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CHAPTER ONE

1.1 Introduction

The technological creativity of man towards advanced development of automobile and discovery of petroleum and refining it into various fractions motivated the construction of petrol filling stations at strategic locations, particularly in the cities and some developing villages especially those on the highways. The rapid increase in population of the country and the attended availability of manufacturing and importations of vehicles attracted the lucrative business of petroleum products at government control price and regulated system/processes.

In light of such development, the management of **NNPC RETAIL LTD - WORLD ENERGY & FLEET** take advantages of this human need and constructed a modern petrol filling station situated Along Kaduna/Lagos Expressway, Tegina, Niger State. However, this gasoline service station for retailing of petroleum products consist of Six (6) underground storage tanks, Eight (8) number of fuel dispensing pumps and other associated facilities to be accommodated in the land size of 57.81m by 71.52m.

Therefore, this project required Environmental Evaluation Studies (EES) as one of the basic requirements in order to establish environmental baseline data and analyses the impacts (positive or negative) generated in details on the environment due to operational processes/activities taking place in respect to this particular project directly aimed at improving the environmental conditions, impacts and changes as a result of the projects implementation and subsequent exploitation were assessed according to the following environmental components: -

- Geological formation of surface and rate of underground water contamination
- Soil and land surfaces pollutions due to oil and gas activities
- Atmospheric pollution on biodiversity
- Protection of the adverse operational activities to the immediate environment

- Landscape and cultural heritage of this project site and immediate environment

- Socio-economic consequences due the establishment of this retail outlet.

The continued operational activities as well as development of the Oil, Gas and Chemical industries in Nigeria has made it necessary for the government to bring up plans and strategies to protect and enhance prudently the environmental resources in the areas of their operations for a better and healthier environment which must work towards reducing and eliminating the adverse environmental, economic and social impacts of the project activities as much as possible or completely, focus on the process operational safety, highlights the benefits to be enjoyed by the host and neighboring Tegina communities, Niger state and the country at large.

Due to the dynamic nature of these oil and gas operations worldwide, awareness of the importance of environmental challenges and other issues have become more and more central in the thinking of the oil and gas industry particularly the regulators of the Nigerian Petroleum Industry.

The exploitation of oil and gas reserves has not always been without some ecological and biological effects. Oil spillage and seepage, damaged land resources, accidents, fires, and incidents of air and water pollutions have all been recorded at various time and places. In recent time the social impacts of oil and gas operations, especially in remote communities has also attracted attentions.

The operators of the oil and gas industry have worked for a long period of time to meet the challenges of providing environmental protection and sustainable development in Nigeria. Environmental Evaluation Studies (EES) is one of such mechanisms by which the natural environment is being evaluated against the wanton consequences of the activities of the oil and gas industry, much have already been achieved but the industry recognizes that more can be accomplished.

Several regulatory agencies have been set up to ensure the protection of environment by the Nigerian government which includes: NESREA, NOSDRA, NMDPRA formally DPR etc. The Nigerian Midstream, Downstream Petroleum Regulatory Authority (NMDPRA) as the major regulatory body of the Nigerian Oil and Gas Industry demands that a project of establishing petrol station of bulk capacity (270,000 ltrs.) and above, must prepare Environmental Evaluation

Studies in case Environmental Impact Assessment (EIA) studies were not conducted at the preliminary stage and submit to NMDPRA for review, consideration and implementations.

In view of the above, **NNPC RETAIL LTD - WORLD ENERGY &** FLEET located Along Kaduna/Lagos Expressway, Tegina, Niger State have engaged the Environmental Services of (***Fasma Engineering and Environmental Services Ltd***) to conduct Environmental Evaluation Studies (EES) on their behalf and prepare this Terms of reference/ scope of work submitted to NMDPRA for review and approval.

