



VRA CORPORATE ENVIRONMENTAL POLICY STATEMENT

1. VRA is committed to ensuring continuous improvement of environmental performance to minimize the impacts of all its operations on the environment, in line with the principles of sustainable development, in addition to complying with national and international environmental protection regulations.
2. In respect of the above, VRA will:
 - a. Make environmental considerations a priority in all business planning and decision-making and comply with relevant national and international environmental protection regulations.
 - b. Take reasonable steps to mitigate the impact of its actions with regard to the development, operation and management of its assets.
3. VRA will thus pursue the following specific objectives:
 - a. Develop and implement Environmental Management Systems for all its business units to:
 - i. Assess environmental impacts of processes, operations and products.
 - ii. Focus on pollution prevention and waste reduction.
 - iii. Ensure compliance with national/international environmental protection regulations.
 - iv. Set annual environmental targets to ensure continuous improvements.
 - v. Monitor and report on environmental performance as required to the appropriate stakeholders.
 - b. Ensure minimum environmental impact of VRA's projects and take adequate steps to mitigate any such anticipated adverse impacts.
 - c. Promote environmental awareness and individual sense of responsibility among its employees and provide adequate empowerment and training for personnel to perform environmental jobs satisfactorily.
 - d. Support research efforts on materials, products, processes and pollution reduction techniques that are directly related to its operations.
 - e. Contribute to the development of public policy and programmes that enhance environmental awareness and protection.
 - f. Promote open communication on environmental issues.
 - g. Undertake projects and programmes in collaboration with relevant agencies to preserve the Volta Lake resource, and reasonably restore/mitigate ecological imbalance caused by the creation of the lake.
 - h. Undertake projects and programmes to mitigate the impact on the livelihood of individuals and communities displaced or affected by VRA's developmental projects.
4. Each employee of VRA is charged to exercise his or her responsibility on behalf of VRA to that the intentions of this Policy Statement are diligently carried out.

SIGNED:.....

E. O. Osei
CHIEF EXECUTIVE

DATE: July 21, 2005

LIST OF ABBREVIATIONS

ACSR	-	Aluminium Conductor Steel Reinforced
AER	-	Annual Environmental Report
ANSI	-	American National Standards Institute
BOD	-	Biological oxygen demand
CHRAJ	-	Commission for Human Rights and Administrative Justice
CTB	-	Coastal Transmission Project
DCEs	-	Deputy Chief Executives
DO	-	Dissolved Oxygen
ECOWAS	-	Economic Community of West Africa States
EA	-	Environmental Assessment
EIA	-	Environmental Impact Assessment
EIS	-	Environmental Impact Statement
EMF	-	Electro-Magnetic Fields
EMP	-	Environmental Management Plan
EPA	-	Environmental Protection Agency
ESD	-	Engineering Services Department
ESIA	-	Environmental and Social Impact Assessment
ESMP	-	Environmental and Social Management Plan
E&SD	-	Environment & Sustainable Development
FSD	-	Forest Services Division
GRIDCo	-	Ghana Grid Company Limited
HSD	-	Health Services Department
ICNIRP	-	International Commission on Non Ionizing Radiation Protection
LCA	-	Life Cycle Analysis
LI	-	Legislative Instrument
LVD	-	Lands Valuation Division
MDGs	-	Millennium Development Goals
MSDS	-	Material Data Safety Sheet
MOU	-	Memorandum of Understanding
NED	-	Northern Electricity Department
NEDCO	-	Northern Electricity Distribution Company
NRPB	-	National Radiological Protection Board
OIC	-	Officer in Charge
OSHEM	-	Occupational Safety, Health & Environmental Management
PAPs	-	Project-Affected Persons
PCBs	-	Polychlorobiphenyls
PEC	-	Project Environmental Coordinator
PIU	-	Project Implementation Unit
PPE	-	Personal Protective Equipment
RAP	-	Resettlement Action Plan
RE&SD	-	Real Estates & Security Department
RoW	-	Right-of -Way
STDs	-	Sexually Transmitted Diseases
TSD	-	Technical Services Department
TxD	-	Transmission Systems Department
VRA	-	Volta River Authority
WAPP	-	West Africa Power Pool
WHO	-	World Health Organisation

EXECUTIVE SUMMARY

1.0 INTRODUCTION

To address the constraint of lack of access to electricity, the Authority of Heads of States and Governments of Member States of the Economic Community of West Africa States (ECOWAS) authorized the establishment of the West African Power Pool (WAPP) Secretariat. The WAPP Secretariat is expected to provide a mechanism and the institutional framework for integrating the power systems of the ECOWAS Member States by providing reliable and sustainable electricity supply for the economic development of the sub-region.

It is within this framework that the WAPP Secretariat, and the national energy utilities of Ghana and Burkina Faso, (Volta River Authority {VRA} and the Societies National d'Electricité du Burkina {SONABEL}) is undertaking a project that will comprise the construction of a 206-kilometre long, 225 kV transmission line from Bolgatanga in the Upper East Region of Ghana to Ouagadougou in Burkina Faso to transmit high-tension electric power from Ghana to Burkina Faso. The project known as the “225kV Bolgatanga-Ouagadougou Interconnection Project” is expected to facilitate the availability of electric power to Burkina Faso from Ghana and enhance the establishment of a regional energy market in West Africa.

It is an offence in Ghana under the Environmental Assessment Regulations LI 1652 of 1999 to start such a project without an Environmental Permit. Thus in order to ensure adherence to the LI 1652 as well as environmental requirements of international funding agencies of the project, the WAPP Secretariat on behalf of VRA and SONABEL procured the services of CabIRA-INGEMA Consultancy to undertake an Environmental and Social Impact Assessment study and also prepare the Environmental and Social Management Plan (ESMP) for the proposed 225kV Bolgatanga-Ouagadougou Interconnection Project. This ESMP has therefore been prepared in compliance with this contractual agreement and follows the format of the Ghana Environmental Protection Agency (EPA) for preparing ESMPs. It provides basic guidelines, policies, and procedures which shall be used in establishing, administrating, and maintaining the environmental program as may be required by VRA and the other relevant parties.

The purpose of the ESMP is to:

- Meet specific environmental legislative requirement (s) and compliance with the funding agencies requirements.
- Ensure systematic management of environmental impacts during project construction.
- Create awareness among all employees on environmental management.

- Ensure continuous improvement of environmental performance for consideration in EPA's annual Continuous Environmental Improvement (CEI) award.

VRA as its contribution to efforts at assisting in managing the environment has developed corporate policies on Environment, Safety and Health to ensure incorporation of Occupational Safety, Health and Environmental Management (OSHEM) issues in its operations. Consequently, VRA has adopted the policy objective of conducting its operations in such a way and manner that the safety, health and welfare of its workers and the integrity of the environment will be safeguarded at all times. These policies are without prejudice to all other existing regulations. Thus, with regard to safety, health and welfare, VRA shall carefully coordinate its activities with the Environmental Protection Agency, Department of Factories Inspectorate and the National Labour Commission in accordance with the EPA Act 490, Factories, Offices and Shops Act, 1970 (Act 328) and Labour Act, 2003 (Act 651). The ESMP has also been prepared taking into considerations guidelines of the World Bank Pollution Prevention and Abatement Handbook 1998. The guidelines are designed to protect human health, reduce mass loadings to the environment, and draw on commercially proven technologies among others.

2.0 PROJECT IMPACTS

The "225kV Bolgatanga-Ouagadougou Interconnection Project" comprise of the construction of approximately 210 km of 225 kV transmission line, Extension of the 161 kV substation in Bolgatanga (Ghana) and Construction of one (1) new 225/161 kV substation in Zagatouli (Burkina Faso). The project corridor in Ghana lies between latitude 10° 45' to 11° 45' N and longitude 1° 7' 30" W to 0° 52' 30" E and is about 39 km long. The power line route in Ghana follows existing roads and tracks wherever practical. The line will commence from the VRA Bolgatanga substation in Zorbisi in the Bolgatanga Municipality, and travel northwest through Sorkabisi, Yikene and Sumbrungu. Between Yikene and Sumbrungu, the line will traverse a tributary of the Yarogatouga River. It continues in the north-western direction till Doba, when it turns in a direct north course, passing by Nayagenia. It again heads in a north-western direction in the Kassena – Nankana District towards Zenga and Paga to exit Ghana near Goiree close to the Ghana – Burkina Faso border in the newly established Kassena - Nankana West District.

The major pre-construction activities anticipated in the construction of the proposed transmission line network that requires mitigation includes the acquisition of the right-of-way (RoW) and the clearing of the right-of-way of vegetation and other physical structures that would conflict with the intended use of the right-of-way (RoW). The acquisition of the RoW and line route survey will have some potential effects on land ownership, land-use characteristics, flora and fauna within the project environment, however, on a very minimal basis.

A summary of key impacts for the various phases of project activities are as below:

Phase of project	Potential significant issues for Considerations
Pre-constructional	<ul style="list-style-type: none"> - Resettlement and compensation - Socio-economic and local community impacts
Construction phase	<ul style="list-style-type: none"> - Resettlement and compensation - Socio-economic and local community impacts - Traffic and transport - Soils - Public and occupational health and safety - Noise - Air quality - Waste - Water quality and resources
Operation phase	<ul style="list-style-type: none"> - Socio-economic and local community impacts - Land use - Public and occupational health and safety - Landscape and visual Impact
Decommissioning phase	<ul style="list-style-type: none"> - Traffic and transport - Air quality and noise - Public and occupational health and safety - Wastes

3.0 KEY PERFORMANCE INDICATORS (KPIs)

In October 2009, a property enumeration and valuation procedure was employed in valuing all affected properties, using the Land Valuation Division rates as reference point. Eighty seven (87) housing units and a hundred and thirty nine (139) economic trees were identified to fall within the approved line route. Their respective owners have been identified and consulted with regard to whether they would want their properties replaced or would want monetary compensation. Presently, a total of eight hundred and twenty six thousand, two hundred and forty three Ghana Cedis, eighty pesewas (GHC 826,243.80) have been determined as compensation to be paid for affected properties.

Following this, a detailed RAP has been prepared in line with the World Bank's Operational Directive on Involuntary Resettlement (OP 4.12). Prompt, adequate and fair compensation will be paid to all project-affected persons before the commencement of constructional activities. The key standard to be met is to *'assist the affected people in their efforts to improve their former living standards, income earning capacity and, production level, or at least to restore them'*. Grievance resolution procedures have been put in place with the sole objective of minimising disputes that may arise in relation to the compensation payments. In view of the time lapse between when these valuations were done (October 2009), it may be necessary for these values to be reviewed accordingly. Other activities that will also need to be factored into the budget would include constructional damage, probable cost of destruction to crops during

construction phase, contingency costs, and pacification rites for family shrines and idols that may need to be relocated.

The constructional phase of the project involves activities that have the potential to impact significantly on the physical, biological and socio-cultural/socio-economic environments within the project's area of environmental influence. An Environmental Management and Monitoring Program shall be implemented by VRA for the constructional phase. The main issues in the program shall include relevant environmental control standards involving a collation of the control limits against which results from the monitoring programmes should be judged. It shall also include a required programme for the monitoring of releases to the environment at source and also for pollutant concentrations in the surrounding areas in terms of parameters to be monitored, sampling points and frequencies of measurements, as well as methods for sampling and analysis.

Construction crew near noisy machinery and power tools will be provided with earmuffs to protect them from hearing loss damage. Maintenance practices and engineering controls shall be practiced to reduce noise levels. Wind pick up of dust from exposed unprotected land surfaces will be minimized by limiting land clearance to minimum area requirements for the constructional activities. VRA will ensure that all exposed surfaces, access road and working areas, are sprayed with water by water browsers as part of regular construction activities. Furthermore, trucks that supply sand, gravel and stone aggregates will have their buckets properly covered with tarpaulin during transit to prevent wind pick-up of dust, spill of materials and the release of dust into the atmosphere.

VRA will apply erosion control practices such as re-grading, compaction and early re-vegetation to promote soil conservation. The transportation of heavy plant and equipment through settlements will be done in a manner not to jeopardise the safety of the local people. Equipment and materials will be properly secured when being transported to prevent them from falling and posing potential danger to people. Legally mandated speed limits on the roads and highways shall be strictly observed in all settlements. Adequate warning will be given to ensure that public safety is not compromised during this activity. In line with existing practice, the towers have be clearly marked with a red inscription on white background - "DANGER – 225,000 Volts" to warn off trespassers and prevent them from exposing themselves to the potential dangers of electrocution. Periodic community awareness training must be given to the workforce regarding Sexually Transmitted Diseases (STDs) and traffic safety regulations.

Construction workers will be closely supervised to ensure that only the minimum area requirements for access trucks, tower corridor track and tower base areas are cleared of vegetation to minimize potential impacts on flora and fauna. Optical impairment of the landscape by the presence of the transmission towers, lines and the substation is unavoidable and could be regarded as a residual impact. The galvanised towers tone down after two to five years of operation to a dark grey colour. In addition, the line route was selected such that the lines blend

with the natural landscape and mostly away from settlements. The 'glare effect' will therefore be minimal and unnoticeable.

VRA will not employ herbicides/weedicides for weed control or vegetation clearing hence any potential pollution from this source is eliminated. The project shall ensure coordination with the road agency to minimise interference between installation and operation following guidelines of the "*Road Reservation Management: Manual for Coordination*" (June 2001). VRA shall ensure that Contractor do not establish work camps close to any water body to avoid water pollution problems. The camp will also be established at least 500m from the closest settlement to minimize noise impacts on the community. VRA will also ensure that employees from the local communities are not accommodated at the camp. Mobile toilet facilities will be provided at the work camp to avoid the pollution of the environment with human waste. The holding tanks of the mobile toilets will be emptied as and when required for disposal at appropriate sites.

During maintenance of construction machinery/equipment and vehicles care will be taken to avoid accidental oil spills, which could lead to soil contamination. Accidental spillage of oil, fuel and paints will be avoided as much as possible. Any spilt materials will be quickly mopped up with rags and/or sawdust. The used sawdust and rags will be collected, put in polythene bags and disposed of at appropriate public waste dumping sites. Waste oil will be drained into impermeable sumps at the work camp for collection and disposal.

Metal wastes will be collected and sold as scrap to dealers who will in turn sell them for recycling. Other solid wastes such as damaged cables and conductors, rags, paper cartons and domestic wastes will be collected and disposed of at appropriate public waste dumping sites. The use of empty paint and oil containers for storage of water will be prohibited. Solid wastes in the form of trees, tree stumps and wooden containers will be gathered together and made available to the local communities as fuel wood. Metal wastes will be collected and disposed of appropriately and/or recycled. Solid wastes in the form of paper, food material, etc. shall be disposed of in dustbins that will be provided at the various work camps and offices. Waste management techniques shall be implemented to help keep a clean site and reduce environmental pollution.

In line with current international practice and the desire to ensure the sustainability of the environment, VRA avoids intruding into or interfering with cultural properties of the local communities as much as possible. Consultations with the Museums and Monuments Board have been carried out in connection with any historical or archaeological 'chance finds'. There were no archaeological chance finds during the construction stage. This notwithstanding, VRA has developed procedures derived from the National Museum Decree 1969, (NLCD 387), for finds regarding archaeological and cultural property.

VRA will ensure that contractors carries out the work in compliance with the relevant provisions of the Factories, Offices and Shops Act, 1970 Act 328) and the Contractor Safety Rules to minimize the potential occupational safety and health hazards and prevent or minimise

accidents. Emergency response plan shall be prepared to manage effectively a wide range of incidents that may occur at the project site. This includes emergency plans for fire, storm, chemical spills and road accident, and other emergency as identified which may affect the project. The protection of the environment shall be primarily dealt with in this plan. VRA shall also take all reasonable measures to prevent contamination of water air or land as a result of any incident, to reduce such contamination if it is unavoidable and to remediate any contamination that has occurred during the works. The Contractor is mandated to immediately report any significant incidents to the VRA Project Manager, who shall in turn inform the Director, Technical Services, responsible for safety issues in VRA.

4.0 ENVIRONMENTAL IMPROVEMENT MEASURES

Following the submission of the ESIA Report, the EPA shall issue an Environmental Permit to allow for the physical construction of transmission project to commence. The Permit shall outline various conditions that must be adhered to in project implementation. VRA shall comply with all project specifications, mitigations, monitoring and other environmental management provisions that would be indicated in the Environmental Permit. Management shall ensure that all conditions are strictly adhered to. The Environmental Officers for the project shall be directly responsible for implementing the conditions outlined in the permit.

A detailed environmental monitoring programme of the identified impacts is required for implementation of the project. Monitoring verifies the effectiveness of impact management, including the extent to which mitigation measures are successfully implemented. Monitoring specifically helps to:

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

An environmental monitoring programme has been designed as part of the strategies for the implementation of the provisions of this ESMP. The monitoring programme has been developed to determine impacts on the physical and biological and socio-economic/cultural environments within the project's area of influence, i.e. Right of way, constructional site, communities, nearby water bodies, substation, etc. It is essential that the basis for the choices, options and decisions made in formulating or designing the project and other environmental and social safeguard measures are verified for adequacy and appropriateness.

The programme will also serve as an early warning system by revealing unforeseen impacts and allowing additional corrective measures to be implemented to arrest the situation and ensure that irreversible damage is not caused. The programme is also expected to provide useful guidance for the successful planning and implementation of future power transmission line projects.

The monitoring results are expected to indicate whether the predictions of potential environmental impacts are accurate and also whether the mitigation measures proposed for the management of the impacts are appropriate and adequate. Data collected will serve the twin purpose of updating existing baseline information as well as checking compliance with the regulatory requirements of the Ghana Environmental Protection Agency (EPA). VRA as well as the Contractor/Consultants Environmental Team members must be trained adequately to understand and appreciate the choice of parameters, sampling sites, methods of sampling/measuring and analysis and frequency of monitoring.

The Environment & Sustainable Development Department (E&SDD) of VRA exercises general oversight over the environmental performance of projects and reports to the Chief Executive on compliance with all regulatory and statutory requirements. Environmental reporting to the Ghana EPA is required in accordance with permit requirements. Subsequently, monthly, quarterly and Annual Environmental Reports (AER) are to be submitted on the project. These reports must indicate the project's environmental performance, problems encountered in monitoring, and environmental improvement actions taken. All statutory environmental reports must be prepared by the Environmental Officer or any designated officer and be submitted through the Director, Environment & Sustainable Development for review and onward submission to the relevant agencies.

It must be noted that power transmission functions in Ghana is executed by a transmission utility company known as Ghana Grid Company Limited (GRIDCo). GRIDCo is responsible for the entire national power evacuation and transmission infrastructure that VRA had hitherto managed together with power generation and would be managing the operational and maintenance phase of the project. Thus, after the expected commissioning of the project, the management and supervisory function over the operations of the "225 kV Bolgatanga-Ouagadougou Interconnection Project – Ghana Section" will be the responsibility of GRIDCo. Consequently, GRIDCo will also become directly responsible for environmental and social reporting on the project to the EPA.

The physical construction of the line may take up to a year following which the line would be commissioned. Prior to the turnover of the project to GRIDCo, VRA may undertake an Environmental and Social Audit of "225 kV Bolgatanga-Ouagadougou Interconnection Project – Ghana Section" as may be agreed with the financiers of the project. Based on information in the Annual Environmental Reports as well as the Environmental and Social Audit (where relevant), VRA will have the responsibility to update the ESMP within eighteen months of the commencement of physical construction and extended to a new phase of 3 years in line with EPA requirements. The updated ESMP will provide suitable responses to all new and emerging issues within the stipulated time period. Details of arrangement with GRIDCo during the operational and maintenance phase shall be detailed out in the updated ESMP. The updated ESMP may be prepared with the support of external consultancy, if necessary. This updated ESMP shall be submitted to the EPA. The ESMP is to be revised on an on-going basis and this

should be an important element of the environmental management system review to be carried out each year.

5.0 POTENTIAL BENEFITS FROM ENVIRONMENTAL INVESTMENTS

It is generally known that implementing an ESMP helps in achieving cost savings and improving environmental performance. This is because implementing an ESMP helps identify, access and manage the environmental consequences of operations. The financial benefits of implementing an ESMP; flow not only to the company implementing it, but also to the public at large. Investment in implementing an ESMP for a project can help save money only if it is implemented in an effective and systematic manner with an emphasis on minimising releases into the atmosphere and waste and ensuring continual improvement.

It is thus important to note that this ESMP can positively assist VRA to demonstrate fully its environmental performance to the financial community, decreasing its cost of capital and enhancing its corporate value. This is because the EMP provides a practical management tool that can help the VRA gain various benefits. Some of the benefits include:

- Identification of opportunities to reduce waste and thus reduce raw material, utility and waste disposal costs.
- Increased profits.
- Lower insurance premiums as risks and liabilities are reduced.
- Reduced risk of fines for non-compliance with environmental legislation.
- More easily obtainable bank loans.
- Attracting shareholders and investors.
- Retaining site asset value.
- Helps in early detection of equipment malfunctioning.
- Improved process control.
- Reduced use of raw materials and consumables.
- Less waste and rejects.
- Improved products.
- Competitive advantage (preferred supplier status).
- Structured approach to environmental issues and continual improvement.
- Keeping ahead of environmental legislation.
- Better relations with regulators.
- Improved relations with local community and environmental groups.
- Improved public image.
- Improved working environment.
- Reduced potential for environmental incidents.
- Increased employee motivation and environmental awareness.
- Avoiding penalties for pollution.
- Conforming to legal requirements.

6.0 BUDGETARY ALLOCATION TO IMPLEMENT ENVIRONMENTAL PROGRAMMES

For purposes of achieving a very high level of compliance with regard to implementation of all environmental commitments, the VRA/Contractor shall make budgetary allocations towards all environmental programmes. Financial commitments shall be made on program-by-program basis. The coordination costs shall be included in the running cost of E&SDD. VRA will finance the environmental monitoring aspects of the transmission line project from the project implementation cost.

An amount of US \$216,300.00 has been estimated for environmental monitoring activities for the constructional phase of the project, i.e. within the 12 months period.

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COVER PAGE

Registered Name of Undertaking: 225 kV Bolgatanga – Quagadougou Interconnection Project
Type of Undertaking/Schedule No: 225 kV Bulk Power Transmission Line /
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Tel. No.: +233-30-2664941-9
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E-mail: desd@vra.com

Location of Undertaking

a) Plot/House No.: Not Applicable
b) Zoning Status: Not Applicable
c) Major Land Mark: Volta River Authority Bolgatanga Substation
d) District: Kassena-Nankana District, Kassena-Nankana West District, Bolgatanga Municipality.
e) Region: Upper East Region
f) Street/Area Name: Not Applicable
g) Town: Zorbisi, Sokabisi, Yikene, Sumbrungu, Kulbia, Anateem, Kandiga, Doba, Nayagnia, Pinyoro, Pungu, Nyangua, Tekuru Kizito, Baduno, Paga Zenga

MEMBERS OF PROJECT ENVIRONMENTAL TEAM

No.	Name	Designation	Agency
1	P. O. Kwakye	Director, Environment & Sustainable Development	Volta River Authority
2	Mr. Seth Asante	Director, Real Estates & Security	Volta River Authority
3	Mr. Bright Siayor	Manager, Projects	Volta River Authority
4	Mr. Ben A. Sackey	Environmental Officer (Monitoring & Compliance)	Volta River Authority
5	Mr. Fred Kyei-Dompreh	Environmental Officer (Acquisition & Compensation)	Volta River Authority
6	Ing. Francis Kyere	Project Manager	330kV West Africa Power Pool Coastal Transmission Backbone Project Unit
7	Mr. Vincent Okine	Design Manager	330kV West Africa Power Pool Coastal Transmission Backbone Project Unit
8	Mr. K. Owusu Afriye	Construction Manager	330kV West Africa Power Pool Coastal Transmission Backbone Project Unit
9	Ing. Nicholina Yembilah	Contracts / Procurement Manager	330kV West Africa Power Pool Coastal Transmission Backbone Project
10	Norbert Anku	Director, Engineering	Ghana Grid Company
11	Francis Atubrah	Environmental Consultant	Ghana Grid Company
12	Kwame Boadi	Environmental Officer	Ghana Grid Company
13	Mr. Charles Doh	Environmental Officer (Acquisition & Compensation)	Ghana Grid Company

1. INTRODUCTION

1.1 VOLTA RIVER AUTHORITY

The Volta River Authority (VRA) was established under the Volta River Development Act 1961 (Act 46) as a public-owned corporate utility. The primary functions of VRA include the generation of electric power, first by the development of the hydroelectric potential of the Volta River and the construction and operation of a transmission system for the supply of electrical energy for industrial, commercial and domestic use in Ghana.

In 2005, the Volta River Development Act, Act 46 of 1961 was amended by Volta River Development Act, Act 692, with the power transmission function of the VRA transferred to a transmission utility company known as Ghana Grid Company Limited (GRIDCo). GRIDCo is now responsible for the entire national power evacuation and transmission infrastructure that VRA had hitherto managed together with power generation.

Following the enactment of the Amended Act, VRA is undergoing a major restructuring in the context of the Ghana Government Power Sector Reforms. Currently, Northern Electricity Department (NED) of VRA has been made a subsidiary of VRA and is operating under the name Northern Electricity Distribution Company (NEDCO). NED was developed as an integral part of a larger scheme, designated the Northern Electrification & System Reinforcement Project to extend the national electricity grid to northern Ghana. Currently, NEDCO is the sole distributor of electricity in the Brong-Ahafo, Northern, Upper East, Upper West, and parts of Ashanti and Volta Regions of Ghana. NEDCO has a customer population of over 300,000 and a load demand of about 120MW.

1.2 RATIONALE OF PROJECT

The per capita consumption of, and the level of access to energy supply services are key indicators of socio-economic development of any country. One of the obstacles to achieving the Millennium Development Goals (MDGs) is the lack of access to energy services such as electricity. A major strategy identified by the Governments of Economic Community of West African States (ECOWAS) for increasing energy access is the interconnection of power systems and the encouragement of trans-boundary electricity supply. The objective is for countries that are better endowed in terms of electricity to provide the less endowed member states with access to cost-competitive energy.

To address the constraint of lack of access to electricity, ECOWAS, the Authority of Heads of States and Governments of Member States authorized the establishment of the West African Power Pool (WAPP). The WAPP is expected to

provide a mechanism and the institutional framework for integrating the power systems of the ECOWAS Member States by providing reliable and sustainable electricity supply for the economic development of the sub-region.

It is within this framework that the WAPP Secretariat, and the national energy utilities of Ghana and Burkina Faso, (Volta River Authority, VRA and the Societies National d'Electricité du Burkina (SONABEL) is undertaking a project that will comprise the construction of a 206-kilometre long, 225 kV transmission line from Bolgatanga in the Upper East Region of Ghana to Ouagadougou in Burkina Faso to transmit high-tension electric power from Ghana to Burkina Faso. The project is expected to facilitate the availability of electric power to Burkina Faso from Ghana and enhance the establishment of a regional energy market in West Africa.

1.3 SCOPE & PURPOSE OF ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Under the provisions of the Ghana Environmental Assessment Regulations, 1999, LI 1652, the construction of power transmission lines is categorized under environmentally critical projects for which an Environmental Impact Assessment (EIA) is mandatory. It is therefore a legal requirement in Ghana that development projects such as the proposed 225kV Bolgatanga-Ouagadougou Interconnection Project should be subjected to an EIA. Again, the World Bank Operational Policy (OP 4.01) for Environmental Assessment for screening projects identifies this project as a Category A Project.

In order to ensure adherence to the international funding requirements as well as the LI 1652 of Ghana, the WAPP Secretariat on behalf of the power utility companies in the West African sub-region procured the services of joint-venture led by CabIRA to undertake an Environmental and Social Impact Assessment study for the proposed 225kV Bolgatanga-Ouagadougou Interconnection Project. In addition, the firm is to prepare the Project's Environmental and Social Management Plan (ESMP) as well as the Property Impact Report / Resettlement Action Plan (RAP).

The Final Report for the Environmental and Social Impact Assessment (ESIA), dated August 2010, was submitted to the Ghana Environmental Protection Agency in October 2010. This is to form the basis for the issuance of an Environmental Approval/Permit by the Ghana EPA for the implementation of the proposed project. LI 1652 requires that an Environmental Management Plan (EMP) in respect of projects is to be submitted to the EPA within eighteen (18) months of commencement of operation. This Environmental and Social Management Plan (ESMP) has been lifted from the ESIA Report and has been expounded to guide the implementation of the project at the commencement stage. This ESMP has therefore been prepared in line with the Ghana EPA format for preparing such reports and provides information on the following:

- Corporate Policy on Environment, Health & Safety
- Impacts of the Project on the Environment
- Current Environmental Management Practices & Impact Assessment
- Environmental Action Plan (EAP)
- Occupational Health And Safety Action Plan
- Emergency Preparedness And Response Plan/Contingency Plan
- Programme to Meet Environmental Requirements
- Cost/Benefits of Implementation Of Environmental Management Plan

The objective of the EMP is to establish and provide basic guidelines, policies, and procedures which shall be used in establishing, administering, and maintaining the environmental program as may be required by the Employer and the other relevant parts. The ESMP provides a summary of activities, their related potential impacts and the corresponding recommended mitigation to be carried out during the pre-construction, construction, operational and maintenance phases of the project. It details out active remedial and mitigative measures to be continuously carried out to prevent or minimize impacts on the physical, biological and socio-economic/socio-cultural environments as well as to promote occupational safety and health of employees. It also seeks to identify the various institutional responsibilities to manage the environmental aspect of the project as well as the cost involved.

The EMP has taken into consideration the guidelines provided in the ISO 14000, which deals with Quality Standards associated with the management of the environment and the World Bank Operational Policy (OP4.01) for Category “A” projects.

VRA will mainly implement this ESMP for the construction phase and update it accordingly for submission to the EPA by the eighteenth month of project commencement. The updated ESMP will also provide suitable responses to all new and emerging issues within the stipulated time period. Details of arrangement with GRIDCO during the operational and maintenance phase shall be detailed out in the updated ESMP.

1.4 TYPE OF INDUSTRY

The transmission line project falls under the power industry and shall comprise of the following:

- a) Construction of approximately 39.3 km of 225 kV transmission line,
- b) Extension of the 161 kV substation in Bolgatanga (Ghana)
- c) Construction of one (1) new 225/161 kV substation in Zagtouli (Burkina Faso).

Activities under project are in three (3) phases as follows:

- a) **Pre-construction Phase:** The pre-construction phase activities include line route selection and the acquisition of the right-of-way, compensation and resettlement of project-affected persons, and tower spotting.
- b) **Construction phase:** Activities at this phase would involve clearing of vegetation to various levels according to VRA specifications, excavations and construction of tower foundations and the tower superstructures, line stringing and construction works at the sub-station terminuses.
- c) **Operational and maintenance phases:** At this. When the line is constructed, tested and commissioned, operational activities would include line maintenance comprising maintenance of the evacuation infrastructure as well as of the right-of-way and activities at the substations.

1.5 EMPLOYEE LEVEL

The Corporate structure of the VRA consists of a Chief Executive as well as three (3) Deputy Chief Executives (DCEs). The DCEs are responsible for managing the four corporate branches, namely the Engineering & Operations Branch, Finance Branch, Services Branch and the Emerging Subsidiaries. The corporate branches have various departments under it which are headed by Directors. The total number of staff in VRA is over three thousand (3,000) and consists of personnel of various professions as well as non-professional staff and labourers.

VRA has established the 330 kV WAPP Coastal Transmission Backbone (CTB) Project Unit which is mandated with overall management responsibility of the West African Power Pool projects in Ghana. This Unit is to carry out due diligence and efficiently manage the project in conformity with sound engineering, financial, administrative and public utility practices. With the establishment of GRIDCo, the 330 kV WAPP CTB Project Unit reports to VRA as well as GRIDCo in line with funding agencies requirements.

Supervision of project construction of the project will be done mainly by the 330kV WAPP CTB Unit, headed by the Project Manager. The Project Manager is supported by the Design Manager, Construction Manager and Contract/Procurements Manager. However, following its construction and commissioning, GRIDCo shall be directly responsible for the operational and maintenance phase of the transmission system project. VRA shall assist as relevant.

There are auxiliary employees from other departments in VRA that provide technical support towards effective project implementation. This includes the Environment & Sustainable Development, Engineering Services, Technical Services, Health Services and Real Estates & Security, etc.

