ND	ND	ND	1050	ND	22
A6.	ND	ND	ND	ND	350	ND	10
A7	ND	ND	ND	ND	1550	ND	22
A8	ND	ND	ND	ND	1350	ND	50
A9	ND	ND	ND	ND	450	ND	22
A10	ND	ND	ND	ND	350	ND	22
A11	ND	ND	ND	ND	350	ND	38
A12	ND	ND	ND	ND	350	ND	38
A13	1	ND	ND	ND	350	ND	38
A14	1	ND	02	ND	450	ND	27
A15	ND	ND	ND	ND	350	ND	22
A16	ND	ND	ND	ND	350	ND	38
A17	ND	ND	ND	ND	350	ND	38
A18	ND	ND	ND	ND	350	ND	22
A19	ND	ND	ND	ND	350	ND	38
A20	ND	ND	ND	ND	350	ND	38
A21	ND	ND	ND	ND	350	ND	22
A22	ND	ND	ND	ND	350	ND	38
A23	ND	ND	ND	ND	350	ND	38
A24	ND	ND	ND	ND	350	ND	22
A25	ND	ND	ND	ND	350	ND	38

A26	ND	ND	ND	ND	350	ND	38
Control	ND	ND	ND	ND	350	ND	22

Source: EIRL, 2018

4.3.2.1 Nitrogen oxide

The two oxides of Nitrogen that are of primary concern in air pollution are Nitrogen oxide (NO) and nitrogen dioxide (NO_2). Oxides of Nitrogen are common to emissions from combustion of fossil fuels.

Nitrogen dioxide ($N0_2$) is, pungent and irritating to respiratory membranes. Exposure to Nitrogen dioxide emitted from a variety of indoor-outdoor sources even at low concentrations can cause chronic irritation of the respiratory tract, headache, loss of appetite, and corrosion of the teeth. Research has also found that extreme high-dose exposure to NO; may result in pulmonary oedema and diffuse lung injury. Continued exposure to high NO; levels can contribute to the development of acute or chronic bronchitis. The relatively low water solubility of NO results in minimal mucous microbial irritation of the upper airway.

Oxides of Nitrogen are oxidized by various photochemical and catalytic reactions that are eventually washed down by rain as Acid Rain.

At several points within the facility, Nitrogen oxide was not detected except for the diesel power generating set location. (0.02ppm) was detected outside the facility while 0.01ppm was recorded at the control.

All NOx values recorded within and outside the proposed project site are within the FME Limit (0.02-0.05ppm).

4.3.2.2 Sulphur Dioxide

Sulphur Dioxide is common to emissions from combustion of Sulphur contaminated fuels. Sulphur dioxide is a colourless but pungent gas that can be tested at 0.3-l.0ppm when human beings inhale sulphur dioxide sufficient concentrations; there is noticeable increase in the breathing rate. The breathing becomes less deep and a general feeling of air starvation is experienced. It acts mainly as irritants, affecting the mucosa of the eyes, nose, throat, and respiratory tract. Acute SO_2 related bronchial construction might also occur in people with asthma or as a hypersensitivity reaction.

The high water solubility of SO_2 causes it to be extremely irritably to the eyes and upper respiratory tract. Concentrations above 6ppm produce mucous membrane irritation. Epidemiologic studies indicate that the chronic exposure to SO; is associated with increase respiratory symptoms and reduced pulmonary function (Lipsett, 1992) clinical studies revealed that some asthmatic respond to as low as 0.4ppm of $S0_2$ with symptoms of bronchocontriction (USEPA, 1993). Atmospheric SO_2 is transformed ultimately to the anion sulphate (SO_4^{2-}). The rate of oxidation of $S0_2$ ranges from <l% to 5% per hour during the day, and it is influenced by the intensity of sunlight humidity and by the presence of nitrogen oxides, hydrocarbons, strong oxidants and catalytic metal containing particulates (Newman 1981, Wilson, 1981, Fox, 1986). long residence time (about 4 days), most SO; is transported a long distance from its point of emission before it is oxidized to Sulphur dioxide may dissolve in body fluids to form sulphuric acid, a very strong and corrosive acid.

Oxides of sulphur are oxidized to H_2SO_4 by various photochemical and catalytic reaction that are eventually washed down by rain as Acid Rain.

The acid dissolves in water vapour and ionizes into H^+, SO_4^{2+} and NO_3^- (Odiete, 1999). This acid rain has been reported to cause extensive damage to building and structural materials as well as valuable ancient sculpture. The acidification of soils and aquatic systems have also been reported to alter species composition among plankton, decline in productivity of fish and amphibians and the mobilization of metals, which were initially locked unto sediment/soil particles. Acidification of drinking water reservoirs and concurrent increases in heavy metal concentration may exceed public health, and cause injurious effects.

Apart from the formation of acid rain, the release of excessive concentration hydrocarbon into the atmosphere from anthropogenic sources may also result in the hydrocarbon being oxidized in the atmosphere by a series of chemical and photochemical reactions resulting in the formation of various end product such as CO_2 and solid organic and aldehyde. These products form photochemical smog which is characterized by, reduced visibility eye irritation, damage to vegetation and accelerated cracking of rubber products.

Sulphur dioxide level was below the detection all the sampling points except for the Riverview (0.02ppm) therefore, Sampled SO_2 values were lower than FMEnv recommended limit of 0.lppm.

4.3.2.3 Carbon Monoxide

Carbon monoxide is a colorless, odourless and highly toxic gas commonly found indoor and outdoor. It is one of the most important emission resulting from incomplete combustion from petroleum-powered engines and indoor combination appliances. Carbon monoxide reduces the oxygen carrying capacity of the blood thereby causing muscular reflexes, impairs thinking and deprive all organs of oxygen thereby resulting to death.

Methylene chloride, found in some common household products, such as paint strippers could be metabolized to form carbon monoxide, which combines with hemoglobin to form carboxyhaemoglobin. Tissues with the ingest oxygen needs such as myocarchine, brain, and exercising muscles are the first to be affected. Symptoms may mimic influenza and include fatigue, headache, dizziness, nausea and vomiting, cognamre impairment and tachycardia.

Carbon monoxide sampling at the proposed was undetectable except for the power generating set that recorded 3.2ppm. CO concentration was below detection at the proposed soap, net hair and insecticide sections.

The ambient (Riverview Road (Westerner Street)) concentration of carbon monoxide was 1ppm while 2ppm was recorded at Riverview The CO values record at sampling points within the study area is attributable to emission from the high vehicular traffic from commuters and delivery trucks. Furthermore, most facilities within the industrial area rely on diesel fired power generating set thereby contributing to high carbon monoxide emission.

CO values within and outside the proposed project site are high but fall within the FMEnv limit of 10ppm.

4.3.2.4 Hydrogen Sulphide

Hydrogen sulphide or source gas is a colourless gas with a specific gravity of 1.18. It is slightly less lethal than hydrogen cyanide and more lethal than chloride. It has an odour of a rotten egg, but it may seem to have no odour in strong concentration. It is a strong poison.

H_2S was not detected at any of the sampling points.

4.3.2.5 Carbon Dioxide

Carbon dioxide is a natural component of air. The amount of CO_2 in a given air sample is commonly expressed as parts per million (ppm). The effects of Carbon dioxide is summarized in the table 4.5 below

Table 4.5 The Effects of Carbon Dioxide

CO_2	Effect
250-350ppm	Normal background concentration in outdoor ambient air
350-1,000ppm	Concentrations typical of occupied indoor spaces with good air exchange
1,000-2,000ppm	Complaints of drowsiness and poor air.
2,000-5,000 ppm	Headaches, sleepiness and stagnant, stale, stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may also be present.
5,000	Workplace exposure limit (as 8-hour TWA) in most jurisdictions.
>40,000 ppm	Exposure may lead to serious oxygen deprivation resulting in permanent brain damage, coma, even death.

Source ASTM Standard D-6245 – 98

The outdoor air in most locations contains down to about 380 parts per million carbon dioxide. Higher outdoor CO_2 concentrations can be found near vehicle traffic areas, industry and sources of combustion.

Where indoor concentrations are elevated (compared to the outside air) the source is usually due to the building's occupants. People exhale carbon dioxide—the average adult's breath contains about 35,000 to

50,000 ppm of CO_2 (100 times higher than outdoor air). (ASHRAE Standard 62.1-2013) Without adequate ventilation to dilute and remove the CO_2 being continuously generated by the occupants, CO_2 can accumulate.

The outdoor air in sampling points recorded 350 ppm (soil sampling points 1, 2 and 3) to 780 ppm (Generator). The proposed building site contains an average of about 350-550 parts per million carbon dioxide.

The indoor value range from 1050ppm (Soap section), 1350ppm (Braid Section) to 1550ppm (Weavon hair factory). These high values are attributable to the high human population releasing carbon dioxide in the factory section. The rate of dilution (air flow) must be increased for a more conducive working condition.

The ambient value recorded 350ppm while the control value recorded 650ppm.

4.3.2.6 Volatile organic compounds (VOCs)

Volatile organic compounds (VOCs) are organic chemicals that have a high vapor pressure at ordinary room temperature. Their high vapor pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublimate from the liquid or solid form of the compound and enter the surrounding air, a trait known as volatility. For example, formaldehyde, which evaporates from paint, has a boiling point of only –19 °C (–2 °F).

VOCs are numerous, varied, and ubiquitous. They include both human-made and naturally occurring chemical compounds. Most scents or odours are of VOCs. VOCs play an important role in communication between plants, and messages from plants to animals. Some VOCs are dangerous to human health or cause harm to the environment. Law

regulates Anthropogenic VOCs, especially indoors, where concentrations are the highest. Harmful VOCs typically are not acutely toxic, but have compounding long-term health effects. Because the concentrations are usually low and the symptoms slow to develop, research into VOCs and their effects is difficult.

Biologically generated VOCs Not counting methane, biological sources emit an estimated 1150 teragrams of carbon per year in the form of VOCs. Plants produce the majority of VOCs, the main compound being isoprene. Animals, microbes, and fungi, such as molds, produce the remainders. The strong odor emitted by many plants consists of green leaf volatiles, a subset of VOCs. Emissions are affected by a variety of factors, such as temperature, which determines rates of volatilization and growth, and sunlight, which determines rates of biosynthesis. Emission occurs almost exclusively from the leaves, the stomata in particular. A major class of VOCs is terpenes, such as myrcene.

Volatile organic compound were below detection in the facility, ambient and the control section.

4.3.2.7 Particulate Matter

This is defined as any dispersed matter either solid or liquid in which the individual aggregates are larger than a single small molecule (about 0.002μM in diameter) but smaller than about 500μM.

Particulates in the atmosphere have deleterious effects on the environment, although it is important to emphasize that the size of the particulates and their chemical nature are more vital in this regard than their number. Particulates includes FeO_4, V_20_5, CaO, $PbCl_2$, $PbBr_2$, fly ash, aerosols soot, polycyclic, polycyclic aromatic hydrocarbon (PAHs), for example, are important constituents of several organic particulates,

which have been found to be carcinogenic. Fine particulates of less than 3 micron in diameter can also penetrate through the nose and the throat causing breathing problems and irritation of the lung capillaries.

The indoor suspended particulate matter at the proposed site sampling points ranged from 8 μg/m^3 at Net hair factory, 22 μg/m^3 at the soap section weavon section and proposed insecticide section. 50 μg/m^3 was recorded at the braid section.

The ambient TSP value was 38 μg/m^3 while the control value was also 38 μg/m^3. All sampling points have SPM lower than the FMEnv/LASEPA standard limit of 250μg/m^3.

4.3.3 Noise level

Sound and noise are unique environment impact indicator and can be measured precisely. The background noise levels of the area of study are attributable to the combination of noise sources identified in table 4.6, distance from source and duration i.e momentary heavy duty truck driving across the road.

Table 4.6: Noise level

Code	dB	Identified Sources
A1	63	Vehicular movement
A2.	76	Vehicular movement
A3.	89	Vehicular movement
A4.	86	Vehicular movement
A5.	71	Production equipment, and human chatter
A6.	74	Production equipment, and human chatter
A7	74	Production equipment, and human chatter
A8	72	Vehicular movement , Generators from other facilities, production equipment and human chatter
A9	53	Vehicular movement , Generators from human chatter
A10	61	Vehicular movement , Generators from other facilities,

		production equipment, and human chatter
A11	60	Vehicular movement , Generators from other facilities, production equipment, and human chatter
A12	71	Vehicular movement , Generators from other facilities, production equipment, and human chatter
A13	61-89	Vehicular movement , Generators from other facilities, production equipment, and human chatter
A14	62-88	Vehicular movement , Generators from other facilities, production equipment, and human chatter
A15	70-91	Vehicular movement , Generators from other facilities, production equipment, and human chatter
A15	61-89	Vehicular
A16	61-89	Vehicular movement
A17	61-89	Vehicular movement
A18	61-89	Vehicular movement
A19	61-89	Vehicular movement
A20	61-89	Vehicular movement
A21	61-89	Vehicular movement
A22	61-89	Vehicular movement
A23	61-89	Vehicular movement
A24	61-89	Vehicular movement
A25	61-89	Vehicular movement
A26	61-89	
Control		

Source: EIRL, 2018

The measured ambient background noise level was arising from vehicular movement along Lagos Ibadan Expressway, and some industrial and communal activities of the community. The locality can be described as industrial area.

The noise levels observed range from 52dB (A) to 89dB (A). The higher noise levels were recorded nearer the highway and the existing power generating set 89dB in the facility. However, the general noise level of the study area is still within the FMEnv Limit for an industrial area.

4.3.4 General Geology

The project site fall within the wrested portion of southern Nigeria sedimentary basin consisting of superficial tertiary Lagos sequence rock. The formation comprises predominately of coarse sandy estuarine deltaic and continental beds that display rapid lateral facie change (Jones 1964). The sediment includes clay, shale, sandstone and geologically Eoecene age. The sand is generally white and miner logically consisting of pure quartz with surrounded or rounded grains

Geologically, the Opic Estate, Isheri lies within the coastal plain sands of Dahomey Basin (Fig. 4.5). This formation consists of alluvial deposit. Sands, clays, lignite, and sometimes mixtures of these constitute the materials that make up this formation.

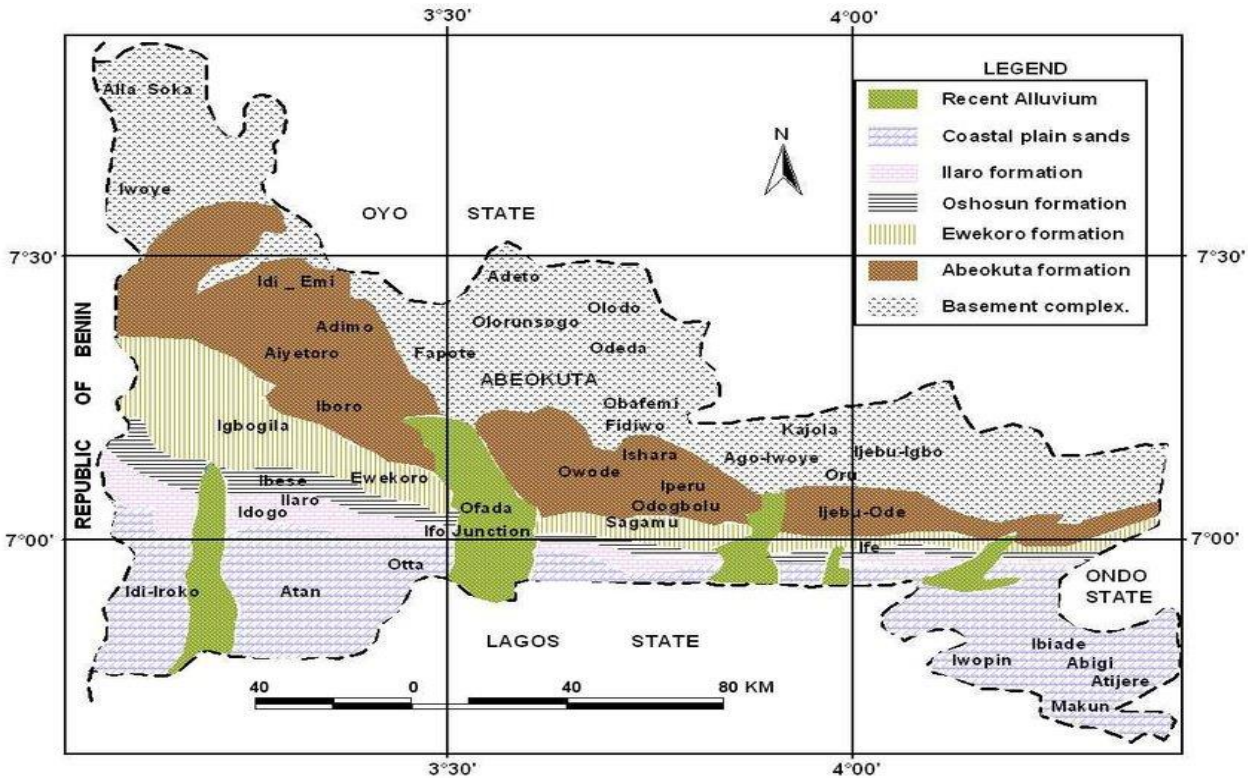

Fig 4.5 Geology of Ogun State

4.3.5 Hydrogeology

The area is located within the Isheri-Oshun River Basin which consists of a number of streams and water bodies that lead to the main river which empties into the Lagos lagoon.

The hydrogeological pattern is controlled by geological and climate factors.

The recharge of the aquifer in the area is by rainwater because the area experience high amount of rainfall of between 850mm and 1530mm per annum. The underground water is held in the acquiferous layer consisting of coarse grained, unconsolidated and fiable sand stone with thickness of 8.4m at the depth of 32.7m.

Groundwater flow direction is found to be in the southward direction. Ground water utilization in that area is mostly by borehole. The water level observed in the available hand dug well around is 2,7m during the rainy season while it was 4.5m in the dry season. The water was found to be odourless, colourless, and taste free.

The physico-chemical and microbial qualities quality results of the proposed project site presented in table 4.7 below

Table 4.7 Ground water Physico-chemical and microbial qualities

Parameter	WHO Limit	Sample	Control
Appearance	Colourless	Colourless	Colourless
Temperature (^{o}C)		28	28
Turbidity NTU	NS	24	00
Conductivity, (μS/cm)	NS	97.5	108
Colour	<5	1	0.0
pH	7.0-8.5	7.42	6.68
Acidity (mg/L)	NS	10.60	10.24
Alkalinity (mg/L)	200	60.47	55.35
Total Hardness ($CaCO_3$) (mg/L)	100	16.10	35.10
Calcium Hardness (mg/L)		7.16	20.30
Magnesium Hardness (mg/L)		7.16	14.80
Total Solids (mg/L)		58	65
Total Suspended Solids (mg/L)		0.0	0.0
Total Dissolved Solids (mg/L)	500	0.0	65
Phosphate (mg/L)	NS	0.04	0.27
Nitrate (mg/L)	45	0.02	0.02
Sulphate (mg/L)	200	0.02	7.11
Chloride (mg/L)	200	17.77	19.75
Sodium Chloride		29.23	32.58
Iron (mg/I)	0.3	0.10	0.04
Lead	<0.01	<0.01	<0.01
Copper (mg/L)	1.0	0.11	0.02
Nickel (mg/L)	<0.01	<0.01	<0.01
Cadmium (mg/L)	0.01	<0.01	<0.01
Zinc (mg/I)	5.0	0.06	0.12
Chromium (mg/L)	0.05	<0.01	<0.01
Manganese (mg/I)	0.5	0.02	0.02
Clostridium perfingenes (cfu/ml)	Nil	Nil	Nil
E.Coli (cfu/ml)	Nil	Nil	Nil
Feacal Streptococci (cfu/ml)	Nil	Nil	Nil
Yeast & Mould (cfu/ml)	Nil	Nil	Nil
Staphylococcus aureus	Nil	Nil	Nil

ND Not Detected

Source: EIRL, 2018

The alkaline pH value (7.4) falls with the desirable range of 6.5 - 8.5 for drinking water. The control sample recorded the pH value 6.68. which was slightly acidic. (pH 6.5) , however, within regulatory limit.