1.2 Objectives of this Environmental Evaluation Studies

The fundamental objective of Environmental Studies in Nigeria is to achieve national sustainable development according to the global best practice, while others are itemized as:-

1. To evaluate likely environmental impact of this project and support the goals of environmental protection and sustainable development.
2. To ensure that planning decisions are made in accordance with the knowledge of environmental laws, policies, standard and considerations are explicitly addressed and incorporated into the developmental decisions making process.
3. To find ways of reducing or eliminating the unacceptable impacts and shape the proposed project so that it can suite the local environment/location where its situated by anticipating, avoiding and minimizing or offsetting the adverse significant biophysical, social and other relevant effects of the project proposal.
4. Involve the public awareness (socio-economic survey) of the immediate communities, demographic, social values and attitudes.
5. To promote development that is sustainable and optimizes resources use and environmental management opportunities and identification of the relevant human concerns.
6. To protect the productivity and capacity of natural resources, the ecological and biological effects which maintain their functions and merits to human

7. To resolve conflicts that may occur between social, economic, visual, ecological and engineering requirements during all the stages of the project development/cycle.
8. Evaluate the findings and identified performance gaps in terms of safety and prioritize the problems, associated with nature of the project environment and road network system, recommend for possible solutions or eliminate them completely.
9. To know the extent of environmental base line data by carrying out field sampling of the major environmental components such as (water, soil and Ambient Air) using national and international acceptable methods in order to examine the physiochemical parameters.

1.3 Terms of Reference for this Environmental Evaluation Studies

The terms of reference considered for this (EIA) encompasses among other factors as clearly stated: -

I. Evaluate the existing present impacts of the project site via the established base-line data, if there is any and relates it to the current situation of the project site as well as the immediate environment.

II. Identification of potential impacts on the environmental components such as land, water, ambient air and the ecological balance associated with petroleum products storage and sales facility to be installed.

III. Identify the number of sampling locations for (WAS) i.e. Water, ambient Air and Soil. Therefore, four (04) points of water samples, three (03) points of soil samples including on-site, reference and control points within and outside the project site while the in-situ analyses of ambient air quality are designed to take place at five (05) different points, which includes frontage of the site location called upstream, within the project site facility, control point and the downstream where the direction of wind is dissipating the pollutant gases and noise inclusive as detailed indicated in appendix (i).

IV. Methodology to be deploy in samples collections, transportations and analysis would be display by the NMDPRA accredited licensed laboratory under Kano State Ministry of Environment.

V. Applicable policies, plans, regulations and standards that guide the full fledge Environmental Impact Assessment against environmental disruptions by all the daily operational activities of this fueling station with detailed description.

VI. The socio-economic assessment of potential impacts associated with the project's community, i.e. to distribute designed questionnaires capable of capturing their emotional views, which must to incorporate land dispute as key component and corporate social responsibilities as well as community resolutions.

VII. Suggestion of mitigation and amelioration measures for the identified potential adverse Environmental Impacts as well as process improvements with respect to process safety as daily operations of this filling station.

VIII. Development of Environmental Management Plan (EMP) for the constructions of this petrol station, continual operations and abandonment stages of the project facility.

In general, the main aim is to reduce the adverse environmental and social impact of the project activities as much as possible and highlight the benefits to be enjoyed by the host and even neighboring communities and this shall only be achieved and approved by Nigerian Midstream and Downstream Petroleum Regulatory Authority (NMDPRA) as per environmental compliance guideline.

CHAPTER TWO

2.1 Methodology

Our company, **Fasma Engineering and Environmental Services Ltd** will adopt the following methodology as part of the scope of work in conducting the Environmental Evaluation Studies (EES) in respect to our client: **NNPC RETAIL LTD - WORLD ENERGY & FLEET.**

1) Initial interactions with the proponent of this project
2) Conduct a preliminary survey with the developer 'proponent' and other stakeholders in order to identify the sampling points and obtain all necessary relevant information of the proposed project site and examine the magnitude of the present situation and predict that of construction stage.
3) Carryout a logical interview with the host community, distributions of questionnaires and critical observations during the interactive session in order to source, collect and collate any relevant data and information about their actual perception of the project construction and operations.
4) Prepare site plans and parametric survey of the proposed sampling points and collections.
5) Analyze the ambient air quality (in-situ) both on-site, upstream, downstream of the proposed project site and collect samples of soil and water for analysis in the NMDPRA certified laboratory owned by the Ministry of Environment Kano State.
6) Prepare site plans in terms of safety and emergency response of the project site and overall process operations.
7) Interpret and discuss the results of the conducted analyses for the single season study.
8) Assess and evaluate the environmental impacts (positive and negative).
9) Highlight the areas of serious concern with regards to Environmental laws, guidelines and international best practice.
10) Make recommendations for mitigation and amelioration measures to be taken for the continual operational process and abandonment stages.
11) Development of Environmental Management Plan.