1.6 SITE AND EXTERNAL NEIGHBOURHOOD/COMMUNITY ENVIRONMENT

The length of the Ghana side of the transmission line is approximately 39.3 km, out of the entire project distance of about 210.1 km. The project corridor lies between latitude 10° 45' to 11° 45' N and longitude 1° 7' "30" W to 0° 52' "30" E.

The power line route will follow existing roads and tracks wherever practical. The line will commence from the VRA Bolgatanga substation in Zorbisi in the Bolgatanga Municipality, and travel northwest through Sorkabisi, Yikene and Sumbrungu. Between Yikene and Sumbrungu, the line will traverse a tributary of the Yarogatouga River. It continues in the north-western direction till Doba, when it turns in a direct north course, passing by Nayagenia. It again heads in a north-western direction in the Kassena – Nankana District towards Zenga and Paga to exit Ghana near Goiree close to the Ghana – Burkina Faso border in the newly established Kassena - Nankana West District.

A review of the line route following consultations with the Ghana Civil Aviation Authority has ensured that the line passes about 1 kilometre clear of the proposed civil airport at Anateem. For the most part, the line runs parallel and close to the Bolgatanga–Navrongo road and the existing high voltage (HV) Bolgatanga – Navrongo transmission line, until just after Doba (A28N), where it parts in a direct north path. It moves slightly westward toward the Navrongo-Dakola road as it approaches the Ghana-Burkina Faso Border.

1.7 METHODS OF DISPOSAL OF HAZARDOUS WASTE AND OBSOLETE CHEMICALS

The following types of waste which may be available are considered as hazardous: petroleum products, septic wastes, paints, stains, wood preservatives, pesticides, acids, solvents, motor oil, lubricants, hydraulic fluid, detergents, batteries, glues, acetylene, cement, mastics/adhesives, medical wastes, etc. Hazardous wastes shall be collected, stored and disposed of using practices, which prevent contact with surface runoff or leakage into soil and surface water.

There may be additional wastes on the project site which are considered as hazardous and it is also possible that non-hazardous waste could come into contact with these hazardous wastes, such that they become contaminated and are therefore also considered hazardous waste. In the event that any of these chemicals expire and become obsolete, the VRA is required to submit Material Safety Data Sheet (MSDS) to the Chemical Control Management Centre (CCMC) of EPA Head Office, Accra for advice on disposal methods for the particular chemical.

Available options for disposal of obsolete chemicals include the following:

- a) Possible re-use by any industry,

- b) Burying at specific locations sites lined with High Density Polyethylene (HDPE),
- c) Manual collection for offsite disposal at waste disposal (landfill) site, and

1.8 MANAGEMENT COMMITMENT TO ADDRESS THE SIGNIFICANT ISSUES

VRA Management is committed to the carrying out of all mitigation measures proposed for the significant environmental issues raised in the project's EIS and the ESMP. Resources required shall be provided through annual budget for the project to address the various recommendations proposed for remediation of the various environmental problems identified.

2. POLICY ON ENVIRONMENT, HEALTH AND SAFETY

2.1 INSTITUTIONAL LEGAL FRAMEWORK

The VRA is committed to providing exemplary levels of care and safety for the employees on projects, the local populations and the environment in general. Subsequently, VRA has adopted the policy objective of conducting its operations in such a way and manner that the safety, health and welfare of its workers and the integrity of the environment will be safeguarded at all times. In view of this, VRA as its contribution to efforts at assisting in managing the environment has prepared corporate policies on Environment, Safety and Health to ensure incorporation of occupational safety, health and environmental management (OSHEM) issues in its operations.

As a result of this Policy and in order to carry out its obligations under the Environmental Assessment Regulations Agency LI 1652, VRA has prepared an “Environmental & Social Management Framework” document outlining how the Ghanaian Environmental Assessment Regulations is followed during construction and operations of bulk transmission projects. VRA has again prepared a “Land Acquisition & Resettlement Policy Framework” document establishing broad principles, organizational arrangements and fair criteria to be applied in acquiring various interests in land and handling the attendant impacts on property affected persons.

Currently also, VRA has a ‘Memorandum of Understanding’ (MOU) with Forest Services Division (FSD) and this provides guidelines for effective collaboration and management of electric power related activities in national forest reserves.

These policies are without prejudice to all other existing regulations. Thus, with regard to safety, health and welfare, VRA shall carefully coordinate its activities with the Environmental Protection Agency, Department of Factories Inspectorate and the National Labour Commission in accordance with the EPA Act 490, Factories, Offices and Shops Act, 1970 (Act 328) and Labour Act, 2003 (Act 651).

2.2 VRA CORPORATE ENVIRONMENTAL POLICY STATEMENT¹

The VRA Corporate Environmental Policy Statement commits the organisation to ensuring continuous improvement of environmental performance to minimize the impacts of all its operations on the environment, in line with the principles of sustainable development, in addition to complying with national and international environmental protection regulations. The VRA Corporate Environmental Policy is attached as part of the cover page of this document. The policy objectives and targets are outlined in the policy statement.

¹ See Cover Page

2.3 ENVIRONMENTAL LEGAL & REGULATORY REQUIREMENTS

The relevant policies and regulatory framework that must be considered for the successful implementation of the project have been gathered and reviewed as part of the ESIA Study and summarised in this ESMP. All relevant national laws, policies, regulations, guidelines and standards that may apply to the transmission line project will be applied as required.

The broad mandate for environmental protection and over-arching resources and sustainable development fall under the Environmental Protection Agency (EPA) as the lead regulator. The adoption of the National Environmental Action Plan led to the enactment of the EPA Act 490 (1994) which for the first time gave legal support to Environmental Assessment (EA) implementation in Ghana, after almost fifteen years of experimentation. The passing of the Ghana EIA Procedures into the EA Regulations (LI 1652, 1999) further consolidated EA application in Ghana.

Once the transmission line route is established, the area of land lying within the Row will be subject to the provisions of the 1992 Constitution and the Lands Statutory Way leaves Act, (1963) Act 186. NLCD 387 provides for the care of any archaeological finds. This is the law governing the activities and operations of the National Museums and Monuments Board. Procedures to be followed on the discovery of any such artefacts are outlined in NLCD 387.

Act 541 established the Energy Commission and provided for its functions relating to the regulation, management, development and utilisation of energy resources in Ghana; provide for the granting of licences for the transmission, wholesale supply, distribution and sale of electricity and natural gas; refining, storage, bulk distribution, marketing and sale of petroleum products and to provide for related matters. The provisions of the Energy Commission's 'PUBLIC NOTICE – EC N. 003' require VRA to register the project with the Commission and to obtain a permit prior to the commencement of construction of the proposed project. This permit is subject to the granting of an environmental permit by the EPA. A "Licensing Manual for Service Providers in the Electricity Supply Industry" was developed and issued by the Energy Commission of Ghana in 1996 to formally establish the framework for licensing electricity production, supply, and distribution and sale services in the power sector of Ghana as stipulated by the Energy Commission Act (Act 541), 1997.

The project is also being done under the framework of the World Bank's Operational Directive, in order to ensure compliance with current international best practice. The World Bank screens projects based in their possible environmental impacts, in order to classify them as "A", "B" or "C". A transmission system development project is normally classified as a Category "A" project, owing to the potentially significant adverse environmental and social impacts, and this triggers a full environmental assessment. Detailed advice and guidance on the conduct of

environmental assessment is provided publicly by the World Bank in its Environmental Assessment Sourcebook².

During project preparation, the World Bank examines the implications of the proposed project for a series of 'safeguard' policies. These are:

- Environmental Assessment (OP 4.01);
- Natural Habitats (OP 4.04);
- Forestry (OP 4.36);
- Pest Management;
- Cultural Property (OP 4.11);
- Indigenous Peoples; (OP 4.20);
- Involuntary Resettlement (OP 4.12);
- Safety of Dams; (OP 4.37);
- Projects in International Waters; (OP 7.50).

2.4 CORPORATE HEALTH & SAFETY POLICY

2.4.1 VRA Corporate Safety Policy

VRA Safety Policy commits the organization to make safety a primary concern throughout the organization in its activities in its operations. It also seeks to achieve an acceptable standard of safety for its employees by effectively managing all risks resulting from or associated with its activities and operations. The VRA Safety Policy assures that measures shall be taken to secure and maintain compliance with all relevant legislation on environmental protection and safety, health and welfare of all its employees.

Safety Rules, Protection Code & Safe Working Practice documents have subsequently been prepared to inform, educate and ensure adherence. The VRA's Safety Rules provides information on major safety areas as follows:

- General safety rules for workers engaged in construction, operation or maintenance work;
- Safety guidelines related to the use of tools and equipment;
- Safety procedures associated with the transportation and of personnel and materials;
- Safety procedures in relation to Forestry work;
- Safety procedures relating to Transmission line work;
- Safety procedures for materials handling, storage and disposal.

2.4.2 VRA Corporate Health Policy

The VRA Corporate Health Policy statement commits that the organization shall establish and maintain health standards, facilities and services to promote and

² <http://lnweb18.worldbank.org/ESSD/envext.nsf/47ByDocName/ToolsEnvironmentalAssessmentSourcebookandUpdates>

safeguard the health, well-being and safety of the organization’s employees, their families and dependants as well as others who may be affected by its operations.

VRA has developed a “Workplace HIV/AIDS Policy” to serve as a guide to both employees and Management in their endeavours to mitigate the impact of HIV/AIDS in both VRA and its business environment and work locations.

2.5 SAFETY & SAFETY LEGAL AND REGULATORY REQUIREMENTS

The various health and safety legislations and regulatory requirement that are to be adhered to in the implementation of this ESMP are:

- a) Factories, Offices and Shops Act (1970) Act 328 which promotes and ensures the health, welfare and safety of persons employed in the country as well as the responsibilities of the employer. Under the Act, employers are required to ensure that a safe and healthy workplace is provided for the safety, health and welfare of all employees.
- b) Labour Act No (2003) Act 651 which among others provides for occupational health and safety.
- c) VRA (Transmission Line Protection) Regulations, (1967) LI 542 which provide security for VRA Transmission Lines and ensure public safety. Define “transmission line right of way” and prohibit/restrict a number of activities in the RoW including farming, cultivation, mining and construction of buildings, which are only allowed with prior consent from the VRA.
- d) Fire Precaution (Premises) Regulations, 2003, LI 1724, which among other requirements requires that adequate measures are taken to eradicate potential sources of fire outbreaks and that a fire certificate be acquired for any project or facility.
- e) Limits for electric and magnetic fields have been published by a number of authorities including the World Health Organisation (WHO), the International Commission on Non Ionizing Radiation Protection (ICNIRP) and the National Radiological Protection Board (NRPB). The two most frequently used guidelines are those produced by ICNIRP (supported by the WHO) and the NRPB. These limits are detailed in Table 1.

Table 1: NRPB and ICNIRP Guidelines

	NRPB		ICNIRP	
	Electric (kV/m)	Magnetic (μ T)	Electric (kV/m)	Magnetic (μ T)
Public	12	1600	5	100
Occupational	12	1600	10	500

Electro-Magnetic Fields (EMF) can be produced wherever there is a voltage or a flow of electricity, and occur both naturally and as a result of man-made products, including transmission lines. In recent years there has been much debate on the potential human health effects of EMFs, in particular in relation to electromagnetic forces generated by transmission lines. However, major research programmes throughout the world have not shown any proven causal link between ill health and EMFs.

The NRPB produced guidelines on restrictions on exposure to static and time-varying EMFs in 1993. Their recommendations are based on biological data relating to thresholds for well-established direct and indirect effects of acute exposure. These guidelines have been widely accepted in the United Kingdom. For both sets of guidelines, the recommendations to restrict exposure are based on the interactions of EMFs with body tissues and are termed basic restrictions. Compliance with the basic restrictions cannot, however, be generally determined directly. Investigation levels (NRPB)/ Reference levels (ICNIRP) are therefore recommended as values of measurable field quantities for assessing whether compliance with the basic restrictions has been achieved. The current advice from the NRPB is that, apart from standard safety clearances, no special precautions near to power lines are necessary to guard against EMFs. At the European Union level, a Council Recommendation to limit the exposure of the general public to electromagnetic fields was adopted in July 1999, based on the guidelines of the International Commission on Non Ionizing Radiation Protection.

3. POTENTIAL IMPACTS IDENTIFICATION

All possible potential impacts have been identified through a comprehensive impact identification process using matrix of impacts and activities outlined in the ESIA Report, dated August 2010. The matrix arrays project activities against environmental media, and supports a methodical, comprehensive, and objective identification of the impacts each project activity may have on each environmental, socioeconomic, and health and safety medium. All potential environmental and socioeconomic impacts of the proposed project were initially identified through this approach.

The main factors used in determining whether an impact may occur at each intersection between a project activity and a specific environmental medium include:

- Literature reviews (desk study);
- Field observations;
- Discussion with project proponent health, safety, and environment departmental officers and schedule officers;
- Consultations with local experts;
- Consultations with stakeholders;
- Experience from similar projects worldwide; and
- Professional judgment.

Table 2 sets out a summary of key impacts from project activities that have been identified based on the above.

Table 2: Summary of Key Impacts of Transmission Project

Phase of project	Potential significant issues for Considerations
Pre-constructional	<ul style="list-style-type: none"> - Resettlement and compensation - Socio-economic and local community impacts
Construction phase	<ul style="list-style-type: none"> - Resettlement and compensation - Socio-economic and local community impacts - Traffic and transport - Soils - Public and occupational health and safety - Noise - Air quality - Waste - Water quality and resources
Operation phase	<ul style="list-style-type: none"> - Socio-economic and local community impacts - Land use - Public and occupational health and safety - Landscape and visual Impact

Phase of project	Potential significant issues for Considerations
Decommissioning phase	General decommissioning activities: <ul style="list-style-type: none"> - Traffic and transport - Air quality and noise - Public and occupational health and safety - Wastes

This Chapter presents the various activities and related environmental and social impacts related to the transmission line system project. It is anticipated that the transmission line will be continuously maintained and repaired and will be operated for several decades. Towers may be upgraded based on cost/benefit analysis and the prevailing new technologies. Because of its long life span, the circumstances under which the transmission line might be ultimately decommissioned are difficult to foresee. There is therefore no decommissioning mitigation measure for the power line itself at this stage of the ESMP.

An environmentally-based process flow chart for the transmission line project is provided as Figure 1.

3.1 PRE-CONSTRUCTIONAL PHASE

Activities under the pre-construction phase are as follows:

- Project Feasibility Study
- Line route survey
- Consultations
- Valuation of Properties
- Acquisition of the land and transmission right-of-way (RoW)

Preconstruction activities are currently ongoing. Details of these activities are outlined below:

3.1.1 Project Activities at Pre-constructional Phase

3.1.1.1 Feasibility Studies

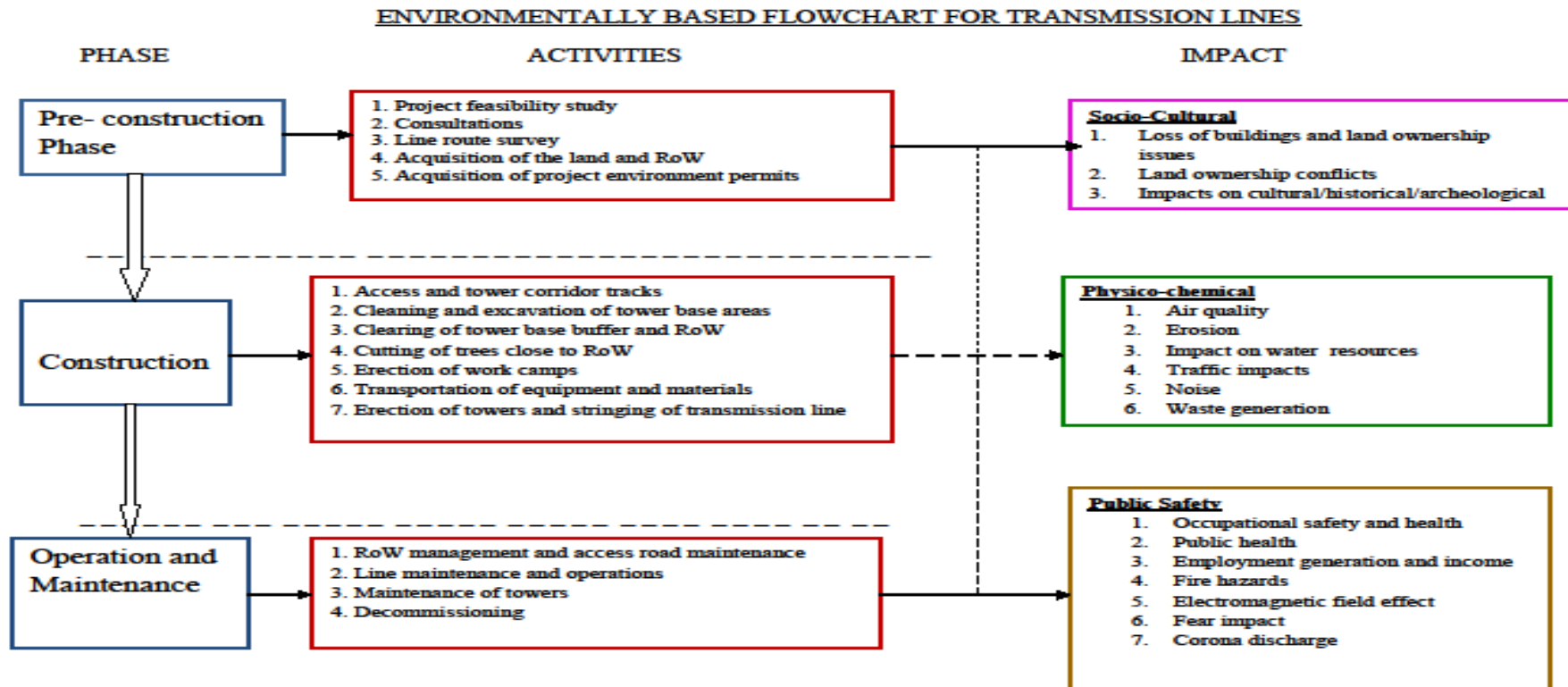
A feasibility study has been undertaken by a consultant, STUDI of Tunisia, to determine the transmission system requirements for the evacuation of power and evaluate the impact of the generation on the transmission system. In accordance with LI 1737, a 40 metre right of way (RoW) is required for the entire length of the proposed line, which will comprise a 20 metre corridor either side of the power line. There is an existing substation at Zorbisi belonging to the VRA, where space has been created to construct a bus bar for the proposed line.

3.1.1.2 Line Route Survey

Line route survey was carried out by survey consultants from the Consultancy joint venture led by CabIRA in 2009. In accordance with LI 1737, a 40 metre right of way (RoW) is required for the entire length of the proposed line, which will comprise a 20 metre corridor either side of the power line. The survey consultants carried out the survey of routes, established land profiles and selected the best route from several different options taking several factors into consideration. Some of the factors taken into consideration in the choice of the proposed line route included the overall route distance and the avoidance of the potential destruction of properties and other environmentally sensitive areas by the alignment of the route off industrial, residential and commercial areas, cultural resources such as sacred groves, cemeteries, and other potentially sensitive areas. Various buildings and crops were identified within the right of way during the line surveying activity. The survey team subsequently had to re-align the route to as much as possible avoid these properties, especially the building and cash crops.

The line route has a RoW width of 40 metres, traversing some 39.3 km from the VRA substation to the Ghana-Burkina Faso border, from where it continues to the termination point at Zagtouli, near Ouagadougou in Burkina Faso. The total area of direct impact for land acquisition is about 1.572 km².

Figure 1: Environmentally Based Flow Chart for Transmission Line Projects



3.1.1.3 Consultations

The transmission line traverses thirteen communities in three administrative districts in the Upper East Region. The communities are Zorbisi, Sokabisi, Yikene, Sumbrungu and Anateem in the Bolgatanga Municipality, Pungu, Pinyoro, Doba, Nayagnia and Nyangua in the Kassena-Nankana East District and Zenga, Baduno and Nyania in the Kassena-Nankana District, all in the Upper East Region of Ghana.

Various community members, especially those whose properties are to be directly impacted were consulted during the line survey process. They were informed of the project and the compensation process involved. Following this, consultations were held with majority of the affected communities identified along the line route. This included traditional authorities, members and opinion leaders of the identified affected communities.

3.1.1.4 Acquisition of Right of Way

Once the route of the transmission line has been established, the land lying within the RoW will be subject to provisions of the Way leaves laws. The Volta River Authority (Transmission Line Protection) Regulations, 1967 LI 542 prohibits activities such as mining, construction of buildings, crops cultivation and farming in the RoW. Conventionally, farmers will be allowed to harvest any crops within areas to be acquired prior to the securing of the RoW. Acquisition of the RoW is yet to be effected.

3.1.1.5 Valuation of Properties

In March 2009, the Consultant completed a valuation of affected properties within the right-of-way in order to provide a provisional data of the compensation required. A provisional figure of GH¢826,243.80 was arrived at. The data provided would have to be validated prior to construction.

The mode of dealing with issues regarding involuntary resettlement for the project will be outlined in a detailed Resettlement Action Plan (RAP) to be prepared for the project and submitted as a separate document to the EPA.

3.1.2 Associated Impacts of Pre-construction Phase

Most of these activities are expected to have negligible impacts on the environment and will therefore require no mitigation measures. The major pre-construction activities anticipated in the construction of the proposed transmission line network at the pre-construction phase that requires mitigation includes the acquisition of the right-of-way (RoW) and the clearing of the right-of-way of vegetation and other physical structures that would conflict with the intended use of the RoW. The acquisition of the right-of-way (RoW) and line route survey will have some potential effects on land ownership, land-use characteristics, flora and fauna within the project environment, however, on a very minimal basis.

The major potential impacts are the Acquisition of the land and transmission right-of-way (RoW).

3.1.2.1 Loss of buildings and land ownership issues

The acquisition of the RoW and access tracks has the potential to adversely affect land ownership and land-use characteristics, as land will have to be acquired from some individuals, communities and/or stools. The land to be affected by the implementation of the proposed project has the following categories of land-uses:

- Agricultural lands
- Potential agricultural lands (or fallow agricultural lands)
- Residential lands (affecting buildings and residential plots)

3.1.2.2 Land Ownership/Conflict

Compulsory land acquisition (expropriation of property for the project) and demolishing of structures associated with transmission line developments can result in displacement of communities, loss of business, properties and incomes, social stress, social and psychological disruption for the affected individuals and families.

Disputes over compensation and resettlement measures may be raised by PAPs informally with local notables or VRA staff or, failing resolution at the informal community level, formally with the Commission for Human Rights and Administrative Justice (CHRAJ) and, ultimately, the courts. This will need to be properly managed through sensitization and information sharing.

3.2 CONSTRUCTIONAL PHASE

The actual period for physical construction of the line in Ghana shall not exceed 12 months. The labour force during the construction of the transmission line is the responsibility of the contractor. The contractor is likely, and will be encouraged by VRA, to use local sub-contractors and local people where skills permit for civil works, tower erection and transportation of equipment to the site.

On the basis of the current construction programme it is estimated that the project will require approximately 10 expatriate, 20 skilled Ghanaian staff and 70 employees from the local community, although there may be some overlap of staff between these teams. All non-local, Ghanaian staff will be accommodated within the Bolgatanga Township.

The types of transport and construction equipment that would typically be used during the construction phase (subject to availability) are detailed in Table 3.

Table 3: Construction Equipment

Equipment	Capacity/Rating
Personnel Carrier	Max 8 Seated
Car	4 Seated
Low Loader Lorry	10 tonnes axle weight
Mobile Crane	12 tonnes axle weight
Dumper Truck	1 - 3 tonnes
Excavator	0.25 - 1.5 cubic metres
Tractor (wheeled)	Up to 100 brake horse power
Trailers	Up to 35 tonnes laden
Winch	1 - 5 tonnes
Conductor Winch	4 - 12 tonnes

Construction will involve the following major activities, which are outlined below:

3.2. 1 Project Activities at Constructional Phase

3.2.1.1 Procurement and Manufacturing

The main equipment associated with the transmission line include Suspension towers, Small angle towers, End and large angle towers, Conductors (i.e. wires), Earth wire and Insulator chains. The contractor will be responsible for manufacturing and/or procuring the transmission line components. A major proportion of the transmission line components will be manufactured and procured outside of Ghana, e.g. tower steel and components, conductors and insulators, as they are not available for purchase in Ghana. Concrete and aggregates will be procured locally. Other local procurement will include foodstuffs and miscellaneous supplies and services. Materials and equipment will be stored at a secured site by the contractor.

3.2.1.2 Transportation of equipment to the site

The imported components will be delivered by ship to the Tema Port. After clearance from the port, the materials shall be stored at a designated storage site. These materials and equipment will be transported by road to the storage site. Materials and equipment procured locally or nationally will be transported directly to the storage site. It must be noted that the materials or the towers will not be bulky and unwieldy. They will therefore not require any specialised vehicles. During construction, the materials will be transported to the site via public roads and access tracks.

3.2.1.3 Route Clearance and Access

The construction and operation of the proposed line will require a right-of-way of approximately 20 metres on each side of the centre line of the transmission line. The right-of-way will therefore be of width of 40 metres. Based upon the results of the comprehensive land survey along the route of the proposed line, the RoW that is required to be cleared will be identified through the use of marker beacons. The total of 40 metres wide corridor, which will run the total length of the transmission line from the enclave, shall be cleared of vegetation to a height of about 1.25 metres above ground level.

Tower corridor access tracks of approximately 3.5m - 5m wide, i.e. sufficient width for construction and subsequent maintenance traffic, will be constructed almost continuously along the centreline of the line route. The tracks will be cleared of tree stumps, shrubs and other vegetation likely to obstruct the transport of construction machinery, equipment and operational and maintenance staff to the tower corridor. Further, trees considered being potentially capable of threatening the proposed transmission line beyond the 20 meters width will be cut down or pruned as appropriate. These will be trees, which could damage the transmission line if they fall on it or those whose branches may grow so big as to foul the lines. All vegetation clearance will be done by physical means.

The tracks when constructed are used for the transportation of men and material to the line route for the installation of towers and the stringing of the lines. It also ensures the safety of construction workers from hazards such as snake bites. Usually, agricultural access tracks are used to gain access to the proposed line. Wherever practicable existing tracks are to be used and all the tracks will be retained for the maintenance of the line during operations. Where there are no such tracks, access tracks are constructed from the closest public roads to the RoW at intervals along the proposed line route. The new access tracks, which will be constructed during the constructional phase, in addition to the tracks constructed during the line route survey will be retained and maintained for the operational phase. This measure will prevent the clearing of additional vegetation to make way for new access tracks for the operational phase.

The soil surface along the tower corridor access tracks will be graded to remove any vegetation and to provide a level surface. Any soils removed during grading will be spread along the roadside and allowed to naturally re-vegetate. It is anticipated that all access tracks formed will be permanent, being required for both the construction and operational stages. The roads will not be surfaced but maintained as graded tracks. Stream crossings shall be avoided where practical but in areas where this is required culverts will be installed to ensure free flow of the watercourses. All cut trees will be neatly stacked to one side of the proposed tracks for the use of, or sale by, the communities close to the site of clearance.

At this stage, clearance and relocation of buildings and structures will also be undertaken in accordance with the provisions agreed between the affected parties as outlined in the associated Resettlement Action Plan (RAP) that will be prepared by VRA, and in consultation with the appropriate local authorities.

3.2.1.4 Civil Works

Studies shall be done to determine the geology of the project area which is important to identify the tower sites. The specific sites (spots) for locating the individual towers will be finally determined based on various criteria including baseline information gathered during the ESIA Study. Generally, wherever possible the towers will be located at or near the summits of the uplands to maximize the clearance between the lines and the ground.

Tower spotting is the determination of the individual sites for the installation of the towers and this takes place over the whole length of the transmission line. Activities that go along with tower spotting will include final survey and soil investigation. These activities necessitate intrusive access and some clearing of vegetation, leading to possible destruction of crops. Geotechnical survey and tower spotting are therefore activities that shall be carried out subsequent to the issuance of an environmental permit and availability of funds from the lending agencies to identify the optimum foundation design for each tower.

The selection of the foundation design type will follow the collection and analysis of the data of each tower location after soil investigations. At this stage minor adjustments may be made to the final tower location, due to the vertical profile of the transmission line corridor, and to avoid buildings that may have been constructed subsequent to the collection of baseline data on structures in the proposed RoW. Such adjustments will be limited to a few metres in either direction. This activity is done during the construction phase and is therefore contingent upon the issuance of an environmental permit and the availability of funds.

The proposed tower base areas shall also be cleared of all vegetation. The extent of clearing and depth of excavation depends on the nature of the vegetation cover and the physical and chemical properties of the soil. These will be selected spots within the RoW for mounting the towers. The area to be cleared for a single tower will be made up of the dimensions of the tower base of 29 m². This total area to be cleared will not be in addition to the total area to be cleared for the RoW but will be within the RoW.

Tower foundations will vary according to the prevailing geology. A majority of them will however have footings of the pad and chimney type, which will be excavated mechanically. By this method, a concrete pad will be constructed at the bottom of the excavation, and each foot of the tower erected within its own 'chimney' of steel reinforced concrete using wood for shuttering. After about two days, the formwork

will be removed, and the excavation will then be backfilled to original ground level and consolidated.

The ground surfaces of the tower sites will be so graded as to gently provide drainage away from the tower legs and to avoid the collection of water (leading to the creation of stagnant pools) at the tower bases. Where necessary, (particularly on hillsides), terracing, cribbing or riprap may be used to provide protection for tower foundations. In areas prone to flooding (swampy areas) a raft foundation for transmission line towers may be used. The raft foundation is similar in concept to the pad and chimney foundation except all four feet of each tower will be set on a single raft of concrete.

Water will be required during construction of the foundations for the concrete. Water will be procured by the contractor for the construction period and is likely to be delivered by water tankers.

3.2.1.5 *Assembling of Towers*

The towers, which are manufactured abroad, are to be shipped to the Tema port from where the components of the towers will be transported by lorry to the lay down areas where project office sites are expected to be created. Angle towers are used at points where the local topography demands it. Suspension towers are used between angle towers. The towers will be assembled on site (approx. 1 day at one site).

3.2.1.6 *Tower Installation*

Economic studies has shown that towers should be spaced about 350 metre apart, subsequently if this is adhered to then a maximum of about 106 towers shall be required for the approximately 39.3 km span. The project shall utilise the conventional four legged freestanding towers of horizontal configuration. These conventional four-legged towers are known to have a life expectancy more than 30 years. Depending on the characteristics of the soil at the selected tower spot, a foundation depth of 2-3 meters concrete footing will be used. Once foundations have achieved their design strength, the next major task shall involve the assembly and erection of the tower structure. These works will be undertaken within the RoW to avoid any additional vegetation clearance. This commences with the delivery on site of the bundled steelwork members using a load-trailer and the full assemble conducted at the tower locations. Anti-climbing guards would be fitted and maintained at an early stage of erection.

The tangent towers will have an average height of 26 metres under cross arms and an average total height of 30 metres. The angle towers are necessary stronger and heavier, but will have a similar height. The height will vary from tower to tower and depends on the site topography. The tangent and angle towers will each take up an average ground area of 29 m². The height of the towers will be such as to

provide a minimum of 7.5–8 metres clearance between the lines and open ground and 8m clearance for roads.

Construction time for tower installation at each site will be short and will be erected using a crane (approx. 2 days at one site).

3.2.1.7 Stringing of Transmission Lines

The next stage of the process will be to install onto the tower structures the necessary insulators to support the conductors as well as the equipment necessary for running out and stringing the conductors. Once a full section of towers has been assembled, the lines will be strung. The total construction time at a tower is approximately 1 week.

The actual line will be equipped with Aluminium Conductor Steel Reinforced (ACSR) of 265 mm². The line is designed to always keep at least a 7.5m clearance between the cables and the ground. This distance is slightly superior to the norms in effect, so it guarantees an optimum safety. The line will be fitted with an optic fibre conductor which will be used for power system protection, control and communication purposes.

As much as possible, the conductors are to conform to GRIDCo's specification for high-tension transmission lines in order to cater for any future developments in the area. The installation equipment and conductor drums would be delivered to each number of pre-selected stages along the line route to allow for stringing using the winch and brake method. The stringing method to be used by the contractor will be subject to prior approval by VRA. In all cases where stringing will cross power lines, telephone lines, public roads etc, due notification to appropriate authorities will be given and the prescribed minimum clearances observed.