The water sample is relatively soft (16.10 mg/l $CaC0_3$) and of low overall mineral content as evidenced by a total solids (58mg/L) content and an electrical conductivity (97.5μS/cm).

TDS value of 58mg/L is similar to the control (65mg/l). These values were within the 500 mg/L maximum permissible limit set by NAFDAC, SON and WHO. The materials present, which determine the amount of TDS, include; carbonate bicarbonate, chloride, sulphate, phosphate, nitrate, calcium, magnesium, sodium, organic ions and other ions.

Total acidity was 10.6 mg/L in the study area while the control value was 10.25mg/l. Water acidity is usually derived from inorganic and organic acidifying precursors including S0x and N0x in most industrialized regions, due to the prevailing industrial processes, which involves gaseous and particulate emission, organic waste decomposing under partially reducing conditions into organic acids as well as acidic precipitation.

Alkalinity is 60.7mg/l while the control recorded 55mg/l.

The Iron content (0.1mg/l) is within specified limit (0.30mg/l) while the control water sample (0.4mg/l) sample exceeded the permissible limit.

The microbiological quality of the samples is satisfactory as suggested by the absence of coliforms.

Generally, the concentration all other parameters analysed were within

the set limit.

Surface Water

River Ogun is one of the rivers in the south-western part of Nigeria which covers a total area of about 22.4 Km^2. It transverses through Ibarapa, Iseyin, Abeokuta, Owode, Ikorodu, and Ifo local government areas before finally discharging into the Lagos Lagoon. This site has become a place of interest considering its constant and continuous pollution owing to the fact that it serves as a focal point of some commercial activities in the ever growing cattle market around the basin.

Opa-aro stream flows South-West into the Ogun River. It is less than 20m from the proposed project site.

The physico-chemical chemical analysis results are detailed in table 4.
The pH of the water bodies ranged between 6.66 and 6.9 which indicates that the river is slightly acidic. The temperature ranged from 28°C - 32°C with a mean value of 30.3°C ±1.3°C. However, highest temperature of 32°C this could be due to direct hot effluent discharge into the river, blood cooking and hide burning. The concentration of oil and grease ranged from 34 – 864 mg/L. The alkalinity ranged from 105 - 146 mg/L with a mean value of 120 -125 mg/L. The quantity of waste in different phases of a natural aquatic system is reflected by the level of hardness, alkalinity, free CO2 and other physico-chemical parameters.

Table 4.8 Surface water quality results

	WHO Stamdard	Opa-Aro River	Opa-Aro River	Ogun River upstream 6°38′41.96′′N 3°22′57.6′E′	Ogun River (underbridge) 6°38′41.6′′ E3°22′52.6′′
Temperature (°C)		29.4	29.8	28	32
Turbidity NTU	NS	3	3	5	18
Conductivity, (µS/cm)	NS	220	240	650	960
pH	7.0-8.5	6.8	6.9	6.66	6.72
Alkalinity (mg/L)	200	115	108	125	120
Total Solids (mg/L)		378	420	400	580
Total Suspended Solids (mg/L)		265	302	80	100
Total Dissolved Solids (mg/L)	500	113	120	320	480
Phosphate (mg/L)	NS	1.09	1.18	1.8	2.47
Nitrate (mg/L)	45	7.83	8.72	5.3	7.23
Sulphate (mg/L)	200	6.38	7.07	9.2	18.8
Chloride (mg/L)	200	10.8	14.3	53.6	49.75
Iron (mg/I)	0.3	1.01	1.23	1.5	2.34
Lead	<0.01	ND	ND	0.01	0.02
Copper (mg/L)	1.0	ND	0.01	ND	0.02
Nickel (mg/L)	<0.01	0.005	0.003	0.001	0.003
Cadmium (mg/L)	0.01	ND	ND	<0.01	0.002
Zinc (mg/I)	5.0			0.02	0.03
Chromium (mg/L)	0.05	0.01	0.01	<0.01	<0.01
Manganese (mg/I)	0.5	0.17	0.13	0.26	0.32
Oil and grease (mg/L)		0.9	0.8	34	864
Dissolved Oxygen		2,88	2.68	3.5	2.8
COD (mg/L)		11	9	134	220
E.Coli (cfu/ml)	Nil	+ve	+ve	+ve	+ve
Feacal Streptococci (cfu/ml)	Nil	+ve	+ve	+ve	+ve

Corrosion of metals in the water distribution system and depending River Ogun water is moderately hard, thereby limiting its use for some domestic purposes, such as washing. The water could be a good source for livestock weathering. In addition, it cannot be used for industrial purposes as hard water forms clogs that can block boilers and pipes (Ndefo *et al*, 2011), thus necessitating its treatment before use for certain

industrial applications.

According to klein (1962) total solids depend on base flow, run-off, and anthropogenic sources such as industrial and municipal wastes as well as agricultural wastes. Hence, the high concentrations at the effluent points could be attributed to anthropogenic sources from human activities, eroded soil particles, road surface degradation and runoffs, degradation of automobile tyres, effluent discharge alongside with animal waste disposal.

TDS comprises of inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulphates) and small amount of organic matter that are dissolved in water. TDS in water originate from natural sources, sewage, urban runoff and industrial wastewater. Concentration of TDS in water varies considerably in different geological regions owing to differences in the solubility of minerals.

Dissolved oxygen concentration in samples from Ogun river ranged from are 2.80 – 3.5mg/L and 2.68-2.88mg/L were recorded at Opa Aro river . These values are above 2.0mg/L. The values at sampling points could be attributed to the fact that as the river flows along its course, it carries soil and partially dissolved and undissolved organic and inorganic matters which are oxidized by the DO present in the water thereby leading to a decrease in the DO. The relatively low DO values could also be as a result of the degradation of cattle waste, cattle feed and hot discharges into the river which are oxygen demanding (Oketola *et al* 2006). In addition, as water flows through towns and cities, different oxygen demanding substances are discharged into the water (oluwande *et al* 1993).

Excessive algae and plant growth can lead to depletion of dissolved oxygen, which adversely affects organisms population. The oxygen content of a water body is mainly controlled by the decay of organic substances, the oxidation of the nitrogen compounds and the photosynthetic aeration of the water by plants and oxygen demand by sediments. Reduced oxygen levels can kill fish and other aquatic life in the river. (Oketola *et al*, 2013).

The range and mean concentration of chemical oxygen demand are 134 - 220 mg/L and 9-11mg/L was recorded at Opa Aro stream. The presence of high biodegradable and non-biodegradable matters as well as exposure of sediment in the river which may have accumulated organic and inorganic matters over a period of time could account for this trend.

The concentration of chloride ranged between 49.75-53.6 mg/L while 10-14mg/L was recorded at Opa Aro stream. Chloride in drinking-water originates from natural sources, sewage, industrial effluents and urban runoff. Excessive the alkalinity of the water; this can lead to increased concentrations of metals in the supply (WHO, 2016). Chloride concentration in excess of about 250 mg/L can give rise to detectable taste in water.

The range of sulphate concentration in the water was 9.2 - 34.8 mg/L This could be attributed to the fact that sulphate occur naturally in numerous minerals and are used principally in the chemical industry. They are discharged into water body from industrial wastewater and through atmospheric deposition (WHO, 2016)

The concentration of nitrate in Ogun river ranged from 5.3 – 7.2 mg/L while this increase could be accounted for by the continuous discharge of nitrogenous compounds in animal waste, agricultural runoff, oxides

of nitrogen emitted during burning of bones, horns and hides etc. Nitrates are high oxide form of nitrogenous compounds and are usually present in surface water. It is the end product of aerobic decomposition of organic nitrogenous matter present in animal waste. Also, atmospheric nitrogen is washed down by rain into streams, lakes, rivers, and coastal waters which in turns lead to an increase in nitrate level and then contributes to algal blooms that deprive fish and other aquatic organisms of oxygen .The accumulation of excess nutrients over a period of time could also lead to eutrophication and the loss of aquatic and other microorganisms in the river.

The primary health concern regarding high levels of nitrate and nitrite in potable water is the formation of methaemoglobinaemia, so-called "blue-baby syndrome". Nitrate is reduced to nitrite in the stomach of infants.

This reduction of nitrate to nitrite by gastric bacteria is also higher in infants because of low gastric acidity. The nitrate concentration in groundwater and surface water is normally low but can reach high level as a result of leaching or run-off from agricultural land or contamination from human or animal wastes (WHO, 2003)

Phosphate concentration in Ogun river ranged between 1.8-2.47mg/L. 1.09-1.18 was obtained in Opa Aro Stream. The presence of water hyacinths on the surface of the river around some sampling points could be attributed to increase in nutrient in the water. Nitrate and phosphate are nutrients very essential for plant growth. However, high concentrations tends to pose more harm on the water body as they can lead to algal growth commonly refer to as algal bloom.

Eutrophication could adversely affect the use of rivers and dams for

recreational purposes as the covering of large areas by water hyacinth could cause unsightly and malodorous scum, which could lead to the growth of algae as well as the release of toxic substances into the water body. The first step to eutrophication is the addition of nutrients to the water, increase in nutrient causes algae bloom, as the algae bloom progresses, the algae begin to die, and organic material accumulates on the bottom of the river. This material supports a boom in the decomposer population and the decomposers rapidly rob the river of its oxygen, suffocating most other organisms in the process. Eutrophication leads to an increase in the treatment cost of potable water as it lead to filter clogging in water treatment plants. Also, high nutrient concentrations interfere with recreation and aesthetic enjoyment of water resources by causing reduced water clarity, odour and blooms of toxic and nontoxic organisms.

The concentration of Cd ranged from ND - 0.02 mg/L in Ogun river sample while it was undetected in Opa Aro Stream. Cadmium is released into the environment in wastewater and diffuse pollution is caused by contamination from fertilizer, local air pollution and leachate from landfill or dumpsite Contamination in drinking-water may be caused by impurities in the zinc of galvanized pipes and solders and some metal fittings. Cadmium accumulates primarily in the kidneys and has a long biological half-life of 10 - 35 years in humans. Hence, kidney is the main target organ for cadmium toxicity. Therefore, chronic exposure by accumulation of cadmium in the environment must, however, be considered under conditions of long-term irrigation water use and soil type.

Concentration of Cu ranged from ND - 0.02 mg/L in Ogun River while it was undetected in Opa Aro Stream. Copper is both an essential nutrient and a drinking-water contaminant with many commercial uses. It is

used to make pipes, valves and fittings and is present in alloys and coatings Copper sulphate pentahydrate is sometimes added to surface water for the control of algae. Copper concentration in drinking water varies widely with the primary source most often being the corrosion of interior copper plumbing. Level in running or fully flushed water tends to be low, whereas those in standing or partially flushed water sources are more variable and can be substantially higher . Copper concentrations in treated water often increase during distribution, especially in systems with an acid pH or highcarbonate waters with an alkaline pH. (WHO, 2003)

The concentration of Fe in River Ogun water around the cattle market ranged from 1.5 - 2.34 mg/L. Iron is one of the most abundant metals in the earth's crust. It is found in natural fresh waters at levels ranging from 0.5 to 50 mg/L. Corrosive materials contribute significantly to the amount of iron in water Iron is an essential element in human nutrition, however, estimates of the minimum daily requirement for iron depend on age, sex, physiological status and iron bioavailability and range from about 10 to 50 mg/day. Iron stains laundry and plumbing fixtures at levels above 0.3 mg/L. There is usually no noticeable taste at iron concentrations below 0.3 mg/L, and concentrations of 1 - 3 mg/L can be acceptable for people drinking anaerobic well water.

The concentration of Ni ranged from 0.001 - 0.003 mg/L. Food is the dominant source of nickel exposure in the non-smoking, non-occupationally exposed population while water is generally a minor contributor to the total daily oral intake.

The concentration of Pb in River Ogun water obtained in this study ranged from 0.01 - 0.02 mg/L Lead is one of the significant toxic metals.

Zn concentration ranged from 0.01 - 0.07 mg/L. Zinc is associated with human activities such as the use of chemicals and zinc based fertilizers

The most significant water quality parameters that contribute to variations in the quality of River Ogun water are presented. Phosphate and DO were the most significant parameters contributing to the variation in water quality in all the years studied. COD, TDS, TSS, SS and oil and grease with strong loading are the most important parameters in water quality variations for five years out of the six years studied. Discharge of effluent from the slaughter houses, river sand mining and other activities in the market causes considerable pollution.
The temperature with strong loadings is the most significant parameter which contributed to variation in water quality in all the years and it represents the impacts of the discharge mostly hot as most of the sampling was done during the wet season when ambient temperature is believed to be lower. There is limited access to the water during the dry season. This is due to very low water volume and the presence of water hyacinth across the water surface which hinders movement on the water surface.

Also, the water is not good for irrigation due to high level of cadmium and manganese based on water quality criteria by Food and Agriculture Organization (FAO, 1985) and Federal Environmental Protection Agency.

4.3.6 Soil

The soil samples were taken from the premises of the proposed facility expansion site in order to determine the present physical and chemical condition of the soil so that prediction could be made on the likely impact of the proposed facility expansion on soil quality. The soil quality assessment was carried out using hand auger. Sample locations were

established in the facility and a control. Both surface (0-15cm) and subsurface (15-30cm) were collected at each sampling point. The sample were placed in properly labeled containers (polythene bags) and then placed in ice containers to retain it quality before taken to the laboratory for analysis.

4.3.6.1 Physico- Chemical Characteristics of Soil Sample

Generally, the soil in the study area could be broadly categorized as rainforest soils which belong to the incepted, Entisol, oxisols and Alfisols soil order of United States Department of Agriculture (USDA) soil classification scheme. These are mineral soils formed as a result of weathering of siliceous sandstone fragments over varying periods of time.

The complete analytical results of the physical- chemical Characteristics of the soils are presented in table 4.8 below.

Soil profile: The Surface and sub-surface soil samples are detailed in table below

Table 4.9 Soil profile

SAMPLE CODE	SOIL DEPTH(CM)	% SAND	% SILT	% CLAY	DESCRIPTION
S1	Top	66.0	21.0	13.0	Dark grey organic silty sand
	Bottom	57.0	23.0	20.0	Greyish brown silty clay
S2	Top	63.0	20.0	`17.0	Reddish brown clayey silty sand
	Bottom	69.0	14.0	17.0	Greyish brown clayey silty sand
S3	Top	97.0	3.0	NIL	Grey silty sand with occasional gravels
	Bottom	89.0	11.0	NIL	Reddish brown silty sand
S4	Top	84.0	7.0	9.0	Brown clayey silty sand
	Bottom	85.0	7.0	7.0	Reddish brown clayey silty sand

S5	Top	70.0	20.0	10.0	Dark grey clayey silty sand
	Bottom	63.0	22.0	15.0	Brown silty sand
S6	Top	86.0	7.0	6.0	Brown clayey silty sand
	Bottom	85.0	7.0	7.0	Reddish brown clayey silty sand
S7	Top	54.0	20.0	26.0	Dark grey silty sandy clay
	Bottom	68.0	18.0	14.0	Brown clayey silty sand
S8	Top	80.0	13.0	9.0	Brownish clayey silty
	Bottom	63.0	21.0	14.0	Greyish brown clayey silty sand
S9	Top	88.0	12.0	NIL	Greyish brown silty sand
	Bottom	88.0	9.0	6.0	Grey clayey silty
S10	Top	65.0	21.0	12.0	Grey clayey silty sand
	Bottom	62.0	14.0	23.0	Reddish brown laterite clayey
S11	Top	60.0	20.0	20.0	Greyish brown silty sand
	Bottom	95.0	1.0	NIL	Greyish brown with silty sand
S12	Top	74.0	20.0	6.0	Dark grey silty sandy clay
	Bottom	68.0	18.0	14.0	Brown clayey silty sand
S13	Top	76.0	14.0	10.0	Dark grey clayey silty sand
	Bottom	73.0	12.0	15.0	Brown silty sand
S14	Top	89.0	9.0	2	Reddish brown silty sand
	Bottom	80.0	11.0	9	Reddish brown silty sand

The measured pH values for the soil samples are acidic (6.10 -6.3). The pH is simply the expression of the concentration of the hydrogen ions and the most commonly measured parameter in soil sample which gives useful information about the availability of exchangeable action e.g. Ca2+, Mg+ K+ etc. The observed pH values are natural and within the critical limit set for plant growth.

The electrical conductivity value of 24-74 (μscm-1) which correspond to an osmotic pressure of 3-5 atmospheres in the soil solution at field capacity is generally accepted as the limit above which the yield of the most sensitive crops will start being affected (Odu et al 1985). The conductivity values of the soil indicate low salinity of the soil. These values fall within the tolerable limit of electrical conductivity for normal

plant growth too.