Table 2.1: Physicochemical parameters to be examine/analyze for environmental components

S/No.	Water	Air/Climate Meteorology	Soil
1	pH	Particulate matter	pH
2	Temperature	Noise	Appearance/color
3	Conductivity	Cl_2	Moisture content (%)
4	Turbidity	CO_x	Texture (g/Kg)
5	T.S.S	SO_X	Particle size/Porosity (%)
6	BOD_5 at 20 ^0C	H_2S	Bulk Density (%)
7	COD	FL	Base Saturation (%)
8	DO_2	NH_3	Organic Carbon (g/Kg)
9	Oil & Grease	HCN	Organic Matter
10	Total coli form	NO_X	Oil and Grease (mg/L)
11	Heavy metals such as Ni, Pb, Cr, Cd, Cu, Fe, Hg, Mn, Zn etc.	Temperature, solar radiation & heat comfort index	Potassium (mg/L)
12	Microbiology and related micro-organisms	Relative Humidity (kg/kg)	Soil fertility and Total Phosphorus (g/kg)
13	Water table depth for boreholes, hand dug wells or both within the project scope	Wind speed	TOC, NO_3, PO_4, SO_4,Cl, CO_3 and Calcium (g/Kg)
15	Total Dissolve Solid	Wind direction	Cat ion Exchange and Heavy metals such as Ni, Pb, Cr, Cd, Cu, Fe, Hg, Mn, Zn etc.
15	Phenol	CxHx	THC
16	THC	VOC	CO (%)
17	Total water hardness	O_2	Nitrogen (%)

18	Groundwater flow direction	Atmospheric pressure, adiabatic lapse rate and cloud cover	Direct observations on vegetations, flora and fauna within the 1 km radius of the project site.

Table 2.2: Methods of Soil Analysis

S/No	Parameter	Method/Equipment
1	Appearance/Color	Visual inspection/Colorimeter
2	Texture	Texture Triangular curves
3	Moisture Content	Evaporation dish
4	pH	Electrometric pH meter
5	Porosity	Water holding capacity
6	Bulk Density	Displacement Method
7	Base Saturation	Atomic Absorption Spectrophotometer
8	Organic Carbon	Wakley black Titrimetric
9	Organic Matter	Spectrophotometer
10	Oil And Grease	Spectrophotometer
11	Potassium	Spectrophotometer
12	Total Phosphorus	Spectrophotometer
13	Calcium	Spectrophotometer
14	Magnesium	Spectrophotometer
15	Zinc	Atomic Absorption Spectrophotometer
16	Total Hydrocarbon Content	Spectrophotometer

Table 2.3: Analytical Methods of Water

S/No.	Parameter	Method/Equipments
1	Temperature	Electrometric- Digital Thermometer
2	pH	Electrometric- Digital pH meter
3	Conductivity	Electrometric- conductivity meter
4	Turbidity	Electrometric- Turbid meter
5	Total Suspended Solutes	Gravimetric- dried at 105 ^{O}C
6	Biochemical Oxygen Demand	Titrimetric- 5 day incubation
7	Chemical Oxygen Demand	Spectrophotometric
8	Dissolved Oxygen	Membrane Electrode
9	Oil & Grease	Spectrophotometric
10	Total coli form	Plate count-MPN
11	Nitrate	Spectrophotometric
12	Lead	Atomic Absorption Spectrophotometer
13	Chromium	Atomic Absorption Spectrophotometer
14	Cadmium	Atomic Absorption Spectrophotometer
15	Phenol	Titrimetric
16	Total Hydrocarbon Content	Atomic Absorption Spectrophotometer

2.2 Sampling Types

Basically the three fundamental environmental components are the key base-line data to be establish for reference and guide to decision making, likewise the type of sampling for both soil and water are important as well. With regard to this retail outlet project, a representative sampling type is adopted for the soil which disturbed its strength due to penetration of soil cutter and auger within the range of 0 - 15 cm and 15 - 30 cm while for the water sampling, grab method/type is selected and the analytical methods are presented in tables 2.2 and 2.3 for both soil and water respectively. Also for the ambient air quality, an in-situ analyses are preferred to be conducted at various five (05) strategic points as outlined in this terms of reference derived.