A pilot wire would initially be installed for each conductor and then used to draw through the conductor under constant tension so as to ensure that no contact is made with the ground. This would minimise both conductor damages as well as ground damage during installation. Any damage to the conductor during this process (particularly any contact with the ground) will impair the line function. Spacers would then be fitted between the pairs of conductors in each phase. When stringing across public roads, public safety (of persons, vehicles etc) is assured by the use of expandable aluminium scaffolds erected at both sides of the road. The wire is passed over the scaffolds to provide the necessary fixed, safe clearance from the road. Further protection is provided by the use of safety nets slung across the scaffolds beneath the line.

3.2.1.8 Testing & Commissioning

The contractor will be responsible for functional testing and commissioning of the new switchyard and works at the existing substation. This consists of connecting the line to the national grid to transmit power. Final commissioning involves,

among others, the testing of the towers to ensure that all steelwork joints are correctly made and are tight, the integrity of the line hardware, the protection system, etc. Connection of electrical plant will be checked and once approved power connections established.

3.2.2 Associated Impacts of Constructional Phase

3.2.2.1 Socio-economic Issues

The socio-economic of the people may be impacted on by the proposed project. The project impacts that may affect the local communities in a number of ways include:

a) Impacts on cultural and historical/archaeological sites/items

The implementation of the proposed project has the potential to impact significantly on cultural properties and historical sites and items. There is the potential to intrude into or interfere with the cultural properties of some local communities. Land take for construction activity can cause impacts on new access tracks and at the tower locations. The main land take for the RoW only requires vegetation clearance to be undertaken and it is proposed that clearance is limited to taller vegetation, i.e. greater than 1.25m in height.

The clearing of the transmission line corridor and creation of access routes can lead to damage to areas of historic, scientific, social and amenity values, and also affect the aesthetics of cultural monuments and archaeological resources. This can occur where design and construction do not take account of such cultural heritage and resources. Damage may also be caused by construction related works such as burrow sites, and unregulated access to cultural heritage sites.

Although the constructional activities will not involve much earthmoving, it is possible to make cultural and/or archaeological 'chance finds' during the constructional phase of the project.

Such cultural finds may be the following:

- Sites of cultural significance such as sacred woods or trees or rock outcrops which the local residents may have not mentioned at the survey stage
- Archaeological heritage which may have remained unnoticed in the past

The potential impacts to archaeology and cultural heritage as a result of the project arise from the potential for destruction or burial of sites of significance as a result of the construction of new infrastructure. The main impacts relate to areas of ground excavation required for construction purposes e.g. lay down areas of work camps, new access roads and at the tower location sites.

The greatest risk of damage to important sites that may exist arises from site excavations rather than the vegetation cutting. The retention of groundcover and the fact that only limited ground excavation at tower sites will be required will limit the potential for impact on any sites of significance. The trafficking of vehicle along the RoW for both construction and operation has the potential to affect sites of importance if they are above ground features. Construction of this maintenance track will not however require any excavation, but limited trafficking over the sites identified below may occur.

No sacred groves or traditional sites of religious significance have been encountered yet. However, issues regarding cultural properties and the possibility of cultural and/or archaeological ‘chance finds’ are considered to be significant requiring mitigation and measures have been proposed

b) Impacts on population and demography

Only about 25% of the construction work-force (during the peak of constructional activities), which is expected to be skilled labour, will be recruited from outside the local communities. The skilled workers from outside the local communities will be accommodated within the Bolgatanga Township. Potential impacts on population and demography are therefore not expected to be significant and will not require any mitigation.

c) Employment generation and incomes

Some employment openings are expected to be created for the local people during this phase of the project. Those local people who will be employed will benefit from the payment of salaries and/or wages. This is expected to lead to improvement in local incomes. On the other hand, there is the potential for loss of income resulting from loss of crops, land and structures.

d) Potential impacts on public health

The proponents intend to utilize local manpower as much as possible during this phase of the project. Only about 25% of the construction work-force will be recruited from outside the local communities. The HIV/AIDS pandemic is a severe one that should continue to engage the attention of authorities in all sectors and in the management of the workers. Findings of international studies of HIV/AIDS in work places suggest that the construction sites of such linear projects are a breeding ground and a vehicle for the HIV/AIDS epidemic.

People working on the project have to be mobile, they have to spend much time away from their homes and satisfy their sexual needs on the road. Migration - short term or long term, increases opportunities to have sexual relationship with multiple partners, thus becoming a critical factor in the propagation of HIV/AIDS. Although awareness of the disease is said to be very high amongst the Ghanaian

population, behavioural change lags far behind this awareness. This is likely to be the case among the workers as well and there will be the need for education for the workforce and monitoring of incidence of HIV among community members.

The skilled workers from outside the communities will be accommodated within the Bolgatanga Township. Despite this small number of 'outsiders', the potential danger of the spread of sexually transmitted diseases (STDs) including HIV AIDS still exists. The spread of these diseases between the construction workers and community persons could occur. In view of the possible spread of HIV and other sexually transmitted diseases during project implementation, mitigation measures are required to minimize this potential impact.

3.2.2.2 Noise Impacts

Any potentially significant noise impacts from the power transmission line arise primarily from the construction phase. The main potential impact is from vehicle and construction noise affecting local residents. The main noise generating activities are:

- Delivery traffic to and from the lay down areas and to the construction sites;
- On site construction activity with fabrication and construction of the towers and stringing of the Lines;

Heavy duty machinery and vehicular movement, friction between vehicles and the road surface, driver behaviour, vehicles' horns, resonance of traffic and piling increase ambient noise levels shall occur far beyond the immediate transmission line corridor. The effects of excessive noise include human welfare and physiological disruption, hearing impairment and communication problems. These may cause elevated stress levels and associated behavioural and health problems. They can also cause auditory fatigue, sleep disorders, and even contribute to learning problems in children. The level of the noise expected to be generated if above 85 Db (A), will require the provision of suitable and adequate protection in line with statutorily requirements.

For traffic noise, overall daily traffic movements are predicted to be low as the delivery requirements for men and materials at any one site are low. However this is likely to represent a large increase over the current traffic volumes due to the very low current number of movements. The potential therefore exists for impacts to be felt by inhabitants along the transport routes due to this change. The overall total traffic volumes will be low and will be restricted to daytime only. As such, the noise increases over the current baseline along these routes will be adverse but temporary in nature and minor in significance.

For the tower construction sites, a majority of the activity will be undertaken in remote locations away from the identified villages. Only for short sections, and therefore for short durations, will the construction sites be close to any property. The operations on site are also not intrinsically noisy, i.e. excavation of foundation,

mixing of concrete, bolting of steel work, vehicle movement for delivery of men and materials and stringing of the lines. In addition to this, good site practice can minimise noise generation and the restriction of operations to the working day will avoid noise generation during the most sensitive, night time, period.

Noise also has the potential to disrupt wildlife habitats and movement. Adequate measures must be in place to reduce this potential impact on the safety and health of the workers who use noisy tools/equipment or work in their immediate environs.

Due to the short duration (2 to 3 day periods at any one construction site) and intermittent nature of works at any one location, the remote nature of most of the workings, the limited working hours (daytime only) and low overall noise generation potential of the activities, noise impacts from the construction activity are assessed as being negative, temporary and insignificant in magnitude.

3.2.2.3 Impact on Air Quality

Vegetation clearing, construction of access routes, excavation and haulage of heavy machinery and construction materials to and from one location to the other along the tower corridor has the propensity to impact negatively on air quality. Apart from the dust particles that will be generated, vehicular emissions that will emanate from the haulage trucks is also a potential source of air pollution. It is however expected that such impacts will be localised especially during the rainy season but has the potential to be widespread during the dry harmattan season.

The principal air quality concern related to the power transmission line is the generation of dust during the construction phase. This has the potential to cause nuisance to residents of local communities located closest to the access roads required for the development and those close to the RoW.

Sources of potential dust generation include the following:

- Dust blow from areas of bare ground, e.g. cleared access roads and areas where full vegetation removal occurs;
- Dust generation from haulage along un-surfaced roads.

More minor impacts can arise from the excavation of materials during construction, during access track grading and gaseous emissions from plant and vehicles used during the construction process. However these are minor sources, will not have a significant impact. By virtue of the nature of a power transmission line the operational phase will not result in any significant dust generation. The only activities that will occur where dust may be caused are the regular site inspections and maintenance activities. However site inspections are likely to be required only once every six months or so and maintenance will be required annually. These activities are therefore too infrequent to cause a significant impact. There is no potentially significant air quality impacts associated with the pre-construction activity.

As indicated earlier, there are 13 settlements along the main access roads to be used for the construction that may be affected. Air pollution may adversely affect the health of people engaged directly or indirectly in the project activities. The effects are due largely to particulates from vehicular emissions and constructional equipment powered by gasoline or diesel as well as silica in dust from the earth agitated by constructional equipment and vehicles plying on un-tarred roads. The resultant effects are acute respiratory disorders, lung and heart diseases, the type of ailment depending on the size of particulates as well as the materials adsorbed on them.

3.2.2.4 Erosion Impacts

Clearing and grading of access and tower corridor tracks, excavation of tower base areas and the construction of access tracks during the constructional phase will expose the disturbed ground surface, which will at least be temporarily unprotected, to the agents of soil erosion such as heat, wind and rain. Top soil removal, excavations, vehicular traffic impact on the un-tarred access routes, etc. has the potential to engender the sheet erosion by exposing the soil to soil erosion agents.

This potential impact requires mitigation measures to ensure that impacts such as soil loss, pollution of near-by streams and siltation of natural waterways are minimized.

3.2.2.5 Impacts of Public Safety

The transportation of heavy plant and equipment through settlements and the presence of unprotected tower base excavations could pose potential safety problems for the local populace. In addition, the excavated foundations, if left unguarded, will pose risks to public safety or even animal safety.

3.2.2.6 Impacts on Flora & Fauna

A 40 m right of way (RoW) also referred to as a way leave, has been acquired for the entire 39.3 Km route, i.e. 20 m each side of the centre of the line. Subsequently, various construction activities especially bush clearing with RoW and access tracks clearing, has an impact on vegetation cover, including trees and crops, as well as habitats of fauna both within and close to the cleared areas. These construction activities involve vegetation removal for access tracks, the tower corridor track and the tower base areas.

During operations, vegetation cover could be a fire threat to high tension lines. In wooded areas, the safe operations of the overhead power lines necessitate the maintenance of unobstructed lanes. Further, access roads and tracks leading to the transmission line are maintained through vegetation control at regular intervals

in order to eliminate hazards and reduce travelling required to access the transmission lines.

Thus vegetation control measures are applied to manage vegetative growth within the RoW, access tracks and under the towers. The objective is to prevent interruption of power supply due to fire and /or falling of danger trees on the line. It is also to facilitate ease of access for line maintenance activities. Clearing of vegetation is usually done through physical or mechanical means and is done by the use of contractors and this is carried out up to twice a year.

The potential impacts to flora and fauna as a result of the project are:

- Habitat loss associated with greenfield land take (e.g. Tower construction, access tracks clearance, etc);
- Habitat degradation (vegetation clearance, edge effects, fragmentation, alien species, encroachment);
- Disturbance caused during the construction phase; and
- Direct loss of individuals.

Potential impact on flora and fauna is insignificant, but measures must be put in place to mitigate these identified potential impact.

3.2.2.7 Impacts on Occupational Safety & Health

During this phase of the project, there will be the potential for occupational safety and health hazards. The potential for safety and health hazards will be most acute when:

- Technical specifications relevant to safety measures are disregarded in the planning and erection of plant and equipment (e.g. the use of low quality components, inadequate sizing of cables, negligent execution of works, general non-observance of safety rules leading to inherently unsafe systems
- The operating personnel have not received sufficient training and experience in connection with safety measures and their observance
- Improper and insufficient supervision of workers are undertaken.

Accidents constitute one of the most important risks in such construction activities resulting in injuries. These are likely to arise from moving machinery in the course of operation, unguarded parts of equipment and a disregard for health and safety measures. These are likely to pose risks to the workers. Injuries may also arise from road traffic accidents during haulage of construction machinery and materials to the site and this has the potential of harming workers. Other sources of injuries to workers are: accidental falls from height, noise, vibration and heat, falling/swinging objects and also lubricants some of which contain solvents with potential to cause skin irritation and allergies, respiratory disorders and acute poisoning.

3.2.2.8 Impacts on Visual Intrusion

The development of the power line will not involve any major earth works that may impact the local topography and therefore alter the physical landscape features of the area. However the line will involve construction of 30m high steel lattice towers and the clearance of all tall vegetation along the RoW. Both these features of the development have the potential to affect the landscape setting and character of the area. Constructional activities have the potential to impact on scenic landscape values at the project site.

Impacts on landscape character will also arise from both the imposition of the transmission line towers into the existing landscape setting and the clearance of tall vegetation from within the RoW. Landscape impact assessment is based on two principal aspects. First is the alteration of the landscape character of an area including impacts on recognised features of landscape importance? The second aspect is impact on public views of the site either from residential properties or areas of public access, e.g. footpaths, and from public roads.

However, the proposed transmission line will not have any impact on scenic views since the site does not have, nor form part of, any scenic views. It must be noted that transmission towers already exist within the project area. The project will not have any impact on aesthetically pleasing landscapes since the site is not part of an aesthetically pleasing landscape. It is expected that the local visual characteristics and expressions of the RoW will be affected by the presence of the transmission towers and lines. This is because of the potential 'tower-glare' effects on people especially in the rural settlements.

3.2.2.9 Traffic Impacts

There will be an increase in traffic associated with the construction phase of this development, which will affect the local roads network.

The main environmental concerns in relation to traffic are:

- Increased traffic causing an increased safety risk on the roads;
- The potential for fumes, vibration and dust rise (on un-surfaced road), from vehicles to affect properties and people living close to the roads;
- Damage to local un-surfaced roads making them unusable once construction is complete.

In terms of total traffic generated by the construction phase, daily movements will be low. The requirement will only be for the delivery of men at the start and end of each day and the construction materials during the working day, both to the depots and to the construction sites. This will present an increased safety risk but with the application of proper mitigation measures particularly the speed controls through villages, this increased risk should be minor. Taking account of the low overall total

traffic movement that will occur, impacts are predicted to be adverse but temporary and insignificant in magnitude.

The improvement of the main access routes for this project has the potential for positive impacts relating to improved access from the affected villages to the main road network. This will provide easier access to the markets for their produce. The negative impacts from this access road improvement relate to the potential for increased encroachment into protected areas such as the forest reserves. This is assessed within the sections on flora and fauna in this report.

There can be serious disruptions to local traffic and also accidents during the construction period. This may result from the transportation of machinery and materials to the project site and also during the stringing of the transmission lines across roads. The situation can be aggravated without carefully planned detours and road closures. The effect of traffic disruptions includes increased travel time, congestion, social stress and agitations. However, this is expected to be minimal as the traffic densities in most of the communities where the transmission line project will traverse are low. The potential for vehicular traffic conflict situations exists especially at the points where access tracks join the main roads.

3.2.2.10 Impacts on Water Resources

The drainage system in the project area is constituted mainly around the tributaries of the Sissili River – Asibelika, Afumbeli, Bukpegi and Beeyi. Within the project area, there is the Yarogatouga river as well as two (2) main dugouts ponds of over 1.5 km² in surface area located at Sumbrungo-Kulbia and Doba which are used for livestock, crop farming and domestic purposes. These could be impacted upon during project implementation because they are quite close to the line route, although very well outside the line route buffer zone.

The construction and operation of power transmission lines does not have a high potential to cause impacts on surface water resources, however, two principal issues may be affected that require assessment. These are the potential to alter the flow and course of a stream, and to impact water quality.

Surface Water Quality

Water quality impacts are classified under surface water or groundwater. Erosion, resulting from vegetation clearing and excavations can lead to downstream siltation resulting from run-offs with high sediment load. This will ultimately lead to contamination of water resources and ruin fish spawning grounds.

Any construction activity of this nature involves removal of vegetation and disturbance associated with creation of access tracks, movement of heavy vehicles within the RoW and the excavation of soils for foundation works. Where

these activities are conducted close to streams the potential for erosion of the exposed soils, with transport of eroded materials to stream, exists.

The proposed power transmission line project has two primary potential impacts on surface water quality. These are the increase in suspended solids as a result of soil erosion caused by construction activity, and pollution from oils as a result of spillages during construction and operation.

The construction activity does not involve storage or use of large volumes of fuels and oils and therefore the risk of major contamination of surface water is low. However transformer oils will be handled at the substations and fuel tanks are present on all mobile plant. Should spillage or leakage of any of these oils occur then the potential exist for these to enter the surface water system and impact water quality. Regular inspections of plant will help identify any leakage or potential failures. In addition the volumes of fuels held are too low to present a significant risk to water resources. Any spillage will tend to be absorbed into the soils. Based on the above assessment the impacts on the surface water systems are defined as adverse, long-term (temporary for construction related impacts) but insignificant in magnitude.

Alteration in the flow and course of local watercourses

Alterations of flow regimes can upset tropic dynamics by affecting the life cycle of plankton, with corresponding effects on the entire food chain. Impact on the flow within a watercourse and the line of existing streams can be affected by the introduction of large engineering structures within the course of a river and by the alteration of the catchments characteristics, e.g. change in land surface cover affecting run-off rates.

The power line construction will only involve shallow foundations excavated at each tower construction site with all other construction being above ground. In addition the selected tower locations are generally remote from streams, with no construction directly on the steam banks or within the main channel. As such no significant new structures will be placed in, or close to, any of the identified watercourses.

Where the access tracks cross small streams then suitable culverts will be installed or existing bridges improves to ensure unrestricted flow of water down the stream. Even though some river bodies are encountered in the project area, the RoW or access roads of the transmission line would not directly cross any major river channels and as such any culverts / bridges to be built will be of a minor nature.

Management of vegetation within the RoW may alter the run-off characteristics of the area, particularly where tall forest vegetation is removed. In areas of existing

agricultural clearance no significant change in vegetation cover will occur and therefore there will be no change in run-off characteristics.

Such changes can only affect river flows if the area affected represents a large part of the stream catchments. The 40m wide RoW will represent an insignificant portion of the overall catchment of any of the streams crossed, and within the RoW only those areas where forest vegetation will be cleared will be subject to any noticeable change. Significant changes in catchment run-off and river flows will not therefore occur. Based on the foundations design and location of the proposed towers, and the minor change in catchment characteristics resulting from the RoW management, there are no identified potentially significant impacts on the flow or course of local streams.

Impacts on Groundwater

The main potential impacts on groundwater arise if deep excavations are required during construction that need dewatering or if fuels and oils leak or are spilt during construction and operation causing potential groundwater contaminations. Construction of the substation civil works involves shallow excavation to support the electrical equipment to be installed. The largest excavation will be for the transformer at approximately 4m x 6m x 1.5m. Construction of the power line itself involves only shallow excavation for support foundations with the most significant being the 1m x 1m x 1m concrete blocks for the pivot tower foundations, plus a concrete anchor block for each of the four stay wires. None of the civil works associated with this development are deep enough to have any significant impact on the groundwater resources.

Construction activities will have no identified potential impacts on groundwater.

3.2.2.11 Work Camps

Work camps may be established along the RoW during the construction phase of the proposed project. The work camps will serve as offices, storage points for the machines and materials that will be used during the construction phase of the project. Issues relating to the establishment, management and decommissioning of site office needs to be properly addressed.

3.2.2.12 Waste Generation

Different forms of solid and liquid waste including excavation spoil vegetative matter, damaged cables, sewage, garbage and oil spills from construction equipment will be generated. Liquid waste from spilled oil, chemicals and paints are likely to be generated. Areas alongside transmission corridors especially where it traverses areas close to towns may become centres of intense trading which will leave in its trail serious sanitation problems. Inappropriate disposal of these wastes have an impact on the environment.

3.3 OPERATIONAL & MAINTENANCE PHASE

As indicated earlier, the Volta River Development Act, 2005, Act 692, the power transmission functions has been transferred to GRIDCo. GRIDCo is now responsible for the entire national power evacuation and transmission infrastructure. Thus it is expected that GRIDCo, with relevant assistance from VRA, shall be responsible for managing the operations of the transmission system using existing guidelines for such operations. Strict documented procedures are in place for the various technical operations, including that of transmission lines for both VRA and GRIDCo. GRIDCo and VRA will adhere to all existing Safety Codes & Guidelines for the operation and maintenance of transmission line infrastructure

Upon completion of construction, the operation and maintenance activities of the line will involve:

3.3.1 Project Activities at Operational & Maintenance Phase

3.3.1.1 *Right of Way (RoW) & Access Road Maintenance*

Right of Way and access road maintenance is aimed at eliminating hazards and reduce travelling required to access transmission lines. Based on report on ground patrol observations, access roads/line tracks are maintained at regular intervals. It includes erosions, culverts, bridges or any obstacle/work nearby which will endanger the lines or public e.g. blasting, excavation, fire hazards, harmful insects, etc. Vegetation control measures are applied during the operational phase of the project to manage vegetative growth within the RoW. The objective is to prevent interruption of power supply due to tree bushing and /or falling of danger trees on the line. It is also to facilitate ease of access for line maintenance activities. During the operational phase of the project the RoW will be maintained in such a condition as to ensure that the transmission line function, or safety of person within the vicinity of the line, is not compromised. This involves both the control of land uses undertaken within the RoW and the management of the vegetation.

To allow access to the RoW for maintenance, vegetation clearance and emergency repair, a network of access tracks will be maintained. These will be graded, un-surfaced tracks and will be maintained on a regular basis to ensure they provide suitably clear access to the RoW. In addition to this a 3 meters wide access road will be maintained running the full length of the RoW. This will not be graded but will consist of cleared tyre tracks with vegetation between these tracks kept cut. This track will not cross any large streams or swamp areas and where these are encountered there will be a requirement to leave the RoW, travel on the

existing road networks to cross the watercourse before tracking back along the graded access roads to the RoW.

Once the power transmission line has been constructed, farmers tend to return to their lands. In areas where farming is being practiced, crop management and annual cultivation will generally act to maintain the vegetation to within the agreed standards. These areas will not therefore require ongoing maintenance by the line operators. Farming within the RoW is permissible with prior consent from the utility company. In addition to the restriction on land uses within the RoW the vegetation has to be managed to ensure that it does not impede the line. For all areas, which will not be farmed, the vegetation will be cut to a height of 1.25m and cleared on an annual basis. In addition, tall trees outside of the RoW, which pose a threat to the transmission line, will also be cut down. This work will be jointly managed by VRA and GRIDCo utilising local contractors for the works themselves. Vegetation clearing is carried out up to twice a year on every line.

3.3.1.2 Line Maintenance & Operations

GRIDCo has comprehensive planned and emergency programmes through its technical operations during the operation and maintenance phase for its existing transmission lines and these shall be adopted on the project. The maintenance activities carried out here include:

- **Aerial surveillance by helicopter:** This is done to ensure that potentially hazardous defects are pre-empted and the integrity of the line is maintained and sustained. This is done on an annual basis.
- **Foot patrol:** The Line Maintenance team carries out routine physical examination of the transmission line and its component parts to ensure the safety, security and integrity of the line. Such activities are carried out at least twice a year.
- **Security patrol:** This is done to check on segments of the line close to populated areas for signs of vandalism, tampering, and general security of the lines. It is to ensure an early detection of and rapid response to acts of vandalism and to rectify such situations as promptly as possible.

During the operational phase of the line there is limited need for regular access with line inspection only being conducted, typically, on a six monthly basis and shut downs for maintenance only being required once every 2 to 3 years. In the course of operation, defects that are identified are repaired. Such defects may include the replacement of defective conductors, flashed over insulators, defective dampers, vandalised components, and maintenance of access tracks and RoW.

3.3.1.3 Maintenance of Towers

Tower auditing and repairs provide a means of assessing the ageing process of towers. It starts one year after the commissioning of a line section and it follows a one-year cycle. In a cycle of tower auditing, 10% of all suspension towers and all

dead-end towers are thoroughly examined. As the line ages, it is subjected to wear and fatigue which may not be noticeable by a distant visual inspection. Detection and tightening of loose bolts on supports and hardware can reduce premature wear and indicate for replacement of worn components before failure.

Corrosion Surveys are undertaken to ensure that the towers and associated parts are protected from atmospheric, chemical or electrolytic corrosion. Corroded towers are re-galvanised. Infra Red Surveys also done to help to identify overheated connectors, clamps, etc, following which such line hardware is then replaced before any failure can occur. Vibration studies known as Aeolian vibrations are done based on ground patrol reports to analyse the nature of vibrations on lines. Vibration dampers are used to stop this. Insulator washing is done to avoid the building up of contaminants on the line insulators, which can cause flashovers. This is carried out using insulator washing machines and a high pressure stream of water. Security Patrols are carried out to stop vandalism of towers and other illegal activities along the RoW. Perpetrators are arrested for prosecution.

Tower Footing Resistance measurement is done to ensure that ground resistance is within acceptable limits. Subsequently, there is continuous checking of the grounding rods and counterpoise for continuity. Tower ground resistance is measured.

3.3. 2 Impacts Associated with Operational & Maintenance Phase

Adherence to the non-encroachment requirement of the right of way will reduce the impact of the operational phase activities especially on public safety and health.

3.3.2.1 Impacts on Flora & Fauna

In wooded areas, the safe operation of the overhead power lines will necessitate the maintenance of unobstructed lanes. Thus, cutting of growing trees and general weed control within the right of way will form an important component of the operation phase of the project.

Vegetation control measures will therefore have to be applied during the operational phase of the project to manage vegetative growth within the RoW. The method to be used will be physical or mechanical clearing of vegetative growth for the maintenance of the RoW. RoW maintenance could also result in opening-up effects especially the activities of hunters and fuel-wood harvesters. This may deprive cattle and other animals of available fodder. This will be very costly, especially in an environment where cattle rearing forms part of the peoples livelihood. RoW maintenance shall be undertaken annually, which shall assist in the regeneration of the cleared vegetation.

These potential effects are not considered to be significant since much of the area is already extensively degraded as a result of intensive farming and the effects of seasonal bushfires.

3.3.2.2 *Effects of rust treatment and painting of towers*

The principal material for the construction of the towers will be steel. It is expected that rusting of some of the towers will occur after a certain period of time. In order to save the pylons from collapse, rust treatment and painting of towers will be done periodically. This can lead to pollution of nearby water bodies in the event of an accidental spillage of chemicals and paints.

3.3.2.3 *Impacts of Waste Generation*

It is expected that a limited amount of waste will be generated during this phase from vegetative matter, cans, packaging materials, insulators etc. Measures have been proposed for the management of these wastes.

Liquid waste will also be generated from the possible washing of various items that may be used. There is the possibility of water pollution if washing is done in or close to nearby water bodies. It is, however, not anticipated that liquid wastes from the various washings will be generated in significant quantities. Accidental spillage of oil, fuel or paints will however need to be managed.

3.3.2.4 *Impacts on Occupational Safety & Health*

Some occupational safety and health hazards are expected during the operational phase of the project during maintenance activities by the workers. These hazards could be from fire, falling and/or swinging objects, potential collapse of towers due to rainstorms or vandalism, electrocution, falling from heights and snakebites. These hazards pose potential threat to the safety and health of the workers.

3.3.2.5 *Impacts on Public Safety*

Potential public safety hazards are enhanced for a project such as the proposed transmission line project when the local populace has not been properly educated with regard to the potential hazards. In addition to the hazards posed to the public due to transportation of equipment and materials, other hazards such as potential exposure to Electromagnetic field (EMF) effects, potential collapse of towers and electrocution will exist during this phase of the project.

The falling of a live electrical conductor could cause severe burns of any object on which it falls. An electrical conductor could fall from the towers as a result of either a mechanical failure of an insulator string on the tower or snapping of the conductor itself. The mechanical failure of an insulator string could be the result of a lightning stroke, rusting of insulator pins or a heavy object falling on the

transmission line. The failure of a conductor joint could also cause snapping of the conductor. Strict adherence to the non-encroachment requirement of the right of way will reduce the potential risks to public safety.

One other potential impact of the proposed project is the perceived danger of transmission lines. Issues relating to electromagnetic fields are not normally understood by the public. The misconception that EMFs may cause cancer or harm children could create fear and perhaps panic among the local populace. Over the last two decades, debate has raged on over the impact of electromagnetic fields (EMF) on human health. Power lines in particular have become a focus for conflicting conclusions. The Environmental Health Division of the Minnesota Department of Health (USA) has collated the current available results of research into EMF and health carried out worldwide. The information is readily available at their web site www.health.state.mn.us.

A recent experts meeting was organised in August 2009 by the World Bank³ to determine the acceptable RoW horizontal and vertical clearances (based on international standards) for operation and maintenance of electric power transmission and distribution. Based on guidelines from the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and other applicable electric power transmission and distribution standards, it was noted that compliance with the specified clearances and other measures and precautions to be adopted, will ensure safety and health preservation of people. On the health risks of EMF and EF exposure, there is consensus about the uncertainty of establishing a clear causal link between occurrence of debilitating illnesses (including cancer) and electricity exposure. Additionally, there are many cases globally where high voltage T-Lines have operated in urbanized settings without any known impact on the health and safety of the people.

In conclusion, it is indicated that transmission lines are highly unlikely to create an electromagnetic field above the ICNIRP guidance values even at the highest risk location, i.e. straight beneath the line. For the proposed line the RoW will result in the nearest properties being at a minimum distance of 20m from the centre of the power lines. With the rapid decay in EMF with distance, at the edge of the wayleave all international standards should be met. It is therefore concluded that the impacts of EMF on community health is long term, local, but insignificant in magnitude.

However, there is the need to provide mitigation measures that will be required to address the notions that EMFs may cause cancer or harm children and the resulting fear and possible panic among the local populations.

³ Unpublished Report

3.3.2.6 Impacts on Effects on birds

The presence of towers and power transmission lines in the RoW has the potential to impact on birds. The pylons and transmission lines will serve as landing facilities for birds. The possibility of electrocution exists. There is the potential danger of debasement of breeding grounds, electrocution, collision with lines and interference in the navigation of birds. No specific breeding grounds of birds have been identified within the RoW hence the potential danger of debasement of such areas does not exist.

3.3.2.8 Impacts as a result of operation of the substation

a) Transformer oils

The presence of transformers on the premises of substations introduces the potential environmental impacts inherent in transformer oils. Polychlorobiphenyls (PCBs) are harmful substances to the environment. They are not produced during electricity generation or distribution, but which are contained in certain equipment, mainly in transformers and condensers, which are purchased from the manufacturers of electrical equipment, who in turn used it because of their perfect dielectric properties. The transformers to be purchased will be required to meet all applicable safety standards and will be enclosed in separate secondary containment structures that will prevent any accidental spills or routine leakages that may occur from being released to the environment.

Transformer lubricant oils are the main lubricant oils used on transmission line projects and are used for transformers, circuit breakers, reactors and voltage regulators that are located in the substations. Other minor lubricants include grease and oils used or maintaining equipment at the plant. Quantities of such lubricants used are very small. The transformers will not be dismantled and so the question of the disposal of the oils will not arise. The transformers are serviced outside the country. No further mitigation measures will be required.

Improper disposal of such transformer oils and lubricants could have an impact on the environment, especially when they are in large quantities such as those stored in storage tanks. This can contaminate both soils and water bodies through storm drains and can also be a source of fire outbreaks.

b) Fire hazards

The presence, storage and use of oils, fuels and other flammable products on the premises of substations give rise to the very likely hazards of fire outbreaks. In addition, there always is a real likelihood of fire outbreaks in substations that are sited in areas where bushes surround them.

c) Avifauna

Potential impacts by/on bird species present in the area associated with the construction and operation of a substation include electrocutions and disturbance during the construction and maintenance of the substation. Other problems include electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure within the substation.

d) Substation security and public safety

Due to the high voltages to be experienced at the various substations, it is important that it is made secure at all times and that unauthorised persons are kept away from the premises. The substation shall be suitably fenced to keep off unauthorised persons from the premises. Also, Security Officers shall man the substation at all times to ensure security and report all incidents that might be out of the ordinary for prompt attention. In addition suitable warning signs, indicating the dangers within, shall be placed at regular intervals on the fencing to warn off would-be encroachers.

e) Storm drains

A network of storm drains shall be constructed in the substation to collect and direct storm water away from the substation. This network shall be isolated from the oil and fuel storage areas to ensure that storm water is not contaminated with oil products prior to discharge.