Table 4.10 Soil Physical and chemical parameters

Sample	pH	Conductivity	Organic Carbon (%)	Total Nitrogen (mg/kg)	Chloride (mg/kg)	K+	Na2+	Ca2+	Mg2+	THC(mg/kg)
S1T	6.53	33.7	5.93	0.3	32.4	1.33	3.241	4.132	2.31	0.005
S1 B	5.19	28.9	4.42	0.22	31.7	1.214	3.17	4.212	2.153	0.003
S2T	7	328	10.2	0.6	14.5	1.432	1.471	2.157	1.61	0.004
S2B	7.1	229	9.4	0.47	13.9	1.123	1.392	2.231	1.51	0.007
S3T	5.04	106	5.65	0.34	12.7	1.345	1.273	2.313	1.342	0.005
S3B	6.7	30.6	10.2	0.64	11.6	1.443	1.16	2.14	1.442	0.002
S4T	6.3	88.7	1.6	0.08	10.52	0.091	1.052	2.33	1.672	ND
S4B	6.9	163.4	6.6	0.33	30.4	2.934	3.041	3.994	1.651	ND
S5T	7.1	177	7.65	0.45	22.7	2.341	2.27	3.534	1.447	0.002
S5B	6.6	160.5	6.52	0.33	20.6	2.132	2.06	3.443	1.35	0.003
S6T	6.6	71.2	5.1	0.3	14.9	1.553	1.492	2.419	1.062	0.003
S6B	5.9	69.7	4.9	0.25	14.5	2.732	1.453	3.341	1.534	0.001
S7T	7.12	160.3	5.1	0.26	21.7	2.653	2.17	3.103	1.494	ND
S7B	6.99	155.6	3.9	0.2	20.9	2.134	2.091	2.531	1.531	ND
S8T	7	108	3.4	0.17	15.11	1.675	1.511	2.943	1.55	ND
S8B	5.9	67.7	2.9	0.18	9.53	1.622	0.953	3.112	1.053	ND
S9T	7	108	5.4	0.27	8.5	1.532	0.851	3.752	1.122	0.002
S9B	6.9	112.3	5	0.25	10.6	1.652	1.063	3.663	1.345	0.004
S10T	7.2	225	5.6	0.28	14.7	0.883	1.473	3.953	1.563	ND
S10B	7.3	335	6.5	0.33	14.9	0.732	1.492	3.144	1.566	ND
S11T	6.8	107	5.95	0.35	13.5	0.651	1.234	2.63	0.934	0.003
S11B	5.95	100	12.75	0.75	12.4	0.773	1.334	2.55	0.813	0.002
S12T	6.61	216	8.65	0.51	11.5	0.813	1.534	2.664	0.922	ND
S12B	6.6	106	9.3	0.47	9.6	0.914	1.245	2.732	0.935	ND
S13T	7.93	25.1	3.14	0.19	10.6	1.353	2.806	1.342	3.351	ND
S13B	8.23	17.6	3.6	0.21	14.7	1.271	3.13	1.162	3.441	ND
Control A	5.01	136	3.21	0.19	14.9	1.443	3.826	1.672	4.531	ND
Control B	7.18	193	2.89	0.17	14.5	1.231	2.728	1.33	3.14	0.001
MIN	5.01	17.6	1.6	0.08	8.5	0.091	0.851	1.162	0.813	0.001
MAX	8.23	335	12.75	0.75	32.4	2.934	3.826	4.212	4.531	0.007
AVE	6.66	130.68	5.909286	0.324643	16.002	1.464	1.875	2.804	1.7276	0.00313

	7142 9	93			14	357	571	607	43	3

T-Top Soil B-Bottom Soil

Nutrients holding ability: the ECEC (effective cation exchange capacity) values of soils of the sampled locations at 0-15 cm depth range from 0.17 cmol(+)/kg to 1.15 cmol(+)/kg At 15-30 cm depth, it ranges from 0.05 cmol(+)/kg at to 1.13 cmol(+)/kg at ss3

The soils ECEC values (in cmol(+)/kg) are classed as:

"low" for <12,
"medium" for 12-25 and
"high" for >25.

With this classification, therefore the ECEC values at all locations at both soil depths are of "low" class. According to FAO (1979). This signifies the soils at all locations hold sufficient cations to sustain vegetation.

The implications of the low ECEC values obtained for all the soils are:

(a) They will have low buffering capacities to resist pH change and nutrient cations depletion by the growing plants and
(b) They will have low ability to hold nutrient cations against leaching losses.

Although there is appreciable presence of soil organic matter in most of the soil samples and the pH range is 6.15-6.3 for 0-15 cm depth, the high "sand plus silt" content of the soils indicates limited capacity of the soil at each location to hold nutrient cations.

Acidity:

The range of exchangeable acidity determined for the sampled locations some of the soils is 0.2 meq/100g at 0-15 cm and 15-cm depths. These data sufficiently indicate there will be low solubility of H^+ and Al^3 ions in the soils at their present pH values. As the Al ions concentration in the solution pool will be small at the pH range obtained for the soils (6.1-6.3), Aluminum toxicity cannot occur in any of the locations if cropped. For the same reason, Fe and Mn concentrations in solution pool cannot reach the level toxic to growing plants.

Salinity:

The range of exchangeable sodium content in soil at the sampled locations is 0.12-0.25 mg/kg at 0-15 cm depth while it is 0.11-0.2 mg/kg at 15-30 cm depth. The exchangeable sodium levels (in cmol (+)/kg) in soils are classed as: “low" for <0.3, “medium” for 0.3-0.7 and “high” for >0.7. With this classification, therefore all the soil exchangeable Na levels at the sampled locations are within the “low" class for both soil depths. Since the pH range obtained for the soils are below pH 8.0 all the soils are non-saline and the levels of sodium ions in solution pool cannot be injurious to vegetation.

Primary Nutrients:

Nitrogen: The range of soil total nitrogen (TN) concentrations for the sampled locations is 0.07-0.11% at 0-15 cm depth while the range is 0.05-0.12% at 15 -30 cm depth. Soil TN concentrations are classed as: “low" for <0.10%, “medium” for 0.10 —0.20% and “high” for >0.20% (Sobulo and Adepetu, 1987). With respect to this classification, soil TN concentrations at all locations are of “low" category.

Phosphorus: The range of plant-available P (as phosphate-P) levels in soil at the sampled locations is 95.6-120 mg/kg at 0-15 cm depth while it

is 100-105 mg/kg at 15 - 30 cm depth. The concentrations of plant-available P in soils (in mg/kg) are classed as: “low” for <8, “medium” for 8-20 and “high” for >20 (Sobulo and Adepetu, 1987). According to this classification, sampled locations fall within the “high” category.

Potassium: The range of soil exchangeable K levels at the sampled locations was 0.3 -0.35 /kg at 0-15 cm depth while it was 0.25-30 cmol(+)/kg at 15-30 cm depth The concentrations of exchangeable K (in cmol(+)/kg) in soils are classed as: “low” for <0.15, “medium” for 0.1-0.30 and “high” for >0.3. Based on this classification, at 0- 15 cm depth, K concentrations of soils at locations fall within “medium” category.

Secondary Nutrients

Calcium: The range of soil exchangeable Ca levels at the sampled locations was 0.2-0.30 meq/100g at 0-15 cm depth while the range was 0.2-0.25 meq/100g at 15-30 cm depth. The concentrations of exchangeable Ca (in cmol(+)/kg) in soils are classed as: “low” for <2.0, “medium” for 2.0-5.0 and “high” for >5.0. With this classification, soil calcium concentrations for all locations and for both depths fall within the “low” category.

Magnesium: The range of soil exchangeable Mg levels for the sampled locations was 0.13— 0.17 meq/100g at 0-15 cm depth while the range was 0.12-0.20 cmol(+)/kg at 15-30 cm depth The concentrations of exchangeable Mg (in cmol(+)/kg) in soils are classed as: “low" for <0.5, “medium” for 0.5-4.0 and “high” for >4.0. Based on this classification, soil exchangeable-Mg levels at locations and depth is low.

Micronutrients

Iron: The range of soil extractable/plant-available Fe levels at the sampled locations was 240.3-310.5 mg/kg at 0-15 cm while at 15-30cm

depth, the range was 190.35 -306.25 mg/kg

Manganese: The range of soil extractable/plant-available Mn levels at the sampled locations was 114.5-190.25 mg/kg at 0-15 cm while at 15-30 cm depth, the range was 103.0-145.5 mg/kg.

Based on these prescriptions, soil Mn levels for all sampled locations at 0-15 cm depth are high. Thus, Mn fertilization will be unnecessary.

Copper: The range of soil extractable/plant-available Cu levels at the sampled locations was 3.2 -6.1 mg/kg at 0-15 cm while at 15- 30 cm depth, the range was 2.45-3.2 mg/kg.

Zinc: The range of soil extractable/plant-available Zinc levels at the sampled locations was 30.4-48.8 mg/kg at 0- 15 cm while at 15-30 cm depth, the range was 17- 45 mg/kg

Heavy metals such as cadmium were not detected in the soil samples available chromium levels at the sampled locations 0.01-0.03 mg/kg at 0-15 cm while at 15-30 cm depth, the range was 0.01-0.06mg/kg. Lead levels at the sampled locations was 0.05-2.3mg/kg at 0- 15 cm while at 15-30 cm depth, the range was 0.04-1.3 mg/kg.

4.11 Soil Heavy metals

Sample	Fe (mg/kg)	Ni (mg/kg)	Mn (mg/kg)	Cr (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Cd (mg/kg)
S1 (0-15cm)	6.733	0.002	0.001	0.002	0.001	ND	ND
S1 (15-30CM)	5.673	ND	ND	0.004	0.002	ND	ND
S2 (0-15cm)	10.501	0.04	0.051	0.005	0.003	ND	ND
S2 (15-30CM)	11.403	0.031	0.043	0.003	ND	ND	ND
S3 (0-15CM)	10.213	0.01	0.032	0.013	0.005	ND	ND
S3 (15-30CM)	4.635	ND	0.102	0.015	0.04	ND	ND
S4 (0-15CM)	7.432	0.01	0.11	0.342	0.132	ND	ND

S4 (15-30CM)	2.914	0.01	0.039	0.009	0.009	ND	ND
S5 (0-15CM)	3.53	0.02	ND	0.041	0.003	ND	ND
S5 (15-30CM)	5.612	ND	ND	ND	0.001	ND	ND
S6 (0-15CM)	10.562	0.02	0.012	0.002		ND	ND
S6 (15-30CM)	8.806	ND	0.003	ND		ND	ND
S7 (0-15CM)	12.342	ND	0.002		ND	ND	ND
S7 (15-30CM)	10.062	ND	ND	ND	ND	ND	ND
S8 (0-15CM)	8.146	ND	ND	0.002	ND	ND	ND
S8 (15-30CM)	8.662	ND	ND	ND	ND	ND	ND
S9 (0-15CM)	10.204	ND	0.001	ND	0.001	ND	ND
S9 (15-30CM)	9.824	ND	ND	ND	0.002	ND	ND
S10 (0-15CM)	5.806	ND	0.003	0.04	0.002	ND	0.001
S10 (15-30CM)	5.882	ND	ND	ND	0.001	ND	0.002
S11 (0-15CM)	6.304	0.001	ND	ND	ND	ND	ND
S11 (15-30CM)	5.248	0.002	ND	ND	ND	ND	ND
S12 (0-15CM)	9.132	ND	ND	0.043	0.002	ND	ND
S12 (15-30CM)	6.804	ND	0.002	0.002	0.001	ND	ND
S13 (0-15CM)	12.821	0.002	0.001	0.002	0.001	ND	ND
S13 (15-30CM)	10.664	ND	ND	ND	0.001	ND	ND
Control A	8.102	ND	ND	ND	0.002	ND	ND
Control (15-30CM)	7.606	ND	ND	ND	0.002	ND	ND
MIN	2.914	0.001	0.001	0.002	0.001		0.001
MAX	12.821	0.04	0.11	0.342	0.132		0.002
AVE	8.057964	0.013455	0.028714	0.035	0.011105		0.0015

All other parameters in the samples were within limits

The rich bacteria and fungi population in the soil samples indicate that the soil is capable of biodegrading foreign materials such as petroleum.

4.3.7 Vegetation

The site is heavily built up for industrial and associated activities and most of the undeveloped surfaces have been concrete, however, the southern end of the site supports mild vegetation.

Table 4.12 Plant Species

				QUADRANTS											IUCN
SN	Botanical Name	Family	Habit	1	2C	3	4C	5	6	7	8	9	10	11	
1	*Alternanthera sessilis*	Amaranthaceae	Herb	+	_	_	_	_	_	_	_	_	_	_	LC
2	*Amaranthus spinosus*	Amaranthaceae	Herb	_	_	_	_	_	_	+	+	_	+	_	NA
3	*Amaranthus viridis*	Amaranthaceae	Herb	_	_	_	_	_	_	+	+	+	+	_	NA
4	*Bambusa vulgaris*	Poaceae	Shrub	_	_	_	_	+	_	_	_	_	_	_	NA
5	*Calopogonium mucunoides*	Fabaceae	Climber	_	+	+	_	_	_	_	_	_	_	+	NA
6	*Centrosema pubscens*	Fabaceae	Climber	_	_	+	_	_	_	_	_	_	_	_	NA
7	*Chromolaena odorata*	Asteraceae	Shrub	_	+	+	+	_	_	_	_	_	_	_	NA
8	*Cleome viscose*	Capparidaceae	Herb	+	+	_	_	_	_	+	_	_	_	_	NA
9	*Commelina diffusa*	Commelinaceae	Herb	_	_	_	_	_	_	_	_	_	+	_	LC
10	*Croton labatus*	Euphorbiaceae	Herb	_	_	+	+	_	_	_	_	_	_	_	NA
11	*Cyperusdilalatus*	Cyperaceae	Sedge	_	_	_	_	_	+	_	_	_	_	_	NA
12	*Cyperus esculentus*	Cyperaceae	Sedge	_	_	_	_	_	_	_	_	_	_	+	NA
13	*Cyperus haspan*	Cyperaceae	Sedge	_	_	_	_	_	_	+	_	_	_	_	NA
14	*Cyperus iria*	Cyperceae	Sedge	_	_	_	_	_	_	_	+	_	_	_	LC
15	*Dactylotenium aegyptium*	Poaceae	Grass	+	_	_	_	_	_	_	_	_	_	_	NA
16	*Desmodium gangeticum*	Fabaceae	Shrub	_	+	_	_	_	_	_	_	_	_	_	NA
17	*Desmodiumtriflorum*	Fabaceae	Herb	_	_	+	_	_	_	_	_	_	_	_	NA
18	*Digitariahorizontalis*	Poaceae	Grass	_	_	_	_	_	_	+	_	_	_	_	NA
19	*Eleusineindica*	Poaceae	Grass	_	_	_	_	_	_	+	+	_	+	_	LC
20	*Euphorbia*	Euphorbiacea	Herb	_	_	+	_	_	_	_	_	_	_	_	NA

	heterophylla	e													
21	*Fiscus exasperate*	Moraceae	Tree	_	_	_	+	_	_	_	_	_	_	_	NA
22	*Gomphrena celosioides*	Amaranthaceae	Herb	_	_	_	_	_	+	_	+	_	_	_	NA
23	*Imperata cylindrical*	Poaceae	Grass	_	+	_	_	_	_	_	_	_	_	_	NA
24	*Ipomoea asarifolia*	Convolvulaceae	Creeper	_	_	_	_	_	_	_	_	+	_	_	NA
25	*Ipoomea involucrate*	Convolvulaceae	Climber	_	_	_	+	+	_	_	_	_	_	_	NA
26	*Lagernaria breviflora*	Cucurbitaceae	Climber	_	_	_	_	_	_	_	+	_	_	_	NA
27	*Lantana camara*	Verbenaceae	Shrub	_	+	_	_	_	_	_	_	_	_	_	NA
28	*Leucaena leucocephala*	Fabaceae	Tree	_	_	+	+	_	_	_	_	_	_	_	NA
29	*Ludwigia abyssinica*	Onagraceae	Shrub	_	_	_	_	+	_	_	_	_	_	_	NA
30	*Ludwigia sufruiticosa*	Onagraceae	Herb	_	_	_	_	_	+	_	_	_	_	_	NA
31	*Mariscus alternifolius*	Cyperaceae	Sedge	_	+	_	_	+	_	_	_	+	_	+	NA
32	*Mimosa pigra*	Fabaceae	Shrub	_	_	_	_	_	_	_	_	_	_	+	NA
33	*Mimosa pudica*	Fabaceae	Herb	_	_	_	_	_	_	_	_	+	_	_	LC
34	*Morinda lucida*	Rabiaceae	Tree	_	+	_	_	_	_	_	_	_	_	_	NA
35	*Musa paradisiaca*	Musaceae	Shrub	_	_	_	_	_	_	_	_	_	_	+	NA
36	*Musa sapientum*	Musaceae	Shrub	_	_	_	_	_	_	_	_	_	_	+	NA
37	*Newbouldia laevis*	Bignoniaceae	Tree	_	_	_	+	_	_	_	_	_	_	_	NA
38	*Nymphaea lotus*	Nymphaeaceae	Herb	_	_	_	_	+	_	_	_	_	_	_	NA
39	*Panicum maximum*	Poaceae	Grass	_	_	+	+	+	+	_	+	+	+	+	NA
40	*Passiflora foetida*	Passifloraeae	Climber	+	+	_	_	_	+	_	_	+	_	_	NA
41	*Paullina pinnata*	Sapindaceae	Climber	_	_	_	+	_	_	_	_	_	_	_	NA
42	*Phyllanthus amarus*	Euphorbiaceae	Herb	+	_	_	_	+	+	_	_	_	_	_	NA
43	*Physallus angulata*	Solanaceae	Herb	_	_	_	_	_	+	_	_	+	_	_	NA
44	*Pleioceras barteri*	Apocynaceae	Shrub	_	_	_	_	_	_	+	_	_	_	_	NA

45	*Sacciolepis africana*	Poaceae	Grass	_	_	_	_	+	_	_	_	_	_	+	NA
46	*Scoparia dulcis*	Scrophulariaceae	Herb	_	+	_	_	_	_	_	_	_	_	+	NA
47	*Senna occidentalis*	Ceasalpiniodeae	Shrub	+	_	_	_	_	_	_	_	_	_	_	NA
48	*Setaria barbata*	Poaceae	Grass	+	_	_	_	_	_	+	+	_	_	_	NA
49	*Sida acuta*	Malvaceae	Herb	_	_	_	+	_	_	+	_	_	+	_	NA
50	*Sida cordifolia*	Malvaceae	Herb	_	_	+	_	_	_	_	_	_	_	_	NA
51	*Solanum erianthum*	Solanaceae	Shrub	_	_	_	+	_	_	_	_	_	_	_	NA
52	*Sorghum arundinaceum*	Poaceae	Grass	_	_	_	_	_	_	_	_	_	_	+	NA
53	*Spigelia anthelmia*	Loganiaceae	Herb	+	_	_	_	_	_	_	_	_	_	_	NA
54	*Spondias mombin*	Anacardiaceae	Tree	_	_	+	_	_	_	_	_	_	_	_	NA
55	*Sporobolus pyramdalis*	Poaceea	Grass	+	+	_	+	+	+	_	_	_	_	_	NA
56	*Stachytarpheta jamascensis*	Verbenaceae	Herb	_	_	_	_	_	_	_	_	_	_	+	NA
57	*Syndrella nodiflora*	Asteraceae	Herb	_	_	_	_	+	_	_	_	_	+	_	NA
58	*Tridax procumbens*	Asteraceae	Herb	_	_	_	+	+	_	_	_	_	_	_	NA
59	*Urena lobata*	Malavaceae	Shrub	_	+	+	_	_	_	_	_	+	_	_	NA
60	*Vernonia cinerea*	Asteraceae	Herb	_	+	_	_	_	_	_	_	_	_	_	NA

4.3.8 Wild life

The proposed project site on Riverview Road (Westerner Street) falls within a government approved OPIC industrial layout and as such subject to frequent modifications.