2.3 Sampling Points and Corresponding Geographical Positioning System (GPS)

The samples of three (03) basic environmental components (WAS) Water, ambient Air and Soil would be collected at different points within the project site, reference point as well as control point in order to give more details of base-line data of the construction and installations of the major facilities as indicated in table 2.4.

Table 2.4: Sampling Points and Coordinates of the Proposed Project Site

S/No.	Sampling Point	Environmental Component to be taken	Description of Sampling Points	Coordinates	Elevation (ft)
1	**A**	Air (A)	Project site (i)	10°04'19.0"N 6°10'54.1"E	896
2	**B**	Air (A)	Project site (ii)	10°04'27.6"N 6°10'45.8"E	896
3	**C**	Air (A)	Upstream	10°04'19.7"N 6°10'54.9"E	893
4	**D**	Soil and Water (S & W)	Control point (i)	6°10'56.1"E	898
5	**E**	Soil and Air (S&A)	Control point (ii)	10°04'23.3"N 6°10'07.6"E	894
6	**F**	Water (W)	Downstream	10°04'19.8"N 6°10'56.1"E	899
7	**G**	Water and Air (W& A)	Reference point (i)	10°04'19.2"N 6°10'54.3"E	897
8	**H**	Water and Soil (W& S)	Reference point (ii)	10°04'17.9"N 6°10'53.7"E	898

2.4 Project Location and Topographical Factors

2.4.1 Site Location

The gasoline station is located along Kaduna/Lagos Expressway, Tegina, Niger State. The land under application was owned by **NNPC RETAIL LTD - WORLD ENERGY & FLEET** for which the petrol station is constructed. The site is bounded by farm lands to the left, right side and behind the proposed site. There are two petrol stations within the 1.5 kilometer radius of the proposed project site, more specific details are provided in table 2.5.

2.4.2 Contiguous features

The contiguous feature will give a clear guide on the features to be considered in conducting the sample taking analysis.

Table 2.5: Contiguous features

S/No:	Properties	Available (✓)	Not-available (X)	Distance in Meters
1.	School	✓		100M
2.	Market	✓		200M
3.	**licensed petrol station** NMDPRA cleared site or **LPG Refilling Plant**	✓		250M
4.	Mosque	✓		
5.	Church or shrine	✓		150M
6.	Residential areas	✓		100M
7.	Hospital/clinic	✓		100M
8.	PHCN High Voltage Transmission/Distribution Lines		**X**	NA
9.	Wet land		**X**	NA
10.	Graveyard		**X**	NA
11.	Commercial area		**X**	NA
12.	Vacant/**farm land**	✓		100M
13.	Govt. green area/forestry		**X**	NA
14.	NNPC ROW		**X**	NA
15.	Railway lines		**X**	NA
16.	Mining field		**X**	NA
17.	**River**, Stream/**Bridge** or Pond		**X**	NA

2.5 Project Description

The proposed project to evaluate is a petrol filling station where petroleum products such as Gasoline (Petrol or PMS), Kerosene (DPK), Diesel (AGO), engine oils and other related products are sold to the public at government regulated prices.

Gasoline (petrol)

This is a mixture of the lighter liquid hydrocarbons used chiefly as a fuel for internal combustion engines. It is produced by the fractional distillation of petroleum; by condensation or adsorption from natural gas; by thermal or catalytic decomposition of petroleum or its fractions; by the hydrogenation of producer gas or coal; or by the polymerization of hydrocarbons of lower molecular weight.

Kerosene (DPK)

This is the thin oil derived from petroleum, coal tar, or oil-bearing shale. Kerosene is used as a fuel for engines, heaters, and lamps, and as a solvent. It also has been called coal oil, illuminating oil, lamp oil, and paraffin oil, this last because it belongs to the family of hydrocarbons called paraffins.

Diesel (AGO)

This is also a fuel from petroleum product similar to kerosene, jet fuel, and home heating oil.

Diesel fuel is less expensive to produce than gasoline and safer to handle. Due to lower volatility (tendency to vaporize) and a higher flash point (the temperature at which diesel fuel ignites), it is less likely to catch fire during an accident. There are three grades of diesel fuel. They are classified according to the ease with which they ignite, the lowest temperature at which the fuel

will flow, and viscosity (resistance to flow). Individual grades of fuel are better suited for certain engines and operating conditions.