4. CURENT ENVIRONMENTAL MANAGEMENT PRACTICES & IMPACT ASSESSMENT

4.1 MANAGEMENT OF SOCIO-ECONOMIC IMPACT

4.1.1 Loss of buildings and land ownership issues

Due to the acquisition of the RoW, land ownership structures and land-use characteristics will have to change within the affected area. The Volta River Authority (Transmission Line Protection) Regulations, 1967 LI 542 prohibits activities such as mining, construction of buildings, crops cultivation and farming in the RoW.

In order to minimize the adverse effects of the acquisition of the RoW and access track areas on individuals, communities and/or families or clans, a detailed survey of project-affected persons is carried out as part of the ESIA for the purposes of compensation payment. A Property Impact Report is then prepared and outlined in a detailed Resettlement Action Plan for the project.

VRA in collaboration with the Lands Valuation Division enumerate and value all properties along the Right of Way and prepared an updated Property Impact Report. When compensation is made, a certificate is issued to the owner in order to indemnify VRA from subsequent claims.

In the light of probable concerns to be raised by the communities, and considering the current developments in participatory approach to resolving social conflicts, the following shall apply:

- The procedure for payment of compensation for affected persons shall be reviewed to ensure that “fair” compensation covers loss of future land use and that prices shall reflect the prevailing market values (economic rates).
- Since most of the farmers are illiterates, District Assemblies, Unit Committees and other community-based organisations are involved in the whole process to safeguard their interests.
- Compensation payments are handled promptly to avoid imposing undue hardship on the rural farmers and also avoid any conflicts with the communities.

Grievances are sometimes raised by some project-affected persons (PAPs) for compensation paid. Grievance resolution procedures are therefore put in place with the sole objective of minimizing disputes that may arise in relation to the compensation payments.

4.1.2 Potential destruction of sacred, cultural and/or historical/ archaeological sites/items

In line with current international practice and the desire to ensure the sustainability of the environment within which VRA operates, VRA will avoid intruding into or interfering with cultural properties of the local communities as much as possible.

Archaeological chance finds

The following procedure, which is derived from the National Museum Decree 1969 (NLCD 387), for dealing with all such finds will be followed:

Upon the discovery of any such chance finds:

- i. The Director of the Ghana Museum and Monuments Board shall be notified immediately in writing, stating the exact site or location of the item. The letter shall include adequate photographs of the antiquity.
- ii. VRA shall permit and facilitate such access to, and inspection of the site of discovery as the Director may so require. VRA shall also permit to be affixed or applied thereto, any seal or identification mark of the board.
- iii. VRA shall not alter damage, destroy or remove any antiquity from its original site without the consent of the Board. If removal of the item becomes immediately necessary for safety or security reasons, the exact location shall be noted and the retrieved artefacts shall be sent to the custody of the Board.
- iv. Through liaising with the Board, the lawful owners of the land shall be duly informed and where necessary, payment shall be made by the Board after due assessment.

Further decisions with respect to site sampling or further excavation will be under the jurisdiction of the Board. The above will ensure that issues relating to archaeological/cultural ‘chance finds’ are properly handled.

Cultural “chance finds” - sites of cultural significance such as sacred woods or trees or rock outcrops which the local residents may have not mentioned at the survey stage – will be properly managed to the satisfaction of both the local communities, the EPA and the funding agencies. Where possible, such cultural properties will be left undisturbed or avoided. In cases where complete avoidance of such sites is impossible, every necessary step will be taken to minimize the potential impact of intruding into the site. This will be done in consultation with and to the satisfaction of the chiefs, elders and opinion leaders of the local communities.

4.1.3 Impacts on population and demography

The project is not expected to have significant impacts on the populations and demography within the local communities. Only about 25% of the construction work-force is expected to be skilled labour may be recruited from outside the local

communities. This may only be done if such skill labour is unavailable in the local communities.

To further minimize potential impacts on populations and demography of the local communities' skilled workers from outside the communities will be accommodated at the work camp that will be established. It is therefore not expected that there will be any significant impacts on populations, demography and gender within the local communities during the duration of the project.

4.1.4 Employment generation and incomes

Some employment openings may be created for the local people. Those local people who may be employed will benefit from the payment of salaries/wages. This is expected to lead to improvement in local incomes. On the other hand, there will be loss of income resulting from loss of crops and land.

4.1.5 Potential impacts on Public health

With the introduction of migrant workers into the communities along the proposed line route, mitigation measures will be required to minimize the potential danger of the spread of sexually transmitted diseases (STDs) including HIV AIDS.

The VRA in collaboration with the Ghana Health Services undertakes HIV/AIDS education for the workforces of the contractors and consultants. The measures shall include the distribution of IEC materials and sale of condoms at subsidised prices to the workforce. The workers will also be continually educated about the dangers of indulging in casual unprotected sex.

4.2 MANAGEMENT OF IMPACT ON FLORA & FAUNA

A distance of approximately 39.3 km along the RoW was cleared of vegetation to a height of about 1.25 m above ground level. Further, an area of 3 m wide (distance yet to be known) would be totally graded of vegetation to pave way as access tracks with a caterpillar.

In the construction of the transmission line, vegetation clearing is done within the right-of way, access tracks, tower spots and campsites. These activities result in loss of vegetation cover. Measures employed to ensure a reduction of erosion, loss of cover for agricultural purposes, restoration of embankments, re-vegetation includes:

- Construction of new tracks is kept to the barest minimum. Track routes are selected in such a way as to minimise any damage to farms and crops.
- Mechanical control is used for all vegetation clearing within the RoW.
- The access tracks are selected so as to avoid crossing streams and other water bodies.

- Where stream crossings are unavoidable, suitable culverts will be constructed over them. Under no circumstances must water bodies be blocked to provide for construction access.
- Removal of stream bank vegetation (especially bamboo/mangrove is avoided as much as possible).
- Compaction of soils along the graded tracks is reduced by regulating the number of passes of heavy trucks to and from the sites.
- The ground surface at each tower site is graded to provide drainage away from the tower legs. Where necessary (particularly on hillsides), terracing, cribbing or riprap may be used to provide protection for tower foundations.
- Cutting of trees is done by a certified timber contractor, and strictly in line with the prescribed safety guidelines provided in the Volta River Authority Safety Code for Forestry Work⁴.
- The landing area of falling trees is carefully selected to minimise damage to farms. Adequate warnings are given to ensure that public safety is not compromised.
- The Contractor is to place warning notices (“NO ENTRY”, “NO TRESPASSING ALLOWED” etc.) at entry to access roads. In addition, random security patrols shall be carried out.
- The public in construction active areas are continuously educated through the beating of gong-gong to avoid the construction areas as much as possible.

4.3 MANAGEMENT OF IMPACT ON WASTE

4.3.1 Solid Waste

Solid wastes that are generated include vegetation waste, office waste, scraps and packaging materials generated by repair and maintenance works on the lines and at substations. Vegetation waste includes cut trees. Office wastes are generated as part of the day to day activities at the work camps.

The following environmental management practices are in place for solid waste management:

- Solid wastes in the form of paper, food material, etc. are disposed of in dustbins that are provided at the various substations.
- Cut vegetation along the RoW and access tracks are left for the community members to use for fuel wood.
- Unusable materials and construction elements such as electro-mechanical equipment, pipes, accessories and demolished structures are kept at the storage site for recycling or reuse, or at an appropriate landfill site within neighbouring communities.
- Unsuitable and demolished elements are dismantled to size fitting on ordinary trucks for transport.

⁴ A copy of the VRA Safety Code regarding forestry work is enclosed as Appendix 1.

4.3.2 Liquid Waste

Major effluents from the project include human liquid waste by staff working at the various temporal offices and storage sites established for the project during the constructional phase. Other waste includes waste oil, lubricants and paints also if they are not properly handled.

Water closets and wash basins for use by the constructional workers at the Site offices are provided at the Contractor's storage site and offices. This is to ensure that decent and comfortable places of convenience are provided for the workers and also to prevent environmental pollution with human waste. Similar facilities are provided at the substations following their construction.

4.4 MANAGEMENT OF IMPACT ON SOILS

Activities during the constructional phase expose the disturbed ground surface, which is at least temporarily unprotected, to the agents of soil erosion such as heat, wind and rain. Erosion of soil from exposed unprotected land surfaces are minimized by limiting land clearance to minimum area requirements for the constructional activities.

After the construction of the line, areas of bare soil are expected to be re-colonised by native cover plants to stabilise the soil, reduce erosion and prevent invasion by undesirable plant species. It must be pointed out here that no chemicals are used for the control of vegetation along the line route and that all vegetation control measures are done manually.

4.5 MANAGEMENT OF NOISE IMPACTS

Noise impacts from constructional activities are temporary- limited only to the constructional phase of the project. This arises from noise making from the constructional workers and machinery and vehicular noise.

As part of noise management techniques, all construction machinery and equipment are maintained regularly, paying particular attention to all noise-reducing devices or mufflers to ensure that they are in good working condition to minimize noise generation. The unnecessary tooting of horns during transportation of equipment and materials through settlements are avoided as much as possible.

Construction site workers are advised to avoid unnecessary noise making. In addition, night time work especially near communities is avoided as much as possible to prevent undue noise impacts on local communities. Construction crew near noisy machinery and power tools are to be provided with earmuffs to protect them from hearing loss damage. In addition, VRA monitors noise levels especially

near areas under construction. Data on noise levels are to be provided as part of data in the annual environmental report for the project.

4.6 MANAGEMENT OF IMPACT ON AIR QUALITY

Wind pick up of dust from exposed unprotected land surfaces are minimized by limiting land clearance to minimum area requirements for the constructional activities. To further reduce dust pollution, regular watering of the site is carried out, when necessary, during construction to reduce the effect of wind pick-up of dust particles. Construction machinery and equipment are maintained regularly to minimize the release of soot in the exhaust fumes. Furthermore, trucks that supply sand, gravel and stone aggregates have their buckets properly covered with tarpaulin during transit to prevent wind pick-up of dust, spill of materials and the release of dust into the atmosphere.

Impacts on air quality are short-lived or temporary since the exposed areas are covered quickly by vegetative re-growth. The vegetative cover is maintained at the tower and access tracks to allow the passage of vehicles for operational purposes.

4.7 MANAGEMENT OF IMPACT ON WATER RESOURCES

Water is used as part of raw materials that feed into concrete production during tower base construction. RoW selection has been done to avoid water bodies and water courses. However there are various water bodies that exist close to the construction sites.

Water is extracted from these sources and used for mixing of constructional purposes. In order to avoid any impact on water resources, the following measures are employed:

- Clearing and grading of access and tower corridor tracks and the excavation of tower base areas are limited to the minimum area requirements.
- Constructional workers engaged must at all costs avoid conflicting with water demands of local communities.
- Site spoils and temporary stockpiles shall be located away from drainage systems and surface run off are directed away from stockpiles to prevent erosion.
- Prevention of bitumen, oils, lubricants and waste water used / produced during the execution of works from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs and also ensure that stagnant water in uncovered borrow pits is treated in the best way to avoid creating possible breeding grounds for mosquitoes.
- In the event of temporary damming of streams and rivers, this must be done in such a way that disruption of water supplies to communities down stream is avoided and maintain the ecological balance of the river system.

- Ensure that existing water flow regimes in rivers, streams and other natural or irrigation channels is maintained and/or re-established where they are disrupted due to civil works being carried out.
- Measuring of quality of sources of water for constructional purposes.
- The contractor shall use galvanised steel pipes across water bodies to allow for access in order to avoid blockage of streams, rivers and other water bodies.
- No construction water-containing spoils or site effluent especially cements and oil must be allowed to flow into natural water drainage courses.

4.8 MANAGEMENT OF TRAFFIC IMPACTS

Equipment and materials are properly secured in vehicles while being transported to avoid the falling of such items on public roads to create potential hazards or safety problems for the public. Also, trucks and vehicles conveying such materials are to display appropriate road safety signals - red flag and flashing amber lights.

Deliveries must as much as possible be made only during daylight hours. Existing speed regulations must be observed within settlements to minimize the potential for accidents. To minimise traffic conflicts at the junction where the access tracks join public roads, it is ensured that road signs are erected at appropriate distances on either side of the junction to warn motorists of the potential danger of heavy-duty trucks turning into and off the main road.

Obstructing vegetations at the junctions are cleared to allow drivers to properly view and assess situations before joining main roads. Also, warning notices like “NO ENTRY” or “NO TRESPASSING ALLOWED” are placed at entry to access tracks. In addition, random security patrols are carried out to ensure that the local people do not unduly endanger their safety.

Furthermore, certain constructional activities like the stringing of transmission lines across public roads cause temporary traffic disruptions. Traffic wardens are employed to direct traffic during such times to avoid confusion and prevent accidents. In addition, in all cases, where line stringing will cross public roads due notification to the general public and appropriate authorities are given as required.

4.9 MANAGEMENT OF IMPACT ON ARCHAEOLOGICAL CHANCE FIND AND CULTURAL RESOURCES

In line with current international practice and the desire to ensure the sustainability of the environment, VRA avoids intruding into or interfering with cultural properties of the local communities as much as possible. Consultations with the Museums and Monuments Board have been carried out in connection with any historical or archaeological ‘chance finds’. There were no archaeological chance finds during

the construction stage. This notwithstanding, VRA has developed procedures for finds regarding archaeological and cultural property.

The following procedure, which is derived from the National Museum Decree 1969, (NLCD 387), for dealing with all such finds, is followed:

Upon the discovery of any such chance finds:

- i. The Director of the Ghana Museum and Monuments Board shall be notified immediately in writing, stating the exact site or location of the item. The letter shall include adequate photographs of the antiquity.
- ii. VRA shall permit and facilitate such access to, and inspection of the site of discovery as the Director may so require. VRA shall also permit to be affixed or applied thereto, any seal or identification mark of the board.
- iii. VRA shall not alter damage, destroy or remove any antiquity from its original site without the consent of the Board. If removal of the item becomes immediately necessary for safety or security reasons, the exact location shall be noted and the retrieved artifacts shall be sent to the custody of the Board.
- iv. Through liaising with the Board, the lawful owners of the land shall be duly informed and where necessary, payment shall be made by the Board after due assessment. Further decisions with respect to site sampling or further excavation will be under the jurisdiction of the Board. The above will ensure that issues relating to archaeological/cultural 'chance finds' are properly handled.

4.10 MATERIAL HANDLING & STORAGE

Various materials and equipment are required for the construction of the transmission line. These include tower members, conductor parts, shield wires, insulators, hardware, circuit breakers, transformer parts, conductor cables, etc. Materials to be procured locally include aggregates, cement, sand, stone and other miscellaneous supplies and services.

Both imported and local materials for the project that requires storage are to be trucked to site via public roads and access tracks as and when required and are stored at the designated storage yard for the contractors. The storage yards are walled for security purposes and there must be a security guard for the entire 24 hours. Further, the storage site is sloped to facilitate drainage of stagnant water due to the soft nature of the ground which will otherwise affect stored materials. The materials that are subject to weathering are kept either in wooden or metal containers. It must be noted that the materials for the towers do not require any specialised vehicles for transportation purposes.

4.11 ENERGY MANAGEMENT

The Volta River Authority is committed to protecting the interests of Ghanaians and assisting consumers to use energy more efficiently. This is aimed at creating an energy efficiency culture that would ensure a reliable, sustainable and diverse supply of competitively priced power for the Nation. Energy management is therefore a key priority in all VRA operations. The primary benefits for VRA in implementing an energy management system include: (1) lowering energy costs and consumption, (2) providing more control over environmental impacts, leading to lower impacts and costs, and (3) sustaining improvements that result in higher productivity and lower capital improvement needs.

Subsequently, VRA has identified energy conservation information tips as a beneficial strategy for its workers and consumers and has developed various information, education and communication materials on energy management. This is to help increase awareness of energy and environmental impacts within the organization.

The energy conservation tips developed by VRA are aimed at the identifying the facilities, equipment, processes and personnel with significant impact on energy usage and/or environmental results. It deals with the use of energy in all VRA offices with respect to office appliances, lighting, use of refrigerators, air conditioners, electrical appliances. All staff are encouraged to be conversant and adhere to these energy saving tips

5. ENVIRONMENTAL ACTION PLAN

This section of the report will outline ways and measures to help reduce, and if possible eliminate the adverse impact identified in Chapter 4. The impacts identified so far are typical of transmission line projects. The mitigation measures that have been proposed to minimise potential adverse environmental impacts and maximise beneficial impacts that are associated with the implementation of the project is presented.

To ensure that environmentally sound practices are adhered to and in order to safeguard the safety and health of persons or any group of persons working on the project during project implementation, the following mitigative measures are proposed for significant potential impacts at the pre-constructional and constructional phases.

A summary of the impacts identified and mitigation measures are provided in Table 5.

5.1 PRE-CONSTRUCTIONAL PHASE

5.1.1 Loss of buildings and land ownership issues

The project is a linear one. This means land ownership structures and land-use characteristics will have to change within the affected area. Legal requirements prohibit activities such as mining, construction of buildings, crops cultivation and farming in the RoW.

In order to minimize the adverse effects of the acquisition of the RoW areas on individuals, families, communities and/or skins, VRA shall engage LVD to undertake a detailed survey of project-affected persons for the purposes of compensation payment. Following this, a detailed RAP will be prepared in line with the World Bank's Operational Directive on Involuntary Resettlement (OP 4.12). Prompt, adequate and fair compensation will be paid to all project-affected persons before the commencement of constructional activities. The key standard to be met is to 'assist the affected people in their efforts to improve their former living standards, income earning capacity and, production level, or at least to restore them'

Several valuation approaches are available for an appraisal depending upon the nature and purpose of valuation. There are normally three traditional approaches to valuation viz: the Income, Market and Cost Approaches. The VRA/LVD adopts the following methods to compensate its project-affected persons to ensure fair and adequate compensation.

a. Agricultural produce

Agricultural loss is generally limited to the crop loss and crop damage due to construction. Landowners who cultivate the affected plot receive compensation for the entire crop within the right of way (ROW) whether or not the entire ROW is cleared.

The methodology for the calculation of crop compensation rates takes into account both the market value of agricultural produce and the reestablishment period of perennial crops. This method operates by the capitalisation of the net income that accrues to the property at an appropriate rate. The net income is arrived at by making allowance for outgoing as land preparation, maintenance expenses, etc from the gross income accruing to the investment.

b. Residential properties

Two methods will be adopted in the valuation of the buildings, depending on the location and other factors affecting values.

The Replacement Cost Method is adopted in the valuation of the affected structures/buildings. This method is based on the assumption that the value of the property tends to reflect the value of the accommodation provided, plus current costs of improvement, without any consideration for depreciation due to age, architectural obsolescence, etc. This method was applied where data on current sale of property is virtually non-existent.

In the Direct Comparison Method or Market Approach, rates adopted take the market condition in the building industry into consideration. This is a direct method of comparing the property to be valued with similar properties in terms of design, quality of construction, finishes, amenities/facilities available, location, neighbourhood characteristics, interest among others, which have changed hands in the recent past. The prices obtained for similar properties are thus analysed and a unit rate per square area is adopted after making the necessary adjustments and applied to the net floor area of the subject property to arrive at its reasonable value. This approach is based on the principle of substitution, which infers that a prudent purchaser acting knowledgeably will not pay more for a property than what it will cost him to acquire a comparable substitute if these are available on the market. The comparative approach is used where there is available and reliable data on what is actually paid in the market for similar or comparable properties.

5.1.2 Land Ownership/Conflict

As indicated, compulsory land acquisition results in displacement of communities, loss of business, properties and incomes, social stress, social and psychological disruption for the affected individuals and families. This has to be properly managed through sensitization and information sharing.

VRA shall maintain a public relations unit responsible for a public information and sensitization campaign in order to inform stakeholders in the project area on issues related to compensation and land acquisition. Ongoing public consultations would be held with PAPs in the project areas as well as the relevant Chiefs, Opinion Leaders, and Governmental Agencies with the aim of providing information on the project and issues relating to compensation.

Further, the RAP/EIS/EMP to be prepared for the project shall be publicly disclosed in any of the widely circulating newspapers for the information of the general public. Copies shall be available at the VRA Head office in Accra as well as the EPA offices in Accra and Bolgatanga.

Grievances are sometimes raised by some project-affected persons (PAPs) during this phase of the project. A Grievance Committee would be established in each of the affected committee to be responsible for relaying grievances to VRA. From experience, most questions involve disputes over the physical inventory counts and subsequently, grievance resolution procedures have been put in place with the sole objective of minimising disputes that may arise in relation to the compensation payments. The grievance/dispute processing and settlement mechanism will be based on the following:

Traditional dispute resolution

Dissatisfied claimants would be invited for negotiation together with the traditional authorities of the area or Assembly members of the area in order to arrive at acceptable figures. This process had been employed at the survey stage to resolve grievances that arose from joint ownership of land, tenant-landlord conflicts and boundary between farm disputes. Mediation took place in the palaces of the traditional rulers. Resolutions were amicably arrived at to the satisfaction of all.

Submission of counter proposals

Although the field counts are generally accurate, it may be that some economic trees were overlooked during the field count. Oversights shall be typically brought to the attention of the VRA staff, either the representative from the Real Estate & Security Department or from the project engineering staff. The second stage of the mechanism is to request the claimant to submit counter proposals supported by valuation opinion prepared by private value's of their choice. The private reports will be considered by VRA in conjunction with the Land Valuation Division to ensure that claimants are treated fairly. At such meetings efforts will be made to arrive at amicable settlements in order to ensure that the third stage of the dispute resolution is not triggered. VRA, in consultation with the LVD, shall then decide each instance on a case-by-case basis.

Resort to Legal action

PAPs may raise issues formally when informal mechanisms fail to redress the concern. PAPs may, in the event of dissatisfaction with the decisions taken in the instances discussed above or without resort to any of the instances above resort to legal action to have the dissatisfaction resolved. If the issue cannot be resolved at this level, the aggrieved party has, in theory, access to redress through the judicial system, although in fact judicial resolution is expensive and time-consuming. Given the mechanisms described above, it is unlikely that disputes will end up in the law courts.

5.2 CONSTRUCTIONAL PHASE

The constructional phase of the project involves activities that have the potential to impact significantly on the physical, biological and socio-cultural/socio-economic environments within the project's area of environmental influence.

The following environmental action measures shall be implemented for the significant potential impacts:

5.2.1 Noise impacts

Noise impacts from constructional activities will be temporary- limited only to the constructional phase of the project. All equipment/plants and vehicles will be new. Thus their ability to generate undesirable sound will be very low indeed. When making order of equipment, requirement for low noise equipment should be priority in order to decrease noise impact. All such equipment and vehicles will undergo periodic routine maintenance to reduce vibrations and other faults that ultimately lead to the generation of noise. Particular attention will be paid to all noise-reducing devices or mufflers to ensure that they are in good working condition to minimize noise generation.

Routine machine operation and tractor-trailer transport are not anticipated to produce noise levels significantly in excess of routine highway noise levels, or approximately 60 dB (A), however, workers in either case will be issued protective gear during working hours to offset any risk of hearing loss. In all cases, noise travel will be least during daylight hours when air density is least, and therefore all of the above-referenced noise producing activities will be kept to daylight hours of operation. All moving and reciprocating parts will be well oiled to reduce friction and subsequent noise as much as possible. This is beneficial not only for noise attenuation, but also for an increased life span of our machines, since wear and tear will be drastically reduced.

The unnecessary tooting of horns during transportation of equipment and materials through settlements will be avoided as much as possible. Construction site workers will also be advised to avoid unnecessary noise making. In addition, night

time work especially near communities will be avoided as much as possible to prevent undue noise impacts on local communities. Construction crew near noisy machinery and power tools will be provided with earmuffs to protect them from hearing loss damage. Noise levels shall be monitored at areas where work is ongoing. Expected worker noise exposure levels shall be in line with the USA Department of Labour OH&SA as provide in Table 4.

Table 4: Acceptable Employee Noise Exposure Levels⁵

Duration of Noise Exposure (Hours)	Sound Pressure Level (dB)
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

Maintenance practices such as the following shall be practiced to reduce noise levels:

- Replacing worn or loose machine parts.
- Performing high noise operations during hours when people are less likely to be affected.
- Maintaining and lubricating equipment to eliminate rattles and squeaks.

Engineering controls, such as replacing noisy materials, considering the noise level of new equipment or processes before purchasing or implementing, placing heavy machines on rubber mountings, using sound absorbing acoustical tiles or baffles shall also be done as a means of reducing noise levels. All stationary machinery and equipment will be mounted on vibration-damping foundations. These measures will be enforced for all new installations. Workers will not be allowed to be in direct contact with machine which vibrates as an operational necessity. This is to help reduce whole body or segmental vibration.

5.2.2 Impact On Air Quality

Fugitive dust will be generated during construction as a result of the exposure of the land surface due to the clearing of vegetation for construction of site facilities. Movement of vehicles over this exposed surface will also increase the concentration of dust particles. Air pollution in the form of dust clouds may be likely to form, particularly in dry weather, from truck travel on un-tarred roads within the project site. At this stage of the project, the dust generated will be from non-point

⁵ USA Department of Labour Occupational Health & Safety Administration

sources. Controlling the concentration at sources therefore becomes almost impossible.

Wind pick up of dust from exposed unprotected land surfaces will be minimized by limiting land clearance to minimum area requirements for the constructional activities. For instance, excavation of the tower base areas will be restricted to the required dimensions of 9.6m x 9.6m. To further reduce dust pollution, regular watering of the site will be carried out during construction to reduce the effect of wind pick-up of dust particles. This potential impact will be short-lived or temporary since it is expected that the exposed areas will be covered quickly by vegetative re-growth. The vegetative cover will however be so maintained as to allow the passage of vehicles.

VRA will ensure that all exposed surfaces, access road and working areas, are sprayed with water by water browsers as part of regular construction activities. This shall be done when necessary by 20,000 litre capacity water browsers. The frequency of spraying will be increased during the dry season. In addition, the construction machinery and equipment will be maintained regularly to minimize the release of soot in the exhaust fumes. Furthermore, trucks that supply sand, gravel and stone aggregates will have their buckets properly covered with tarpaulin during transit to prevent wind pick-up of dust, spill of materials and the release of dust into the atmosphere.

5.2.3 Erosion

Activities during the constructional phase will expose the disturbed ground surface, which is at least temporarily unprotected, to the agents of soil erosion such as heat, wind and rain. Erosion of soil from exposed unprotected land surfaces will be minimized by limiting land clearance to minimum area requirements for the constructional activities. For example, excavation of the tower base areas will be restricted to the required dimensions of 9.6m x 9.6m. Also, the erection of towers/tower footings on steep slopes will be avoided as much as possible to prevent slip erosion.

This potential impact will, however, be short-lived or temporary since it is expected that the exposed areas will be covered quickly by vegetative re-growth to stabilize the soil and minimize erosion. VRA will apply erosion control practices such as re-grading, compaction and early re-vegetation to promote soil conservation.

5.2.4 Public Safety

The transportation of heavy plant and equipment through settlements will be done in a manner not to jeopardise the safety of the local people. Equipment and materials will be properly secured when being transported to prevent them from falling and posing potential danger to people. (It is important to note that it is not the constructed towers that will be transported to tower locations but rather the

tower members or parts). Legally mandated speed limits on the roads and highways shall be strictly observed in all settlements.

Also, tower base excavations in or near settlements or farms will be protected or clearly marked to prevent people from inadvertently falling into these excavations. For areas with animal populations, these excavations will be guarded with boards to ensure no animals fall into the pits. Tree felling will be done by a certified timber contractor with competent workers. Adequate warning will be given to ensure that public safety is not compromised during this activity.

The transmission line poses potential public health and safety hazards when the local populace has not been properly educated with regard to the potential hazards, such as collapse of towers, which actually occurs rarely. In addition to the hazards posed to the public due to transportation of equipment and materials, other hazards such as potential exposure to Electromagnetic field (EMF) effects, potential collapse of towers and electrocution exists. These potential hazards require mitigation to ensure the safety of the public.

Since the hazardous effects (e.g. falling on people and electrocution) of the collapse are normally felt only within the RoW public safety is ensured by restricting public access to the right-of-way. In line with existing practice, the towers have be clearly marked with a red inscription on white background - “DANGER – 225,000 Volts” to warn off trespassers and prevent them from exposing themselves to the potential dangers of electrocution. Further, regular maintenance ensures the minimizing of corrosion and wearing out of parts of the towers and their accessories.

5.2.5 Flora and Fauna

Care will be taken to minimise the area that will be cleared and the number of trees that will have to be cut. Construction workers will be closely supervised to ensure that only the minimum area requirements, as given earlier, for access trucks, tower corridor track and tower base areas are cleared of vegetation to minimize potential impacts on flora and flora. Also, surveys conducted and desk studies carried out during the baseline study have not revealed the presence of any floral and faunal species of conservation concern that will be irreversibly impacted by the proposed project.

It is expected that impacts on fauna will be temporary and will not be significant. In addition, fauna that will be scared away during this phase will quickly return to the vicinities of the RoW once construction ceases. To control potential animal disturbance and death, speed restrictions shall be placed on all construction vehicles. VRA shall ensure that all workers are educated not to do any hunting, shooting, egg collecting or trapping.

5.2.6 Occupational Safety & Health

VRA believes that its human resource is its greatest asset. It will therefore proactively pursue measures at promoting safety, health and welfare of its workforce. Relevant national policies, labour laws and codes of conduct concerning employment shall be applied to regulate behaviour of workers in the local communities. Measures shall be designed and adhered to regarding employment and workforce policies to mitigate environmental, health and social impacts that are associated with the influx of formal and informal workers by the Contractor. Local employment and sourcing policies are used to give priorities to people within the project affected areas.

Education and awareness training are given to every worker upon employment. VRA shall promote the need for safety awareness in all aspect of the work by conducting safety awareness programmes and campaigns, displaying posters and signs and using audio visuals. Weekly and monthly safety meetings are held in all the sections, both for workers of VRA and contractors.

VRA will ensure that contractors carries out the work in compliance with the relevant provisions of the Factories, Offices and Shops Act, 1970 Act 328) and the Contractor Safety Rules to minimize the potential occupational safety and health hazards and prevent or minimise accidents. To further minimize the potential safety and health hazards, the VRA will ensure that the contractor employs properly trained and experienced operatives and adhered to all technical specifications relevant to safety measures in the execution of the works. In addition, the contractor will be expected to provide an “All Risk Insurance” cover for the contractor, subcontractors, project management staff and all other employees.

VRA/Contractor shall conduct formal induction sessions for all people on site, including issuing each of its employees and employees of its subcontractors with an induction health and safety booklet, and during the contract, continue with ongoing training onsite health and safety matters. Road safety signs are put at the appropriate places to prevent accidents. Dangerous construction sites are always flagged with caution reflectors.

Periodic awareness training is often given to the workforce regarding Sexually Transmitted Diseases (STDs) and traffic safety regulations. VRA undertakes public health education for all employees and HIV & AIDS education is an integral part of this educational activity in line with its “Workplace HIV&AIDS Policy”. This includes education on appropriate use of condom as well as provision of male condoms to all workers as a form of mitigating this impact.

An Occupational Health & Safety Plan for the Project is provided under Section 7 of this ESMP.

5.2.7 Visual Intrusion

Optical impairment of the landscape by the presence of the transmission towers, lines and the substation is unavoidable and could be regarded as a residual impact. The galvanised towers tone down after two to five years of operation to a dark grey colour. In addition, the line route was selected such that the lines blend with the natural landscape and mostly away from settlements. The 'glare effect' will therefore be minimal and unnoticeable.

5.2.8 Traffic Impacts

Equipment and materials shall be properly secured in vehicles while being transported to avoid the falling of such items on public roads to create potential hazards or safety problems for the public. Also, trucks and vehicles conveying such materials shall display appropriate road safety signals - red flag and flashing amber lights. VRA shall ensure that deliveries are only made during daylight hours. Existing speed regulations shall be observed within settlements to minimize the potential for accidents.

To minimise traffic conflicts at the junction where the access tracks join public roads the VRA shall ensure that road signs are erected at appropriate distances on either side of the junction to warn motorists of the potential danger of heavy-duty trucks turning into and off the main road. Obstructing vegetation at the junctions will be cleared to allow drivers to properly view and assess situations before joining main roads. Also, warning notices like "NO ENTRY" or "NO TRESPASSING ALLOWED" shall be placed at entry to access tracks. In addition, random security patrols shall be carried out to ensure that the local people do not unduly endanger their safety.