Some of the wildlife reported around the project site is presented in table 4.13

Table 4.13: Species of mammals in the project area

SN	BIOLOGICAL NAME	COMMON NAME	CONSERVATION STATUS
1	*Thryonomys swinderianus*	Grass cutter	Least concern
2	*Cricetomys gambianus*	Giant rat	Least concern
3	*Eidolon helvum*	Fruit bat	Near threatened
4	*Furnisciurus pyrrhopus*	Tree squirrel	Not assessed
5	*Rattus rattus*	Common rat	Least concern

Table 4.14 List of Avian species in the project area

S.N	BIOLOGICAL NAME	COMMON NAME	CONSERVATION STATUS
1	*Egretta garzetta*	Little egret	Least concern
2	*Ardea cinerea*	Grey heron	Least concern
3	*Stephanoaetus coronatus*	Crowned hawk eagle	Near threatened
4	*Gypohierax angolensis*	Palm-nut vulture	Least concern
5	*Milvus migrans*	Black kite	Least concern
6	*Streptopelia vinacea*	Red-eyed dove	Least concern
7	*Centropus senegalensis*	Senegales coucal	Least concern
8	*Ardeola ibis*	Cattle egret	Least concern

Source: EIRL, 2018

4.4 Socio-Economic Characteristics

Ogun State was created from the old Western State on February 3, 1976 by the then regime of General Murtala Mohammed. It has Abeokuta as it's capital and largest city.

Located in South Western Nigeria, Ogun State covers 16,762 square kilometres. It borders Lagos State to the south, Oyo and Osun states to the North, Ondo State to the east and the Republic of Benin to the west.

Fig 4.6 Map of Ogun State highlighting major towns

The proposed project falls within Ifo LG. There are twenty Local Government Areas in Ogun State. Local Governments & LCDAs in Ogun State are Abeokuta North Abeokuta South, Ado-Odo/Ota, Egbado North, Egbado South, Ewekoro, Ifo, Ijebu East, Ijebu North, Ijebu North East, Ijebu Ode, Ikenne, Imeko-Afon, Ipokia, Obafemi-Owode, Ogun Waterside, Odeda, Odogbolu, Remo North and Shagamu. Ifo LG has a total land area of 82,000 sq km.

The people in Ifo Local Government area are predominantly farmers, trader and general business people. The main staple food in the area is fufu made from cassava. The main cash and food crops abundantly grown in the area are kolanut, palm kernel, sugar cane, rice (Ofada), cassava, yam, maize, plantain, vegetables and fruits.

Ifo LG is borderd by Yewa South Local Government in the West,

Ewekoro Local Government in the North, in the East by Obafemi-Owode Local Government and in the South by Ado-Odo\Ota in Ogun State and Kosofe, Ikeja and Ifako-Ijaiye Local Governments in Lagos State

Each Local Government Area is divided into wards and each ward is represented in the Local Government Council by a Councillor. The proposed project site falls within Ifo local Government and Isheri/Akute/Ajuwon Local Government Development Area.

The present Ifo Local Government is the first half of the old Ifo Local Government from which Ewekoro Local Government was carved out in December 5, 1996. The Local Government is predominantly peopled by all the sections of Egbas (i.e. Egba-Alake, Egba-Owu, Egba Oke-Ona and Egba-Gbagura) and the Aworis and all other sub-ethnic groups co-existing in a peaceful atmosphere.

Ogun State is made up of six ethnic groups viz, the Egba, the Ijebu, the Remo, the Egbado, the Awori and the Egun. The language of the majority of the people of Ogun State is Yoruba but this is however broken into scores of dialects. Notable people like Obafemi Awolowo, MKO Abiola, Mike Adenuga, Olusegun Obasanjo, Wole Soyinka, Fela Kuti, Tunde Bakare and so on hails from the state.

History has it that the Ijebus in the state were the first Yoruba speaking people to have contact with the Europeans in the early 14th century. They were the first Yorubas to have invented money made from cowry shells called 'Owo Eyo', which was accepted throughout the kingdom of Yorubaland but was later replaced by legal tender coins made from silver materials called 'Pandora' when the Europeans came.

4.4.1 History and Cultural Characteristics of Isheri.

Isheri is an ancient indigenous Awori settlement that has been in existence long before the advent of British Colonization of the country.

The story is that Olofin (or Ogunfunminire, founder of the Awori) and his followers left the palace of King Oduduwa (founder of the Yoruba) in Ile-Ife and migrated southward along a river. Oduduwa had given Olofin a mud plate and instructed him to place it on the water and follow it until it sank into the river.

Several days after leaving Ile-Ife, the plate suddenly stopped near Olokemeji near present-day Abeokuta. After seventeen days, it began moving again, only to stop at Oke-Ata for another seventeen days. At the end of seventeen days, the plate began moving again, only to stop again on the southern outskirts of present-day Abeokuta, where it stayed for another seventeen days. At this location, some of Olofin's followers decided to remain, led by a man named Osho Aro-bi-ologbo-egan. The plate continued downriver, stopping again at Isheri, where it remained for a much longer period of time. Olofin began instructing his followers to begin setting up a permanent settlement, but after 289 days (17 x 17) the plate began moving again. Olofin and a few followers followed the plate, while the rest of the group stayed behind. After two days the plate stopped briefly at Iddo in Lagos. At Idumota in central Lagos, it whirled around in the water and sank to the bottom. When Olofin returned to his group at Iddo, they are said to have asked him where the plate was. He answered "Awo Ti Ri" meaning "The plate has sunk". This is how the name Awori is said to have come into being.

In accordance with Yoruba custom, they brought their crown along with them from Ile Ife. Osolo, one of the sons of Prince Olofin, settled at the Osi quarters as his father and his brother journeyed further south from the place where the plate sank at Idumota.

However, because of the long historical goodwill and benefit derived up to the present day, Ikeja-Lagos has attracted a lot of people from different ethnic nationalities working and living within the territory boundary. The industrial revolution of the 1970s and 1980s as well as being the state capital contributed in no small measure to the attraction of diverse people to the city. As land became scares due to excessive demand, this led to outward expansion of creation of "New-Lagos" (Ojodu- Berger to Mowe)

4.4.2 People and population

Isheri is traditionally inhabited by the Aworis and is the cradle of its civilization. However, because of the long historical goodwill and benefit derived up to the present day, Ikeja has attracted a lot of people from different ethnic nationalities working and living within the territory boundary. The Lagos industrial revolution as being the state capital contributed in no small measure to the attraction of diverse people to Isheri and the "New Lagos".

Isheri is the Lagos Megacity Region peri-urban settlement suffers from water and air pollution due to the poor waste disposal facilities, traffic intensity along the Expressway, discharges of cattle waste from the operators of the Kara Cattle Market and Slaughter Slab greatly impair the quality of water in the Ogun River

Population size, growth and distribution

Though Nigeria conducted the last national census exercise in 2006, the population figure was 524,837 for Ifo local government, figures for the individual surrounding community's population from Ogun state office of the National Population Commission (NPC) were not available.

In order to harmonize information to align with the Commission's

growth rate, the presented population projection for the surrounding communities is based on 3. 5%.

However, the CIA World factbook defines growth rate as "the average annual percent change in the population, resulting from a surplus (or deficit) of births over deaths and the balance of migrants entering and leaving a country. The rate may be positive or negative. The growth rate is a factor in determining how great a burden would be imposed on a country by the changing needs of its people for infrastructure (e.g. schools, hospitals, housing, roads), resources (e.g. food, water, electricity), and jobs'.

In projecting population figures, both the linear and exponential models are often used:

A. Linear Extrapolation Model

$P_n=P_o*(1+r)$

Where:

P_O = the base population

r = growth rate of the population

n = time lapse, in years

B. Exponential Growth Model

C. $P_n=P_o*(1+r)^n$

Where:

PO, r and n are as above.

Demographic scholars have argued that the exponential growth model provides the best population growth estimate. In lieu of this, the affected communities' population projections were calculated using the exponential growth model.

4.4.3 Political setting

There are ten (10) geo- political wards within Ifo LGA. These are

- Ifo I
- Ifo II
- Ifo III
- Agbado Central ward IV
- Akute-Ajuwon ward V
- Isheri ward VI
- Oke-Aro-Ibaragun ward VII
- Ososun ward VIII
- Sunren ward IX
- Coker ward X
- Ibogun ward IX

The proposed project site falls within Isheri ward VI.

4.4.4. Existing Major Land-use within Isheri

Expressway which runs in a north-west direction from Metropolitan Lagos towards Ibadan along the state boundary with Ogun State The physical extent of the towns and settlements runs in a linear fashion along the Expressway extending inwards to some few kilometres from the Expressway.

The existing major land use in Isheri is presented in figure 4.7

Fig 4.7 Major land use in Isheri

4.4.4.2 Residential Land use

Major housing projects are Gateway Estates Riverview Estates, Havillah Estates and Sparklite Estates. Residential use in the peri-urban zone covers 50.9% of the total land area.

The peri-urban settlements have similar land use with slight variations along the population pattern. All of them of course provide residential

land use. A very high percentage, 86%, has farmland cultivated by peasant subsistence farmers. These are the two predominant uses of the land. 28% have social facilities such as schools, police posts and institutions that complement residential land use. Only a few, 12.3%, have any commercial activities and these are mainly retail shops. The bigger settlements have markets and petrol filling stations. (CPMS, 2005). Only six have any industries at all, and these include textile industries in Ibafo, feed mill in Orimerunmu, cocoa processing industry in Warewa Araromi, and several cottage industries in Mowe, Loburo, Ofada and other smaller settlements. Major development axes are at Mowe, Ibafo, Ofada and the Redeem camp, where intensive development activities extend from the Expressway inwards to a distance of about 2.5 kilometres. Table 1 below highlights the key characteristics of the zone.

4.4.4.4 Industrial Land use

The proposed project site is falls within the second largest Industrial Estate in Lagos State. The OPIC Industrial Estate is located within the project area. 10.5 % of the total land area.

4.4.5 Road Network System (Circulataon)

The physical development of Lagos-Ibadan corridor is further reinforced by various religious institutions that have taken over the corridor in recent years; and are major flash Point for seasonal traffic congestion. They include the Redemption Camp at Mowe, Mountain of Fire Ministry Camp at Km 12, Deeper Life Ministry at Km 15, and NASFAT site at km 16. Other major land uses are those of various private universities, Cargo Airport at Sagamu Interchange, residential estates such as the Gateway Village, Riverview, Havillah, Sparklite Estates, Paradise City and others.

4.4.6 Traffic Situation

Traffic is usually heavy during peak periods of morning and evening and thin out during off peak period except during un-usual incident which may cause heavy traffic jam or traffic grid lock.

Traffic is usually heavy during peak periods of morning and evening and thin out during off peak period except during un-usual incident which may cause heavy traffic jam or traffic grid lock.

4.4.7 Storm Water Drainage

All the roads in and around the proposed project site are provide with storm water drainages and are well connected discharge points particularly Ogun river

Typical of most Nigerian drainages, the open drains along all streets are clogged with refuse, plastic bottles and failed structures. Isheri area experience periodic flooding due to blockade of Ogun River and release of water from the dams.

4.4.8 UTILITIES

4.4.8.1 Water Supply

As in many parts of the State, the area still experiences irregular water supply, Property owners in the area therefore resort to the construct boreholes as alternative or supplementary source of water supply. So far underground water of the coastal plain sands has not yet been depleted as its aquifer is being replenished constantly annually.

4.4.8.2 Sewage

All developments in Isheri depend on the conventional septic/ soak away system. Sewage operator services are efficient and effective in the

study area.

4.4.8.3 Electricity

The proposed project area is connected to the National Grid by the Ikeja Electric (IE) which also services the system. However, this supply is irregular and many have had to be provided with generating sets as alternative sources of power supply.

4.4.8.5 Solid Waste Management

The proposed project site is an industrial area and the services of OGMOE/OGEPA Licensed Private Refuse Operators are well established. However, it was evident that there would be a need for an improved service as delayed collection had led to dispersal of solid waste by natural and human agents thereby littering the street medians and clogging the drains.

Wastes from automobiles, oily wastes and other wastes from spray painters, all generated from mechanic workshops in the CBD and mud from car washing depots are emptied into drains. All these contribute to the drains and subsequent collapse of their concrete walls.

4.4.9 OTHER TOWNS AND CITIES

- **Kosofe Local Government**

Kosofe Local Government / Ikosi-Isheri LCDA Lagos State is located to the south of the project site and it is less than 1000m areal distance from the proposed project site. The Twenty Local Government Areas in Lagos state are also categorized into five Administrative Divisions. They are Epe, Ikorodu, Badagry, Lagos and Ikeja. Kosofe Local Government falls under the Ikeja Division.

The boundaries of Kosofe Local Government are Ojota to Alapere on Ibadan express to the north; Oworonsoki-Apapa express to Anthony to the South; Oworonsoki- Ibadan express to junction of Ketu and Ikorodu road from Anthony to Maryland to the west.

- **Ifako-Ijaiye Local Government**

Historically, Ifako-Ijaye Local council Government Area is in Agege Area of Ikeja division of Lagos west has an area of about 15km^2.

The Local Government, which was divided into 7 political wards, is bounded in the North - Junction of Abeokuta expressway through the other of Old Agege motor road at Abule–Egba; South - Other side of Dopemu at Anu-Oluwapo Street, on Agbotikuyo junction to include Olukosi, Fagbola Street to Old Agege motor road; East - Other side of Old Agege motor road from the Nitel junction to Lagos State Dev. Project at Abule-Egba and West - Abeokuta expressway from Dopemu to Abule-Egba junction.

The first settlers are the Awori who migrated from Ota town in Ogun State.

The population of the Aworis is now a minority given the enormity of migration and urbanization in the area.

According to 2006 National population commission census the population of Ifako-Ijaye Government Development Area is put at 427,878

4.4.10 Consultations Methodology

There was also a stakeholder's consultation held with neighbouring facilities.

There was also a survey with Questionnaire administration to elicit information from workers in neighboring companies, artisans and petty traders outside the company premise and individual persons met around Riverview Estate, sparklight Estate and Wawa.

42 questionnaires were returned for analysis out of the 50 administered. See appendix 2 for sample questionnaire. The results obtained from the questionnaire administration and analyses are presented below.

4.4.10.1 Results and Discussions

4.4.10.1.1 Demographic Characteristics

The population distribution of this neighbourhood is not available from the available record of the National Population Commission. The survey revealed that 58.2% are Yoruba, 12.8% are Ibos, while other ethnic groups in the area account for the remaining 19%. The relative higher percentage of Yoruba ethic origin is not surprising apparently because, Lagos state is part of the former Western region melting pot of all tribes even most of the non-Yoruba's speak Yoruba language fluently.

The age distribution of respondents in the area shows that 24.5% of the respondents are below the age of 25 years, while 58.2% are within the economically active age group of 26 and 50 years. 17.3% are within the age bracket of 51 and 75, while none of the sampled respondents is below the age of 15years

Furthermore, the various on-going industrial, construction and other business activities around the project area provide reasons for economically active age population to be drawn to this location.

The predominance of this age group in this area is also an indication that

getting a labour would not be difficult in this area. The sex ratio in the area is in the range of 62:38. This figure shows a slightly higher male population over female counterpart in the area.

A vast majority (76%) of the respondents had lived in the area for nearly their entire adult life. Recognizing the importance of gender issues

4.4.10.1.2 Educational status: The educational status of respondents revealed that 60% of the respondents below the age of 25years indicated that they possess both primary and secondary school leaving certificates. This high level of literacy can be traced to the impact of free education in the western region. About 35% of the respondents indicated that they have tertiary (colleges of Education, Polytechnic or University) educational certificates. The remaining 5% account for people with either no formal education or with Koranic education etc.

The foregoing therefore serves to reinforce the fact that the educational status of most of the respondents in the neighbouring communities is very high.

4.4.10.1.3 **Religion**

The result of the sample survey carried out in the neighbouring areas around the proposed facility expansion shows that majority of the sampled population are Christians (50. %) and Moslem (47.5%). These two religions are the two dominant religions in most part of the country and they jointly account for 97.5% of the sampled population remaining 2.5% represent people who are traditional worshippers and other religions.

4.4.10.1.4 **Marital Status**

The marital status of the sampled respondents in the area shows that

64.3% of the respondents are married, while 33.3% claimed to be single. The percentage of divorce/separated/widow respondents was 2.3%. There is however variation in marital status by religion in the project area. The results of the cross-tabulation showed that 64.4% of the respondents from the Yoruba ethnic origins are married, while 34% of Ibos indicated that they are married.

4.4.10.1.5 **Income and Occupational Pattern**

The neighbourhood around the proposed plant factory at Ikeja area of Lagos can be effectively described as industrial and based on this, it is expected that many of the respondents are likely to be factory workers or people that are servicing the needs of these workers through the provision of various retail products for them. From the questionnaire survey carried out in this neighbourhood, 54.4% indicated that they are company executives, factory workers and civil servants, 16.8% are artisans, 18.8% engage in different kinds of other businesses, while the remaining 7.5% indicated that they are students.

With regards to the distribution of income in this area, 64.6% of the respondents indicated that they earn between 0-30,000, 26.2% earn between 31,000- 60, 0000, while the remaining 9.5% earn over 60,000 per Month. The cross tabulation analysis of income with occupation shows that 57.4% of the artisans group earn below N30, 000, while most of the highest paid respondents in the area belong to civil servants, company executives and business people group.

4.4.10.1.6 **Household Size**

All the respondents do not live around the project site because it falls within a government approved industrial scheme. However, the household survey revealed that respondents (58.3 %,) are with between 1 and 4 household size while 36.6% indicated that their household size is

between 5 and 8 persons. The remaining 5.1% indicated that their household size is more than 8 persons. The result from the survey is not surprising. This is because most of the people living in this area have preference for low family size. Secondly, most residents are educated and the importance of small family size is well understood by them.

None of the respondents indicated they live in a hurt. The Type of roofing materials used in the respondent houses were galvanized corrugated, corrugated slate roofing "asbestos" and long span aluminum. All (100%) the respondents indicated building materials used to construct their houses were cement and block. These responses are indicative of the development in the area

4.4.10.1.7 **Toilet Facility**

Everybody (100%) in the area uses water cistern/hand flush toilet.

4.4.10.1.8 **Water supply:**

Nearby waterworks at Iju waterworks belonging to Lagos State Government could not meet the immediate needs of Ikeja. About 60% of the population depends on wells and borehole water that could be near or far to their abode. The remaining 40% depend on pipe borne water.

As public water supply is usually not reliable respondents resort to alternative means such as borehole/well.

42% of the respondents believe that the water quality/ of water source is Good while the rest (68%) of the respondent believed the water quality was fair.

4.4.10.1.9 **Environmental Sanitation.**

There are no communal dwellings around the project site.

All facilities in and around the project site are mandated to provide an adequate waste receptacle and store waste produced in the facility for collection by OGMOE/OGEPA Licensed Private Refuse Operators. It may be logical to believe that the level of sanitation in an area must be commensurate with the attitude, facilities and regulatory aspects. Majority (69%) of the respondents believe that the sanitation of their areas are satisfactory while 16% found the situation as unsanitary. Solid waste such Garbage (81%), effluents (9%) and Gases (8%) were the common waste reported by respondents in the study area. Most (98%) of the solid waste are collected by OGMOE/OGEPA Licensed Private Refuse Operators for Landfilling.

Most (50%) of the respondents believe the air quality in their area is fair while 23% believe it is fair.

Though the project site is in an industrial area, respondents (54.7%) believe that contaminants are released by domestic activities.

4.4.10.1.10 Health Facilities:

There is a general hospital at Isheri Health Clinic and Ojodu Primary Health 56% of the respondents indicated patronizing other health care facilities for medical and other health care services that could be classified as primary health care services. There are also several reputable privately owned health facilities in the area. Malaria (73%) and typhoid fever 24%) were the most reported

4.4.10.1.11 Transportation

The transportation network in the area of study is fairly adequate as there are motorable roads in and out of the study area. The area is also plied by motor cars and motorcycles etc.