2.6 Project Components

The project components includes

- ✓ Six (06) underground tanks for the storage and sales of petroleum products, each tank is to contains forty-five thousand (45,000) liters, Three (03) of the tanks are for Premium Motor Spirit (PMS), Two (02) for Automotive Gas Oil (AGO) and other one (01) for Dual Purpose Kerosene (DPK).
- ✓ Dispensing lube oil bay with necessary accessories
- ✓ Piping of petroleum products connected to the underground storage tanks
- ✓ Pump island with dispensing pumps.
- ✓ Administrative block and security office
- ✓ A mini mart
- ✓ Store and Mosque

2.7 Activities for Project Development and Operations

The project activities include the following:-

- ❖ Office block, servicing area, generator house, canopy frames, underground storage tanks, piping networks.
- ❖ Project operations, which include delivery, dispensing sales/servicing of petroleum products which include gasoline (petrol), Kerosene (DPK), Diesel (AGO), engine oils, grease and other administrative activities.

2.8 Evaluation of Potential Impacts of the Project

Environmental impacts are expected or likely to occur at various stages of the project. The potential impacts on environmental components such as land, water and air will be evaluated and assessed due to operations.

2.8.1 Impact on Soil/Land Pollution

Land is a universal platform for all project structures and thus a major environmental component likely to be adversely affected at various stages. The Impacts to be evaluated are as follows.

i. Project Operations

The impacts on land during operational stage of the project may occur as a result of the following:-

- Storage tanks and connected piping leakages
- Oil spillage and seepage
- Indiscriminate dumping of used spent lubricating oil
- Solid waste generation and poor methods of collection and disposal.

- Leakage and spillage of black water from the sewer pipeline networks. Sami-solid slurry generated from the septic tank/chamber and poor methods of Collection and disposal.

iii. **Project De-Commissioning**

At this stage, the Land will be restored to its original form or land use. The soil structure may be restored and compartment be improved upon provided the mitigation and amelioration measures can be completely adopted as well as the used of biotechnology as the major enhancement mechanisms.

2.8.2 Impact on Water Quality

The quality of water both surface and underground may be affected majorly during the project operation through the following ways:-

- Storage tanks and connected piping leakages
- Oil spillage and seepage
- Indiscriminate dumping of used spent lubricating oil Solid waste generation and disposal to the nearby stream
- Storm water washes off oil to nearby stream and public wells.
- Sami-solid slurry generated from the septic tank/chamber and poor methods of

Collection and disposal.

2.8.3 Impact on Air Quality

The effects on ambient air that will or are likely to occur during site clearance, construction and equipment installation and operation stages include:

- Increase noise level resulting to formation of air pollution.
- Air may be polluted by gases such as CO, SO_2 and CO_2, H_2S, CH_4 and other poisonous gases.
- Suspended particulate matter formation.
- Sami-solid slurry generated from the septic tank/chamber or leakage of black water Pipeline, poor methods of collection and disposal, resulting to high formation of unpleasant odors.

The ambient air may possibly to be adversely affected during project de-commissioning by all the pollutants listed above as a result of evacuations of all the underground tanks, dismantling of equipment demolition of structures and abandonment of septic tank/sewage chamber and finally land filling.

CHAPTER THREE

3.1 Environmental Management Plan (EMP)

This is a plan document to be prepared by the management through environmental professionals/experts. It involves issues on sanitation, waste management, safety training, operational process etc. The document is a guide to management on the company's environmental and safety responsibilities which can be reviewed annually, and it contains the details of environmental management plan system with the functions of each stakeholder, the full fledge environmental evaluation will carry out comprehensive studies and provide lasting/permanent solutions in order to manage the environmental affairs of every phase of NNPC Retail Ltd - World Energy & Fleet.

3.2 Objectives of Environmental Management Plan

Basically the main objectives of environmental management and monitoring plan are integrated and itemized here, while further details would be highlighted and reflected in the final draft report:

- To proffer solution to the risks and potential hazards of day to day activity of each project phase, being it construction, operations or abandonment.
- To generate adequate environmental information to assess the project environmental risks, detection of any environmental shortcoming or oversights in the Environmental Evaluation Studies (EES) exercise.
- To ensure proper compliance with the operational/regulatory requirements and to encourage the project developers to self-regulate their environmental policies and practices.