Furthermore, certain constructional activities like the stringing of transmission lines across public roads will cause temporary traffic disruptions. Traffic wardens shall be employed to direct traffic during such times to avoid confusion and prevent accidents. The proposed transmission line will encounter various roads, some with asphalted surfacing. It is therefore important to ensure coordination with the road agency and VRA to minimise interference between installation and operation following guidelines of the "Road Reservation Management: Manual for Coordination" (June 2001). Thus in all cases, where line stringing will cross public roads due notification to the general public and appropriate authorities (GHA and/or District Assemblies) shall be given as required.

5.2.9 Potential Pollution of Water Bodies

Clearing and grading of access and tower corridor tracks and the excavation of tower base areas will be limited to the minimum area requirements. Other measures proposed in other sections of this report for minimizing erosion and managing excavated materials, wastewater from excavations and accidental spillage of oil, fuel and paints are valid for the prevention of pollution of water bodies.

The Contractor shall use culverts across water bodies to allow for access in order to avoid blockage of streams, rivers and other water bodies. Under no circumstances must water bodies be blocked to provide for construction access. Removal of stream bank vegetation (especially bamboo/mangrove) must be avoided as much as possible. VRA shall not employ herbicides/weedicides for weed control or vegetation clearing hence any potential pollution from this source is eliminated.

5.2.10 Work Camp Management

First and foremost, VRA shall ensure that Contractor do not establish work camps close to any water body to avoid water pollution problems. The camp shall also be established at least 500m from the closest settlement to minimize noise impacts on the community. VRA will also ensure that employees from the local communities are not accommodated at the camp.

During maintenance of construction machinery/equipment and vehicles care will be taken to avoid accidental oil spills, which could lead to soil contamination. Accidental spillage of oil, fuel and paints shall be avoided as much as possible. Any spilt materials will be quickly mopped up with rags and/or sawdust. The used sawdust and rags will be collected, put in polythene bags and disposed of at appropriate public waste dumping sites. Waste oil will be drained into impermeable sumps at the work camp for collection and disposal.

Metal wastes shall be collected and sold as scrap to dealers who will in turn sell them for re-cycling. Other solid wastes such as damaged cables and conductors, rags, paper cartons and domestic wastes will be collected and disposed of at appropriate public waste dumping sites. The use of empty paint and oil containers for storage of water shall be prohibited.

Mobile toilet facilities shall be provided at the work camp to avoid the pollution of the environment with human waste. The holding tanks of the mobile toilets shall be emptied as and when required for disposal at appropriate sites.

5.2.11 Waste Generation

Solid wastes in the form of trees, tree stumps and wooden containers will be gathered together and made available to the local communities as fuel wood. Metal wastes will be collected and disposed of appropriately and/or recycled. Solid wastes in the form of paper, food material, etc. shall be disposed of in dustbins that shall be provided at the various work camps and offices.

With respect to waste management, the following measures shall be put in place to help keep a clean site and reduce environmental pollution:

- Adequate numbers of containers shall be provided with covers to keep rain out or to prevent loss of wastes when it is windy.

- Solid and hazardous waste containers shall be properly labelled to identify them to ensure that toxic liquid wastes (used oils, solvents and paints) are not disposed of in solid waste containers. Additionally, the project personnel have been trained on proper collection and disposal methods of different types of solid wastes.
- Construction waste and domestic waste are collected, removed and disposed of only at designated areas.
- Wherever possible, production of construction waste and domestic waste shall be minimized by reusing and reusing leftover materials wherever possible and also through proper planning and design.
- Construction workers shall be instructed in proper construction waste and domestic waste storage and handling procedures.
- If scrap metal occurs, these scraps shall either be reused or sold to companies whose business activity is dealing with scraps.
- Wood and cardboard wastes shall be reused if possible.
- Disposing of domestic waste on the construction site is prohibited for workers and visitors.
- Domestic rubbish field have been established as planned, and regularly disinfected.
- Sanitary facilities have been well planned and cleaned daily.
- Construction work camps and surroundings shall be kept in clean and neat conditions at all times.
- Collected domestic waste and construction waste will not be store in the vicinity of drainage systems or watercourses.
- No waste shall be disposed off or buried on the site. Illegal dumping, either at the construction camp, along public roads or in the surrounding areas, or into the river will not be allowed.

The following measures shall be implemented to help reduce pollution from concrete related wastes:

- The wastewater and runoff from concrete batching plants (mobile and stationary plants) will be clarified by settlement ponds and the alkali level of waste water and run off will be neutralised to prevent water pollution.
- Waste generated from concreting activities will not be allowed to flow into drainage ways, and receiving waters.
- The amount of daily concrete production will be determined according to the construction schedule. Mixing excess amounts of fresh concrete will be avoided by planning of order volumes for each. The person in charge will control the quality and the amount produced concrete to avoid excess concrete production.
- Concrete transit mixers will be washed out only in designated areas. It will not be permitted to wash into drainage lines, open ditches or into watercourses. Designated areas with sign boards – “concrete washout areas” will be located near batching plants, where settlement ponds will be constructed.

- For concrete additives, material safety data sheet (MSDS) will be obtained from the manufacturer. The MSDS will be used to obtain information on hazards and safety precautions, the specific information on how to deal with spills.
- Both employees and subcontractors shall be instructed about concrete waste management techniques
- Hardened concrete waste will be disposed of according to solid waste management procedures.

Wastewater from tower base excavations is not expected to be significant. No towers shall be sited in permanently wet locations requiring the extraction of large volumes of wastewater. At worst, towers shall only be allowed to be sited at seasonally wet locations. The required dewatering will therefore be temporary, limited and localized. Hence only small quantities of wastewater shall be pumped and discharged through sediment traps or silt screens into surrounding marshlands. The effects of discharging the wastewater into the surrounding marshlands shall be insignificant and short-lived.

Accidental spillage of oil, fuel and paints shall be avoided as much as possible. Any spilled materials shall be quickly mopped up with rags and/or sawdust. The used sawdust and rags shall be disposed of at appropriate public waste dumping sites.

Table 5: Impacts identified and Mitigation Measures being implemented

Activity	Impacts	Environmental Quality Objective	Mitigation Action	Implementation Time Frame	Responsibility
Pre-construction Phase					
Line Route Selection & Surveying	- Loss of crops	This activity addresses the impacts associated with line route survey process	<ul style="list-style-type: none"> - Cultural and religious properties should be avoided absolutely / as much as possible. - Farmers/land owners should be fully briefed on the project, time schedule and extent of land to be affected by the project and mitigation measures. - The line should be made to run close to the existing line - Roads and paths used for maintenance of existing line should be used to provide access for contractors/ valuation team. - Destruction of crops should be kept to the barest minimum 	Completed	VRA/Contractor/ Bolgatanga Municipal
Acquisition of Right-of-Way, Consultations and Compensation	<ul style="list-style-type: none"> - Loss of crops and buildings - - Land Ownership/Conflict 	This activity addresses the socio-economic impacts associated with land acquisition process and ensures that PAPS are adequately compensated	<ul style="list-style-type: none"> - Owners should be consulted and given prior notice to any such action - The process of acquisition should be carried out with due consultations with all stakeholders and in line with the national policy, which requires that all landholders, including explicitly those holdings under various forms of traditional or customary tenure are compensated for loss of the land. - Property affected persons should be briefed on grievance procedures - Losses should be adequately compensated for - 	Prior to physical construction	VRA/Contractor/ Bolgatanga Municipal/Lands Valuation Division
Construction Phase					

Activity	Impacts	Environmental Quality Objective	Mitigation Action	Implementation Time Frame	Responsibility
Tower spotting	Flora & Fauna	This activity addresses the impacts on flora and fauna associated with construction of the transmission line	<ul style="list-style-type: none"> - Construction of new tracks is kept to the barest minimum. Track routes are selected in such a way as to minimise any damage to farms and crops. - Mechanical control is used for all vegetation clearing within the RoW. - The access tracks are selected so as to avoid crossing streams and other water bodies. - Where stream crossings are unavoidable, suitable culverts will be constructed over them. Under no circumstances must water bodies be blocked to provide for construction access. - Removal of stream bank vegetation (especially bamboo/mangrove is avoided as much as possible. - Compaction of soils along the graded tracks is reduced by regulating the number of passes of heavy trucks to and from the sites. - The ground surface at each tower site is graded to provide drainage away from the tower legs. Where necessary (particularly on hillsides), terracing, cribbing or riprap may be used to provide protection for tower foundations. - Cutting of trees is done by a certified timber contractor, and strictly in line with the prescribed safety guidelines provided in the Volta River Authority Safety Code for Forestry Work⁶. - The landing area of falling trees is carefully selected to minimise damage to farms. Adequate warnings are given to ensure that public safety is not compromised. 	Construction / Operational Phase	VRA / GRIDCo / Contractor
	Noise	This activity addresses	- As much as possible, all equipment/plants and vehicles for	Construction	VRA /

⁶ A copy of the VRA Safety Code regarding forestry work is enclosed as Appendix 1.

Activity	Impacts	Environmental Quality Objective	Mitigation Action	Implementation Time Frame	Responsibility
		the impact of noise associated with constructional activities	the project will be new. - When making order of equipment, requirement for low noise equipment should be priority in order to decrease noise impact. - All such equipment and vehicles will undergo periodic routine maintenance to reduce vibrations and other faults - Workers will be issued protective gear during working hours to offset any risk of hearing loss. - All noise producing activities will be kept to daylight hours of operation. - The unnecessary tooting of horns during transportation of equipment and materials through settlements will be avoided as much as possible. - Night time work especially near communities will be avoided as much as possible to prevent undue noise impacts on local communities. - Noise levels shall be monitored at areas where work is ongoing. - Routine maintenance activities shall be practiced to reduce noise levels. - Engineering controls shall also be done as a means of reducing noise levels. - All stationary machinery and equipment will be mounted on vibration–damping foundations. - Workers will not be allowed to be in direct contact with machine which vibrates as an operational necessity.	Phase	Contractor
	Air quality	This activity addresses the impact of air quality	- Regular watering of the site will be carried out during construction to reduce the effect of wind pick-up of dust	Construction Phase	VRA / Contractor

Activity	Impacts	Environmental Quality Objective	Mitigation Action	Implementation Time Frame	Responsibility
		associated with constructional activities	particles - Construction machinery and equipment will be maintained regularly to minimize the release of soot in the exhaust fumes. - Trucks that supply sand, gravel and stone aggregates will have their buckets properly covered with tarpaulin during transit to prevent wind pick-up of dust, spill of materials and the release of dust into the atmosphere.		
	Water Resources	This activity addresses the impact of water resources associated with constructional activities	- Minimize erosion and manage excavated materials, wastewater from excavations and accidental spillage of oil, fuel and paints - Clearing and grading of access and tower corridor tracks and the excavation of tower base areas are limited to the minimum area requirements. - Constructional workers engaged must at all costs avoid conflicting with water demands of local communities. - Site spoils and temporary stockpiles shall be located away from drainage systems and surface run off are directed away from stockpiles to prevent erosion. - Prevention of bitumen, oils, lubricants and waste water used / produced during the execution of works from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs and also ensure that stagnant water in uncovered borrow pits is treated in the best way to avoid creating possible breeding grounds for mosquitoes. - In the event of temporary damming of streams and rivers, this must be done in such a way that disruption of water supplies to communities down stream is avoided and	Construction / Operational Phase	VRA / GRIDCo / Contractor

Activity	Impacts	Environmental Quality Objective	Mitigation Action	Implementation Time Frame	Responsibility
			maintain the ecological balance of the river system. - Ensure that existing water flow regimes in rivers, streams and other natural or irrigation channels is maintained and/or re-established where they are disrupted due to civil works being carried out. - Measuring of quality of sources of water for constructional purposes. - The contractor shall use galvanised steel pipes across water bodies to allow for access in order to avoid blockage of streams, rivers and other water bodies. - No construction water-containing spoils or site effluent especially cements and oil must be allowed to flow into natural water drainage courses.		
	Erosion	This activity addresses the impact of erosion associated with constructional activities	- Excavation of the tower base areas will be restricted to the required dimensions of 9.6m x 9.6m. - Erection of towers/tower footings on steep slopes will be avoided as much as possible to prevent slip erosion. - Erosion control practices such as re-grading, compaction and early re-vegetation shall be applied to promote soil conservation.	Construction / Operational Phase	VRA / GRIDCo / Contractor
	Public Safety	This activity addresses the impact of public safety associated with constructional activities	- Tower base excavations in or near settlements or farms will be clearly marked. - All towers will be clearly marked with a red inscription on white background - "DANGER – 225,000 Volts" to warn off trespassers, etc. - Equipment and materials will be properly secured when being transported to prevent them from falling and posing potential danger to people.	Construction / Operational Phase	VRA / GRIDCo / Contractor

Activity	Impacts	Environmental Quality Objective	Mitigation Action	Implementation Time Frame	Responsibility
			<ul style="list-style-type: none"> - Legally mandated speed limits on the roads and highways shall be strictly observed in all settlements. - Tower base excavations in or near settlements or farms will be protected or clearly marked to prevent people from inadvertently falling into these excavations. - Tree felling will be done by a certified timber contractor with competent workers. Adequate warning will be given to ensure that public safety is not compromised during this activity. - The Contractor is to place warning notices (“NO ENTRY”, “NO TRESPASSING ALLOWED” etc.) at entry to access roads. In addition, random security patrols shall be carried out. - The public in construction active areas are continuously educated through the beating of gong-gong to avoid the construction areas as much as possible. 		
	Occupational Safety & Health	This activity addresses the impact of occupational safety & health associated with constructional activities	<ul style="list-style-type: none"> - Provision of personal protective equipment. - All work to be done according to corporate safety rules of VRA - Adhere to conditions of Occupational Health & Safety Plan 	Construction / Operational Phase	VRA / GRIDCo / Contractor
	Socio-economic/cultural issues	This activity addresses the impact on the socio-economic and cultural issues associated with constructional activities	<ul style="list-style-type: none"> - Procedure outlined in the National Museum Decree 1969 (NLCD 387), for dealing with all sculptural finds should be followed - Cultural “chance finds” - sites of cultural significance must be managed to the satisfaction of both the local communities - Workers from outside the communities must be accommodated in Bolgatanga Municipality 	Construction / Operational Phase	VRA / GRIDCo / Contractor / Ghana Museums & Monument Borad

Activity	Impacts	Environmental Quality Objective	Mitigation Action	Implementation Time Frame	Responsibility
	Visual intrusion	This activity addresses the impact of visual intrusion as a result of the erection of towers and line stringing	<ul style="list-style-type: none"> - Undertake actions to minimise 'glare effect' of galvanized towers 	Construction / Operational Phase	VRA / GRIDCo / Contractor
	Traffic impacts	This activity addresses traffic impacts as a result of the project	<ul style="list-style-type: none"> - Equipment and materials must be properly secured in vehicles while being transported to avoid the falling of such items on public roads to create potential hazards or safety problems for the public. - Trucks and vehicles conveying materials are mandated to display appropriate road safety signals - red flag and flashing amber lights. - Deliveries of all equipment are to be made during daylight hours. - Existing speed regulations must be observed within settlements to minimize the potential for accidents. - Road signs must be erected at appropriate distances on either side of the junction, where the access tracks join public roads, to warn motorists of the potential danger of heavy-duty trucks turning into and off the main road to minimise traffic conflicts. - Obstructing vegetations at the junctions are cleared to allow drivers to properly view and assess situations before joining main roads. - Warning notices like "NO ENTRY" or "NO TRESPASSING ALLOWED" are placed at entry to access tracks. - Traffic wardens must be engaged to direct traffic during such times to avoid confusion and prevent accidents. 	Construction / Operational Phase	VRA / GRIDCo / Contractor / Ghana Highway Authority

Activity	Impacts	Environmental Quality Objective	Mitigation Action	Implementation Time Frame	Responsibility
			<ul style="list-style-type: none"> - In addition, in all cases, where line stringing will cross public roads due notification to the general public and appropriate authorities are given as required. 		
	Work camp management		<ul style="list-style-type: none"> - Establish camp at least 500m from the closest settlement to minimize noise impacts on the community - Do not accommodate employees at the camp. - Avoid accidental spillage of oil, fuel and paints as much as possible. - Collect metal wastes and sell as scrap to dealers for re-cycling purposes - Dispose damaged cables and conductors, rags, paper cartons and domestic wastes at appropriate public waste dumping sites. - Provide mobile toilet facilities to avoid the pollution of the environment with human waste. 		
	Waste Generation	This activity addresses the impact of waste generation on the environment as a result of the project	<ul style="list-style-type: none"> - Adequate numbers of containers shall be provided with covers to keep rain out or to prevent loss of wastes when it is windy. - Solid and hazardous waste containers shall be properly labelled to identify them to ensure that toxic liquid wastes (used oils, solvents and paints) are not disposed of in solid waste containers. Additionally, the project personnel have been trained on proper collection and disposal methods of different types of solid wastes. - Construction waste and domestic waste are collected, removed and disposed of only at designated areas. - Wherever possible, production of construction waste and domestic waste has been minimized by reusing and reusing 	Construction / Operational Phase	VRA / GRIDCo / Contractor

Activity	Impacts	Environmental Quality Objective	Mitigation Action	Implementation Time Frame	Responsibility
			<p>leftover materials wherever possible and also through proper planning and design.</p> <ul style="list-style-type: none"> - Construction workers shall be instructed in proper construction waste and domestic waste storage and handling procedures. - If scrap metal occurs, these scraps shall either be reused or sold to companies whose business activity is dealing with scraps. - Wood and cardboard wastes shall be reused if possible. - Disposing of domestic waste on the construction site is prohibited for workers and visitors. - Domestic rubbish field have been established as planned, and regularly disinfected. - Sanitary facilities have been well planned and cleaned daily. - Construction work camps and surroundings shall be kept in clean and neat conditions at all times. - Collected domestic waste and construction waste will not be store in the vicinity of drainage systems or watercourses. - No waste shall be disposed off or buried on the site. Illegal dumping, either at the construction camp, along public roads or in the surrounding areas, or into the river will not be allowed. - The wastewater and runoff from concrete batching plants (mobile and stationary plants) will be clarified by settlement ponds and the alkali level of waste water and run off will be neutralised to prevent water pollution. - Waste generated from concreting activities will not be allowed to flow into drainage ways, and receiving waters. 		

Activity	Impacts	Environmental Quality Objective	Mitigation Action	Implementation Time Frame	Responsibility
			<ul style="list-style-type: none"> - The amount of daily concrete production will be determined according to the construction schedule. Mixing excess amounts of fresh concrete will be avoided by planning of order volumes for each. The person in charge will control the quality and the amount produced concrete to avoid excess concrete production. - Concrete transit mixers will be washed out only in designated areas. It will not be permitted to wash into drainage lines, open ditches or into watercourses. Designated areas with sign boards – “concrete washout areas” will be located near batching plants, where settlement ponds will be constructed. - For concrete additives, material safety data sheet (MSDS) will be obtained from the manufacturer. The MSDS will be used to obtain information on hazards and safety precautions, the specific information on how to deal with spills. - Both employees and subcontractors shall be instructed about concrete waste management techniques - Hardened concrete waste will be disposed of according to solid waste management procedures. 		
	Public Health	This activity addresses the impact on public health as a result of the project	<ul style="list-style-type: none"> - Education of workers to avoid casual sex 	Constructional Phase	VRA/Ghana Health Service

6. OCCUPATIONAL HEALTH & SAFETY ACTION PLAN

It is important to institute safety, health and welfare measures to mitigate the hazards and prevent accidents. It is the goal of VRA Management to provide a safe and healthful working environment for its staff, attachment workers, casual and visitors. Managers and supervisors are responsible to lead by example, and demonstrate proper attitudes toward safety and health in their operations.

The construction, operation and maintenance of a transmission system poses potential occupational health and safety hazards. Such hazards may arise as a result of the properties of the raw materials and the inherent dangers in the design and use of machinery. The potential for safety and health hazards will be most acute when:

- a) Technical specifications relevant to safety measures are disregarded in the planning and erection of plant and equipment (e.g. the use of low quality components, negligent execution of works, general non-observance of safety rules leading to inherently unsafe systems).
- b) The operating personnel have not received sufficient training and experience in connection with safety measures and their observance.
- c) Improper and insufficient supervision of workers are undertaken.

It is therefore important that Management must believe, commit to, and impress upon its staff the ethic that no job, program is so important or so urgent that one cannot take time to perform that function safely and in compliance with environmental regulations.

6.1 HEALTH & SAFETY ADMINISTRATION

The Occupational Health and Safety (Factories, Offices and Shops) Act of 1970 (Act, 328) gives employers and employees the general guidelines which are needed in the workplace to protect employees from occupational risks and hazards which may cause them physical or physiological harm. The Act aims to make sure that working conditions are acceptable. This means that everyone in the workplace must be aware of all hazards, as well as the safety, health and environmental standards which should be in place to prevent any unacceptable exposure to these hazards.

6.1.1 Corporate Responsibility

The VRA is committed to making safety a primary concern throughout the organization. It also seeks to achieve an acceptable standard of safety for its employees by effectively managing all risks resulting from or associated with its

activities. The policy and responsibilities of various players involved in achieving this goal are as indicated below:

6.1.1.1 Policy

- a. Occupational injuries, accidents and illness can be prevented. The prevention of such injuries, accidents and illness shall be incorporated into all aspects of works activity performed for and on behalf of VRA.
- b. Management accepts responsibility for preventing injuries, accidents and illness. The Chief Executive is responsible for the fulfilment of the policy assisted by his deputies, directors, managers and head of special units.
- c. Management is responsible for:
 - Ensuring the availability of adequate protective clothing, tools and equipment to all employees.
 - Establishing safe working practice, procedures and directives.
 - Employees receiving training, orientation and re-training to enable them work safely
- d. All employees have a personal responsibility to work safely and contribute to the achievement of high level performance in safety.
- e. All employees shall comply with:
 - Applicable safety acts
 - VRA Safety rules, protection codes and safe working practice
- f. All contractors and employees of such contractors when working for VRA on VRA sites or facilities shall comply with:
 - Applicable safety acts
 - VRA Safety rules, protection codes and safe working practiceContractors or their employees working where a special knowledge is required to work safely shall perform the work under direct supervision of competent VRA personnel.
- g. Standard with respect to occupational fatalities
It is the policy of VRA to ensure that necessary actions are taken to reduce fatalities in its work force to levels as low as practicable. The corporate performance standard on five year rolling average is to achieve less than three fatalities per (50) fifty million man hours worked.
It is also the policy that each department, in consultation with the safety management unit, will establish performance standard with respect to facilities that are consistent with the achievement of the corporate standard.
- h. Safety Management
In accordance with this policy, there shall be:

- A Central Safety Committee is formed under the chairmanship of the Chief Executive.
- A Safety Management Division headed by a Manager.
- Work Area Safety Committees chaired by Chairmen, nominated by Heads of Department.

The responsibilities of the above committees are enshrined in the Corporate Safety Handbook (2001 Revision).

i. Health Service

In accordance with this policy the Health Services Department shall:

- Provide emergency medical treatment and handle medical reports after accident or injuries'
- Conduct medical examinations on injured personnel
- Give advise on occupational health
- Maintain and collate health statistics of all VRA workers

j. Training

Managers and supervisors are to be given training in safe working practices. Supervisors are responsible for the training of personnel in safe working practice. Training may cover individual needs and in addition to the VRA Safety Management Unit, the services of other organizations may be obtained.

6.1.2 Safety Committees

a. Work Area Safety Committees

Work Area Safety Committees shall be formed in all work areas, throughout the organizations. It shall be the responsibility of each department to establish its Committee(s).

The membership of the Committee shall consist of the Senior Officers in charge of the various sections of the department.

- The Chairman of each safety Committee shall be appointed by the Head of Department or his authorized representative
- The Secretary to the Committee shall be member/secretary

The Chairman through the committee shall be responsible for:

- The implementation of safety programme prepared by the Safety Officer
- The implementation of local safety programmes prepared by the Committee
- Seeing to the correct interpretation and application of the safety rules
- Organization of joint safety meetings of all Units at their localities once very month
- Establishment of first aid boxes in the area of operation
- Investigation of unsafe practices and unsafe tools, machines and equipment
- Ensure that all accidents/incidents are reported and Medical Form 39 completed by the appropriate supervisor or distributed as instructed.

The regular meetings should be scheduled well in advance and at the convenience of all members, particularly those working on a shift schedule. Minutes shall be maintained on Committee meetings/inspection reports. One copy of the minutes shall be forwarded to Director, Technical Services, one copy for review by local safety meetings and one copy to the Head of the affected department or project, in this case the Project Manager.

Health & Safety Representatives are appointed in the various work areas to carry out workplace inspections in order to locate, report and act on hazards that have the capacity to cause accidents at the workplace with the primary focus on accident prevention. The representative is expected to:

- Investigate employee's complaints about safety, health and environmental issues in the assigned work area.
- Report these problems to the employer or management representative.
- Attend the meetings of the Safety committee.
- Discuss problems or concerns at the periodic Safety committee meetings.
- Report back to fellow employees after the committee meetings and always keep them informed about safety, health and environmental decisions and action plans.
- Attend any safety, health and environmental investigations, surveys, audits, inspections or formal inquiries in the designated area.
- Participate in internal safety, health and environmental audit.
- Carry out safety, health and environmental inspections in the work place, this may include plants and machinery.
- Identify deviations from the safety, health and environmental standards.
- Identify hazards.
- Check the safety equipment in the workplace.
- Make recommendations for improvements and discuss these at periodic committee meetings.
- Check to see that any newly introduced safety, health and environmental recommendations or procedures are being followed.
- Accompany management on surveys and audits.
- Visit the site of an incident and speak with incident victims, or witnesses.
- Examine the cause of incidents in the workplace.

b. Central Safety Committee

A Safety Committee comprising all heads of Departments and Deputy Chief Executives shall be formed

- The Chairman shall be the Chief Executive
- The Manager, Operating & Safety shall be Secretary/Convener
- The Committee shall meet at least twice a year or as may be directed by the Chairman

6.1.3 Role of Employees

a. Responsibilities of Departmental Heads

Departmental and sectional heads controlling specific areas or activities are to ensure safe working conditions. They are to ensure VRA's Safety Rules and Protection Codes are understood and observed by all employees.

The responsibilities include:

- Informing and consulting managers, Supervisors, employees and work area safety committees on all safety matters relevant to the department.
- Promoting safety amongst subordinates by example training, hazards identification and use of safety tools, clothing and equipment.
- Ensuring that personnel are trained in safe working practices

b. Responsibilities of Supervisors

Supervisors are responsible for:

- Showing their concern for health and safety at work by commitment and example
- Making their subordinates aware hazards involved in their task through their own training and experiences
- Making sure that their subordinates adhere to VRA Safety Rules, protection Code, Operating procedures, directives, by regular inspection and auditing work practices at work places
- Ensuring that safety equipment, tools and clothing are available for use and used as required and audited from time to time.

c. Responsibilities of Employees

Employees have responsibilities to the Authority, themselves and others to:

- Be aware that the responsibility for health and safety is that of each and every employee
- Carry out their duties in safe manner
- Be familiar with safety rules and protection code of VRA
- Be aware of the health and safety of the equipment, plant and materials with which they are working

6.2 HEALTH & SAFETY ACTION PLAN

6.2.1 Occupational Noise

The cost of setting up a monitoring system is far below the cost of injuries and penalties after the damage is done. If noise levels at the work place are measured, it is much easier to contain the human risk factors caused by excessive noise, as well as the economic risk arising from potential fines for breach of

regulations. Knowledge and understanding of noise regulations and the ability to use the correct measuring equipment, to record and interpret the results obtained in accordance with the regulations and to make suitable and appropriate recommendations, are of great value.

When employees are subjected to sound exceeding those levels listed above, feasible engineering and administrative controls must be used as the first step in noise control. If these controls fail to reduce sound to acceptable levels, hearing protection devices shall be used. Personal protective equipment (PPE) should be a last resort control measure.

As noted earlier the main noise generating activities are the delivery traffic to and from the lay down areas and to the construction sites and on site construction activity with fabrication and construction of the towers and stringing of the Lines.

Noise measurements will be carried out to determine the ambient levels of noise in areas where work is ongoing and nearby communities. In addition to this, the following shall be adopted:

- Provision of hearing protection devices for workers and staff
- Education of workers to avoid unnecessary noise making
- Good working practices will be adopted to minimize noise impacts.
- Working hours for work that requires noise generation will be restricted to the normal working day with no over night activity.

Maintenance practices such as the following should be practiced to reduce noise levels:

- Replacing worn or loose machine parts.
- Performing high noise operations during hours when people are less likely to be affected.
- Maintaining and lubricating equipment to eliminate rattles and squeaks.

Engineering controls, such as the following, can also reduce noise levels:

- Replacing noisy materials.
- Using large, low speed fans.
- Considering the noise level of new equipment or processes before purchasing or implementing.
- Placing heavy machines on rubber mountings.
- Using sound absorbing acoustical tiles or baffles.
- Placing noisy machinery or operations in a separate area or room.
- Enclosing noisy conveyors.

During the implementation of administrative and/or engineering controls, affected employees shall be provided with hearing protection devices and trained. Employees working with or near noisy equipment like concrete mixers will be provided with earmuffs to protect them against noise-induced hearing loss damage.

Before using personal protective equipment, such as ear plugs or muffs, to reduce noise exposure, it is important to reduce noise levels by changing work procedures. Further, to avoid contamination when using earplugs, it is important to wash hands before inserting earplugs and to replace disposable earplugs after each use.

6.2.2 Potential Hazardous Machinery

All potentially hazardous machinery such as lifting appliances (cranes, forklifts, etc) and unfired pressure vessels (compressors, etc) must undergo statutory examination by a certified engineer. This will ensure that accidents due to material failure are pre-empted. All electrical cables of mobile or hand-held machines (electric hand drills, temporary lights) must be examined for flaws in insulation and when any flaws are detected the cables must be promptly replaced.

6.2.3 Accidental falls from height

Fall hazards must be minimized through the use of fall prevention or fall protection. Fall prevention refers to using permanent engineering controls so that hazards associated with working at elevated locations are reduced or eliminated. Fall prevention should always be considered first and include measures such as outlined below:

- a) Employees on a walking/working with an unprotected side or edge that is 4 feet or more above a lower level must be protected from falling by the use of a guardrail system or a personal fall arrest system.
- b) Employees working on an aerial lift that is 1.2 metres (4 ft) or more above a lower level must wear personal fall arrest systems, with the lanyard attached to the boom or basket.
- c) Employees on walking/working surfaces shall be protected from falling through holes more than 1.2 metres (4 ft) above lower levels by the use of a guardrail system, a personal fall arrest system, or covers.
- d) Many falls occur because portable ladders are not placed or used safely. Ladder users are at risk of falling if a ladder is not safely positioned and moves or slips from its supports. A stairway or ladder must be provided at all worker points of access where there is a break in elevation of 48 cm or more and no ramp, runway, embankment, or personnel hoist is provided.

Fall protection is a temporary system that is designed to protect personnel from the risk of falls when working at elevated heights. Fall protection includes:

- a) The use of Scaffolds: Scaffolding is a temporary framework used to support workers and materials in the construction or repair of buildings and other large structures. It is usually a modular system of metal pipes, although it

can be made out of other materials. Scaffolds shall be furnished and erected for workers engaged in work that cannot be done safely from the ground, from ladders, or from solid construction.