4.4.10.1.11 Respondents Expectations

Most of the respondents were aware of Franemm Ind. Ltd presence in the area. However, of the respondents expressed the desire for provision of better amenities and also employment.

Moreover, the residents expressed their fears on pollution. They advised that the effluent from the company should be properly treated before they are released.

4.4.10.2 STAKE HOLDERS CONSULTATION

Consultations have been accorded the utmost priority in the proposed project and all the developmental activities associated with it. The main objectives of the consultation programme which is in tandem with Franemm Industries Limited Corporate governance to maintain and sustain a meaningful communication amongst stakeholders; these include:

- Acquire first-hand information from a varied cross section of the stakeholders namely Riverview Estate and Ifo LG Ojodu/Isheri LCDA see appendix 4 for official invitation and detailed minutes of meeting.
- Disseminate information to Stakeholders
- Identify and address the environmental and other concerns of the stakeholders.
- Elicit and build the confidence of a wide spectrum of the stakeholders
- Ensure that their inputs are considered in establishing priorities, partnership and implementation of developmental plans.
- Proffer appropriate mitigation and intervention options for all identified negative impact of the proposed project activities. .

4.4.10.2.1 Issues and Concerns

Issues raised during the meeting and their corresponding responses are detailed in table 4.9 below

Table 4.15 Issues and Concern

ISSUES/ CONCERN	RESPONSE	ACTION
Groundwater: The representative expressed his concern about the need to ensure that the proposed project does not pollute or decrease the quality of groundwater.	• The proponent assured that the ETP capacity is adequate for the waste water generated in the facility.	Franemm Industries Limited
Noise from Generator	The proponent assured the gathering that the Generator shall be well soundproofed and maintained to avoid nuisance	Franemm Industries Limited
Effluent Management	• The detergent and plastic plant will not release effluents. However, the existing ETP will be upgraded to meet the demand of the existing and proposed plant • Effluents will be treated to standard before discharge into the environment.	Franemm Industries Limited
Air Pollution	The respond was the dust emanating from detergent process are totally reabsorbed thereby	

	considerably reducing the effect of air pollution.	
Environment and Analysis of Effluent	The proponent assured the stakeholders that effluent will be treated and certified OK before discharge into public drains.	Franemm Industries Limited

Source: EIRL, 2018

See appendix 4 for more photographs of the meeting.

Plate 4.1 Cross section of the stakeholders meeting attendees.

Plate 4.2 Consultation with the residents of Riverview Estate during data witnessing exercise by the FMEnv Officials.

4.11 Health Impact Assessment

A wide range of economic factors determines health and well-being of individuals and communities. They include social and environmental conditions as well as factors like family history and access to health services (Taylor and Plaair-Stephen, 2002).

Development projects at all levels have a potential impact on health. A pointer to the magnitude of the influence of environmental factors on the health of human populations is the recent data from the World Health Organization (WHO), which estimated that over 25% of the burden of human illnesses worldwide can be attributed to modifiable environmental conditions (Frumkin et al. 2004, Pruss-Ustun and Corvalan 2006).

The Health impact Assessment of the facility was conducted using a questionnaire. See appendix 3 for sample questionnaire Most (83%) of the respondents believe that their current health status is well.

4.4.11.1 Health Infrastructure

An inventory of health care facilities in the study areas shows adequate provision of government health facilities in the communities. There were private clinics in the area and patent medicine stores. Private medical clinics and patent medical stores are providing healthcare at high prices forcing residents to patronize General Hospitals. Major private hospital with five minutes of reach to the facility are Isheri health clinic, Ojodu Primary Health Centre, Bofab Hospital, al heri hospital, Adigboluja hospital, Bemil hospital, Life Force Medical centre, The Valley Surgical and Medical home, Ewa hospital, Eniolu hospital, Blessing clinic and Maternity home, Funmilola hospital, Yosola hospital, Solan clinic and maternity, Tomade Medical Centre

There are patent medicine stores serving the purpose for the purchase of drugs and for treatment of minor injuries. These stores are relatively small in size and have limited range of drugs in stock. Some members of the communities were satisfied patronizing these stores whilst a greater part says they do so on ground of no better alternative.

4.4.11.2 Housing and Environment

In order to study the role environment plays in health and disease, the environment may be categorized into three: biological physical and social. It is of utmost importance to manage all the factors in the environment which may have harmful effects on the physical development as well as health and survival of the inhabitants. (Gupta and Mahajan, 2007). Most houses in the sampled communities were built

with cement and roofed with corrugated iron sheets. These characteristics provide stable condition to safeguard respondents from the weathering effects of the elements. Most of the respondents (58.3 %,) are with between 1 and 4 household size while 36.6% are within 5-8 household size. Therefore, the rooms' ventilation will be fairly good for comfort and prevention of communicable diseases, and modest share of sanitary conveniences.

Though city noise and exhausts fumes from vehicles and power generators pollute not only the rooms but also the immediate compounds.

4.4.11.3 Disease Prevalence

Respondents indicated that Malaria (79%) and typhoid fever (11.9%) ranked highest among the disease prevalence in the areas of study. Respiratory infections, measles and Diarrhea diseases were surprisingly low, Hypertension had low prevalence too.

40% of the respondents patronize government hospital to manage health problems while 38% of the respondent patronized private healthcare facilities.

4.4.11.4 Availability of Potable Water

Potable water available to all respondents engender proper health and cleanliness (Gupta and Mahajan, 2007). All the respondents in the communities' sampled use water from borehole and public tapwater, none use stream water and rain water. Out of the 100% that use borehole water, only 5% treat the water before usage, and about 2% boil their water before drinking.

4.4.11.5 Lifestyle

The lifestyle has serious social, economic and public health implications and contributes to the overall health and well-being of the people. People's indulgence in alcohol consumption and cigarette smoking and alcoholic beverages and infusion are common in the area

4.4.11.6 Immunization coverage

Report shows that Immunization of children was carried out in the communities. These include BCG (Bacillus, Calmette, Gueerin), OPV (Oral Polio Virus), and DPT (Diphtheria, Pertusis, Tetanus). Effective enlightenment campaign by government in the communities was responsible for the high immunization status observed in the sampled communities. Health care personnel carrying out immunization were also reported to be regular to the communities during rounds of immunization-.

4.4.11.7 Nutrition

Good nutrition is an important index in enhancing resistance to infections. Individual responses to questionnaires and oral interview revealed that the commonly consumed food rich in carbohydrates (garri, plantain, yam, rice and other forms of cassava other than garri). Few of the respondents in the communities took seafood and fishes regularly instead beef was more consumed than the sea foods. Vegetables such as fluted pumpkin, bitter leaves and fruits such as banana, paw-paw and so on form sources of micro nutrients.

4.4.11.8 Employee health Impact Assessment

30 participants in the study were subjected to a pre-designed questionnaire to collect information about personal, socio-demographic data, occupational history, use of personal protective equipment, frequently perceived health

The target population includes workers in production (factory) exposed to conditions on performing their job, these include temperature, chemical materials, fumes, dust and noise and workers at other sections of the facility.

Demographic Characteristics survey revealed that 53% are Ibos, 26% are Yorubas, while other ethnic groups in the area account for the remaining 21%. 90% of the respondents are within the economically active age group of 26 and 50 years. Majority (53%) of the respondents were female. Majority of the respondents were Christians (87%) and Moslems (10%).

Majority (76%) of the respondents indicated that they have tertiary (colleges of Education, Polytechnic or University) educational certificates. While the rest have secondary education (24%) This result also reinforces the fact that the educational status of most of the respondents in the neighbouring communities is very high.

The respondents' professions include Engineer / Technician (7%) Machine Operator (40%), Human Resources, Administrative, sales, Management (33%) Nurse/Doctor/therapist (7%), Industry (factory) worker (2%). 33% of the respondents have worked in the facility for 4-6 years, 23% have worked for 11-15 years in the facility, 20% have worked for 7-10 years in the facility, while 10% of the respondents have worked for less than 3years in the facility. Majority of the respondent have also lived in the neighborhood for up to 10 years. Therefore the respondents are knowledgeable of their working environment and conditions.

Most of the respondents were currently working in production section (73%), Human Resources, Administrative, sales and Management (17%)

while 10% work in other sections of the facility. Majority of the respondents work for more than eight hours a day therefore the respondents are exposed to maximum working environment and conditions.

The respondents (100%) affirmed the working environment is safe. Working environment Temperature, illumination and floor were described by the respondent as fair to excellent.

Work hazards respondents are you exposed to include one or combinations of Chemicals (3%), Fumes (3%), Heat (16.6%), Noise (20%), Heat and Noise (20%) Dust, Heat and Noise (23%) Chemicals, Fumes and Noise (7%) and Fumes Heat and Noise (15%)

93% of the respondent indicated company provide a personal protective equipment , there include helmet, Nose masks, Safety boot, Overall, Goggle and Hand gloves. However, Response (96%) also indicated that the despite provision and enforcement of use of PPE only 77% of the respondents utilize the PPE Company provide for them.

10% of the respondent have suffered job related injury or illness. Equal number of respondents Respondent rated quality of care provided by the medical department as excellent (33.3%), good (33.3%) and fair (33.3%). Respondent indicated supervisor response was helpful and cooperative (66.6%) while 33.3% of the respondent indicated that their supervisors are uncooperative.

Respondent indicated that their sources of drinking water was Tap water (30%) Borehole (36.6%) and bottled (33.3%) while they described the quality of the water as Good (53.3%), Fair (36.7%) and Poor (10%).

The respondent indicated Industrial activities (66.6%) Vehicular Traffic (10%), Commercial activities (10) and Generators as the primary sources of noise in the facility.

63.3% of the respondents indicated that the air quality was good while 26.6% indicated that the air quality was fair. However, 10% believed the quality of air you workers breathe is poor. Industrial activities (53.3%) is the primary source of air pollution.

80% of the respondents expressed that they are satisfied with the sanitation in the area. Solid waste is gathered into receptacles and given to OGMOE/OGEPA Licensed Private Refuse Operators for disposal. 97% of the respondent indicated that they are in good health. While the unwell were sick of malaria. The respondent indicated Malaria (60%), Typhoid fever (3.3%), and Headache (3.3%) as the most prevalent illness. Respondent indicated they were severely (6.63%), Sparingly (13.3%), rarely (66.6%) affected by workplace related illness and 10% claimed they are never affected by workplace related illness. These responses inferred that most of the illnesses are not related to the work place environmental conditions. The various health conditions treated in the facility are mostly malaria and job related abressions

Most (63.3%) of the respondents indicated they manage their illnesses through quality medical services provided by the company while the rest patronize private hospitals.

80% of the respondents indicated that there were adequate toilets in the facility while the respondents described the sanitary condition of the toilet as Excellent (16.6%), Good (40%) and fair (36.6). This response further corroborated the low incidence of toilet born communicable disease among the respondents.

66.6% of the respondents (80% of respondents in production) indicated that Cloakrooms provided in the facility are adequate. 90% of the respondents described the described the sanitary conditions of the cloakrooms as excellent (10%) Good (30%), fair (30%) and bad (13.3%).

Training on health, safety and environment is crucial to the environmental performance of an organisation. 93.4% of the respondents have received some form of training on health; all (100%) respondents have received training on safety and environment.

CHAPTER FIVE

5.0 ASSOCIATED AND POTENTIAL IMPACTS

5.1 Introduction

The chapter presents an overview of the impact assessment methodology as well as results of impact screening followed by detailed qualitative and quantitative impact assessments. Their inclusion does not mean they would necessarily occur or cannot be successfully mitigated.

The potential environmental impacts were evaluated by considering the anticipated effects of the proposed project on the existing physical, chemical and biological, socio-economic and health conditions of the environment.

At an earlier stage in this study, an environmental screening and scoping exercise was carried out, the process employed was a combination of desk study, site visitation and consultations with stakeholders. From this, an overview of the potential impacts, the choice of the appropriate field analysis and likely mitigation measures and the monitoring programme were examined.

The boundaries (spatial and temporal) of this EIA study were determined through the scoping process involving consultation with stakeholders, social, economic and health studies. The project activities that would impact on the environment were identified as:

- Pre-construction activities
- Construction.
- Operation and maintenance

- Decommissioning

5.2 Methodology for Impact Assessment

5.2.1 Overall methodology

The overall methodology comprises of five steps as follows:

Step 1

- Identification and description of project phases,
- associated activities and their possible interactions with environmental, social and health components

Step 2

Preliminary identification of potential impacts on the biophysical, social and health components of the environment.

Step 3

- Screening for impact significance.
- Elimination of activity of environmental interactions producing no effect;
- Selection of focus impacts for further assessments;

Step 4

Detailed assessment of selected focus impacts in terms of: -

- Nature- positive or negative, direct or indirect
- Magnitude - qualitative and quantitative
- Areal extent - qualitative and quantitative
- Frequency
- Receptor sensitivity
- Duration including reversibility
- Cumulative effects

Step 5

- Final assessment and assignment of overall impact significance levels based on Step 4 results and application of objective impact severity criteria and likelihood;
- Identification of impacts requiring mitigation.

The analysis of impacts covers the following aspects of the project activities described in Chapter 3

For each activity, potentially affected environmental media are identified and the nature of the effects are qualified and quantified. The project schedule provided in Chapter 3 provides a summary of the construction activities covered in this EIA.

5.2.2 Preliminary Identification and Screening

In accordance with recommended impact assessment approaches (FMEHUD, 1995; UNEP, 1996; Canter, 1996; Lohani *et al*, 1997), the first level of impact assessment involves the preliminary identification and screening of potential environmental impacts by anticipating activity-environment interactions. This requires a thorough understanding of the project activities (project description), the project setting (the environmental description), and the interaction with environmental components. A modified Leopold matrix (Leopold, 1971) was used for the identification and screening. The matrix shows project activities against environmental (biophysical, social and health) components, and supports a methodical, comprehensive, and objective identification of the impacts each project activity may have on each biophysical, social, and health component.

Impact identification is based on Wathern (1988), who defines an impact

as "having both spatial and temporal components and can be described as the change in an environmental parameter over a specified period within a defined area, resulting from a particular activity compared with the situation which would have occurred had the activity not been initiated.

To further guide the identification and screening of impacts using the matrix, established environmental impact indicators or indices are developed for each of the environmental interaction categories. Impact indicators are the observable or measurable parameters of each environmental component that can be directly or indirectly linked to changes in environmental conditions.

Table 5-1 gives the specific environmental components and sub-elements used and a description of the indicators. While this integrated impact assessment is conducted with consideration of environmental, social, and health elements, some procedures specific to each element were used in the process as relevant to the study.

Table 5.1 Checklist of associated and potential impacts.

Project Phase	Project Activity	Environmental Component	Potential/ Associated Impacts
Site preparation	Site survey and Mobilisation	Vegetation, soil	Vegetation removal exposes soil to weather conditions
		Air Quality, traffic, Aesthetics	• Dust from vehicular movement leading to high suspended particulates in the atmosphere • Noise emissions emanating from heavy duty vehicles and workers activities and resultant hearing impairment on workers • Increased Vehicular traffic in and around project area. • Poor Solid waste management constituting aesthetic nuisance • Sewage Nuisance
Construction	Construction	Air Quality	• Dust emissions from ground excavation leading to high suspended particulates in the air. • Emission of CO and greenhouse gases
		Noise and Vibration	• Noise emissions generated by construction activities and resultant hearing

			impairment on site workers.
		Water Quality (Ground water)	• Improper storage and handling of paints, thinners and fuel and oil would inevitably result in spillage during equipment refueling
		Erosion	• Exposed soil in the affected areas could be vulnerable to erosion during storm.
		Transportation	• Disturbance to Traffic Flow in by Heavy Duty Trucks and plants conveying construction materials to site
		Safety.	• Accidents, vehicular, slips, falls, trips etc • Hearing impairment due to exposure to noise of heavy machineries • Improper storage and handling of Hazardous materials (e.g. paints, thinner, solvents, lubricants, fuels, etc.), onsite, are potential health hazards for construction workers.
		Waste Management	• Wastes constitute aesthetic issues for the project area. • Accumulated wastes could lead to contamination of soil/

			groundwater. • Breeding grounds for vectors and rodents.
		Sewage	• Fecal/ aesthetic issues for the project area. • Spillage of septic liquor
		Social economics	• Sexual laxity • Pressure on social amenities due to increase in population.
Operation	Facility operation	Air Quality	• Fugitive emissions from tanks used to store petroleum products and volatile organic compounds as raw materials. • Combustion emissions from exhausts from machines e.g pumps, power generating sets and truck. • Burning
		Noise and vibration	• Noise emissions generated by machines and resultant hearing impairment on site workers.
		Fires and explosions	• Mechanical or electrical failure, • Accidental ruptures of tanks, • Leakages petroleum products • Operators carelessness and • Static electricity or lightening discharges

			• Sabotage or terrorist attacks
		Traffic	• Disturbance to Traffic Flow around project area.
		Effluent	• Effluent Laden with high BOD_5, COD, TSS and Oil and grease.
		Office and manufacturing Waste	• Solid waste constituting aesthetic nuisance • Sewage Nuisance
		Health and Safety.	• Hearing impairment due to exposure to noise of heavy machineries • Accidents- vehicular, falls, trips, production line injuries. • Hearing impairment due to exposure to noise of heavy machineries • Improper storage and handling of Hazardous materials (e.g. paints, thinner, solvents, lubricants, fuels, etc.), onsite, are potential health hazards for construction workers. • Lack of/inadequate or inappropriate/wrong usage of PPE
		Water supply and usage	• Excessive water demand
		Socio	• Sexual laxity disruption

		economics	• Income
		Power	• Excessive load on existing public power supply. • Fugitive emissions from power generating plants. • Noise nuisance • Hazards of electrocution
Decommissioning	Decommissioning	Land use, soil, waste, workers	• Facility Abandonment.

Source: EIRL, 2018

Table 5.2: Impact indicators

Components	**Impact Indicators**
	Biophysical
Soil	Changes to physical and chemical properties and soil ecology
Air	Emissions of NOx, SOx, PM, CO, VOC, greenhouse gases (CO_2, CH_4, and N_2O), Ozone and changes to ground level concentrations of pollutants
Vibration and Noise	Change in noise or vibration levels at sensitive receptors
Aesthetics	Physical presence of facilities, increased night time light
Groundwater	Contamination of shallow or deep groundwater resources, change in ground water resources
Population	Changes ill population indices, total population, gender ratio, age distribution Infrastructure
Infrastructure	Improvement or pressure on existing urban/rural Infrastructure including waste handling facilities
Macro and Micro economy	Change in Macro and Micro economy, employment, standard of living occupation
Social and Cultural Structure	Demolition of structures and facilities within the ROW. Disruption in local authority and governance structure; change in social behaviours; intra and inter ethnic clashes;
Social	
Components	**Impact Indicators**
Physical and economic displacement	Permanent or temporary displacement livelihood activities; partial or whole severance from social cultural networks.
Transport	Traffic Nuisance and inability to move efficiently.