3.3 Conclusion

This terms of reference/scope of work is submitted to (NMDPRA) in order to optimizes environmental protection while maintaining the cost of natural resources exploitations within acceptable limits in respect to operational activities of petrol station by ***NNPC RETAIL LTD - WORLD ENERGY & FLEET*** Located Along Kaduna/Lagos Express, Tegina, Niger State.

- The full-fledge Environmental Evaluation Studies will stipulate how potential threats to the environment and human life can be controlled, managed or annihilated and highlight the benefits to the environment and society. It is a document in which potential environmental, social and health impacts of this proposed project site are identified and assessed, evaluate alternatives and design appropriate environmental and social management plans during the life-cycle of this project.

In line with these, we hereby request for review and approval of this terms of reference for implementation and further actions, please.

Thank you.

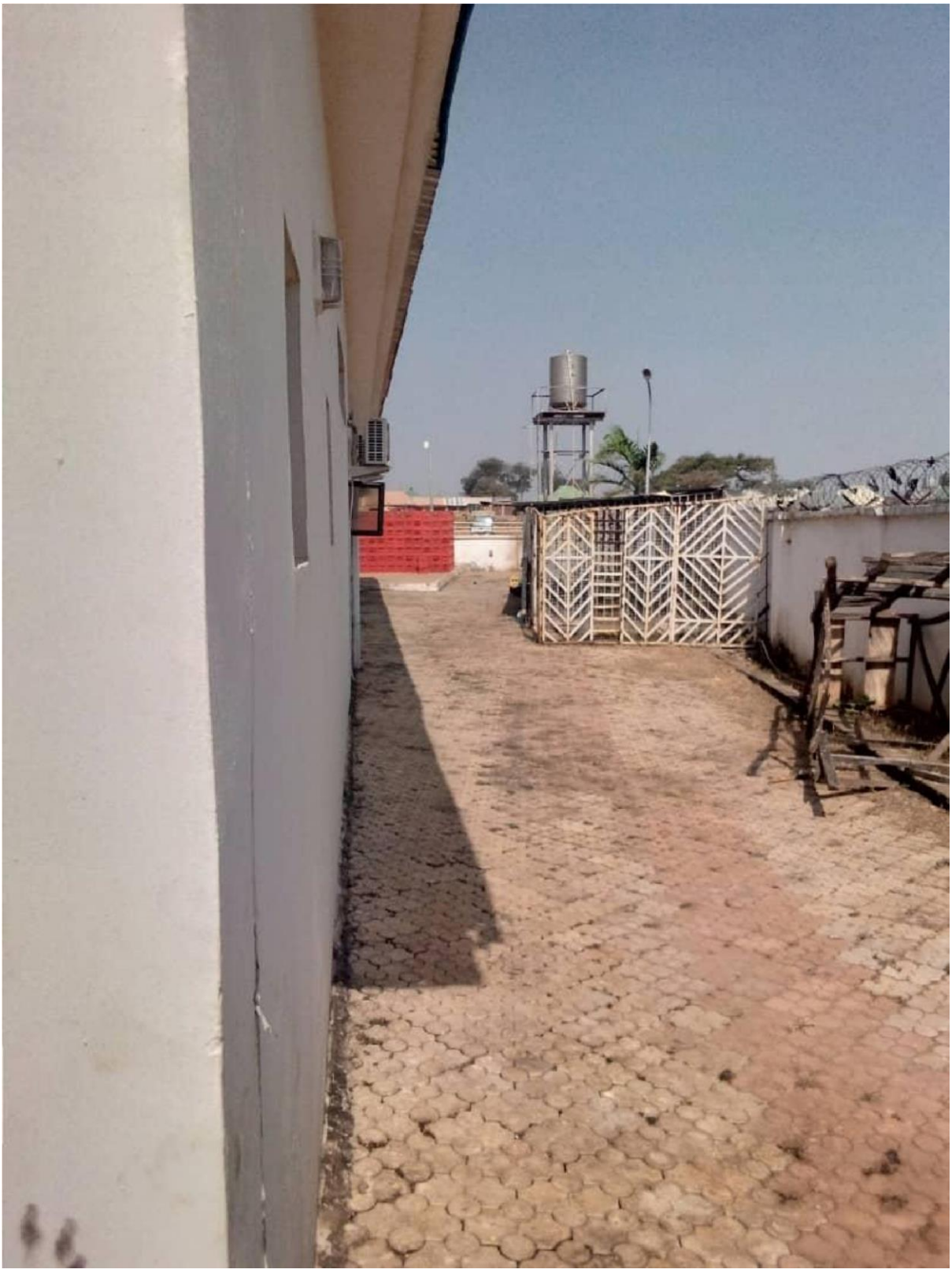
Saidu Muhammad CESM

Managing Director/CEO

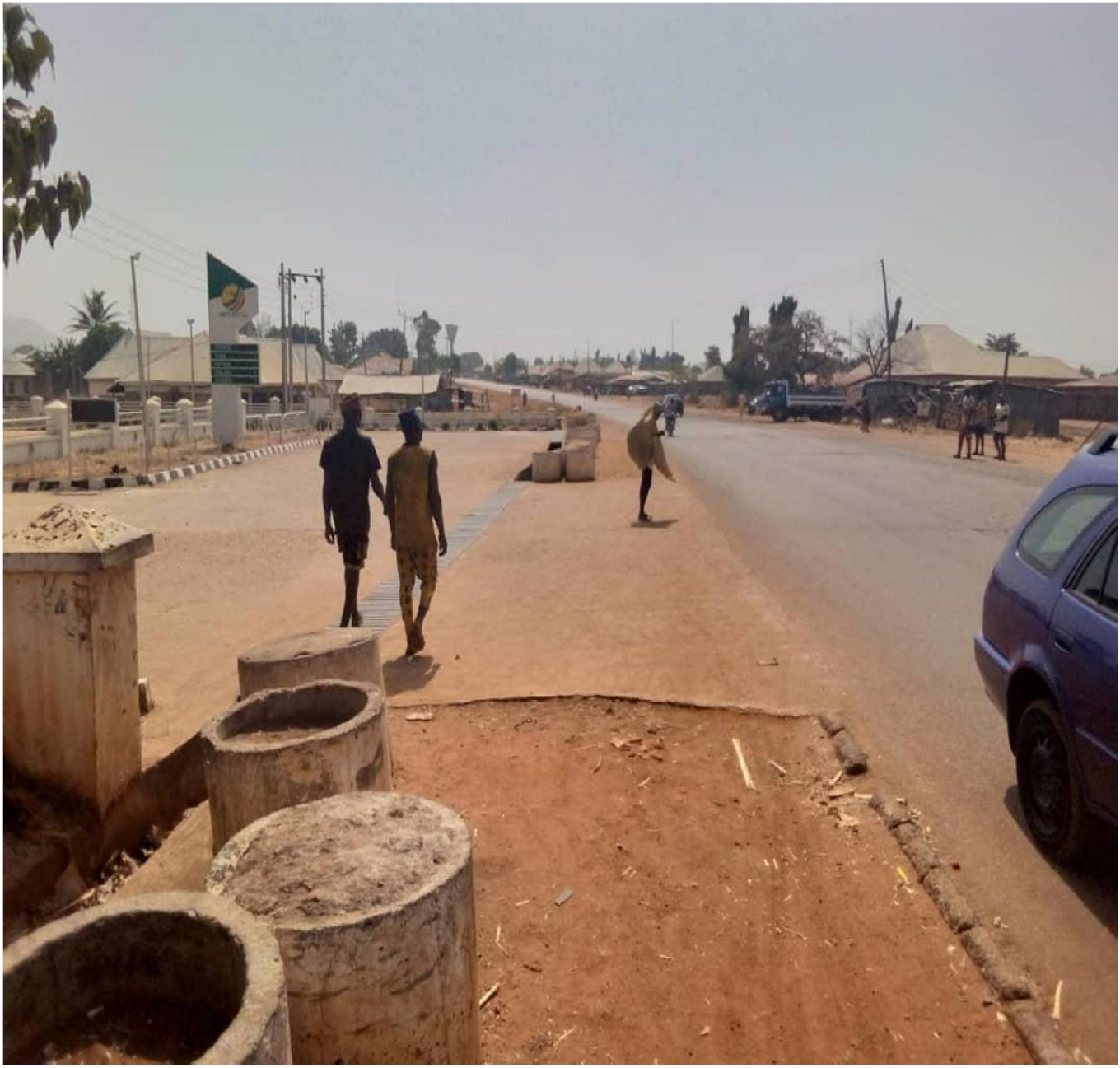
Appendix

PICTORIAL FEATURES:

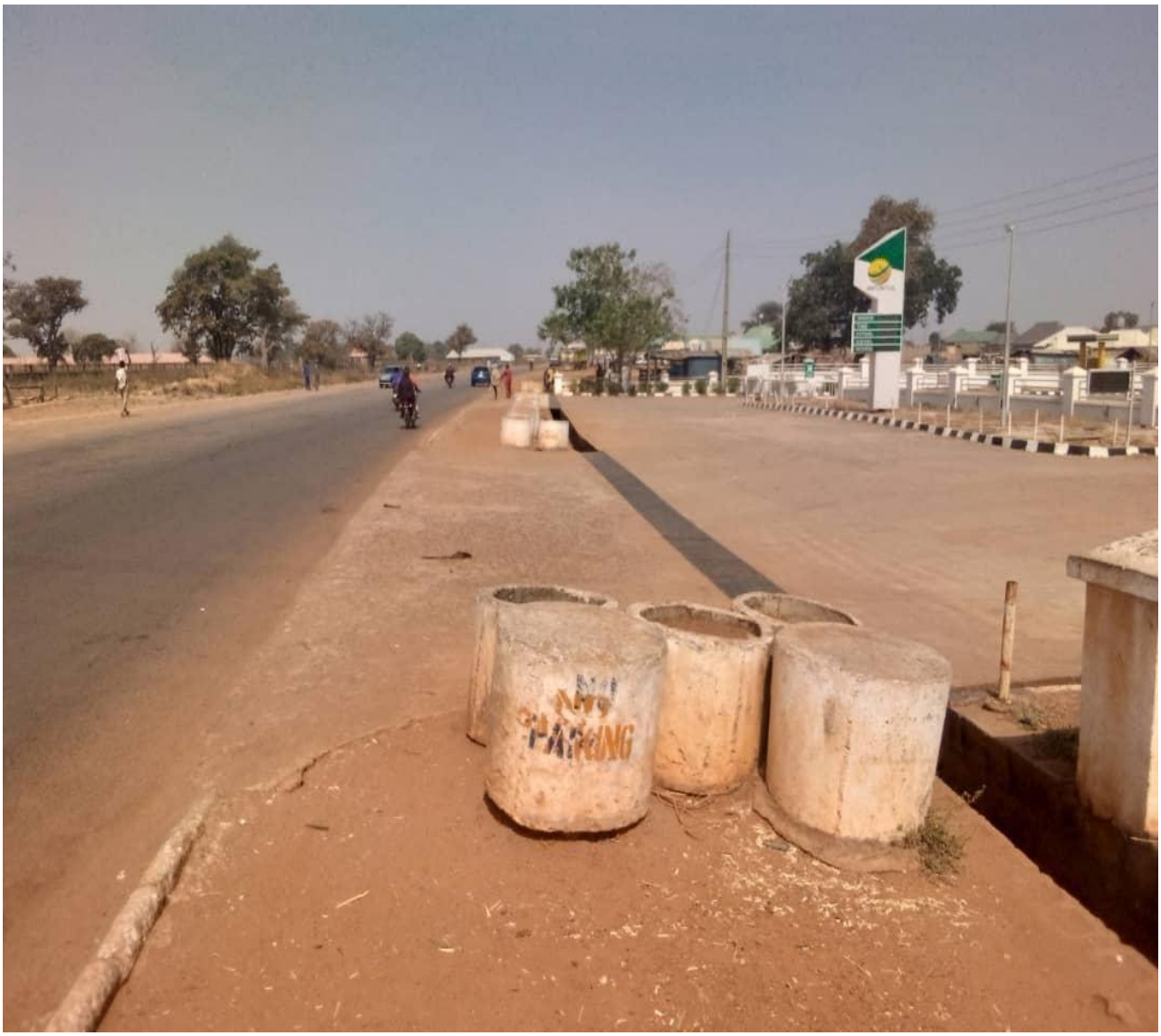
Front view of the proposed site



Rear view of the project site



Left side view (access road and commercial shops)



Right side view of the project site (Access road and farm lands)