- b) Stairways with railings; Stairs shall be provided for access from one structure level to another where operations require regular travel between levels and for access to operating platforms for any equipment that requires attention during operation. Stairs shall also be provided where regular access is required to work areas that may expose employees to acids, caustics, gases, or other harmful substances, or if carrying tools or equipment by hand is required.
- c) Floor and wall opening/hole covers;
 - Coverings may be installed over floor holes and floor or roof openings that will be open for a brief period of time.
 - Covers must be constructed with material and bracing capable of supporting, without failure, at least twice the weight of any load that may be placed on them. Loads on covers include employees, any type of equipment that may drive over the cover, and material loads.
 - Warnings must be painted on each covering, such as “Floor Hole Cover-Do Not Remove.”
 - Coverings must be secured in order to prevent accidental displacement by employees, equipment, or wind.
- d) Guardrails; Guardrail systems are the primary fall protection system for walking and working surfaces. All holes, openings, ramps, runways, and other walkways crossing or covering openings 1.2 metres (4 ft) or more in depth shall be protected with a guardrail system on all unprotected sides or edges.
- e) Bucket trucks or aerial lifts with work platforms; Safe aerial lift use includes:
 - Only authorized personnel may operate aerial lifts.
 - The manufacturer or equivalent must certify any modification.
 - The insulated portion must not be altered to reduce its insulating value.
 - Test lift controls daily.
 - Controls must be clearly marked.
 - Brakes must be set and outriggers used.
 - Boom and basket load limits must not be exceeded.
 - Employees must wear personal fall arrest systems, with the lanyard attached to the boom or basket.
 - Do not use any devices to raise the employee above the basket floor.
- f) Use of personal fall arrest systems shall be required on all unprotected elevations of 4 feet or more above a lower level. Fall arrest systems shall be set up so that employees cannot free fall more than 1.2 metres (4 ft) and will

not contact a lower level. Where this system is impractical, an alternative form of fall protection must be provided.

- g) Safe use of ladders instead of scaffolding or aerial lifts. Ladders with non-conductive side rails must be used when working near electrical conductors, equipment, or other sources. Ladders shall not be used horizontally for platforms, runways, or scaffolds. Overhead protection shall be provided for employees exposed to overhead hazards.

6.2.4 Fire Hazards Mitigation

The following measures must be put in place to minimize fire hazards during construction and at the substations:

- Fire extinguishers are provided at vantage points within all buildings.
- The construction site offices and substation shall be declared a 'No Smoking' zone. Workers must be educated to appreciate the importance of the prohibition of smoking on the premises.
- In order to forestall any explosions and outbreak of fire, it will be ensured that the use of naked flames close to 'live' pipelines is prevented.
- Design of building, exhibits, and facilities shall be in accordance with specific fire protection design criteria. Such designs must incorporate redundant fire protection concepts, employing active fire protection through automatic sprinkler protection, passive fire barrier features, and limiting combustible fuel load within office buildings in order to control and minimize potential losses to collections and infrastructure.
- In addition only spark-proof tools and equipment are allowed around 'live' pipelines.
- The use of liquefied fuel gases, such as propane, is prohibited inside all buildings or facilities unless authorized by Management.
- Fuel fired space heaters (e.g. kerosene) shall not be used inside any building or facilities.
- High temperature drying ovens and other heat producing equipment that operates at abnormally high temperatures shall be closely monitored and shall not be left unattended. Temperature controls shall be set under the ignition temperature of the material being heated.
- Lights used for drying within cabinets, cabinets, or drying boxes, shall be protected with a wire guard to prevent direct contact with combustible materials.
- Combustibles shall be maintained clear (minimum of 45 cm) from boilers, dryers, ovens, portable heaters, gas or oil fired burner flames, furnaces, water heaters, hot ducts, mufflers from engines, electric lamps, and irons.

6.2.5 Welding hazards mitigation

Measures must be in place to ensure that worker safety and health are not compromised during welding including the use of welding aprons to provide protection from sparks. A welding helmet is worn to protect the head from flash

burn due to welding, soldering, or brazing, but this does not provide primary eye protection and therefore safety glasses or goggles should be worn with the helmet.

6.2.6 Plant Lighting Mitigation

Workplaces today however, rely more and more on computers and generally do not require high levels of illumination. Such computer offices should have lower illumination levels if possible since high light levels can "wash out" the image on a computer screen and make it harder to view. If light levels are decreased, task lighting (e.g. desk lights) can be used to provide additional light for hard copy tasks.

To mitigate the effect of glare, however, overhead lights must be mounted in rows and the computer workstations should be placed between the rows to help reduce any glare and intensity of the light source. Windows should also be taken into account when placing any equipment. Workstations are best placed at right angles, so that no operator has their back to or face a window, therefore moving the light source - daylight - out of the line of sight. If this is a problem, office screens can be used to block daylight.

For reading and writing, adjustable task lights or desk lights can be placed on the desk to provide additional light when needed.

6.2.7 Work environment temperature

It is important that employee exposure to extreme heat temperature, protect personnel from the adverse effects of working in hot environments, and protect personnel from possible heat-related disorders must be controlled. Subsequently, Safe Work Practices must be implemented to combat the effects of heat temperature extremes, such as changes in work schedules and practices will help combat the effects of exceedingly hot and humid weather. Local work conditions and the use of personal protective clothing may produce an environment that will require restricted work schedules in order to protect employees. Adaptation of work schedules and training on recognition of heat stress conditions should help prevent heat-related illnesses from occurring.

6.2.8 Ventilation

Employees and workers must be protected from inhalation health hazards of airborne pollutants by first implementing engineering controls. Processes that generate dusts, mists, vapours, and gases without engineering controls must be evaluated by supervisors to determine if engineering controls are necessary. If engineering controls are not feasible, or while controls are being installed or repaired, administrative controls and/or personal protective equipment (PPE) are to be used.

Below are some criteria for the effective use of mechanical ventilation systems to mitigate inhalation hazards at their source, and the investigation and mitigation of indoor air quality concerns:

- a) Guidance on ventilation in the workplace recommends that the air supply rate for the workplace should not fall below 5 to 8 litres per second, per occupant. When looking at air supply the following should be considered:
 - The amount of floor space available
 - The work activity
 - The provisions of the premises smoking policy
 - Whether there are other sources of airborne contamination arising from process machinery, heaters, furniture, furnishings etc
- b) Local exhaust ventilation shall be the primary method for controlling toxic or noxious substances at the source of generation and before they can enter the environment to pose a potential health hazard to employees.
- c) General (dilution) ventilation is primarily used to control employee comfort (for example, temperature and humidity). Dilution ventilation may be used to reduce airborne concentrations of contaminants of low toxicity when they are generated at relatively low rates from diffuse sources.
- d) Visual/audible alarms shall be present in all areas where highly hazardous materials are used or may be present to detect leaks or malfunctions.
- e) Canopy hoods shall never be used to control toxic, radioactive, or explosive materials, since they could pull contaminants through a workers breathing zone and cause illness or injury.
- f) After recommended ventilation controls have been installed, an evaluation (testing and air balance report/ system commissioning report) of the system's effectiveness and operating efficiency shall be maintained.
- g) A Preventative Maintenance program shall be implemented to ensure that building mechanical systems are operating at peak performance and according to manufacturer's specifications. When a system failure occurs, preventive maintenance will be done.

6.2.9 Personal Protective Equipment (PPE)

An effective program shall be instituted to ensure that all personnel who, by nature of their job functions, have the potential to be adversely exposed to (or come in contact with) chemical, physical, radiological, or biological hazards are provided with appropriate PPE. This programme includes the following four steps:

a) Hazard identification and assessment

Once a job hazard analysis has been performed, efforts to eliminate or reduce the identified hazards through product or process substitution, engineering controls (physically changing a machine or work environment) or administrative controls (changing how or when employees perform their job) must first be attempted. If the hazards cannot be reduced to an acceptable risk by any of these methods, then PPE shall be selected that will protect employees from the identified hazards.

PPE devices alone shall not be relied on to provide protection against hazards, but shall be used in conjunction with feasible engineering controls, administration controls, and safe work practices.

After identification of workplace hazards has been completed, the Safety Coordinator shall assist the supervisor in making PPE product and selection recommendations. Selection shall be based on the technical requirements and with careful consideration of the following factors:

- Application - what part of the body is being protected?
- Chemical resistance - will the PPE material maintain its structural integrity and protective qualities? If hazardous materials are a concern, the Material Safety Data Sheet (MSDS) shall also be reviewed for PPE recommendations.
- Strength - is the PPE material resistant to punctures, tears, and abrasions?
- Flexibility - does PPE provide the necessary dexterity and tactile sensitivity required of the task?
- Thermal limits - does the PPE material maintain its mobility and protective capacity in temperature extremes?
- Cleanable - can the material be easily decontaminated and reused?
- Longevity - will the material resist aging?
- Ergonomic considerations (comfort and fit) – will the equipment be extremely uncomfortable (increasing the likelihood of its not being worn or worn properly), excessively restrict movement, or lead to ergonomic injuries when used in this task?

Selection must meet the minimum technical criteria applicable to the hazard. However, the choice of models meeting these criteria are often varied and therefore input from the affected employees as to the final selection is to be solicited. Employee involvement will greatly enhance wearer acceptance.

VRA will provide the PPE required by the job function at no cost to the employee. In the unlikely event that an employee must provide his or her own PPE, the supervisor shall be responsible to ensure its adequacy, reliability, proper maintenance and sanitary condition.

All PPE shall be of safe design and construction for the work performed.

b) Proper selection and assignment of PPE for each hazardous task performed

Eye/Face Protection

Eye protection and/or face protection shall be worn when there is the potential for exposure to the eyes or face from flying particles, molten metal, chemical splashes, gases or vapours, or potentially injurious light radiation. There are four general classes of eye and face protection: safety glasses face shields, goggles and welding helmets. The type of protection required shall be determined by the type and degree of the hazard

Side protection shall be required when there is a hazard potential from flying particles. Employees whose vision requires the use of corrective lenses shall wear goggles or a full-face shield that can be worn over the prescription lenses when their job duties require eye protection.

Foot Protection

Foot protection shall be worn when there is the potential for injury to the feet from falling or rolling objects, objects piercing the sole of the foot, electrical hazards, hot surfaces and slippery surfaces.

Head Protection

Head protection shall be worn when:

- There is a potential for injury to the head from impact or flying objects;
- There is a potential for injury to the head from falling objects (e.g., working below other workers who are using tools and materials which could be dropped);
- Any employee enters a construction site;
- There is danger of contact with energized power lines or equipment;
- Hair may be caught in machinery; or
- Sanitary protection is required.

Hand Protection

Hand protection shall be worn when hands are exposed to hazards such as skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns and harmful temperature extremes. Selection of PPE's for "Hand Protection" shall be based on (a) Performance characteristics of the hand protection relative to the task(s) to be performed (b) Conditions present; (c) Duration of use; and (d) Hazards or potential hazards identified.

Body Protection/Protective Clothing

Body protection/protective clothing shall be worn when there is a potential for exposure to other parts of the body (e.g., legs, arms, back, chest) from:

- Excessive heat or cold;
- Hot liquid or molten metal splashes;
- Radiation;
- Impacts or cuts; or
- The contact or absorption effects of acids, alkalis, and other hazardous chemicals

Selection of body protection/protective clothing depends on the type of hazardous exposure, the working environment, and the task to be performed. Body protection/protective clothing may include one or more of the following items:

- Lab coats or jackets;
- Leather chaps and sleeves;
- Aprons or vests;
- Cotton coveralls

An employee's personal work clothes are to fit his/her work assignment. The minimum protection required is a full short sleeve "T" shirt (tank shirts and cut down "T" shirts are not permitted) and long pants. These work clothes will help to prevent sunburn, plant rashes, abrasions and insect bites, and to afford some protection against flying particles and accidental spills of liquids. Shorts may be approved for some work duties (e.g., mail carriers) that do not present hazards to the skin. Any exceptions shall first be approved by your supervisor and the Safety Coordinator.

Electrical Protective Devices

Rubber insulating equipment shall be used to protect employees from shocks/burns while working on/near "live" electrical systems and equipment. Electrical protective PPE shall be inspected for damage, deterioration, and visible defects before each day's use, and immediately after an incident suspected of causing damage. Supervisors shall ensure the proper use of electrical protective PPE (e.g., gloves not turned inside out, leather protectors in place, etc.). Supervisors shall ensure that a hard hat designed to reduce electrical shock hazard is worn by each affected employee when near exposed electrical conductors which could contact the head. Supervisors shall ensure that occupational safety footwear designed to reduce electrical shock hazard is worn by each affected employee when near exposed electrical conductors which could contact the feet.

All electrical protective equipment shall be subjected to periodic electrical tests conducted in accordance with voltages identified by the required standards to indicate if the insulating equipment can withstand the voltage involved. Insulating equipment that fails to pass an inspection or electrical test shall be removed from

service immediately, tagged with a “Do Not Use” sign, and discarded. Rubber insulating equipment test intervals shall be performed. If the insulating equipment has been electrically tested but not issued for service, it shall not be placed into service unless it has been electrically tested within the previous 12 months. Supervisors shall be responsible for making test arrangements for rubber insulating equipment. Supervisors shall retain test results on file for the duration of use of the insulating equipment item.

Respiratory Protection:

VRA shall provide respirators to employees performing tasks/operations for which inhalation exposures cannot be controlled by use of engineering or administrative controls.

c) Established methods for effectively cleaning and maintaining PPE

All PPE’s provided shall be used and maintained in a sanitary and reliable condition, and in accordance with manufacturer’s recommendations. PPE shall be inspected prior to each use for tears, punctures, holes, cuts, cracks, embedded foreign objects and texture changes (e.g., swelling, softening, hardening, becoming sticky, inelasticity). Damaged or dirty PPE shall be discarded, changed and/or decontaminated. At a minimum, all PPE shall be discarded when it has become excessively contaminated, worn, torn or has other integrity problems.

d) Training users in the correct fit, use, care, and maintenance of PPE

Any employee who is required to wear PPE shall receive training on the proper use and care of the assigned PPE, to ensure that maximum protection is achieved by wearing the PPE correctly and maintaining it in good condition. The training shall be provided by the supervisor, with assistance as needed from the Safety Coordinator. Documentation is to be maintained by the supervisor and/or Safety Coordinator.

The training shall include at least the following subjects:

- When PPE is necessary to be worn, and why (i.e., the results of the Hazard Assessment);
- What PPE is necessary for each task;
- How to properly don, do, adjust, and wear PPE;
- The limitations of the PPE; and
- The proper care, cleaning, useful life, storage and maintenance of PPE;
- How to properly inspect PPE for signs of damage or wear, and how to tell when the PPE needs repair or replacement.

As part of the training, employees shall demonstrate their ability to use, maintain, and inspect their assigned PPE properly before being allowed to perform work requiring its use.

Retraining will be required under the following circumstances:

- Changes in the workplace render previous training obsolete.
- Changes in the types of PPE to be used render previous training obsolete.
- Evidence that the employee does not understand the need for, or proper use, maintenance or inspection of assigned PPE.

Training documentation must verify that the affected employee has received and understood the required PPE training through a written certification containing the name of each employee trained, the date(s) of training, and the subject of the training.

Protective clothing such as hard hats and safety boots will be provided for all employees at the proposed project site for protection against falling and/or swinging objects.

Raincoats, Wellington boots, etc will be provided for construction workers who will be working in rainy or wet conditions.

6.2.10 Current Dress Code

VRA has instituted a dress code for all plant workers, other staff and visitors to the plant. Employees need to wear clothing that is unwrinkled, clean, and maintained well. Clothing that is torn, dirty, or frayed is not acceptable. Appropriate dress code for VRA includes casual, comfortable clothing or uniforms, appropriate in a hands-on-workplace and the required safety equipment comprising of safety glasses, hard hats, and steel-toed shoes. All those involved in plant work must be dressed in appropriate attire for safety purposes.

All visitors must wear tags and hard hats when visiting the plant site. Additionally, clothing with words, logos, or pictures that could be offensive should not be worn.

6.2.11 Medical Monitoring

It is important that apart from putting in place adequate measures to prevent accidents, there should also be the provision of a medical facility to treat as well as monitor the health of the workers at VRA. The VRA has designated hospital/clinics around the country for use by staff. Contractors are required to identify appropriate health facilities of their staff. This notwithstanding, first aid boxes well stocked with the requisite items, as prescribed by law must also be provided on-site.

A first aid box stocked with all the items prescribed by the Factories, Offices and Shops Act, 328 will be provided and maintained. In addition, a vehicle will constantly be on standby for use as an ambulance for the conveyance of all persons who may sustain major injuries during the course of the implementation of the project to the nearest Health Centre.

7. EMERGENCY PREPAREDNESS AND RESPONSE

The basis for emergency response and planning is firstly incident prevention, and secondly rendering any incidents harmless. The priorities for protection in an emergency situation are the following:

- a. Human life and health;
- b. The environment;
- c. Assets belonging to VRA or the contractor;
- d. Maintenance of normal operations on site.

Emergency response plan shall be prepared to manage effectively a wide range of incidents that may occur at the project site. This includes emergency plans for fire, storm, chemical spills and road accident, and other emergency as identified which may affect the project. The protection of the environment shall be primarily dealt with in this plan.

VRA shall also take all reasonable measures to prevent contamination of water air or land as a result of any incident, to reduce such contamination if it is unavoidable and to remediate any contamination that has occurred during the works. The Contractor is mandated to immediately report any significant incidents to the VRA Project Manager, who shall in turn inform the Director, Technical Services.

7.1 RESPONSIBLE PERSONNEL

The person responsible for emergency response shall be the Site Safety Officer. Personnel are required to familiarize themselves with all emergency procedures. Such procedure shall be displayed at notice boards where appropriate, and made available to all. The alarms and procedure will be regularly tested (at no less than 3 months interval) for effectiveness, and where necessary, the procedures will be updated and additional training given to personnel.

Teams of employees will be selected and trained to be involved in handling emergency situation. These teams will be called into action in times of emergency, and will be given other authorities beside their usual work responsibilities.

7.2 ROAD ACCIDENTS

In the event of road traffic accident, the appropriate channel of information shall be established for the line managers, road accident emergency team leaders, in addition to the relevant authorities associated with the accidents, such as the police, hospital, fire brigade, etc.

The Road Accident Emergency Response team will activate their response plan according to the situation, aside from providing medical attention, transporting the

injured for medical attention, removing the accident Vehicles after the necessary investigation has been done, and dealing with the relevant authorities, the aim is to bring the situation back to normalcy soonest possible. In all respect, traffic management procedure will be activated where the appropriate emergency procedures such as temporary diversion of traffic, the deployment of flagman, installation of traffic diversion signs, barricades or traffic cones, blinkers lights and any other traffic safety requirements as instructed by the authorities will take precedent.

7.3 EMERGENCY PRE-PLANS

All work areas shall be equipped with a layout plan for emergency purpose, locations of Assembly Areas, locations of emergency equipment and names of fire fighting team members, first aid team members and emergency contact numbers.

In case of an emergency, the following steps shall be undertaken:

- Sound the Emergency Alert
- Switch off all equipment, machinery and electrical appliances.
- Alert other members/ workers of the emergency.
- Leave the emergency area and go to the allocated Assembly area.
- Supervisors/Foremen shall perform a Headcount and ensure that all personnel are accountable for.
- Report to the Rescue Leader should any personnel is found missing.
- Alert the Rescue Team Leader and Members.
- All Rescue Team Members shall report to the Rescue Team Leader for instructions.
- Rescue Team Leaders shall report to the Emergency Controller on the status of the emergency.
- Emergency controller shall decide on the next action to be taken or should any external parties be involved.

7.4 DUTES OF EMERGENCY CONTROLLER

- The Emergency Controller shall take control of full operation of the emergency;
- The Emergency Controller shall give instructions to Rescue Team Leaders in performing the rescue operation;
- The Emergency Controller shall decide and call for additional help when required;
- The Emergency Controller shall station himself in the office and call for external help when required;
- All communications shall be by phone, or any other available means.

7.5 DUITES OF RESCUE TEAM

- Attend emergency when required by the Emergency Controller
- Access and advise the Emergency Controller of the situation
- Arrange for road diversion when required
- Arrange for First Aid when necessary
- Arrange for Fire Fighting Crew when required
- Ensure access route to Emergency area is clear for Emergency Vehicles
- Request for additional help when required
- Arrange personnel for crowd control

7.6 PROCEDURES FOR ENVIRONMENTAL INCIDENT/ACCIDENT INVESTIGATION

Understanding the causes and circumstances involved in adverse incidents is essential in making changes to prevent future occurrences. It is paramount that all incidents and accidents are reported and investigated in order to understand how and why incidents occur, identify root causes, and develop countermeasures to prevent future occurrences. When injuries occur, access to prompt medical attention and effective case management is crucial to limiting the number of days lost and insuring the employee receives timely medical treatment and returns as soon as possible to healthy and productive employment.

The primary purpose of investigating accidents and work injuries is to determine the cause so that the necessary action can be taken to prevent re-occurrence. To have an effective Accident Prevention Programme, therefore all accidents whether or not they result in injuries must be reported so that necessary preventive measures can be instituted.

Investigations following an accident should be conducted soon after the accident as can be arranged. This will ensure that statements are made while the incidents are still fresh in people's mind. Details of accidents and incident investigations and reporting to be followed for this project can be found in Chapter 4 of the VRA Corporate Safety Handbook (2001), and is summarised below and outlined in Table 6:

- Serious accidents and serious and fatal work injuries shall be investigated by a Committee of at least three persons appointed by the Director, Technical Services. The Committee shall have a chairman appointed by the Director, Technical Services and shall have the Chief Safety Officer as secretary/member.
- The Committee appointed by the Director, Technical Services shall be required to investigate the circumstances of the accident and the unsafe act or acts which caused or contributed to the accident and submit its findings in writing in quadruplicate to the Director, Technical Services. The report shall include appropriate recommendations for the prevention of a recurrence of such incident.

- On the receipt of the report of the Committee of Enquiry, the Director, Technical Services, shall study the report and make final recommendations covering all aspect of the accident. The recommendations should not however include disciplinary action against any employee involved. The Director, Technical Services shall forward a copy of the report together with his recommendations to the Chief Executive and a copy to the Project Manager/Contractor.
- The Manager, Safety shall maintain an Accident records file for each employee and shall be responsible for compiling accident statistics as may be required by the Director, Technical Services.

Table 6: Definitions of incidents based on the severity of injury or property damage, the notification procedures and requirements and defines who investigates the incident.

CATEGORY AND DEFINITION	WHO INVESTIGATES	NOTIFICATION REQUIREMENTS
<p>Catastrophic</p> <p>Fatality, permanent total disability, hospitalization of 3 or more personnel for the same incident, a hazardous materials that causes mortal injury or irreparable environmental damage, or property damage</p>	Investigation conducted by Committee of Enquiry in conjunction with Chief Safety Officer, appointed by the Director, Technical Services	The first person with knowledge of the catastrophic incident will report immediately to the Safety Officer, also if appropriate, directly to 911. Also report as soon as possible but no later than 2 hours to the Safety Officer who will report to the Director, Technical Services through the Manager, Safety
<p>Serious</p> <p>Any hospitalization, injury or illness of 2 or more personnel from the same incident, permanent partial disability, a hazardous materials incident causing reparable but long term damage to the environment, a radiological event causing non-compliance, any fire and property damage.</p>	Investigation conducted by Safety Officer, and at the discretion of Director, Technical Services	The first person with knowledge of the serious incident will report immediately to the Safety Officer and directly to 911 if appropriate. Also report as soon as possible but no later than 24 hours to the facility/ organization director and Safety Officer. Safety Officer will report to the Director, Technical Services through the Manager, Safety, at least within 48 hours of the incident.
<p>Recordable but not meeting the serious or catastrophic criteria</p> <p>Occupational injury or illness causing a lost workday other than the day of the incident, restricted work activity or job transfer, unconsciousness, medical treatment, significant injury or illness</p>	Investigation conducted by Safety Officer	Supervisor of the injured employee will report immediately to the facility Safety Officer who will investigate. The supervisor will complete a VRA Medical Form 39 and forward to Safety Officer within 3 days. The Safety Officer will sign and forward original to Director, Technical

CATEGORY AND DEFINITION	WHO INVESTIGATES	NOTIFICATION REQUIREMENTS
that does not result in lost time or restricted work activity.		Services within 6 days of the incident.
<p><i>Reportable but not recordable</i></p> <p>Occupational injuries/illnesses not resulting in a lost workday other than the day of the mishap (first aid, treated and released), property damage, hazardous materials release under reportable quantities, or near misses.</p>	Investigation conducted by Safety Officer	Employees and supervisors will report all suspected hazards, near misses and non-recordable occupational injuries and illnesses to their supervisor and the facility/organization Safety Officer.

7.7 EMERGENCY RESPONSE PLAN FOR HAZARDOUS CHEMICAL SPILL

The following materials may be available on site and can be considered as hazardous: petroleum products, septic wastes, paints, stains, wood preservatives, pesticides, acids, solvents, motor oil, lubricants, hydraulic fluid, detergents, batteries, glues, acetylene, cement, mastics/adhesives, medical wastes, etc. There is a potential of spillage of any of these hazardous materials and there is the need to prepare a procedure for an emergency preparedness plan in the event of hazardous chemical spills.

A. Purpose

The purpose of the procedure is to define a plan of action for potential hazards associated with the transmission line project including accidental spills of all hazardous materials in accordance with the material data safety sheet (MSDS) and international standards.

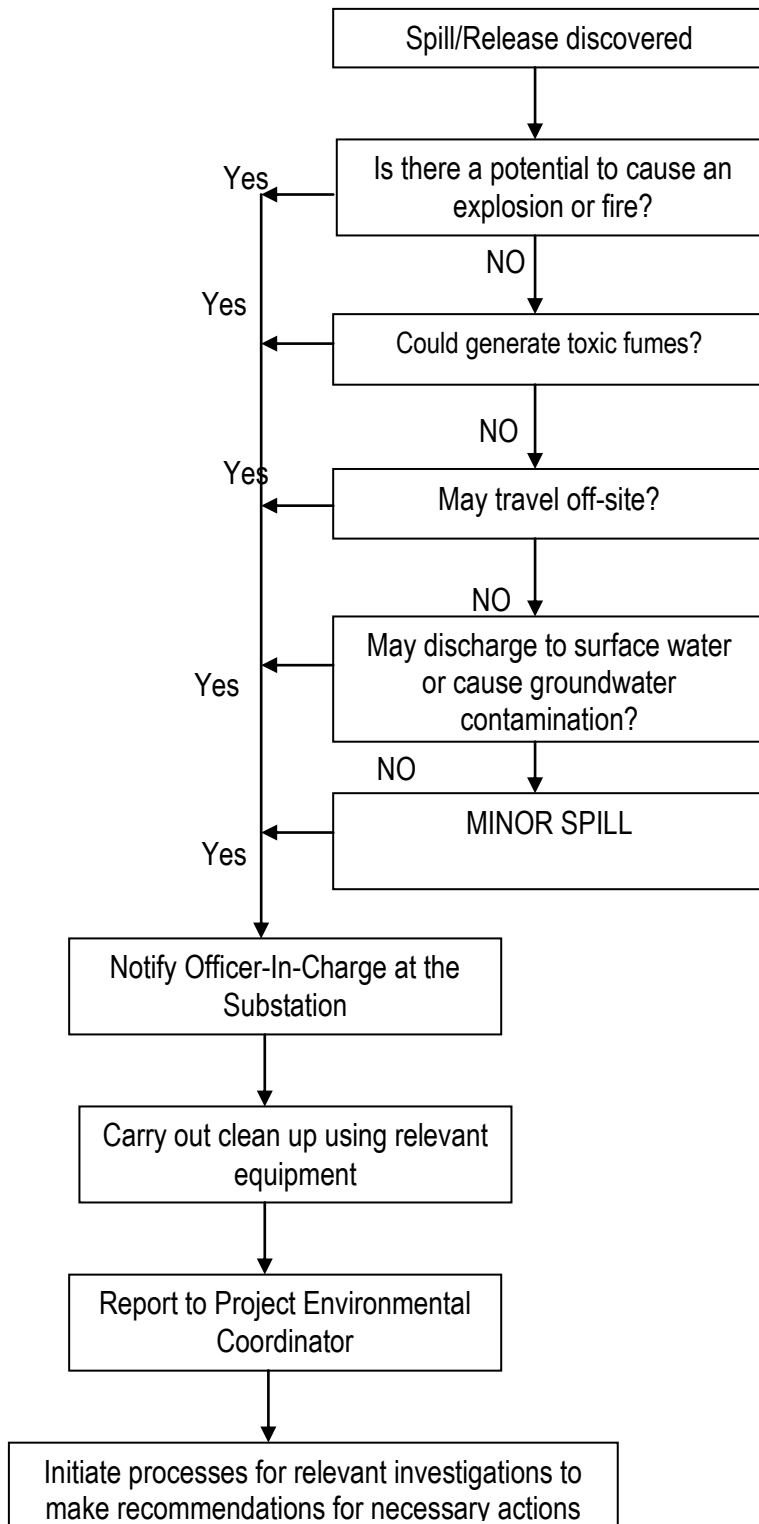
B. Scope

The procedure covers the actions to be implemented in the event of substantial spillage or accidents caused by hazardous materials. It applies only to the 225 kV Bolgatanga-Ouagadougou Interconnection Project – Ghana Section.

C. Notification procedure

The notification procedure indicates the measures to be taken on discovering the spill, and the personnel to be informed. This will enable trained personnel and outside agencies to respond quickly.

Figure 2: Hazardous Material Spill Notification Flow Chart



i) First notification

Upon the discovery of a spill or suspected spill from a transformer, the person discovering the spill, the First Notifier, must immediately contact the Officer-In-

Charge (OIC) at the affected substation. They should attempt to provide the following information:

- a) Time of discovery
- b) Possible Spill Material
- c) Quantity of Spill Material
- d) Area of land or lake involved in the spill event
- e) Estimate of whether or not the spill is ongoing
- f) Actions which have been taken

Using the above information, together with knowledge of the volumes of petroleum products available for the project, available personnel, and visual observations, the OIC at the substation will make a determination of the severity of the spill event and the notification procedures to be implemented using the Hazardous Material Spill Notification Flowchart outlined in Figure 2 above.

It is the responsibility of the Officer in Charge (OIC) at the project site to collect the above information to determine the source and cause of the discharge. It is anticipated that any hazardous chemical will be of very limited quantities and therefore any accidental spillages will be minor and will be well contained without any offsite notification.

- ii) The OIC shall: -
 - a) Immediately move logistics as appropriate to the site of the incident.
 - b) Contain the spill and prevent its spread
 - c) Undertake the spill clean-up

Take appropriate steps to inform the Project Environmental Coordinator for any relevant internal or external action to be taken.

- D. If any accident or incident detrimental to the environment occurs, the cause(s) of the accident / incident and the aspects of the action plan that could be improved shall be identified through VRA's accident investigation procedures and plans to correct the hazard or amend the EMP shall be made.

7.8 PROCEDURES FOR HANDLING RAW MATERIALS/PRODUCTS

All materials handling and storage shall be performed in accordance with the requirements contained in the Material Safety Data Sheet (MSDS) and as outlined under Section IX "Material Handling, Storage & Disposal" of the VRA Corporate Safety Rules, 2001. Since injuries may result from improperly handling and storing materials, it is important to be aware of incidents that may occur from unsafe or improperly handled equipment and improper work practices when handling and storing materials.

Some hazards associated with materials handling are outlined below to make all workers aware of the consequences:

1. Back injury is the number one injury associated with improper material handling.
2. Heavy or unbalanced loads could fall and injure employees, especially head and feet.
3. Vehicle becomes unbalanced and overturns with driver not wearing seat belts.
4. Improper or unsafe use of material handling equipment could cause injury or property damage.
5. Falls from working platforms or ladders could occur.
6. Damaged or poorly maintained equipment could cause injury.
7. Battery charging and filling pose significant risks.
8. Loading docks pose numerous risks for injury or property damage including:
 - falls from unguarded dock edges,
 - slips/trips due to wet or icy surfaces,
 - caught between/under due to crowded staging areas, unbalanced loads,
 - collision due to numerous pieces of moving equipment or vehicles,
 - tip over due to steep inclines improperly traversed,
 - lift platforms could fail or operate improperly,
 - Wheeled vehicles could roll if not properly secured, or damage to vehicles could occur due to tight manoeuvre room,
 - Overhead doors may open or close unexpectedly,
 - Hazardous chemicals with their commensurate risks may be involved during loading/unloading operations
 - Any fuel-operated material-handling vehicle poses the risk of fire and explosion.
 - Material handling equipment used in cramped spaces or populated areas pose significant hazards of injury or property damage.

7.8.1 Material Handling Procedures

7.8.1.1 Moving Loads (General)

- a. Check the load first to decide how best to move it—forklift, hand truck, hoist, conveyor, manually, etc. Then check the route to be taken and remove obstacles, or find another route if the obstacle cannot be moved. Make sure there is space for the load at its destination and that equipment, platforms, elevators, etc. are rated to handle the load weight and bulk.
- b. Forklifts, hand trucks, dollies, or other material handling equipment (MHE) carrying unbalanced loads or loads that obstruct the operator's view may be dangerous to the operator and any other employees in the area. Place loads carefully so they are stable and will not fall off or tip the equipment over. Load heaviest objects at the bottom and secure/strap any bulky or awkward items. Ensure operator has sufficient view in direction of movement.