	Health Determination
Pollution related health effects	Increase in concentration of air pollutant of concern (NO_x SO_x, VOC, CO. PM, increased vibration and noise beyond regulatory limits increased night time light beyond acceptable limits.
Communicable and non communicable diseases	Changes in incidence of Communicable and non communicable diseases or disease causing agents.
Morbidity and mortality	Changes in health of workers and general public.
Health care facility	Changes in availability or access to healthcare facilities
Recreational facility	Changes in availability of access to Recreational facilities
Psycho-social factors	Drug use or abuse, communal violence, crime, suicide depression and prostitution, changing expectation of quality life.
Accident/ fires /explosions	Changes to rate of occurrence and severity of accidents/ fires /explosions

5.2.2 Screening

Leopold Matrix (**Leopold *et. al.*, 1971)** Screening is adopted. The modified Leopold impact matrix consists of a horizontal list of biophysical, social and health environmental components that could be affected by the proposed project activities versus a vertical list of project activities, which represent environmental aspects, or "sources of impact," associated with each project phase. Environmental aspects are elements of an activity that can or will interact with the biophysical, social and health conditions within the area of influence.

Entries in the matrix cells represent the nature and preliminary ranking

of the severity of the impact. Ranking of the severity is based on the following scale and symbols:

- Major: 2
- Minor: 1
- Negligible or no effect: - (a dash)
- Positive: +

For this preliminary impact assessment stage, the impacts are defined as follows:

In order to facilitate the process of impact assessment, a tabular checklist was developed from information provided by the client, to highlight the major activities and the key concerns in the project location.

Table 5.3 Impact screening matrix

Project Phase	Activity	Biophysical Aspects								Socioeconomic Health Aspects					
		Soil &	Geophysi	Hydrolog	Air quality	Ground water	Vegetatio	wildlife	Land use	Populatio	economy	Transport /traffic	Facilities and	Health	Safety and
Constructio n	• Mobilization	1	0	0	1	0	1	0	0	1	+	1	1	1	1
	• Base camp	1	1	1	1	0	1	0	1	1	+	1	1	1	1
	• ground excavation and Backfilling	1	2	1	1	1	1	0	1	1	+	2	2	2	2
	•construction	1	2	1	1	1	1	0	1	1	+	2	2	2	2
	• Operation of construction machines	1	0	1	1	1	0	0	0	0	+	1	1	2	2
	• handling of paints, thinners and fueling	1	1	1	1	1	1	0	1	1		0	1	2	2
	• Vehicular Traffic Flow	1	0	1	1	1	1	0	1	1	+	1	1	1	1
	• Construction Wastes Management.	0	0	1	1	1	1	0	1	1	+	1	1	1	1
	• Accidents- fire, vehicular, falls, trips	0	0	0	1	0	1	0	1	1		0	0	2	1
Operation	• Production/Operation of machines and equipments	0	0	0	1	0	0	0	0	1	+	0	0	1	1
	•Transport of raw materials and product.	1	0	0	1	0	0	0	0	1	+	1	1	1	1
	•Solid Wastes Management.	1	0	0	1	1	1	0	1	1	+	1	1	1	1
	•Effluent Laden with high BOD_5, COD, TSS and Oil and grease.	2	2	2	2	2	2	0	1	1	+	1	1	2	2
	• Accidents- fire, vehicular, falls, trips	0	0	0	0	0	0	0	0	0		0	0	2	2
	• Excessive water demand	0	0	1	0	2	0	0	0	1		0	0	0	0
	• Excessive load on existing PHCN power supply	0	0	0	0	0	0	0	0	1		0	0	0	0
Decommiss ioning	• Facility Abandonment.	2	2	2	2	2	0	0	0	0	+	0	2	2	2

Key:

	Minor Negative Impact		**Positive impact**
	Major Negative Impact		**No Impact**

Source: EIRL, 2018

5.3 IMPACT ANALYSIS

In this section of the report, analyses of associated and potential impacts of construction and operation activities related to the project are presented. The various activities covered under each phase of the project include:

A. CONSTRUCTION ACTIVITIES

This will include the following:

- Pre-construction (Site preparation);
- Movement of materials and men;
- Construction of structures
- Piping and electrical works;
- Installation of safety and fire prevention facilities;
- Commissioning and start-up.

B. OPERATION IMPACTS

This will include the following:

- Facility Operation
- Release of effluent and waste water;
- transportation;
- Maintenance;

In discussing the impacts of the project therefore, an assessment of the effects of the activities listed above on the various relevant environmental components was undertaken and is presented accordingly.

5.3.1 Construction Impacts

5.3.1.1 Impacts on Air Quality and Noise

A lot of noise will be generated during the various construction activities

such as foundations and piling, movement of materials and men, etc. This could lead to an elevation of the already high noise level in the area beyond the safe threshold for occupational exposure. Emissions from the various combustion units such as generating sets, heavy duty equipment, vehicles, etc. could impact negatively on air quality in the area.

Impact Severity Rating

The magnitude of the impact will be minor given the fact that the project is restricted to a site, which is already quite accustomed to high noise levels. The duration of the impact will be moderate. Construction activities are expected to continue for not less than 6 months. The frequency of the impact will be moderate, as the impact will occur intermittently throughout the construction period. The areal extent of the impact will be minor. Noise and air emissions will only take place within the immediate vicinity of the project area. Given the fact that noise levels are not expected to significantly exceed the existing background and the fact that the area is already quite used to high levels of noise, the sensitivity of the project is adjudged minor.

Impacts of construction activities on noise and air quality is anticipated, however, the inputs will be incremental to an already existing high noise level in the area, therefore, noise from the project will not be too noticeable This impact is classified as an adverse impact of minor significance.

5.3.1.2 Impacts on Hydrology

The project area has a well-defined storm water and drainage that runs water off the proposed site. Accidental spillage of oil and grease from vehicles, machinery and storage may find its way into the underground waters. This impact will be negative and major in terms of magnitude if corrective actions are taken. Thus, the impact is preventable if

appropriate mitigation measures are put in place.

5.3.1.3 Impacts on Socio-economics

Impacts of Transportation

In the course of the project, there will be a need to transport materials and men to the project site at various times during construction. Apart from the workmen that will be working on the project, the various project components will have to be transported to the site. It is expected that transportation will be primarily by road.

The increased presence of heavy duty trucks associated with construction activities may further worsen the traffic situation in the area. This could lead to physiological stress on the human population around the project area and loss of valuable man hours as a result of traffic congestion. Also, economic and human losses could result from accidents during the various project-related transportation activities.

Impacts on transportation resulting from construction activities will be medium and short-termed, especially considering that transportation issues already exist in the project area. Therefore the project has a Medium significance with regards to transportation impacts.

5.3.1.4 Impacts on Income

Given the level of industrial activities currently going on around OPIC Industrial Estate, a lot of casual workers exist in the area, that are willing to work for daily pay. It is quite obvious that there will be a positive impact for them in this regard, as they stand to gain employment, even if temporary, during project construction. This is a positive impact.

Similarly, some proportion of the materials and expertise to be used for the project can be obtained locally Therefore, project proponent will

acquire many of these things within the local market. This means that finances will be injected into the economy. This is another positive impact

5.3.1.5 Impacts on Health and Safety

Project workers during the various construction activities will be exposed to loud noise levels, especially within the immediate vicinity of the project site. This could cause long-term health effects, such as hearing impairment. Similarly, workers could be exposed to harmful levels of emissions from the various equipment and machinery that will be used for the project; this could lead to health effects on project workers.

Impact Severity Rating

The magnitude of the impact will be minor given the fact that noise emission issues will be most significant within a 100m radius of the project location. Noise emissions will be attenuated by distance and diffusion into background noise levels. The duration of the impact will be moderate. Construction activities are expected to continue for not less than 6 months. The frequency of the impact will be moderate, as the impact will occur intermittently throughout the construction period. The areal extent of the impact will be minor. Noise issues will be limited to the immediate vicinity (within a 100m radius) of the project site. Given the small number of anticipated project personnel and the short duration (overall) of project activities, the sensitivity of the workforce is adjudged minor.

Given the relatively short duration of the construction activities and the fact that noise issues will be limited to only the immediate environment of the construction area, the project is deemed to have a Minor significance, with regards to health impacts of noise and air emissions.

5.3.1.6 Waste Management Impact

A lot of wastes will be generated during the construction phase of the project. These wastes will include metal cuttings, packaging materials, hazardous wastes such as anti-corrosion chemicals and paints, empty drums and tins, welding electrodes, and materials from demolished warehouses. These wastes will present a challenge in terms of handling, particularly since solid and hazardous waste management is already a major issue in the Lagos area.

Wastes generated from the project could constitute aesthetic issues for the project area. The handling of the wastes could also pose a major challenge. Accumulated wastes could lead to contamination of soil and groundwater as well as the adjacent water body, especially if percolation and runoff into the waters is allowed.

Piles of wastes from metal cuttings, packaging materials, anticorrosion materials, paints, empty drums, demolished concrete, etc. from construction activities will be evacuated from the site for proper disposal by government accredited waste operators. Effective control of all types of solid wastes and air/liquid effluents will be instituted during operational activities. In addition, regular maintenance of all the facilities in the FMN complex will be carried out.

The magnitude of the impact will be minor given the fact that wastes will be contained within the clearly fenced and demarcated project site. The duration of the impact will be minor. Construction wastes will only be generated once during the construction phase of the project. The frequency of the impact will be medium, as the impact will occur only a few times during the project construction phase. The areal extent of the impact will be minor. All wastes will be contained within the project site and will not be allowed to leave project site unless it is in the custody of experienced, certified and duly authorized persons or corporate entities.

Given the relatively small volume of wastes that will be generated and the fact that the area is already heavily built up and consistently generates wastes, even prior to the proposed project, sensitivity of the project environment is adjudged minor.

Impacts of wastes from the project activities during construction are deemed to be of a medium negative impact.

5.3.2 Operation Impacts

5.3.2.1 Impacts on Air Quality and Noise Level

The main impacts of operation activities on air quality in the project area will include emissions and combustion exhausts from the various machines that will run during project activities, power generating sets as well as trucks conveying raw materials and products. Such emissions will deteriorate the existing local air quality in the area.

In addition, noise emissions from the various pieces of equipment will be intermittent and will contrive to elevate background noise levels in the area.

The magnitude of the impact will be minor given the fact that the emissions will be from only a few pieces of equipment and vehicles at a time, thus, total emissions will be minimal, compared to the overall emissions currently occurring in the area. The duration of the impact will be major. The plant is expected to operate for not less than 30 years and during the period, emissions will be taking place all along. The frequency of the impact will be Major, as the impact will occur continuously throughout the operational life of the project Areal extent of the impact will be minor. The impacts of emissions and noise levels will be most acute within the immediate vicinity of the project site and would be significantly attenuated at distances beyond 100m from the

project area. The sensitivity of the project environment is adjudged minor given the fact that air emissions and noise is already commonplace in the area and the environment appears to have adjusted most admirably to receiving emissions from various activities around.

Given the fact that the overall severity rating of this impact is moderate, and the fact that the impact has a high likelihood of occurring continuously over project life, this impact yields a negative of Medium significance.

5.3.2.2 Impacts on Water Quality/ Hydrology

The main impacts of project operation on water quality will include discharge of effluent wastewater with high BOD_5 and COD and suspended solids which could affect the quality of the receiving surface water by lowering its dissolved oxygen thereby causing deleterious effects on aquatic life. Similarly, accidental release and poor management of fuel, spent oil and grease could contaminate the surface and underground water.

Also, excessive demand for water may impact the ground water quantity and quality.

The frequency of the impact will be medium, as the impact will occur throughout the operation period, but an installation and maintenance of an effluent treatment plant will mitigate the effect. The areal extent of the impact will be minor. Noticeable impacts are felt only within and around the main vicinity of the project area. Given the fact that the area is already subject to industrial usage, it can no longer be said to be pristine, neither would the planned project significantly affect this status. The sensitivity of the environmental components is adjudged medium.

Impacts on water quality and hydrobiology from the operation of the plant will be minimal, based on the various extrapolations done earlier. Therefore the project impacts has a minor significance.

5.3.2.3 Impacts on Socio-economics

5.3.2.3.1 Impacts on Transportation

The main transportation impacts of the proposed project will be reflected in terms of heavier vehicular movement because the plant is designed to operate for 24hours, every day of the week. As such, trucks will be loading/off-loading with finished products/raw materials daily. Vehicles are expected to be loaded each day at the facility. This could contribute significantly to the exacerbation of traffic jams and hold-ups in the area. Apart from emissions from exhausts, the traffic situation could impose physiological stress on neighbours around the plant, in addition to significant man-hour losses in traffic.

The magnitude of impact will be moderate. Although the project area is small, the backlash of traffic build-up would typically extend well beyond the immediate vicinity of the project area. The duration of the impact will be major.

Given the moderate level of anticipated operational transport impacts on the sensitive human receptor, and the fact that the impact will persist for a long time, the significance of the adverse of this impact is rated as Medium.

5.3.2.3.2 Impact on Local Economy

Toiletries, Cosmetics and hair products are well demanded consumer products in Nigeria as a whole. Therefore, the construction and operation of the planned project would contribute in no small measure, to alleviating this problem. This is a positive impact.

Another expected positive impact resulting from the planned project is the possibility of employment for various categories of workers, no matter how minimal. According to project information, the staffing requirement currently estimated is presented in Chapter 3.

With the foregoing, it is easy to conclude that some level of employment opportunities would be generated by the project. As such, apart from reducing unemployment in the national picture, some level of monetary injections would occur to the local economy as a result of the project. Also, local food vendors and other domestic wares sellers would benefit patronage from project workers.

5.4 Abandonment

When the project is no longer required, it would be decommissioned and abandoned.

Industrial sites abandoned in the past posed serious risks to humans and the environment. The dangers often originate from hazardous materials that are left behind by the last enterprise that has been operating the facilities. For instance, water reservoirs, septic tanks, tanks with residual fuels or chemicals started leaking in the years after proper maintenance has stopped. An additional risk may also be imposed by the structural disintegration of the buildings over the years. Also, fire safety or electrical safety measures are frequently insufficient at this period. This will increase the risk of fire or electrical accidents. Risks are particularly at hand when the terrain is not properly fenced off and is used for habitation or small businesses.

A decommissioning project is simply a construction project in reverse thus the associated impacts identified with construction is applicable. The impact from abandonment would be significant and long term.

CHAPTER SIX

6.0 MITIGATION MEASURES

6.1 Introduction

The rationale for impact quantification and significance has earlier been discussed in the previous chapter. The results indicate that various components would be impacted positively or negatively. In order to preserve the present integrity of the environment certain steps have been recommended to mitigate or control the major negative impacts identified in this study. The control/mitigation measures have been based on the baseline conditions with regards to the biophysical environment, socio-economic and health status of the host communities. Also considered were the project activities and their envisaged impacts and concerns of stakeholders during consultation meetings and socio-economic/health status of the host communities.

Mitigation measures are defined for the identified significant associated and potential impacts based on the following criteria:

- **Prevention** - design and management measures for ensuring that significant potential impacts and risks do not occur,
- **Reduction** - Operational and management measures for ensuring that the effects or consequences of those significant associated and potential impacts that cannot be prevented are reduced to a level as low as reasonably practical,
- **Control** - Operational and management measures for ensuring that residual associated impacts are reduced to a level as low as reasonably practical,

6.2 Mitigation Options

Table 6.1 presents a summary of the mitigation measures recommended

to ameliorate all the significant associated and potential impacts identified for the proposed Project.

Table 6.1 Summary of Impacts and mitigation measures.

Mobilization/Pre-construction Phase

Component	Type of Impact	Mitigation Measures
Air Quality,	• Dust and gaseous emissions from excavation of structures leading to high suspended particulates in the atmosphere	FRANEMM) shall ensure • Low-emission/high efficiency engines shall be used • Movement of men and materials shall be properly coordinated to optimize vehicle use and resultant emissions • Dust and particulate barriers shall be used during operation • Avoid burning on site.
Noise and Vibration	• Noise emissions generated by heavy duty vehicles and workers activities and resultant hearing impairment on site workers.	FRANEMM shall ensure • Noise attenuation measures such as installation of acoustic mufflers, on large engines and equipment; • Hearing protection shall be provided and usage enforced for workers on site.
Water Quality and Hydrology	• Spillage of septic liquor from Burst sewage pipes	FRANEMM shall • Contain surface runoffs within the existing storm water drainage system of the site; • Adequate contingency measures shall be put in place to contain accidental spills ensure Spill containment equipment shall be available at the construction site
Erosion	• Exposed soils in the affected areas which could be vulnerable to erosion.	• Where possible, phase the site clearance exercise so as to reduce the amount of exposed soil at any given time. • Deliberately re-cover exposed soils with grass and other appropriate species as soon as possible. • Temporarily bund exposed soil and redirect flows from heavy runoff areas that threaten to erode.

Solid Waste	• Solid waste constituting aesthetic nuisance • Sewage Nuisance	FRANEMM shall ensure • Waste are contained and removed regularly by OGMOE/OGEPA Licensed Private Refuse Operators • Provision of mobile toilet and prompt removal by OGUN STATE MOE accredited sewage service operator.
Traffic	• Vehicular traffic in and around Riverview Road (Westerner Street) street and Lagos - Ibadan Expressway	FRANEMM shall ensure • that the driver are properly educated to obey road signs and rules • Drivers are in good physical and mental health and not under influence of alcohol.
Health and Safety.	• Vehicular Accident and reckless driving	FRANEMM shall ensure that • driver are properly educated to obey road signs and rules • drivers are in good physical health and • drivers are not under alcohol or drugs

Construction Phase.

Component	Type of Impact	Mitigation Measures
Air Quality	• Dust emissions from ground excavation leading to high suspended particulates in the atmosphere • Emission of CO and greenhouse gases	FRANEMM shall ensure • Access roads and exposed ground should be regularly wetted in a manner that effectively keeps down the dust. • Movement of men and materials will be properly coordinated to optimize vehicle use and resultant emissions • All fine earth materials must be covered during transportation to the site to prevent spillage and dusting. • Trucks used for transporting material on the project should be fitted with tailgates that close properly and with tarpaulins to cover the materials. • The cleanup of spilled earth and construction material on the main roads are the responsibility of the contractor and should be done in a timely manner so as not to inconvenience or endanger other road users. • These requirements are included as clauses within contracts made with relevant sub-contractors. • Workers on the site are issued with dust masks during dry and windy conditions. • Low-emission/high efficiency engines shall be used. • Vehicles and machines are properly maintained and serviced. • Vegetation and combustible

		waste must not be burned on the site.
Noise and Vibration	• Noise emissions generated by construction activities and resultant hearing impairment on site workers.	• Construction activities that will generate disturbing sounds should be restricted to normal working hours. • Noise attenuation measures such as installation of acoustic mufflers, on large engines and equipment; • Hearing protection shall be provided for workers on site.
Water Quality	• Improper storage and handling of paints, thinners and fuel and oil would inevitably result in spillage during equipment refueling	FRANEMM shall • Put in place adequate contingency measures to curtail accidental spills and ensure Spill containment equipment shall be available at the construction site • In order to reduce ground contamination, an impervious sump or container should also be placed under the spigots of fuel drums to collect drippings. • Re-fuelling and maintenance of heavy construction vehicles at the site, should be done at specified areas or makeshift "depots" where measures are in place to deal with spillages and temporary storage of oily wastes. Preferably these depots should be located in an area that would ultimately be permanently paved (e.g. parking lots) thereby covering any contaminated soil. • A thick layer of sawdust or absorbent would be used to absorb any spillages. Subsequently, this layer shall be removed for proper disposal. In the event of a large spill, the latter must be cleaned up immediately

		by excavating the contaminated soil and removing it in a secure vehicle to an approved disposal site.
Erosion	• Expose soils in the affected areas which could leave them vulnerable to erosion.	FRANEMM shall • Where possible, phase the site clearance exercise so as to reduce the amount of exposed soil at any given time. • Deliberately re-cover exposed soils with grass and other appropriate species as soon as possible. • Temporarily bund exposed soil and redirect flows from heavy runoff areas that threaten to erode • Monitor areas of exposed soil during periods of heavy rainfall throughout the construction phase of the project
Transportation	• Disturbance to Traffic Flow on Riverview Road (Westerner Street) street and Riverview by Heavy Duty Trucks conveying construction materials to site	FRANEMM shall ensure • Traffic Management plan is instituted • Transportation of equipment and material to coincide with low traffic period
Waste Management	• Wastes constitute aesthetic issues for the, project area. • Accumulated wastes could lead to contamination of soil/ groundwater as • Breeding grounds for vectors and rodents	FRANEMM shall ensure the following: • A site waste management plan should be prepared prior to project commencement. This should include designation of appropriate waste storage areas, collection and removal schedule, identification of approved disposal site, and system for supervision and monitoring. • Preparation and implementation of the plan must be made the responsibility of the building contractor with the system being

		monitored independently. • Waste generation shall be properly contained to avoid contamination of ground water. • Reusable inorganic waste (e.g. excavated sand) should be stockpiled away from drainage features and used for in-filling where necessary. • Unusable construction waste, such as damaged pipes, formwork and other construction material, must be disposed by OGMOE/OGEPA Licensed Private Refuse Operators at approved dumpsite. • Accredited sewage operator to provide mobile toilet throughout the construction period.
Waste Management	• Wastes constitute aesthetic issues for the, project area. • Accumulated wastes could lead to contamination of soil/ groundwater as • Breeding grounds for vectors and rodents	FRANEMM shall ensure the following: • A site waste management plan should be prepared prior to project commencement. This should include designation of appropriate waste storage areas, collection and removal schedule, identification of approved disposal site, and system for supervision and monitoring. • Preparation and implementation of the plan must be made the responsibility of the building contractor with the system being monitored independently. • Waste generation shall be properly contained to avoid contamination of ground water. • Reusable inorganic waste (e.g. excavated sand) should be stockpiled away from drainage features and used for in-filling where necessary.

		• Unusable construction waste, such as damaged pipes, formwork and other construction material, must be disposed by OGMOE/OGEPA Licensed Private Refuse Operators at approved dumpsite. • Accredited sewage operator to provide mobile toilet throughout the construction period.
Sewage	• Fecal/ aesthetic issues for the project area. • Spillage of septic liquor	FRANEMM shall ensure the following: • Existing toilets onsite shall be used • Where toilets are inaccessible LSMOE accredited sewage operator will provide mobile toilet and ensure prompt disposal throughout the construction period.
Social economics	• Sexual laxity disruption	FRANEMM shall ensure the • Enlightenment about potential health risks (STDs).
AESTHETICS	Landscaping Plan and Design Review	FRANEMM shall ensure the following: • The proposed landscape plan shall include landscape screening throughout the project site to further screen the proposed project from off-site views. • • The use of screen plantings shall borrow from naturally established form, line, color and texture so that the visual characteristics are compatible with their surroundings.

Table 6.1 contd.

Operational Phase

Air Quality	• Fugitive emissions from tanks used to store petroleum products • Combustion emissions from exhausts from machines e.g pumps, power generating sets and truck • Open Burning	FRANEMM shall ensure the following: • All flanges and vents shall been properly tightened to reduce fugitive emissions. • All systems shall be properly checked to ensure there are no leakages or losses. • All machinery and vehicles for the project shall have high efficiency burner to reduce emission of noxious gases. • Avoid all forms of Burning
Noise and vibration	• Noise emissions generated during operation of the facility and resultant hearing impairment on site workers.	FRANEMM shall ensure • Noise attenuation measures such as installation of acoustic mufflers, on large engines and equipment; • Hearing protection shall be provided for workers on site. • Equipments are serviced regularly.
Fires and explosions	• mechanical or electrical failure, • accidental ruptures of tanks, • leakages petroleum products • operators carelessness and • static electricity or lightening discharges • sabotage or terrorist attacks	FRANEMM shall ensure • Lighting conductors shall be installed in the facility • Fire extinguisher and fire hydrant shall be provided on site with sufficient capacity for sustaining the firewater spray. • Applicable Warning poster shall be used in all chemical and fuel storage areas and other strategic location and processes within the facility. • A contingency plan that will have an alert mechanism and

		shall be incorporated into the environmental management plan of the project.
Transportation	• Disturbance to Traffic Flow around project area.	FRANEMM shall ensure • Traffic Management plans shall be instituted • Speed limit must be observed
Solid Waste	• Waste runoff flowing into the drainage • Solid waste constituting aesthetic nuisance • Sewage Nuisance	FRANEMM shall ensure • Waste are contained and removed regularly by OGMOE/OGEPA Licensed Private Refuse Operators • Prompt sewage removal by OGUN STATE MOE accredited sewage service operator.
Health and Safety.	• Hearing impairment due to exposure to noise of heavy machineries	• FRANEMM shall ensure the following: • Protocols include maintaining a safe speed. • Wearing of ear protection. • Compliance with maximum exposure hours to loud noise by site workers.
	• Chemicals hazards: Corrosive • substances • Poor chemical handling • Asphyxiating atmosphere	FRANEMM shall ensure • Guideline on safe handling of chemicals (SHOC) and appropriate PPE are provided. • Provide and enforce usage of appropriate PPE
	• Working at heights • Low Awareness • Wrong use of PPE • Inadequate PPE	FRANEMM shall ensure: • Training of staff and contractors if necessary. • Sufficient PPE are provided
	• Inadequate equipment/Surface guard on equipment • Low awareness	FRANEMM shall ensure: • Equipment specification are made available • Adequate Training • Warning signs

		• Design • Construction
	• Electricity Exposed cables • Wrong use of PPE • Poor earthing • Design specification • Structured HSE review (SAFOP, etc)	FRANEMM shall ensure: • Design specification • Structured HSE review (SAFOP, etc)
	• Accidents- vehicular, falls, trips • Improper storage and handling of Hazardous materials (e.g. paints, thinner, solvents, lubricants, fuels, etc.), onsite, are potential health hazards for construction workers. • Lack of PPE	FRANEMM shall ensure : • Protocols including maintaining a safe speed, within the facility are observed • Illustrative safety, warning and information posters will be pasted at all strategic places within the facility. • Wearing of ear protection. • Compliance with maximum number of hours of exposure to loud noise by site workers. • PPE shall be provided
Water supply and usage	• Excessive water demand	FRANEMM shall o adopt non-water cleaning and sterilizing means . o Aerators/flow restrictors are installed. o Low flush toilets are installed. o Water meters are installed at key usage points to monitor and manage water usage. o Grey-water are separated from sewage and reused for irrigation. o Rainwater shall be collected from roofs for landscape irrigation.
Socio economics	• Sexual laxity disruption	FRANEMM shall • Public enlightenment about

		potential health risks (STDs).
Fires and explosions	• mechanical or electrical failure, • accidental ruptures of tanks, leakages petroleum products, operators carelessness • static electricity or lightening discharges • sabotage or terrorist attacks	FRANEMM shall • ensure Lighting conductors shall be installed in the facility • Ensure Fire extinguisher and fire hydrant shall be provided on site with sufficient capacity for sustaining the firewater spray. • Ensure Applicable Warning poster shall be used in all chemical storage, fuel storage areas and other strategic location and processes within the facility. • Ensure A contingency plan that will have an alert mechanism and shall be incorporated into the environmental management plan of the project.
Transportation	• Disturbance to Traffic Flow around Oba Akran, Riverview Road (Westerner Street) street and Riverview	FRANEMM shall ensure • Traffic Management plans shall be instituted • Speed limit must be observed
Power	• Excessive load on existing power supply-	FRANEMM shall ensure • IE supply power to the Proposed Project from 11KV High Tension Line • Separate transformer(S)for the facility • Energy efficient lightings must be used
Decommissioning.	• Facility abandoned	FRANEMM shall ensure • Machines and equipment will be drained of all fluids and sold to scrap buyers

		• Provision of Appropriate compensation to employees • Re-vegetate all bare areas and restore site as much as possible. • Demolition debris shall be used to reclaim all pit and excess sold to builders for filling. • Educate/guide road users on days of movement of dismantled parts.

CHAPTER SEVEN

7.0 ENVIRONMENTAL MANAGEMENT PLAN

7.1 INTRODUCTION

This chapter presents the Environmental Management Plan (EMP), which also covers the social aspects of the facility expansion project at Isheri, Lagos. Environmental Management Plan is an important management tool, which demonstrates how the environmental impacts identified for which mitigation measures have been proffered shall be managed as the proposed project progresses. It states categorically how commitments will be implemented to ensure wholesome environmental practice.

The EMP has been designed in line with the Environmental Policy of FRANEMM and also in accordance with ISO 14001 Environmental Management System specification. The EMP for the proposed project in conjunction with the various mitigation measures for potential impacts shall form the basis for the actual project implementation.

7.2 OBJECTIVES OF EMP

The objectives of the EMP are

- To ensure that all mitigation measures proffered in the EIA document for eliminating, minimizing and enhancing the projects adverse and beneficial effects respectively are fully implemented.
- To provide part of the basis and standards needed for the overall planning, monitoring auditing and review of environmental and soda-economic performance throughout the project life cycle.

7.3 STRATEGIC PLANS OF ACTION

- To ensures compliance with all stipulated legislation on protection of the biophysical and socio-economic environment and FRANEMM Policy.
- To integrate environmental and socio-economic issues fully into the project development and operational principles.
- To promote awareness on the management of the biophysical and socio-economic environmental among the workers.
- To rationalize and streamline existing environmental activities and to add value to efficiency and effectiveness.
- To ensure that only environmentally and socially sound procedures are employed during the project implementation.
- To maintain constant consultations with the relevance regulatory bodies (FMENV, NAFDAC, LSMOE, LASEPA and Ifo Local Government)
- Lagos State Ministry of Environment, community leaders (local heads/chiefs, clan heads, landlords, etc), youth leaders, and community based organizations (CBOs), and other stakeholders through the project lifecycle.

The EMP shall be reviewed with changes in regulatory regime and in the event of new-policies or guidelines from FRANEMM or government agencies. Periodic reviews and updating shall be carried out throughout the project life cycle, to incorporate improved environmental technologies, management systems and economic policies.

- **Human Resources**

The Environment, Safety and Public Affairs Manager shall be responsible for all environmental and socio-economic related matters respectively throughout the life of the project. This is to ensure compliance with regulatory standards. The above-mentioned manager shall for effectiveness, supervise the quality assurance manager, the sire

safety and environment supervisors and the commitment of the project. The Environmental, Safety and Public Affairs managers shall also source for competent specialists on environmental and soda issues to form part of the social and environmental monitoring team as liaison officers.

- **Allocation of Responsibility**

The Environmental Manager shall be responsible for ensuring that environmental and social commitments are met throughout the project implementation. Schedule of responsibility and training on matters relating to the biophysical and socio-economic environmental management shall be established.

Responsibility for environmental and social management shall lie with top management who shall ensure that environment.al and social considerations are integrated into the project execution. The Environment and Safety Department of FRANEMM shall be required to offer expert advice on protection measures and monitor performance.

7.4 EMP GUIDELINES

The project phases and elements that interact with the environment (aspects), area of influence, impact mitigation measures, and designated responsibility for implementation are presented in the table below:

Table 7.1 EMP Guidelines for the proposed facility expansion project.

Project Phase	**Potential Impacts**	**Mitigation Measure**	**Effects Monitoring**	**Frequency**	**Action Party**
Pre-Construction	Mobilization	• FRANEMM shall ensure that heavy vehicles and equipment are deployed in the night/ weekends. • FRANEMM shall ensure that the drivers are	Records of traffic situation in the immediate project	Daily	FRANEMM FMEnv LASEPA

		properly educated to obey road signs and rules. • FRANEMM shall ensure that the vehicles are properly maintained and serviced. • Avoid interference/destruction of infrastructures such as NITEL lines, existing NEPA transmission lines and settlement. • FRANEMM shall ensure that outriders are engaged during vehicle and equipment movement • FRANEMM shall ensure that well trained drivers are employed for this service. • FRANEMM shall ensure that drivers are in good physical health and are not under alcohol or drugs	Area shall be kept during pre-construction activities.		
	Air quality and Noise and Vibration	FRANEMM shall ensure • Construction machinery and generators have environmental and noise pollution control equipment. • Construction equipment shall be shut down when not in use. • All potential sources of leak from operational equipment shall be indirectly reduced through maintenance and inspection activities.	Air quality monitoring near work site for hydrocarbons PM, VOC and Noise.	Every other day during the activity	FRANEMM *FMEnv LASEPA*

		• Mesh and barriers shall be used to contain particulates and flying debris. • Water shall be sprinkled on open soil surfaces during excavation to reduce the amount of soil particle that get suspended in the ambient air. • The activity is completed within schedule.			
	Socio economics : transportation	FRANEMM Shall ensure • Transportation of equipment and materials to the site shall be timed to coincide with low traffic periods. • FRANEMM shall ensure mobilization activity is completed within schedule. • FRANEMM/ contractor shall ensure that workers are properly cautioned to respect the culture and place of worship of the people • FRANEMM shall ensure that the plant is in good working condition and maintained always. • FRANEMM shall ensure that the living quarters are built to provide accommodation for the workers.	Records of traffic situation in the immediate project Area shall be kept during construction activities.	Daily but during periods of transportation only.	FRANEMM /Contractor
	Health and safety	FRANEMM Shall ensure • FRANEMM shall ensure that the living quarters	Records of PPE availabilit	Daily	FRANEMM/ Contrac

		are always safe and clean. • Adequate Personal Protective Equipment (PPE) shall be provided for construction workers. • Proper use of PPE by construction workers shall be enforced.	y and usage during constructi on activities shall be kept.		tor
	Waste Managem ent	FRANEMM Shall ensure • Containment shall be provided for Solid Waste stream on project site. • Runoffs from contained waste stream shall be prevented. • Metal scraps from demolition sold to recyclers • OGMOE/OGEPA Licensed Private Refuse Operators shall be engaged to cart out all solid waste.	Records of all waste handling activities shall be kept.	Daily	FRANE MM/ Contrac tor *FMEnv LASEP A*
Constructio n	Air quality, Noise and Vibration	FRANEMM Shall ensure • Construction machinery and generators shall have environmental and noise pollution control equipment. • Construction equipment shall l be shut down when not in use. • All potential sources of leak from operational equipment shall be indirectly reduced through maintenance and inspection activities. • Water shall be sprinkled on open soil surfaces during excavation to reduce the	Air quality monitorin g near work site for hydrocarb ons heavy and trace metals PM, CO, VOC and Noise.	Daily	FRANE MM/ Contrac tor *FMEnv LASEP A*

		amount of soil particle that get suspended in the ambient air.			
	Soil and groundwater	FRANEMM Shall ensure • All hazardous material / substances (e.g. petrochemicals, oils, etc.) shall be stored on site only under controlled conditions. • All hazardous material / substances shall be stored in a secured, appointed area that is fenced and has restricted entry. All storage shall take place using suitable containers to the approval of the HSE officer. • Hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure. • Fuel shall be stored in a steel tank supplied and maintained by the fuel suppliers. The tank shall be located in a secure, demarcated area and an adequate bund wall (110% of volume) shall be provided. • The floor and wall of the bund area shall be impervious to prevent infiltration of any spilled / leaked fuel into the soil.		weekly	FRANEMM/ Contractor *FMEnv LASEPA*
	Storm	• Monitor that storm water		Weekly/	FRANE

	Water	are well channelled and free flowing and in the right direction.		daily during the wet season.	MM/ Contractor
	Socio economics transportation	FRANEMM Shall ensure • Existing drainage are free of debris. • Construct additional channels if existing ones are inadequate • FRANEMM Limited shall ensure transportation of equipment and materials to the site shall be timed to coincide with low traffic periods.	Records of traffic situation in the immediate project Area shall be kept during construction activities.	Daily but during periods of transportation only.	FRANEMM/ Contractor
	Community health	• FRANEMM shall ensure that an in-house clinic is built and manned by well trained staff. • FRANEMM shall ensure that the workers are educated about sexual and communicable disease. • guard the health of the workers. • FRANEMM shall ensure the availability of drugs/hospital FRANEMM shall ensure that cases that cannot be handled in the clinic are referred to general hospitals or retainership hospitals • FRANEMM shall put in place safety measures to safe • consumables in the in-house clinic.		Quartely	FRANEMM *FMEnv LASEPA*
	Health	FRANEMM Limited shall	Records of	Daily	FRANE

	and safety	ensure • Adequate Personal Protective Equipment (PPE) shall be provided for construction workers. • Proper use of PPE by construction workers shall be enforced. • The Contractor shall provide a method statement detailing the hazardous substances / material that are to be used during construction, as well as the storage, handling, and disposal procedures for each substance / material and emergency procedures in the event of misuse or spillage that might negatively affect people or the environment.	PPE availability and usage during construction activities shall be kept.		MM/ Contractor
	Access into the project site.	FRANEMM shall ensure that the facility is well fenced to prevent unwanted visitor from the site.			FRANEMM/ Contractor
operation	Air Quality and Noise	FRANEMM Limited shall ensure • Operation machinery and generator shall have environmental and noise pollution control equipment. • Machinery and generators shall be regularly maintained	Air quality monitoring near work site for hydrocarbons heavy and trace metals PM, NO_x, SO_x, CO, VOC and Noise.	Quarterly	FRANEMM *FMEnv LASEPA*

	Soil and Ground water Quality	FRANEMM Limited shall ensure • Regular integrity checks shall be conducted on all storage tanks, pipes and metal facilities. • Spill response team shall be put in place and shall be properly trained. • Bundwalls/ containment shall be established around petroleum storage. • Accredited sewage operator shall evacuate sewage	Ground water shall be monitored for TSS, TDS, pH, Temperature, conductivity and THC.	Quarterly	FRANEMM *FMEnv LASEPA*
	Storm Water Management	FRANEMM shall ensure: • Drainage channels are free and without hindrance for storm water to pass through into existing drains • New channels are to be constructed where existing ones are inadequate	Monitor for Free flowing and pollutants	Weekly/ daily during the wet season	FRANEMM
	Health and Safety	FRANEMM Limited shall ensure • Adequate Personal Protective Equipment (PPE) shall be provided for construction workers. Proper use of PPE by construction workers shall be enforced. Protocols include maintaining a safe speed. Wearing of ear protection, Compliance with maximum exposure hours to loud noise by site worker.	Records of PPE availability and usage shall be kept.	Quarterly	FRANEMM *FMEnv LASEPA*