- c. Whenever MHE are equipped with seat belts, operators should wear them.
- d. Consider a ground guide when negotiating bulky loads through narrow aisles or crowded spaces.
- e. When operating on a ramp or steep incline, employees shall keep loads downhill to prevent the load from rolling over them if they lose control.
- f. Employees shall inspect material handling equipment before each use
 - Check the framework for obvious signs of damage such as broken welds or fractured boards.
 - Check the tires for large pieces missing from solid tires and air missing from pneumatic tires.
 - Ensure accessories (e.g., handle extensions, nose plate extensions, stair climbers, etc.) are properly attached.
 - Inspect straps and ratchets for damage or deterioration. Test wheel brakes to ensure they work.
 - If damage/defects are noted, remove the equipment from service and tag with a “Do Not Use” sign until it is repaired.

7.8.1.2 Manually Moving Loads

- a. Manual lifting and moving loads is a major potential source of back injuries among workers. When manually moving materials, employees shall follow proper lifting techniques. Employees shall seek additional assistance when:
 - A load is so bulky they cannot grasp or lift it;
 - When they cannot see around/over the load;
 - When the load is too heavy to handle for one person, and
 - When a worker cannot safely handle the load manually.
- b. Supervisors shall assist employees in reducing the potential for back injuries by employing the following lifting principles whenever possible:
 - Eliminate the need to handle materials manually by using/installing mechanical lifting aids (e.g. lift truck, conveyor, hoist, etc.);
 - Manually move the loads with a handling aid (e.g. cart, dolly, etc.);
 - Reduce the size or weight of the objects lifted;
 - Change the height of a pallet or shelf.
- c. Using safe manual lifting techniques may reduce back injuries such as pulls and disc impairments. Leg muscles are stronger than back muscles, so workers should lift with their legs and not with their back.

7.8.1.3 Forklifts/Powered Industrial Trucks

- a. Trucks shall have a label indicating acceptance by a nationally recognized testing laboratory. No one shall be permitted to make modifications or additions affecting the capacity or safe operation of a powered industrial truck without the manufacturer's prior written approval. Any modifications and additions shall be added to the truck's capacity, operation, and maintenance information and postings.
- b. Powered industrial trucks operating in potentially hazardous atmospheres must be approved for that purpose and have additional safeguards for use.
- c. Because of the fire hazard, only electrically powered material handling equipment will be used in museums, collections areas and populated spaces. Newly purchased forklifts will be battery powered. Large, gas-powered equipment required for lifting extremely large exhibits may only be used when no visitors are present.
- d. Trucks shall not be parked and left unattended in areas occupied by or frequented by the public.
- e. Forklifts/powered industrial trucks shall be inspected prior to use. Keep on hand the last five (5) checklists for auditing purposes to ensure documentation of inspections.
- f. Forklifts/powered industrial trucks have a high centre of gravity and may tip over if not driven slowly and carefully by trained, authorized operators. Materials lifted incorrectly or placed improperly on the forks may easily slip, causing a hazard to the operator and any other employees in the area. When picking up materials with a forklift/powered industrial trucks, operators shall:
 - Follow the manufacturer's operational instructions.
 - Keep forks and loads low and tilted back while moving.
 - Centre the load on the forks as close to the mast as possible, which minimizes tipping or chances of the load falling.
 - Do not overload forklifts/powered industrial trucks because it will impair the controls and cause tipping. Do not put extra weights on the rear of a counter-balanced forklift/powered industrial truck to allow an overload.
 - Adjust the load to the lowest safe position when travelling.
 - If the load obstructs the operator's forward view, then the operator shall travel with the load trailing the vehicle. Consider the use of a ground guide if needed.
 - Pile and cross-tier stacked loads correctly.
- g. Additional safety precautions for forklifts/powered industrial trucks:
 - Provide sufficient head room under overhead installations, lights, pipes, and sprinkler systems.

- Forklifts shall be equipped with a cage over the operator’s seat to protect them from shifting or falling loads. The forklift shall also be equipped with a vertical load back rest extension when the load presents a hazard to the operator.
- Forklifts shall be equipped with a back-up alarm and a horn. When a forklift is used inside a building it must have a strobe light attached to its roll cage.
- Be careful when approaching doorways, aisle crossings, and other intersections—sound a warning signal whenever pedestrians or other moving equipment are operating in the same area. When more than one forklift is operating in the same area, follow the rules of the road- e.g. yield to the right, stop at intersections and clear before preceding, etc.
- Where applicable provide signage to warn pedestrians to be on the look-out for powered industrial trucks and stay out of the way when truck is in use.
- Park a forklift with the forks lowered and tilted flat, brake set, and keys removed. Block the wheels if the truck is parked on an incline. These precautions will be followed when an operator will be more than 7.62 metres away from the vehicle or the vehicle is out of sight.
- Set the brakes when using the truck to load/unload materials. The dock/board/bridge plate shall be secured so they will not move when equipment drives over them.
- Additional riders are prohibited on forklifts/powered industrial trucks.
- Never stand or walk under the raised part of a forklift/powered industrial truck.
- Do not put arms/legs between the uprights of the mast or outside the running lines of a forklift/powered industrial truck.
- Locate battery-charging installations in designated areas, and ensure fire extinguishers are within 7.62 metres meet when charging. This area must be designated as a “No Smoking” area. Spill control supplies must be available for neutralizing and flushing spilled electrolyte. The battery-charging equipment shall be protected from truck damage. Provide ventilation of battery-charging gases.
- Disconnect battery before repairing an electrical system.
- Provide auxiliary directional lighting on forklifts/powered industrial trucks when the general lighting is less than 2 lumens/square foot.

7.8.1.4 Hoist

- a. It is required that all hoisting equipment be inspected initially according to standards set by the individual manufacturer.
- b. Inspections:
 - Prior to First Use/Major Alteration: Following assembly and erection of hoists, and before being put in service, an inspection and test of all functions and safety devices shall be made under the supervision of a

- Competent Person (one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them). A similar inspection and test shall be required following major alteration of an existing installation.
- Daily (or prior to use) inspections: Daily (or prior to use if hoists are not used daily) inspections shall be performed by the operator at the start of each shift, or at the time the hoist is used for the first time during each shift. The inspection regimen shall include, but not be limited to, an examination of the chain for wear, twists, excessive dirt, broken links, and proper lubrication. Hooks shall be inspected for deformations, cracks, damage, and properly operating latches.
 - Frequent inspections: Frequent inspections are the next level up from daily inspections. Frequent inspections shall be performed by a person who is trained, experienced, and qualified to perform hoist inspections. How often the frequent inspections are done is a function of hoist service. If the hoist is seeing normal service, then the frequent inspections should be conducted once a month. For heavy service, the frequent inspections should be weekly to monthly. Severe service applications warrant frequent inspections, daily to weekly. During frequent inspections, check the hoist more thoroughly than the operator's daily inspections.
 - Periodic inspections: Periodic inspections shall be performed by a qualified inspector, and at intervals recommended by the manufacturer and according to the severity of the service. Hoists shall also be inspected and tested at not less than three month intervals. Periodic inspections are more thorough than frequent inspections. Disassembly is not required for any of these inspections unless the inspection indicates a breakdown is needed. However, prior to placing the hoist back in service, load testing is required if some disassembly involving load-bearing components has occurred.
- c. The most important variables in safe hoist operation are knowledge about the hoist, the load, and safe operating practices, and the training and communication that support that knowledge.
- d. Safe hoist operation begins with proper hoist selection. The hoist must be matched to the application. Hoist capacity is of primary importance; it is critical that the hoist selected has a capacity that exceeds the weight of the load. Consider a powered hoist if the load has to be lifted a long distance or repeatedly.
- e. Ensure the hoist's load chain is long enough to reach the load. The chain must be straight and properly seated in the load sheave. Avoid tip loading unless the hook is specifically designed for point loads.

- f. Operator training shall be specific to the type of hoist the operator will be using, including information about lift capacity as well as inspections and maintenance, slip clutches, load limit devices, braking mechanisms, and wear limits. Training shall include a discussion of balanced lift points and safe rigging practices.
- g. Slings or other attachments shall be seated in the saddle of the hook and hook latches shall be present and functioning properly. The hoist's load chain shall never be used as a sling.
- h. Loads shall always be lifted slowly at first to ensure everything is seated and operating properly. Lift loads vertically, and do not side pull a load, which places additional stress on the hoist and risks uncontrolled load swings.
- i. Avoid using the hoist's travel limits to stop operation. These limits are usually not designed for regular everyday usage; they are intended for emergency use.
- j. When the hoist is coupled to a trolley, take care not to crash the trolley into the end stops on the beam. Hitting the end stops increases stress on the hoist and may cause dangerous load swings.
- k. Jogging the hoist's motor shall be minimized; it generates heat in the motor's windings, which could lead to motor failure.
- l. Supervisors shall ensure hoist operators and signal persons can communicate, especially in noisy environments where lifting operations require a hoist operator and a signal person (e.g., rigging or hook-up person) to use hand signals or voice communication. Hand signals shall be documented and posted. Except to obey a stop signal, the operator shall only respond to hand signals from the designated signal person.
- m. Before giving the signal to lift a load, the operator shall inspect their surroundings, to ensure they have a solid foundation for executing a manual lift, and that all personnel are clear of the load. The operator shall communicate their intention to begin lifting to employees in the immediate vicinity of the lift, and pay close attention to the hoist in progress. Operators shall never leave a load unattended or suspended.
- n. It is the hoist inspector's responsibility to alert maintenance workers of an inspection's findings. Hoists that do not pass inspection need to be tagged "Out of Service" and removed from the hoisting area until repaired or replaced.
- o. The employer shall prepare a certification record for frequent and periodic inspections that includes the date the inspection and test of all functions and safety devices was performed; the signature of the person who performed the inspection and test; and a serial number, or other identifier, for the hoist that

was inspected and tested. The most recent certification record shall be maintained on file.

7.8.1.5 Scissor Lift Work Platforms

- a. Lifting and elevating the work platform must be done on flat, firm surfaces.
- b. The safety bar located inside the lifting mechanism must be used to prevent lowering of the scissor-type lift during maintenance or inspection.
- c. Do Not:
 - Elevate the work platform if it is not on a firm level surface; or
 - Exert excessive side force while the work platform is elevated;
 - Overload (the relief valve does not protect against overloading);
 - Alter or disable limit switches;
 - Raise the platform in windy or gusty conditions. (The manufacturer recommends not raising to full height or half height in windy or gusty wind conditions). The manufacturer follows a 32 km per hour wind speed as a guide. The manufacturer recommends not raising the lift if the wind speed is 32 km per hour or greater.)
 - Park the work platform on high traffic sidewalks that will impede foot traffic or wheelchair traffic.
- d. Safety Devices
 - The guardrails must be upright and locked in place with locking pins.
 - The safety bar must be used for inspection and maintenance.
 - Do not reach through scissor assembly without ensuring that the safety bars in its proper position.
 - The operator must wear a personal protective device (positioning device system) to prevent movement past or over handrails. The personal protective device will consist of a body belt with a lanyard attached to an anchor point to ensure a 100% no-fall situation. The anchor point must be positioned so the employee cannot reach the handrail with slack in the lanyard; this will prevent an employee from being able to fall from the platform.
- e. Operators must read and completely understand the operator's manual before being allowed on a work platform.
- f. Inspect and/or test for the following daily (documentation not required):
 - Operating and emergency controls;
 - Safety devices and limit switches;
 - Tyres and wheels;
 - Outriggers;
 - Air, hydraulic, and fuel systems for leaks;

- Loose or missing parts;
 - Guardrail systems;
 - Engine oil level; and
 - Hydraulic reservoir level.
- g. Do not operate unless proper authorization and training have been received.

7.8.1.6 Slings and Hooks

- a. Personnel using slings should adhere to the inspection and safe use criteria.
- b. Personnel using hooks for moving materials will use hooks with self-closing safety latches or their equivalent to prevent components from slipping out of the hook.

7.8.1.7 Cranes and Gantries

- a. The project may utilize overhead cranes to facilitate materials handling. Though this machinery facilitates the work, unsafe operators can put lives and property at risk.
- b. Operators of cranes and hoists must be aware of equipment limitations, inspection requirements, proper rigging, and control functions. If your department maintains and operates a crane or gantry, ensure operators are properly trained

7.8.1.8 Rated Capacity Markings

All material-handling equipment (e.g., forklifts/powered industrial trucks, conveyors, hoists, dollies, carts, etc.) shall have a rated capacity noted on it that determines the maximum weight the equipment can safely handle and the conditions under which it can handle that weight. Employers must ensure that the equipment-rated capacity is displayed on each piece of equipment.

7.8.1.9 Storage Requirements (General)

- a. Emergencies could become disasters if exits, fire alarms, power switches, sprinklers, light switches, etc., are blocked – even temporarily. Employees shall not block emergency access or equipment. Aisles and passageways must be kept clear of obstructions and slip, trip, and fall hazards. A 91 cm clearance shall be maintained around emergency equipment and the emergency equipment shall be clearly marked.
- b. Do not store materials in excess of supplies needed for immediate operations in aisles/passageways.

- c. Employers shall mark permanent aisles and passageways. Obstructions in aisles (e.g. columns, posts, etc.) shall be clearly marked.
- d. When using aisles and passageways to move materials mechanically, employees shall allow sufficient clearance for aisles at loading docks, through doorways, wherever turns must be made, etc. Sufficient clearance will prevent workers from being pinned between the equipment and objects in the workplace and will prevent the load from striking an obstruction and possibly falling on an employee.
- e. When different levels exist, ramps shall be used by vehicles moving materials.
- f. Doors shall be of sufficient height and width to accommodate material handling equipment. Aisles shall be 60 cm wider than the widest vehicle used. Exit access aisles in storage areas shall be at least 110 cm wide.
- g. There must be enough operating space for handling and stacking materials safely in all storage areas.

7.8.1.10 Storage of Hazardous Materials/Chemicals using Material Handling Equipment

- a. Read labels and Material Safety Data Sheets (MSDSs) before storing chemicals or flammable/combustible materials. Match storage conditions to material handling requirements (e.g., dry, cool, ventilated, etc.). Smoking and using open flames or spark-producing devices are prohibited in chemical storage areas. Non-compatible materials must be segregated in storage.
- b. Trash, brush, long grass, and other combustible materials shall be kept away from areas where flammable/combustible materials are handled or stored.
- c. All spills of flammable/combustible materials shall be immediately cleaned up.

7.8.1.11 Storage of Other Materials

- a. When storing materials, workers shall:
 - Prevent creating hazards when storing materials by being aware of the material's height and weight; how accessible the stored materials are to the user – consider the need for availability of the material; and the condition of the storage containers. All materials stored in tiers must be stacked, racked, blocked, inter-locked, or otherwise secured to prevent sliding or collapse.
 - Keep storage areas free from accumulated materials that may cause slips, trips, falls, or fires or that may contribute to harboring pests.
 - If possible, place bound materials on racks and secure it by stacking, blocking, or inter-locking to prevent it from sliding, falling, or collapsing.

- Ensure stacks are stable and self-supporting. Observe height limitations when stacking materials.
- Stack bags and bundles in interlocking rows and limit the height of the stack to keep them secure.
- Block the bottom tiers of drums/barrels/kegs to keep them from rolling if stored on their side.
 - i. Stack drums/barrels/kegs symmetrically.
 - ii. Place planks, pallets, etc. between each tier of drums/barrels/kegs to make a firm, flat stacking surface when stacking on end.
 - iii. Chock the bottom tier on each side to prevent shifting in either direction when stacking two or more tiers high.
- Materials must not be stored on scaffolds or runways in quantities exceeding those needed for immediate operations.
- Additional safe material storage practices include:
 - i. Ensuring shelves and racks are sturdy and in good condition.
 - ii. Stacking all materials on a flat base.
 - iii. Placing heavier objects closer to the floor and lighter/smaller objects higher.
 - iv. Not stacking items so high that they could block sprinklers (46cm of clearance) or come in contact with overhead lights or pipes.
 - v. Using material-handling equipment or a ladder to place or remove items above your head.
 - vi. Never standing on a shelf, rack, boxes, or a chair.

8. PROGRAMME TO MEET REQUIREMENTS

8.1 ENVIRONMENTAL MANAGEMENT STRATEGY

Environmental protection management with supervision and organization tasks have been established under direct leadership of the Project Manager at the time of work beginning, to organize and supervise the carrying out of the environmental protection procedure. Conflicts and problems between environmental protection and project works during the construction phase shall be well harmonized to achieve coordinated development of environmental protection and constructional activities.

The Corporate structure of VRA provides for a department of Environment & Sustainable Development Department (E&SDD) headed by a Director. This department is responsible, among others, for pre-project development as well as the post project implementation of all environment-related activities of the VRA. E&SD exercises general oversight over the environmental performance of all projects and reports to the VRA Executive on compliance with all regulatory and statutory requirements.

VRA's organizational chart, which has been put in place to enhance the implementation of the Environmental Management Plan (EMP), is shown in the Figure 3. The chart details the position of the Environmental Officer as well as other officers of the project that play various roles in the implementation of the EMP. In the absence of the jobholder, the relevant manager or subordinate undertakes the assigned duties or delegates as required.

The Project Manager of the 330 kV WAPP CTB has overall responsibility regarding the implementation of the ESMP as well as the environmental protection procedure on site. The Project Manager will issue clear instructions to Departments, through the Director, E&SD, which shall impact on environmental protection, to ensure that no unnecessary damage or environmental pollution is created during the construction. The Project Manager has been empowered to order the cessation of work if he feels that it is unnecessarily detrimental to the environment.

The Project Manager, 330 kV WAPP CTB Project Unit shall be responsible for, among others:

- The definition and implementation of the station's environmental policy
- The level of environmental management compliance the project achieves
- The availability of trained and capable workers to manage, perform and verify work affecting the environment
- Provision of budgetary allocation, financial resources and logistics

All line managers are responsible for:

- Organising and managing personnel reporting to them,
- Ensuring that the requirements of the Environmental Management System as detailed in the company's environmental policy are implemented and maintained in their area of responsibility

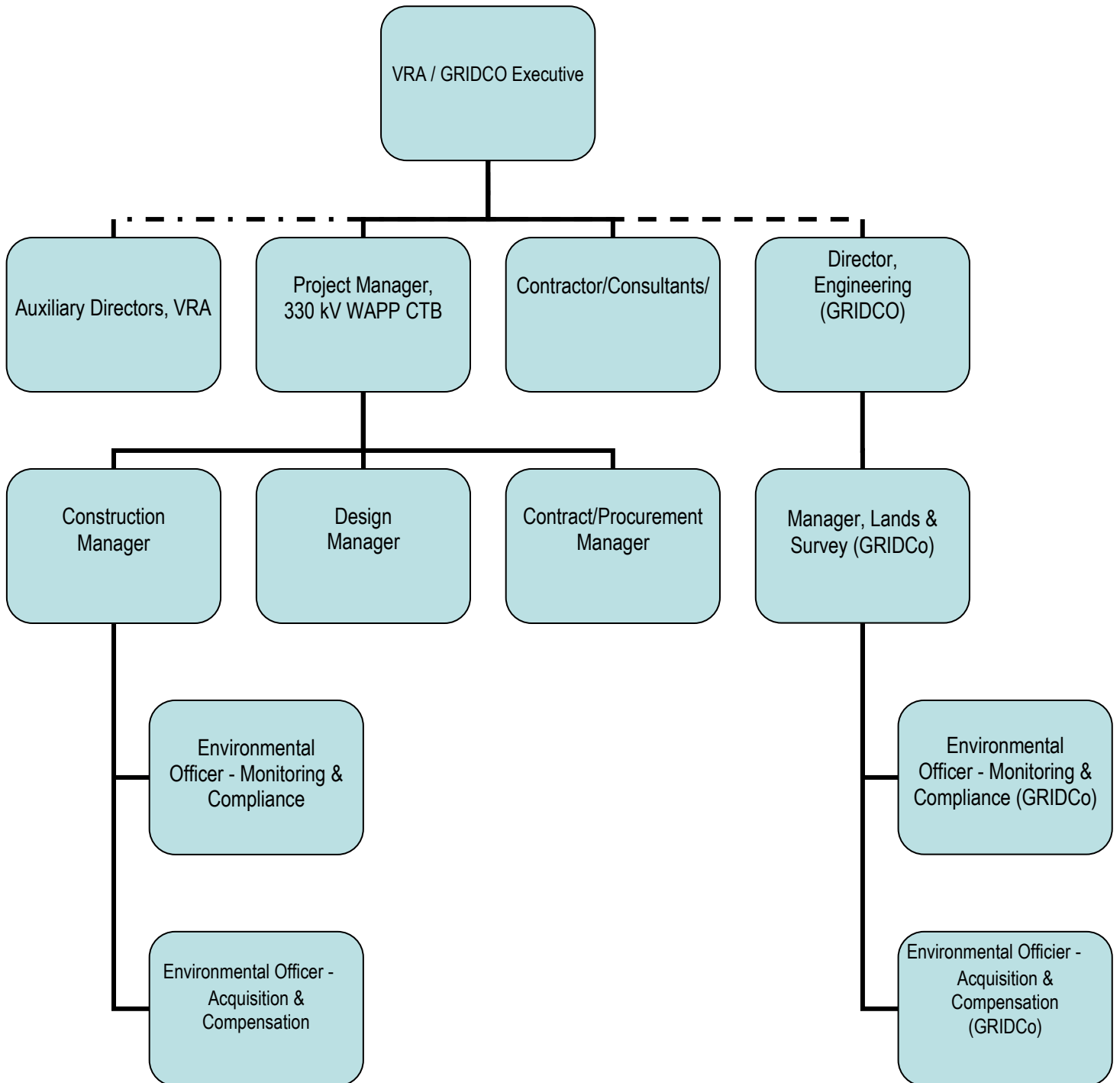
The Environmental Officer-Compliance & Monitoring is the project's representative responsible to the Project Manager and reporting through the Director, Environment & Sustainable Development, VRA, for the detailed day-to-day coordination of inputs from various staff towards the implementation of the plan. The Environmental Officer-Compliance & Monitoring from GRIDCo shall provide support as when relevant.

The responsibilities of the Environmental Officers include:

- Monitoring all environmental and social programmes for the operation phase of the project, including those related to bio-physical and socio-economic/cultural components.
- Working closely and coordinating efforts with the EPA and other enforcement bodies to ensure full compliance with all legal and regulatory requirements.
- Organising activities to motivate and maintain the interest of project staff in environmental and social issues and assisting to increase project staff awareness of environmental issues through training programmes and review meetings.
- Coordinating investigations into/of all types of accidents.
- Conducting environmental and social audits in accordance with project monitoring guidelines.
- Working closely with contractors to ensure that all monitoring and mitigation guidelines recommendations for the project are strictly adhered to. This includes compliance with all health, social and safety guidelines outlined and following strictly VRA's environmental policy guidelines.
- Developing a work plan for the implementing of the EMP.
- Make budgetary provisions for projects' environmental programmes.
- Establishing and running a reporting system on progress (or otherwise) in implementing mitigation measures (including contractor's obligations), training, etc.
- Production of Environmental Reports.

Despite these responsibilities, site supervisors within their own sections are responsible for the working methods, which are adopted in the working practices and must be made aware of the serious consequences of any lapses in the implementation of the environmental protection procedure. Again, site operatives are responsible for their own actions in so much as they may be detrimental to the environment, usual aids such as notices must be strategically placed in order to remind everyone on site of their responsibilities.

Figure 3: Environmental based Organisational Chart



8.2 TRAINING, AWARENESS CREATION AND COMPETENCE

VRA Management is committed to ensuring that there is environmental awareness amongst all workers. It therefore provides training for all workers in environmental aspects of their work and maintains record of such training programmes. Currently at VRA, training is carried out in both the formal and informal manner. Some of such programmes include attending formal training courses, workshops and conferences, lectures on environmental issues at general plant meetings, showing of environmental videos and slides, drills on oil spill prevention and management, as well as other on-the-job activities.

The project shall produce training needs assessment matrix on an annual basis and this shall include the relevant job functions and the different types of technical knowledge required to operate the ESMP. This shall be achieved by:

- Identifying the issues and procedures that employees need to be trained in and the key roles that they will require training.
- Filling out a training needs matrix to ensure that training is targeted to a specific audience.
- Ensuring that, as a minimum, all workers (including new recruits) receive basic training in environmental awareness and the elements of the ESMP.

Proof of various trainings to enhance environmental performance must be outlined in training reports for the project. It is important that system is put in place to ensure that if a worker misses a key training session, it is flagged up and rescheduled for a later date. Procedures for recording training needs and keeping records of attendance must be kept at all times by relevant staff.

8.3 ENVIRONMENTAL MONITORING PROGRAMME

The project will undertake continuous monitoring of the identified impacts. A detailed environmental monitoring programme is required for implementation of the project. The monitoring programme has been developed to determine impacts on the physical and biological and socio-economic/cultural environments within the project's area of influence, i.e. Right of way, constructional site, communities, nearby water bodies, substation, etc.

The monitoring results are expected to indicate whether the predictions of potential environmental impacts are accurate and also whether the mitigation measures proposed for the management of the impacts are appropriate and adequate. The programme will also serve as an early warning system by revealing unforeseen impacts and allowing additional corrective measures to be implemented to arrest the situation and ensure that irreversible damage is not caused. The programme is also expected to provide useful guidance for the successful planning and

implementation of future power transmission line projects that will be undertaken by the VRA/GRIDCo.

Data collected will serve the twin purpose of updating existing baseline information as well as checking compliance with the regulatory requirements of the Ghana Environmental Protection Agency (EPA). The monitoring programme has been designed as part of the strategies for the implementation of the provisions of the ESMP. It is essential that the basis for the choices, options and decisions made in formulating or designing the project and other environmental and social safeguard measures are verified for adequacy and appropriateness.

Monitoring verifies the effectiveness of impact management, including the extent to which mitigation measures are successfully implemented. Monitoring specifically helps to:

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

VRA and GRIDCo as well as the Contractor/Consultants Environmental Team members must be trained adequately to understand and appreciate the choice of parameters, sampling sites, methods of sampling/measuring and analysis and frequency of monitoring. Annual Environmental Reports are to be prepared for the project will specifically provide information on the transmission activities.

The result of the environmental monitoring programme will go in to preparation on the updated ESMP for the transmission project.

8.3.1 Monitoring Parameters

A description of the monitoring activities aimed at monitoring the pollutant concentrations in the surrounding area in terms of parameters, frequency of measurements, and responsibilities is presented in Table 7.

The monitoring programme has been developed for the following parameters:

8.3.1.1 Noise pollution

Noise pollution levels will be measured once every week close to the areas where construction activities are being carried out including settlements such as indicated earlier. An integrating noise meter that conforms to the latest edition of American National Standards Institute (ANSI) S1.43 shall be used.

The noise measurements will determine the ambient levels of noise due to the operation of machinery in addition to the exposure of workers to noise for purposes of mitigating worker health. Noise levels associated with certain identified plant equipment shall also be measured on regular basis to assess the need for protection for staff working in proximity to such equipment.

EPA guidelines shall provide basis for comparison to adherence to regulatory requirements. Any unforeseen excessive noise from any machinery will indicate a lack of proper servicing and prompt remedial action can then be taken.

Table 7: Summary of the Monitoring Programme

Parameters to be Monitored	Measurements	Frequency of Measurement	Responsibilities
Line Route Survey Clearing of vegetation cover during line route survey. <ul style="list-style-type: none"> • Clearing of farms lands • Tree felling (forest reserves) Public Information Disclosure of EIS Report	Hectares (area cleared in project area) Disclosure in the National Dailies	Throughout line route survey One Disclosure	VRA/Contractor VRA/EPA
<u>Water Quality Monitoring</u> <ul style="list-style-type: none"> • BOD • pH • DO • Turbidity • Total suspended solids • Conductivity • Total coli form 	<ul style="list-style-type: none"> • mg/l • mg/l • mg/l • NTU • mg/l • µS/cm • MPN/100 ml 	Weekly	VRA/Contractor
<u>Transportation</u> <ul style="list-style-type: none"> • Speed Limits of vehicles, traffic congestion on main roads (near project sites) • Trucks conditions and maintenance • Vehicular accident records • Vehicle safety signals (flares, warning lights, reflectors etc) • Vehicle fuelling procedures • Vehicle loading/off loading procedures • Vehicle daily check outs • Driving licenses and permit to drive • First Aid and Fire Extinguishing kit 	<ul style="list-style-type: none"> • Km/hr • No. of Preventive Mtce. • Number • Number • Number • Number • Number • Number • Number • Quantity 	<ul style="list-style-type: none"> • Daily • Monthly • Monthly • Monthly • Monthly • Monthly • Monthly • Monthly • Daily 	VRA/Contractor
<u>Waste Management</u> <ul style="list-style-type: none"> • Burning of waste bush • Waste water handling • Waste segregation • Waste dump sites • Disposal of conductor drums • Disposal of metallic waste • Disposal of empty chemical containers 	<ul style="list-style-type: none"> • Kgs. • Cm3 • Kgs. • Number • Number • Kgs. • Number 	Weekly	VRA/Contractor
Public Safety Warning Signs on Pylons			

Parameters to be Monitored	Measurements	Frequency of Measurement	Responsibilities
<u>Socio-economic/cultural issues</u> <ul style="list-style-type: none"> • Shrines • Sacred Grove • Identifying all affected persons • Assessment of compensation • Payment of compensation (adequate amounts, timely payments); • Archaeological Chance finds • Employment and job creation • HIV/AIDS Education programme • Condoms made available for workers • Level of employment of local labour 	Number Number Number Amount Amount Number Number Number of programmes Number Number	Daily Daily Annually	VRA / Contractor / Dept. of Museum / Ghana Health Service / Bolgatanga Municipality
<u>Vegetation Clearing</u> Clearing of vegetation cover at tower tracks, construction accesses, and right-of-way should be monitored under the following activities: <ul style="list-style-type: none"> • Tree felling (forest reserves) • Clearing of farms lands • Clearing of right of way (vegetation cut only to 1.25m height) • Clearing of tower track (graded width 2.5m-3m) • Clearing access tracks (graded width 3.5m) 	No. of trees Hectares Hectares Hectares Hectares	Daily	VRA/Contractor
<ul style="list-style-type: none"> • Routine aerial inspection of lines • Routine ground/aerial inspection of lines • Towers (vandalism, corrosion) • Insulators and accessories (damages, Replacements) • Accidents involving lines and structures • Occupational hazards and accidents • Accidents affecting public safety • Substations – oily wastes, transformer oil 	Number Number Number Number Number Number m ³	Annual Quarterly Quarterly Quarterly Quarterly Quarterly As and when it occurs Quarterly	VRA/GRIDCO
Occupational Safety & Health <ul style="list-style-type: none"> • Manual lifting • Hearing protection • Protective equipment • Good housekeeping • Fire prevention • Prevention of falls from heights • Electrical hazards • Machinery safety • Welding safety • Head protection • Feet protection • Provision of first aid items 	<ul style="list-style-type: none"> • Number • Number • Number • Number • Number • Number • Number • Number • Number • Number • Number • Number 	<ul style="list-style-type: none"> • Daily • Daily • Daily • Daily • Daily • Daily • Daily • Daily • Daily • Daily • Daily • Daily 	Safety Officer

Parameters to be Monitored	Measurements	Frequency of Measurement	Responsibilities
Fire Prevention: <ul style="list-style-type: none"> • Posting of “no smoking” signs at fire sensitive areas (e.g. fuel storage areas at the work camp, etc) • Provision of appropriate and adequate number of fire extinguishers • Proper storage of rags used in cleaning hands and containing flammable liquids (e.g. in metal containers for safe disposal) • Handling of flammable materials by competent persons only • Provision of emergency fire alarm systems 	<ul style="list-style-type: none"> • Number 	<ul style="list-style-type: none"> • Daily 	Safety Officer

8.3.1.2 Water quality of rivers/streams

Within the project area, there is the Yarogatouga river as well as two (2) main dugouts ponds of over 1.5 km² in surface area located at Sumbrungo-Kulbia and Doba which are used for livestock, crop farming and domestic purposes. In the event that the project requires to draw water from any of these water bodies, there shall be the need to monitor the water quality for purposes of quality assurance and reference purposes. Table 8 outlines the relevant parameters which are to be monitored on a weekly basis if the project draws water from these water bodies for constructional activities.