		• Medical Emergency Response Plan shall be provided. First aid services shall be provided within the project area. • Services of a retainer clinic shall be secured for use health cases beyond the first aid scope			
	Fires and explosions	• Lighting conductors shall be installed in the facility • Fire extinguisher and fire hydrant shall be provided on site with sufficient capacity for sustaining the firewater spray. • Applicable Warning poster shall be used in all chemical storage, fuel storage areas and other strategic location and processes within the facility. • A contingency plan that will have an alert mechanism and shall be incorporated into the environmental management plan for the project..	Record of drills and training, List of fire equipment, conditions and functionality	Quarterly	FRANEMM OGUN STATE fire Service
	Socio-economics	• Use local labour as much as possible to reduce inflation in local economy. • Use local labour as much as possible in order to minimize additional Demand for infrastructure. • Help increase the capacity of local infrastructure • Public enlightenment			FRANEMM *FMEnv LASEPA*

		about potential health risks (STDs). • Jobs will be provided for locals			
	Traffic Management Around Riverview Road (Westerner Street) and Riverview Road and Transportation of goods material	FRANEMM Limited shall ensure • Traffic Management plans shall be instituted • Speed limit must be observed • Delivery of raw materials and truck loading of finished products shall be timed to coincide with the low traffic periods • Adequate warning signs shall be displayed at strategic areas around the project location to ward off intruding vehicles	Records of traffic situations in and around the project area during operational phase shall be kept.	Quarterly	FRANEMM Ikeja LG
	Effluent Management	FRANEMM Limited shall ensure • Installation of efficient Effluent treatment plant. • Adopt non-water cleaning and sterilizing means.	Records of all effluent handling activities shall be kept.		FRANEMM *FMEnv LASEPA*
	Waste Management	FRANEMM Limited shall ensure • Jobs will be provided for locals	Records of all waste handling activities shall be kept.	Quarterly	FRANEMM
	Sewage	FRANEMM Limited shall ensure • Prompt removal by OGUN STATE MOE accredited sewage service operator.	Records of all waste handling activities shall be kept.	Monthly	FRANEMM
	Power	FRANEMM Limited shall ensure			FRANEMM

		• IE supply power to the Proposed Project from 33KV High Tension Line • Separate transformer (S)for the facility • Energy efficient lightings must be used			
Decommissioning	Abandonment	FRANEMM Limited shall ensure • Re-vegetate all bare areas and restore site to original land use. • Restore land to original form as much as possible and return to indigenes. • Educate/guide road users on days of movement of dismantled parts.			FRANEMM *FMEnv LASEPA*

7.5 ENVIRONMENTAL MONITORING PLAN

Monitoring plan has been developed to provide information on the impacts compared with prediction thereby providing advanced warning of any adverse changes in the biophysical and socio-economic environment. The monitoring programme shall commence from the pre-construction stage through operation stage to keep track of the entire project development activities and programme.

The monitoring plan has been developed to achieve the following objectives:

Table 7.2 Environmental Monitoring Programme

Environmental Component	**Indicator Parameters**	**Method of monitoring**	**Frequency**	**Responsibility**
Air Quality	NOx, SOx, COx, Hydrocarbon and SPM	Sampling and measurement around the plant	Bi-weekly during site preparation and construction phases and yearly during operation phase	FMEnv and FRANEMM.
Noise	Noise level dB (A)	Measurement of points locations	Weekly during construction and Monthly during the operational phase.	FMEnv and FRANEMM.
Ground water	Turbidity, pH, Nutrients	Sample collection from existing borehole		FMEnv and FRANEMM.
Soil	Storm water management, spillages, Drainage	Visual observations and soil sampling	Weekly during construction and Quarterly during the operational phase.	
Vegetation	Vegetal spread onsite	Inventory of plants onsite	Quarterly during the operational phase.	
Traffic and circulation	Vehicular traffic	Traffic record	Daily	Weekly during construction and Quarterly during the operational
Socio	• Employme	Employment	Weekly	

economics	nt record • Concerns of the stakeholders at all phases of the project. • Elicit and build the confidence of a wide spectrum of the stakeholders	record Documentation of corporate social responsibilities	during construction and Quarterly during the operational	

7.6 WASTE MANAGEMENT

The management of waste that is associated with the project shall be in accordance with FMENV principle/guidelines. The principle of waste reduction, recycling, recovery and reusing shall be practice. All waste materials, which cannot be reused, will be managed and disposed in accordance with FMENV waste management guidelines.

The nature of waste materials and disposal methods that must be considered for the Food ingredients blending are presented below:

- Monitoring of alterations in the existing physical, chemical, biological and socio-economic characteristics of the environment
- Ascertaining whether any detected changes in the biophysical and socio-economic environment were caused by the project or by other natural factors.
- Monitoring and control of emissions and discharges and ensure compliance with local, national and international standards.
- Determination of effectiveness of the mitigation/enhancement measures for adverse and beneficial impacts respectively.

- Assurance of continual interactions and flow of information between FRANEMM and stakeholders.
- Provisions for recommending additional mitigation, enhancement measures.
- Assurance that established transparent procedures for carrying out the proposed project is sustained.
- Assurance to sustain accountability and sense of local ownership through the project life cycle.
- Provision of early warning on any potentially serious problems.
- Measurement of long term impacts of the project.

FRANEMM shall comply with the FMEnv regulatory controls as well as monitor specific environmental parameters at the various phases of the Project. The monitoring programme and the environmental and social parameters to the monitored are presented in Table 6.2 above.

- **Social and Environmental Monitoring Programme Operational Waste.**

This will include biodegradable, non-biodegradable and industrial wastes. Non-hazardous and non-biodegradable waste, which include: paper, plastics, bottles etc that will require pre-collection in appropriate sized waste bins and collection for transportation to an approved dumpsite. While disposal of biodegradable wastes will require pre-collection in a marked or coloured waste bins. In Lagos, these biodegradable are easily broken down at dumpsites.

Solid wastes will include: metal scraps, woods and high molecular weight plastic materials that must be collected in skips of the right sizes. This will be collected and transported for sorting, reuse and/or disposal according to the FMENV waste management guidelines.

- **Process Wastewater**

There will be process wastewater from wet hair factory. The bulk of the wastewater comes from the washings, boiler process; the cooling tower and the chiller equipment for this equipment, wastewaters shall not be allowed in the public drain channels.

- **Waste Handling Guidelines**

Waste and disposal procedures shall be well defined at source and the definition transmitted along with the waste unit disposal stage. The waste container shall define, and document information required as maximum, for adequate definition of waste must include:

- Waste stream identification
- Proper waste categorization
- Waste segregation
- Appropriate handling and disposal practice
- Recommended management practice.

- **Waste Minimization Guidelines**

Waste minimization implies reduction to the possible extent of the volume of relative toxicity of liquid or solid waste. This involves four principles of waste minimization, recycle, reduction, reuse and recovery shall be adopted as applicable. Opportunities to achieve significant waste volume reduction in facility expansion Project are a function 0 level of activities equipment. All waste associated with oils, hydraulic fluids, oily sump water, etc shall be recycled, treated or be placed in appropriate facility. It also includes energy rationalization and occasional audit too.

- **Waste segregation Guidelines**

Waste must be segregated at sources into clearly chosen bins at strategic, locations to achieve effective implementation of appropriate waste disposal methods.

- **Waste Disposal Guidelines**

As debris, spoilt materials, rubbish and other wastes, except excavation soil shall be cleared regularly from the site and disposed of accordingly. Instructions on materials safety handling sheet shall be strictly adhered to and shall form the basis for the disposal of waste related products. Adequate treatment measures shall be undertaken, where applicable, for all waste before final disposal. All wastes in transit shall be tracked and should as a minimum contain the following information:

- Date of dispatch
- Description of waste
- Waste quantity/container type
- Designated disposal method
- Consignee/driver name and means of transportation
- Confirmation of actual disposal (time a. date)

7.7 HEALTH MANAGEMENT PLAN

The health concerns enumerated must be properly managed. The tool for achieving this is the incorporation of a health management plan into the project plan. The health management plan provides the measure of assessing the accuracy of the predicted project impacts and monitoring of the effectiveness of the proposed mitigation/enhancement measures contained in the HIA report. The recommended health management plan indicates how the health concerns highlighted in the HIA would be managed (**Table 7.3**).

The health risk associated with the proposed expansion project will be alleviated if the mitigation measures suggested are implemented.

Table 7.3: Recommended health intervention activities and performance indicators

Health intervention activity	Phase	Performance indicators	Time frame	Action party
Health education (operations phase)	All	Number of Community-Based Health Education Activities carried out.	Quarterly	FRAN EMM
Provision of safe water (operations phase)	All	Number of functional potable water supply system.	Quarterly	FRAN EMM
Provision of sanitary facilities (operations phase)	All	Number of Sanitary facilities	Quarterly	FRAN EMM
Strengthen Health Management Information System (HMIS) (operations phase)	Operational	Efficient HMIS in place	Quarterly	FRAN EMM
Train and equip The existing Health Management System (operations phase)	Operational	Number of communities with functional VHWs/TBAs	Quarterly	FRAN EMM
Sustain and strengthen immunization services	All	Polio vaccine coverage	Quarterly	Government agencies

(operations phase)				FRAN EMM

7.8 EMERGENCE RESPONSE/CONTINGENCY PLANNING

There are hazards that are normally associated with project implementation and operation regardless of how good the intentions of the project proponents are. No matter what i done to reduce the scale and probability of hazards, nevertheless there remains a finite possibility that certain hazards may occur. Therefore, FRANEMM shall put in place all necessary plans and measures to ensure compliance activities associated with the execution of project in the project locations. The likely causes of accidents in the execution of this kind of project will include; equipment failure, negligence and acts of sabotage. A contingency plan shall be put in place to handle such emergencies and accidental situations.

While it is important for all employees to be thoroughly trained in emergency procedure, emergency exercises ere only effective when personnel's are familiar with their personal functional in the overall system. Both training and regular emergency exercise shall be held by FRANEMM.

7.9 AUDIT PLAN

An audit programme shall be in place to revive and verify effectiveness of the EMP and EMS in general. It shall include audits by auditors independent of the process or facility audited. Audit follow -up shall be timely and thorough. A schedule of environmental audits/reviews will be developed for all phases of the project to monitor site activities and to effectiveness of the EMP. Reviews and audits will be carried out including review of design drawings, specifications and other documents to verify that environmental objective and requirements will

be satisfied. Audits of site operations at key stages and during the construction phase

7.10 RESOURCING

FRANEMM considers environmental management an important aspect of project procedures. Consequently, in any project for which a project management team is set up, an environmental specialist is always an integral part of the team. In this project, an environmental focal point has been appointed to liaise between the engineering project managers and the environmental specialist consultants as well as advise on all environmental issues in conformity with the Group policy.

FRANEMM recognizes the need to use external environmental consultants to supplement in-house environmental specialists. To this end, environmental consultants will continue to provide expert advice to environmental managers throughout the development of this project.

In FRANEMM, environmental protection, like safety, is the responsibility of all staff at all levels. The environmental specialist assists with advice on environmental matters from an expert point of view. However, responsibility and accountability must be clearly defined, from those who monitor environmental performance to individual contractors who have responsibility for environmentally sound practices in their workplace and surrounding area. All staff will be made aware of their responsibilities through induction and training courses. The following mitigation steps shall be clearly borne in mind:

Adherence to the environmental and social issues raised in this study

· Land uptake for ROW will be kept to the barest minimum

· At crossings of rivers, construction time will be reduced to a minimum and restoration of riverbanks to avoid erosion will be undertaken.

7.11 CONTINGENCY/EMERGENCY PLANS

FRANEMM shall develop contingency plans that respond rapidly to any of these occurrences which may result from equipment failure, malfunctioning, obsolescence or sabotage. Consequently, gas contingency plan to respond to emergencies is available to back up this project.

7.12 CONSULTATION

FRANEMM has a principle of direct line of communication with all third parties. The primary objective has always been to ensure that its operations are devoid of interruption and disturbances arising from community - related issues. The proposed facility expansion project will involve this form of consultation during the site preparation and development phases.

FRANEMM shall also maintain regular communication with all the regulatory bodies–Federal Ministry of Environment, State Environmental Protection

Agencies and Local Governments Areas on issues that may arise as a result of this project.

7.13 TRAINING PLAN

A training programme is an essential part of an EMS. HSE Training will be given to key operators and those who are responsible for dissemination of information and their teams. Topics will include pertinent environmental legislation, health and safety procedures, environmental awareness, and identification of environmental risks, and the plans and actions, which the project is committed to carry out as part of EMP

7.14 CULTURAL HERITAGE MANAGEMENT

As at the time of construction, no archeological discoveries were made.

Management of cultural heritage (CH) is a statutory requirement. Cultural heritage is defined as areas, objects and places displaying archaeological or historic significance. This may include but is not limited to scar trees, rock paintings, fossils and artifacts.

There is no possibility of locating Cultural Heritage sites/features on the project area. However, Should a site be discovered, the following steps shall be taken:

- Cease work and take care to minimise further disturbance
- Notify the supervisor immediately, who should then report the find to the onsite environmental officer and project manager.
- The project manager will notify Management of FRANEMM and submit an incident report.
- Protect and manage the site, restrict access, do not disturb materials or site, erect barriers and FRANEMM shall proceed as to notify relevant government agencies.

7.15 DECOMMISSIONING AND ABANDONMENT

The project is designed last over minimum period of 50 years, at the end of the project life span; FRANEMM shall invoke the standard decommissioning and abandonment programme. The tasks shall include the following:

Ensuring that the decommissioning and abandonment are done with the same care and respect for the environment with which the pipeline project was designed, constructed and operated.

- Assessing residual impacts that the project has had on the environment during its life span.
- Monitoring the abandoned environment.

- Restoring the environment as much as possible to its original state.

The abandonment process shall involve the following:

- Removal of all gas from system
- Capping and sealing of all open ends of buried pipeline
- Remediation of impacted sites in order to restore them to their original condition as far as possible.

FRANEMM shall maintain a record of the abandoned facilities and a copy will be given to the relevant Government - FMENV, host communities and other stakeholders.

CHAPTER EIGHT

8.0 CONCLUSION AND RECOMMENDATIONS

This EIA of the facility expansion project for FRANEMM was carried out in accordance with the Nigerian Environmental Regulatory (FMEnv) and international standards. Numerous activities during the life cycle of this project will provide benefits to the host communities such as provision transfer of technology, promotion of human capital development, and the promotion of good relationship between FRANEMM and the host communities. The project will provide employment opportunities for young people during all phases of the development.

The potential impacts of the proposed project (facilities) on the existing environment have been identified and evaluated. The cumulative impacts of the existing and proposed projects have been captured. The cumulative impact assessment was based on the interactions between the project activities and the biophysical, social and health. A combination of methodologies was used for the impact assessment including field data collection, laboratory analysis, literature review, focused group discussions, interviews and administration of questionnaires, remote sensing and geographical information systems, trend analysis, professional judgment, modeling and matrices.

The magnitude of the anticipated impacts of the project activities (facilities) on the environmental components - air, water, soils, sediment, vegetation, fauna, land use, waste management, social, economic and health issues - were rated. The cumulative impacts of the facility expansion project activities with past/existing projects and foreseeable future projects in the region were also assessed in time and space.

Mitigation measures were proffered to reduce the magnitude of identified significant adverse impacts to a level as low as reasonably practicable (ALARP), while the positive impacts were enhanced.

An Environmental Management Plan (EMP) was developed in order to ensure that mitigation measures would be established and maintained throughout the life of the project.

On the basis of the approach and methodology employed in conducting the EIA study as well as the outcome and findings, the facility expansion project is capable of achieving its goal of plant expansion and manufacturing paints and coats in environmentally sustainable manner.

FRANEMM is therefore committed to the following:

- Develop a full environmental plan that sets out in detail the objectives and targets of the EMS and the means by which they will be achieved.
- Compliance with all applicable environmental legislation is mandatory.
- The EMS shall be carefully flexible to response to changes in environmental legislation.
- A register of all environmental legislation and regulations affecting the organization shall be compiled and used of achieve the previous requirement.
- A complete review of the environmental effects of the organization's activities shall be carried out.
- Environmental management responsibilities shall be assigned to employees, with definition of who has responsibility for managing the EMP.
- Personal environmental targets for employees should be assigned.

- Training of staff shall include awareness of potential problems likely to result from non-adherence to the EMP.
- Continuous improvement of environmental performance must be demonstrated.
- Environmental targets shall be set for specific procedures; the targets must be met, or reviewed over time.
- Records shall be kept on the achievement of objectives and targets. Including on the disposal of wastes.
- Internal audits shall be carried out, on regular basis.
- The EMP shall be reviewed periodically.

REFERENCES

APHA, "Standard Methods for the Examination of Water and Wastewater," 20th Edition, American Public Health
Association, Washington DC, 1998.

EPA, "Quality Criteria for Water Use," Environmental Protection Agency, Washington DC, 1976.

L. Klein, "River Pollution. II. Causes and Effects," Butterworth & Co. (Publishers) Ltd., London, 1962.

C. J. Ndefo, E. O. Alumanah, P. E. Joshua and I. N. E. Onwurah, "Physicochemical Evaluation of the Effects of Total Suspended Solids, Total Dissolved Solids and Total Hardness Concentrations on the Water Samples in Nsuk-ka Town, Enugu State of Nigeria," Journal of American Science, Vol. 7, No. 5, 2011, pp. 827-836.

International Chamber of Commerce (ICC) (1991) 'ICC Guide to Effective
Environmental Auditing', Paris ICC Publishing S. A. Publication No. 483

Leopold Luna B. et al, (1971) 'A Procedure for Evaluating Impact, Geolog. Surv. Circ. 645, in Canter .L. W., Environmental Impact Assessment; 1974.

A. A. Oketola, S. M. Adekolurejo and O. Osibanjo, 2013, Water Quality Assessment of River Ogun Using Multivariate Statistical Techniques Journal of Environmental Protection, 4, 466-479 ttp://dx.doi.org/10.4236/jep.2013.45055 Published Online May 2013 (http://www.scirp.org/journal/jep)

WHO, “Nitrate and Nitrite in Drinking Water. Background Document for Preparation of WHO Guidelines for Drinking Water Quality,” World Health Organization, Geneva,2003.

A. A. Oketola, O. Osibanjo, B. C. Ejelonu, Y. B. Oladimeji and O. A. Damazio, “Water Quality Assessment of River Ogun around the Cattle Market of Isheri, Nigeria,” Journal of Applied Sciences, Vol. 6, No. 3, 2006, pp. 511-517. doi:10.3923/jas.2006.511.517

P. A. Oluwande, M. K. Shrider, A. O. Bammeke and A.O. Okubadejo, “Pollution Levels in Some Nigerian Rivers,” Water Research, Vol. 17, No. 9, 1993, pp. 957-963. doi:10.1016/0043-1354(83)90035-0

S. Schiffman, “Effects of Livestock Industry on the Environment,” Environmental Health Perspectives, Vol. 102, 1995, pp. 1096-1099.

Appendices

Socioeconomic impact questionnaire

Socioeconomic impact assessment responses