Table 8: Water Quality Parameters for Monitoring & Maximum Permissible Levels

Parameter	Maximum Permissible Level	Parameter	Maximum Permissible Level
Colour (TCU)	200	Phosphate PO ₄ -P mg/L	2.0
pH	6 – 9	Nitrate NO ₃ -N mg/L	0.1
Turbidity NTU	75	Temperature (Mean) °C	< 3° C above ambient
Solids (Tot. Dissolved) mg/L	50	Ammonia as N (mg/L)	1.5
Solids (Suspended) mg/L	50	Sulphate, mg/L	< 400
Conductivity (µS/cm)	750	Oxygen Demand (chemical) mg/L	250
E. Colliforms (MPN/100ml)	0	Oxygen Demand (Biological) [BOD ₅] mg/L	50
Ammonia as N (mg/L)	1.5	Oil & Grease mg/L	10.0

8.3.1.3 Vegetation Clearing

During the constructional phase, clearing of vegetation cover within the tower corridor and access tracks and the tower base areas will be monitored carefully to ensure that the minimum area requirements are not exceeded. Individual tree felling activities will be monitored to ensure that environmental and safety measures proposed under mitigation are fully implemented. Dumping shall be monitored on weekly basis to ensure that it is done at the appropriate spoil areas.

Clearing of vegetation and cutting of trees within the RoW but outside the tower corridor track will be monitored to ensure that the specified height of 1.25m is complied with. Monitoring will also ensure that fire is not used for vegetation clearing. These measures, apart from the clearing of tower base areas, are also relevant for vegetation maintenance during the operational phase.

8.3.1.4 Transportation effects

The following parameters/activities will be monitored:

- a) Speed limits of vehicles especially within settlements. Random checks on speed limits of vehicles will be carried out daily.
- b) Loading of vehicles. Vehicle loading procedures will be monitored at all loading points to ensure that materials and equipment are properly secured in truck/vehicles.
- c) Covering of vehicles conveying dust-generating materials. Random checks will be carried out daily on vehicles.
- d) Trucks/vehicle conditions and maintenance (i.e. road worthiness of vehicles). Daily checks on conditions of vehicles. A monthly check will also be conducted on vehicles to ensure that maintenance schedules are adhered to.
- e) Vehicular accident records. All vehicular accidents or dangerous occurrences relating to vehicles will be recorded in the accidents record book or register.

8.3.1.5 Occupational safety and health issues

The availability and use of personal protective equipment will be closely monitored continuously during both the constructional and operational phases. All employees who refuse to use the protective equipment provided will be properly sanctioned. To ensure that personal protective equipment is always readily available, all equipment will be promptly replaced. Regular safety tests as recommended by manufacturers will be conducted on equipment such as cranes and winches.

8.3.1.6 Fire hazards

In order to prevent any outbreak of fires construction work will be monitored continuously to ensure that the execution of works is done adhering strictly to technical specifications relevant to electrical safety. The use of low quality components, inadequate sizing of cables and negligent execution of works and

general non-observance of safety rules will be monitored regularly. Proper and sufficient supervision of workers will be monitored.

Fire extinguishers will be checked on a regular basis. Periodic servicing and recharging will be promptly done. The servicing and recharging schedule will be staggered in such a way as to ensure that adequate fire protection is provided at all times.

8.3.1.7 Waste Management

The collection and use of wooden wastes as fuel wood by the local communities will be monitored on monthly basis. Also, the collection and sale of scrap metal to dealers will be monitored monthly to ensure that metal wastes are managed efficiently. The management of other solid wastes will be monitored on weekly basis to ensure that the wastes are collected promptly and disposed of at appropriate public waste dumping sites.

The cleanup of accidental spills of oil, fuel and paints whenever they occur will be monitored to ensure that the cleanup is promptly and properly done.

8.3.1.8 Transmission lines

Continued exposure to electromagnetic field (EMF) effects is suspected to be the cause of cancer, though no direct link has been medically established yet. Public apprehension about EMF due to misunderstanding could cause panic.

Transmission lines will be monitored half yearly during the operational and maintenance phase through inspections for signs of damages and/or deterioration of insulators and accessories. Aerial inspection through the use of helicopter will be done on an annual basis. Replacements of any such damaged parts will be promptly carried out. Periodic maintenance works shall be carried out to eliminate dangers posed by corroded and worn out tower parts and accessories.

8.3.1.9 Public/Worker Safety

Occurrences of accidents involving transmission lines and structures that affect public safety or worker safety will be monitored and recorded whenever they happen. The frequency and severity of such occurrences will be recorded. This will eventually indicate whether additional mitigation measures are required to make the system safer.

Further, VRA shall continue with its public educational programme by placing warning notices, "DANGER-225,000 VOLTS", on each pylon to deter the public from climbing the pylons. The warning signs on the pylons should be monitored on a regular basis and replaced in the event that they are removed or not visible enough.

Monitoring of the construction of homes and permanent structures shall be done and destroyed.

8.3.1.10 Identification of project-affected persons and compensation payment

Monitoring of project-affected persons will be carried as long as required to ensure that all affected persons have been identified and payment of adequate compensation duly effected. It is however expected that issues of compensation will be concluded within a period of five (5) years from the date of commencement of payment.

8.3.1.11 Cultural/archaeological ‘chance finds’

During constructional phase, cultural/archaeological ‘chance finds’ - sites of cultural significance such as sacred woods or trees or rock outcrops and historical or archaeological heritage/items or sites which the local residents may not have mentioned at the survey stage – will be monitored to ensure that such sites or items are properly managed to the satisfaction of both the local communities, the EPA and/or the Museums and Monuments Board.

8.3.1.12 Substation

During the operational phase of the project the substation will be monitored to ensure that it complies with all regulatory requirements. Parameters that shall be monitored shall include following:

a) Fire safety

The substation will be monitored once a year to ensure that all installed fire extinguishers and water hydrants are in working conditions and that all extinguishers have been recharged as required by the Factories, Offices and Shops Act (Act 328). The perimeter of the substation shall also be inspected to ensure that the vegetation barrier (fire buffer) created against bush fires is well maintained.

b) Storm water drains

Storm water drains at the substation shall be monitored on a regular basis to ensure that there are no blockages and that the water drains out smoothly to avoid backflow and flooding of the substation.

c) Noise

Operating noise levels of the substation shall be monitored to ensure the levels do not go beyond the guideline limit values.

d) Occupational safety, health and welfare

The safety health and welfare of the workers is of paramount importance to the BPA/GRIDCo. Monitoring shall therefore be carried out on occupational safety and health within the substation during its operational phase. Parameters to be monitored shall include, but not limited to:

e) Personal protective equipment

The provision and use of PPEs shall be monitored on a monthly basis to ensure workers are well protected against the hazards of the workplace.

f) Good housekeeping

Management will ensure that good housekeeping is maintained at all times on the premises. All weeds springing up through the stone carpet of the substation shall be physically removed. The buffer zone of the substation shall also be monitored on a daily basis to ensure that there is always a fire break at the perimeter. The premises will be monitored to ensure that potential nesting places of birds are kept free of bird nests that are likely to cause electrical faults.

8.3.1.13 HIV/AIDS

In addition to the HIV/AIDS education of the workforce, VRA will, in close cooperation with the District Health Management Team of each of the Districts, monitor the incidence rate of the districts for any drastic changes during the construction stage of the project cycle through review of District Health Reports. Even though this monitoring programme could be useful, the VRA will ensure, through its educational programme that safe sex is practised by the construction teams so that incidences of the disease due to activities of the construction crew is prevented.

8.4 PROJECT ENVIRONMENTAL PERMIT

Following the submission of ESIA Reports, the EPA issues an Environmental Permit to allow for the physical construction of projects to commence. The Permit outlines various conditions that must be adhered to in project implementation. It must be noted that it is an offence under Regulation 29 of the Environmental Assessment Regulations LI 1652 of 1999 to start a project without an Environmental Permit.

Some conditions that are general in an Environmental Permit for Transmission line projects and must be adhered to include:

- a) Commitment to Project Specifications
- b) Occupational Health Safety Management
- c) Noise & Dust Level Monitoring

- d) Traffic Management
- e) Compliance with Forest Service Guidelines
- f) Waste Management
- g) Commencement & Completion Notice
- h) Notification of Changes
- i) Annual Environmental Report
- j) Environmental Management Plan
- k) Environmental Certificate

VRA shall comply with all project specifications, mitigations, monitoring and other environmental management provisions that would be indicated in the Environmental Permit for the “225 kV Bolgatanga-Ouagadougou Interconnection Project – Ghana Section”. Management shall ensure that all conditions are strictly adhered to. The Environmental Officer is directly responsible for implementing the conditions outlined in the permit.

8.5 EMP AUDITING AND REPORTING

As part of the ongoing environmental management practices of VRA, and in order to enhance the environmental compliance, VRA allows for both internal and external environmental auditing of its projects. This assessment is performed by external consultants, covering environmental and social aspects.

For the evaluation of the implementation of this ESMP, an annual internal environmental audit will be performed. The objectives to conduct the environmental audit shall be:

- To determine the status of compliance with the present VRA environmental policy statement;
- To determine the status of the implementation of the ESMP;
- To determine the status of compliance with EPA and international environmental protection regulations;
- To assess environmental awareness with workers' and management;
- To assess the actual capacity to implement the ESMP; and
- To identify areas of potential improvement in the ESMP.

Based on the results of the internal environmental audit, an Annual Environmental Report will be prepared. This annual report, which is a legal obligation, shall be submitted to the EPA.

The physical construction of the line may take up to a year following which the line would be commissioned. As earlier indicated, after the expected commissioning of the project, the management and supervisory function of VRA over the operations of the “225 kV Bolgatanga-Ouagadougou Interconnection Project – Ghana Section” will be the responsibility of GRIDCo. GRIDCo will therefore be responsible for environmental and social reporting on the Project to the EPA. Prior to the turnover of the Project to GRIDCo, VRA may engage an external consultant to

undertake an Environmental and Social Audit of “225 kV Bolgatanga-Ouagadougou Interconnection Project – Ghana Section” as may be agreed with the financiers of the project.

The objectives of the Environmental and Social Management Audit shall be as follows:

- a) To verify the accuracy and status of VRA’s activities carried out with respect to environmental management compliance and Land/Right of Way Acquisition and payment of compensation to Project Affected Persons (for crops economic trees and estates) due to the implementation of the Project.
- b) To define, cost and plan a schedule for any supplemental actions that may be required to be undertaken to mitigate any departures from national, international and funding agencies policies in the environmental management strategies and land acquisition and compensation activities undertaken to date
- c) To advise VRA on the sufficiency of environmental and land acquisition activities undertaken and inform VRA on whether the environmental management and acquisition and compensation activities meet national, international and funding agencies standards and confirm compliance with all relevant environmental, health socio-economic and safety regulations.

Based on information in the Annual Environmental Reports as well as the Environmental and Social Audit (where relevant), VRA/GRIDCo will have the responsibility to update the ESMP within eighteen months of the commencement of physical construction and extended to a new phase of 3 years in line with EPA requirements. This updated ESMP shall be submitted to the EPA. The updated ESMP may be prepared with the support of external consultancy if necessary.

8.6 LEGAL REQUIREMENT AND BIDDING CONTRACT DOCUMENTS

It must be noted that whether an Environmental Impact Assessment (EIA) and/or an Environmental Management Plan (EMP) is prepared for a particular project, it is important that before the order to commence any works the Contractor is required to prepare his own EMP for each subproject within a Lot as specified in the EIA/EMP. The EMP shall spell out how the Contractor will achieve environmental targets and objectives specified in the EIA/EMP.

The Contractor’s EMP shall include, to the extent practicable and reasonable, all steps to be taken by the Contractor to protect the environment in accordance with the current provisions of national environmental regulations and/or the EIA/EMP for this project. Basic information required includes the following:

- a. Worksite/camp site Waste Management
- b. Material Excavation

- c. Material Deposit
- d. Rehabilitation and soil erosion prevention
- e. Water resources management
- f. Traffic management
- g. Blasting
- h. Disposal of Relocated Elements
- i. Health and Safety
- j. Repair of Private Property

Notwithstanding the Contractor's obligation under the above clause, the Contractor shall implement all measures necessary to restore the sites to acceptable standards and abide by environmental performance indicators specified in the Projects EIA/EMP to measure progress towards achieving objectives during execution or upon completion of any works.

The legal requirements and contract clauses provided in the bidding documents for the 225 kV Bolgatanga – Ouagadougou Interconnection Project to guide the operations of contractors/consultants/agencies is outlined below:

1. **Minimization of Resettlement:** As far as possible, the Contractor shall avoid routing construction access tracks through farmlands. Existing and available farm tracks shall be as much as is possible. The Contractor shall supervise the re-growth of access roads to check erosion.
2. **Property Valuation:** For now, properties that have been valued only comprise permanent buildings and perennial cash crops such as shea nut trees, plantain, and fruit bearing trees, as well as other crops cultivated purposely for some purposes, such as for burning into firewood. There are no plantations falling within the corridor. These have been done by a licensed property value using approved Land Valuation Division rates. This valuation remains tentative, and will only be effective after the approval of the ESIA report.
3. **Resettlement:** The VRA shall hold consultations with and supervise the payment of compensation to project-affected persons. Persons whose properties such as buildings, farms and lands will be affected would be promptly and adequately compensated when the optimal line route is approved by Ghana EPA via the ESIA study report. A record of such compensation payments will be kept.
4. **Loss of vegetation:** The Contractor shall ensure that vegetation clearing is kept to the barest minimum, and is done only in areas where it is necessary.
5. **Noise:** The Contractor shall ensure that equipment used on the project is well maintained and operated in such a manner as not to generate noise exceeding the EPA standards on ambient noise levels. Measures would include avoiding working in the night, when permitted noise threshold levels are lower than daytime levels.

6. **Air quality (Dust):** The Contractor shall ensure that work sites and sand heaps are watered down to limit dust emissions within the EPA guidelines on air quality for a particular working area.
7. **Soil Erosion:** The Contractor shall ensure that selected access roads do not cross water bodies, wetlands and marshy areas. Number of truck passes to and from tower construction sites shall be regulated to the barest minimum. Ground surfaces at tower sites shall be so graded as to drain runoff from tower legs.
8. **Occupational Health and Safety:** The Contractor shall be responsible for the occupational health and safety of all workers on the site at all times. Workers will be provided with personal protection equipment (PPE) such as hand gloves, safety boots and nose masks at all times, and their use enforced. All machinery and equipment shall be operated and maintained in accordance with the manufacturer's specifications to minimize accidents. The Contractor shall ensure strict adherence to regulatory safety standards and precautions.
9. **Public Health:** The Contractor shall ensure that appropriate warning notices are placed at entry points of access roads, and appropriate road safety signals and safe speed limits are observed.
10. **Pollution of Water bodies:** The Contractor shall ensure that drains leading from work areas are directed away from nearby water bodies.
11. **Solid and liquid waste generation:** The Contractor shall ensure that cleared vegetation is collected and properly disposed of. The Contractor shall also ensure that liquid wastes are directed away from water bodies. Waste oils and fuels shall be collected and properly disposed of.
12. **Environmental supervision:** The Contractor shall nominate an officer with knowledge in environmental issues to supervise the project to ensure that environments commitments are adhered to by the VRA.
13. **Chance archaeological finds:** the Contractor shall license with VRA/Ghana Museums and Monuments Board for any archaeological chance find in the project area.

8.7 ENVIRONMENTAL DOCUMENT CONTROL

Results of environmental monitoring activities will be reported to allow for identification of mitigation measures that need corrective action. VRA has the ultimate responsibility to ensure environmental reporting procedures are being undertaken at the project. The Environmental Officer shall monitor all environmental activities whilst the Safety Officer monitors the health and safety activities. Results of environmental monitoring activities will be reported to allow for identification of mitigation measures that need corrective action.

During the project phase, VRA will carry the ultimate responsibility of ensuring that environmental reporting procedures are undertaken. The Project Team will carry out monthly discussions on the project which will form a forum for discussions on environmental issues, and decision making with regard to further mitigation, monitoring, or changes to project activities.

All environmental procedures, periodic statutory reports to regulatory agencies such as the EPA, Energy Commission should be produced and controlled in accordance with the station's document control procedure.

The following types of reports shall be produced:

- a) Monthly Regular Report: This shall comprise of monthly activity report which shall provide information on environment protection activities performed during the period.
- b) Emergency report: This shall comprise of issues to be submitted promptly in case of emergencies
- c) Topic Report: Report concerning influential environment issues.
- d) Annual Environmental Report: This shall comprise of information on all environmental activities undertaken during the year beginning from January to December and submitted to the EPA.

The Environmental Officer shall coordinate the production of monthly, quarterly, activity as well as legally binding environmental reports. The reports shall form the basis for the preparation of an Annual Environmental Report (AER), as a requirement of the Environmental Impact Assessment Regulations, to be submitted to the Environmental Protection Agency. The Quarterly Environmental Reports and AER must be submitted to the E&SD Department for review to ensure that accurate and appropriate information is provided. The AER shall be prepared and must be submitted to the EPA by close of March, each year.

These statutory reports when finalised must be forwarded to all relevant VRA departments, specifically, 330kV WAPP CTB Unit, Engineering Services, Technical Services as well as to GRIDCo and kept by the Environmental Officer, and should be made available to every worker who require its use in the course of activities undertaken. All monitoring and reporting documents must be kept on file, as part of VRA/GRIDCo/Contractor documentation procedures. An open door policy must be maintained by all agencies on information regarding all environmental issues; such information can be accessed by any worker for purposes of improving on work output.

8.8 MONITORING COST

For purposes of achieving a very high level of compliance with regard to implementation of all environmental commitments, the VRA/Contractor shall make budgetary allocations towards all environmental programmes. Financial

commitments shall be made from these allocations on program-by-program basis. The coordination costs shall be included in the running cost of E&SDD.

VRA will finance the environmental monitoring aspects of the transmission line project from the project implementation cost. An amount of US \$216,300.00 has been estimated for environmental monitoring activities for the constructional phase of the project, i.e. within the 12 months period. Detailed budget for achieving environmental compliance shall therefore form part of VRA Corporate budget.

A breakdown of the budget for the monitoring is shown in Table 9.

Table 9: Estimated budget for the environmental monitoring activities

Environmental Monitoring Parameter	Equipment	Contracts (Works & Services)	Training, Workshop and Communication	Sub-Total investment	Administration	National Consultants	International Consultants	Consumables	Sub-totals operations	Unforeseen Investments+ Operations (5%)	Grand Total (US \$)
Noise Level Monitoring at Project Site / Noisy Equipment	5,000	0	500	5,500	500	0	0	0	500	300	6,300
Water quality of rivers/streams	3,000	10,000	500	13,500	500	0	0	2,000	2,500	800	16,800
Vegetation clearing	5,000	15,000	500	20,500	500	0	0	0	500	1,050	22,050
Transportation effects	0	0	500	500	500	0	0	0	500	50	1,050
Occupational safety and health issues	25,000	5,000	500	30,500	500	0	0	0	500	1,550	32,550
Fire hazards	20,000	10,000	500	30,500	500	0	0	0	500	1,550	32,550
Disposal of Waste	10,000	25,000	500	35,500	500	0	0	0	500	1,800	37,800
Monitoring of Transmission lines	5,000	3,000	500	8,500	500	0	0	0	500	450	9,450
Public Worker safety	10,000	0	500	10,500	500	0	0	0	500	550	11,550
Community Social Impact Monitoring	0	20,000	500	20,500	500	0	0	0	500	1,050	22,050
Cultural/archaeological 'chance finds'	5,000	2,000	500	7,500	500	0	0	15,000	15,500	1,150	24,150
GRAND TOTAL (US \$)	88,000	15,000	5,500	183,500	5,500	0	0	17,000	22,500	10,300	216,300

9. COST BENEFITS OF IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PLAN

Benefit-cost analysis has played an important role in determining environmental policies. However, the process of analyzing benefits has a number of difficulties. One is the inherent uncertainty and variability in the approaches used in a benefit-cost analysis. Bearing the inevitable limitations, another weakness in analyzing benefits of policies is the time and resource that it takes between proposing a new policy and analyzing its benefits.

Currently, there has not been any study or detailed analysis to identify the cost benefits for implementing the various action plans under this ESMP. Thus this document cannot provide information on cost savings. It is however important to note that the EMP can positively assist VRA/Contractor to demonstrate fully its environmental performance to the financial community, decreasing its cost of capital and enhancing its corporate value. It is generally known that implementing an ESMP shall help in achieving cost savings and improving environmental performance. The financial benefits of implementing an ESMP; flow not only to the company implementing it, but also to the public at large.

For example, even though the environmental, health and safety benefits to the public have not yet been adequately quantified, recent studies in the US indicates that for every dollar that company invested in pollution prevention equipment, between 43 and 54 cents of additional state taxes are realized through income taxes on the increased profits of these businesses⁷. Local governments also benefit from private sector zero emissions goals. Reduced air emissions and reduced discharges to a water treatment system, for example, provide immediate additional capacity for local economic development without having to expand local infrastructure.

The ESMP for “225 kV Bolgatanga-Ouagadougou Interconnection Project-Ghana Section” can help save money only if it is implemented in an effective and systematic manner with an emphasis on minimising releases into the atmosphere and waste and ensuring continual improvement. This is because implementing the ESMP helps identify, assess and manage the environmental consequences of operations. However, the ESMP provides a practical management tool that can help the company gain various benefits as outlined in Table 10.

⁷ Strategic Environmental Management in Pennsylvania: New Tools for Gaining Environmental and Economic Efficiencies

Table 10: Potential benefits of implementing an EMP

Area of benefit	Potential Benefits
Financial	Identification of opportunities to reduce waste and thus reduce raw material, utility and waste disposal costs
	Increased profits
	Lower insurance premiums as risks and liabilities are reduced
	Reduced risk of fines for non-compliance with environmental legislation
	More easily obtainable bank loans
	Attracting shareholders and investors
	Retaining site asset value
	Helps in early detection of equipment malfunctioning
Productivity	Improved process control
	Reduced use of raw materials and consumables
	Less waste and rejects
Sales and marketing	Improved products
	Competitive advantage (preferred supplier status)
Management	Structured approach to environmental issues and continual improvement
	Keeping ahead of environmental legislation
	Better relations with regulators
Public relations	Improved relations with local community and environmental groups
	Improved public image
Personnel and training	Improved working environment
	Reduced potential for environmental incidents
	Increased employee motivation and environmental awareness
Peace of mind	Avoiding penalties for pollution
	Conforming to legal requirements

9.1 TOOLS FOR COST BENEFIT ANALYSIS OF ENVIRONMENTAL PERFORMANCE

Various tools exist that can help the project realise the financial benefits that result from the implementation of this ESMP by tracking environmental performance and its associated costs and benefits which is a key to future business success. These added value tools include environmental accounting and lifecycle analysis.

A brief on these tools is highlighted below to draw attention to them;

9.1.1 Environmental Accounting

One tool that may prove useful to an evolving environmental management system is a process for identifying the true costs and savings associated with managing the organization's environmental aspects. Environmental accounting principles incorporate environmental cost information into standard accounting practices. Environmentally-related costs normally hidden in general categories, such as overhead accounts, are allocated to the products or processes that generated them. Environmental accounting should factor in all of the environmental costs (direct and indirect) of the product/process--not just the cost of pollution prevention and new equipment. The cost of disposal, potential liability from exceedances or from disposal, cost avoidance, etc., should also be included. These are included in life cycle cost assessment and performance measures, and should be included in the overall accounting system. An environmental accounting system can generate reliable financial data which will enable organizations to:

- Evaluate and compare the total costs of current processes to the total costs of potential alternatives based on pollution prevention and energy efficiency strategies, and assign these costs to units of production.
- Determine the benefits and cost savings associated with investments in pollution prevention through improved measures of profitability such as Payback Period, Net Present Value, or Internal Rate of Return.
- Evaluate potential capital investments using total cost environmental data.
- Identify current and potential environmental liability costs.
- Identify less tangible costs and benefits that can affect an organization's financial standing such as product quality, productivity, market share, stakeholder relations, employee health and safety, and public image.

9.1.2 Life Cycle Analysis

A second tool that can add value to an organization's environmental management system and is a key element of sustainable development is Life Cycle Analysis (LCA) also referred to by some as product stewardship. Life Cycle Analysis is a process to evaluate the environmental burdens associated with a product, package, process, or activity by identifying and quantifying energy and material usage and environmental releases throughout the life cycle. A product's life cycle begins with the initial acquisition of raw materials from the ground or water and

continues through all stages of processing, manufacturing, distribution, transportation, consumption, and final disposal. Although the concept of Life Cycle Analysis is still evolving, it is increasingly being recognized as a valuable tool to assist organizations with environmental improvements. By conducting a Life Cycle Analysis, organizations can more effectively develop and substantiate strategies to eliminate or minimize waste associated with their products and processes.

Specifically, Life Cycle Analysis can assist an organization to:

- Assess the impact of energy and material usage and environmental releases.
- Determine whether a particular material, design, or process will help or hurt the environment relative to other alternatives.
- Evaluate opportunities for environmental improvements and source reduction strategies.
- Develop product designs that are more sustainable and environmentally friendly.
- Enhance credibility with customers and regulators through good product stewardship.

9.2 BENEFITS OF TRANSMISSION LINE PROJECT

Indications from various system planning studies on transmission networks in the West Africa sub-region are that the increasing reliance on hydro-based power systems will not provide sufficient regional security of electricity supply, and the lack of adequate transmission infrastructure (within and between national power systems) is the weakest link in the drive towards greater cooperation in power sector development. There is therefore the need to provide adequate transmission capacity for the evacuation of the power. The West Africa Power Pool (WAPP) thus serves to establish a regional electricity market in West Africa through the judicious development and realization of key priority infrastructure that would permit accessibility to economic energy resources, to all member states of the ECOWAS.

The ongoing and near-term electricity generation and transmission projects in Ghana, in addition to the 330 kV WAPP Coastal Transmission Backbone Project will serve to increase the available spare capacity in Ghana when combined with the current importations from Côte d'Ivoire. Additionally, the availability of gas in Ghana from the West African Gas Pipeline and the Jubilee Fields will permit the exportation of low cost power from Ghana to other countries in the West Africa Sub-Region.

9.2.1 Project Benefits

The VRA under the WAPP CTB Project is constructing this project to facilitate the exportation of power to the sub-region. The transmission line project will have a significant impact on the macro-economic base of Ghana. Some of its inherent benefits are as follows:

- a) The Project will create jobs during the construction and operations and will create up to more than 300 jobs for both skilled and unskilled staff.
- b) The Project will provide assistance to communities around its catchment area in the areas of education, sports, health and the provision of food, drinking water and electricity.
- c) The Project will also contribute vital electrical power infrastructure and will significantly support the development of the Ghanaian economy and stimulate industrialization in Ghana and the West African sub-region.
- d) The prospects for the longer term development of Ghana's hydro-power potential will be improved through the development of increased regional power trading.
- e) The stimulus to regional trade and improved export tariffs will also benefit Ghana's export activities.
- f) Access to possible markets in the West Africa sub-region would be improved.
- g) Ghana's position as the gateway for power into West Africa will be enhanced.
- h) The enhanced interconnection will further demonstrate the benefits of an interconnected electricity system and the ability to develop generation projects on a least-cost integrated resource planning
- i) Increased access to the West Africa Power Project market will assist in the longer term development of the country's abundant sources of hydropower resources providing significant long-term benefits to the industrial performance of the whole of Western Africa.
- j) Diversified growth plan strategy for Ghana will be enhanced.
- k) The technical performance of GRIDCo will be enhanced reducing the impact of fault-related disturbances.
- l) The project will remove a capacity constraint that is denying GRIDCo from some much-needed additional revenues in the short term.
- m) A significant increase in wheeling revenue will accrue to GRIDCo without the need for additional capital investment on their part.

9.2.2 Benefits For Implementing ESMP

In line with VRA Corporate Policy, this ESMP has been prepared as part of the corporate environmental management systems and is being implemented in order to enhance economic and environmental performance. Various mitigative measures that the VRA proposed, and was outlined in the Project's Environmental Permit, have been diligently included in this ESMP. Effective management of the potential environmental impacts and careful monitoring will help to keep predicted impacts to tolerable levels.

Below are some of the benefits to VRA from implementing the ESMP.

9.2.2.1 Environmental Benefits

- i. Enhances environmental compliance
- ii. Effective waste oil management of transformer oils helps in reducing pollution resulting from oil spillage.
- iii. Reduction in fire hazards

- iv. Accidents and subsequently injury to both persons and equipment are prevented and or minimised
- v. Reduction of health and safety hazards through the provision of personal protective equipment during operational and maintenance phase.
- vi. Minimise vegetation clearing and exposure of soil surface.
- vii. Avoid contamination of nearby water bodies
- viii. Avoid environmental degradation and exposure of soil surface.
- ix. To minimise soil destabilisation
- x. Avoid erosion around tower legs and possible tower collapse
- xi. To minimise damage to vegetation and trees
- xii. To minimize possible effects of earthling and electrocution.
- xiii. Minimise incidence of insulator shattering
- xiv. Avoid theft of tower components.
- xv. Minimised damage to crops and hence of compensation to be paid by VRA.
- xvi. Payment of Compensation will offset economic losses of affected persons
- xvii. Minimise risks of accidents and injury
- xviii. To ensure work side safety and avoid accidents

9.2.2.2 Economic Benefits

- i. Cost-effective and reliable supply of electricity in Ghana and the sub-region.
- ii. Tariff paid provides a reliable source of income to VRA.
- iii. Minimised damage to crops and hence of compensation to be paid by VRA.
- iv. Routine maintenance of the project equipment and accessories reduces cost of replacement of equipment to the VRA and allows for the smooth operation of the project without major damages and repairs.
- v. Energy management reduces cost associated with energy wastage.

9.2.2.3 Social Benefits

- i. Provides good corporate image to VRA.
- ii. Payment of Compensation will offset economic losses of affected persons
- iii. Cut vegetation during RoW clearing is left for the community persons to use.
- iv. Community members' benefit from compensation payment for all affected properties.
- v. Community members are engaged to undertake vegetation clearing of RoW.

10. CONCLUSION

The VRA is constructing a 39.3 km 225 kV single circuit twin bundle “TERN” conductor transmission line from the VRA substation to the Ghana-Burkina Faso border, from where it continues to the termination point at Zagtoui, near Ouagadougou in Burkina Faso. In accordance with LI 1737, a 40 metre right of way (RoW) is required for the entire length of the proposed line, which will comprise a 20 metre corridor either side of the power line. The total area of direct impact for land acquisition is about 1.572 km². There is an existing substation at Zorbisi belonging to the VRA, where space has been created to construct a bus bar for the proposed line. The project is known as the “225kV Bolgatanga-Ouagadougou Interconnection Project”.

The constructional phase of the project is expected to commence in June 2011 for a period of one (1) year. In line with VRA Corporate Policy, this Environmental & Social Management Plan for the “225kV Bolgatanga-Ouagadougou Interconnection Project” has been prepared as part of the corporate environmental management systems and is being implemented in order to enhance economic and environmental performance. Management of VRA is committed to ensuring continuous improvement of environmental performance to minimize the impacts of all its operations on the environment, in line with the principles of sustainable development, in addition to complying with national and international environmental protection regulations. Subsequently, a Project Environmental Officer has been assigned to be responsible for maintaining and reviewing the ESMP to ensure adherence to all commitments made.

Apart from the human resources to be made available by the VRA, financial provision shall be made to ensure that mitigation, monitoring and training programmes are effectively implemented. The VRA Corporate Annual Budget includes budgetary provision for environmental management activities. The VRA shall make the necessary budgetary provisions as part of its corporate budget to cover all commitments for the “225kV Bolgatanga-Ouagadougou Interconnection Project”. Various mitigative measures that the VRA proposed, and was outlined in the Project’s ESIA Report, have been diligently included in this ESMP.

Effective management of the potential environmental impacts and careful monitoring will help to keep predicted impacts to tolerable levels. VRA is committed to ensuring that environmental management, health, safety and social activities that need to be implemented shall be satisfactorily executed. This ESMP shall be updated as and when relevant.

Appendix: VRA Safety Code for Forestry Work